

# Strong Bones for Life: Prevent Osteoporosis

## Amy Kostelic, Ph.D.

Family and Consumer Sciences Extension

## Heather Norman-Burgdolf, Ph.D.

Dietetics and Human Nutrition

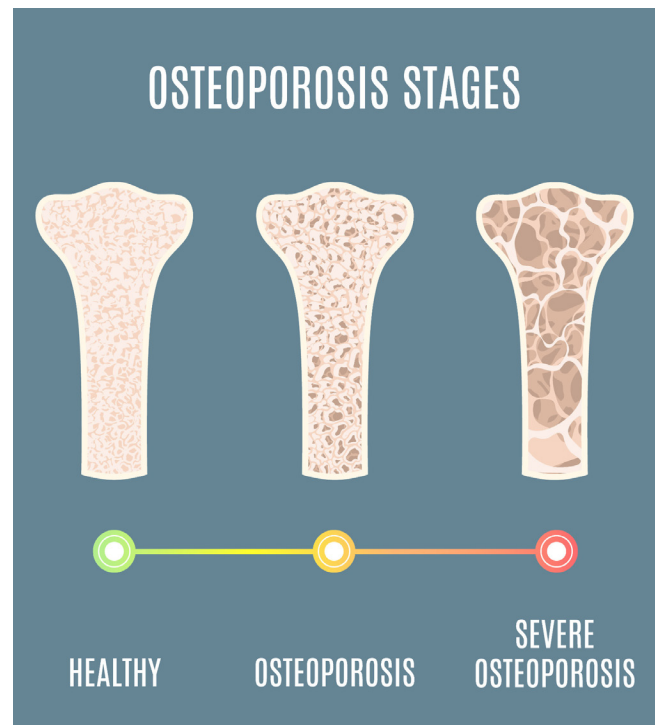
There are many things you can do to keep bones healthy and strong at every age and stage of life. It is never too early, or too late, to embrace a healthy bone lifestyle and work toward preventing osteoporosis.

This publication highlights the risk factors and diagnosis of osteoporosis, prevention and treatment recommendations, as well as lifestyles that promote bone health across the life span. Investing in bone health enhances life quality and independence.

## Bone Health Across the Life Span

The benefits of investing in bone health while young last into old age (NIH, 2022). Proper nutrition and lifestyle habits of a pregnant mother can help build strong bones before a baby is even born (NIH/Medline Plus, 2022). During childhood, adolescence, and early adulthood, bones continue to grow in size and density. During this period, proper nutrition and regular exercise can significantly increase bone mass and enhance bone health. Poor health decisions like smoking, inactivity, excessive alcohol intake and poor diet, can decrease bone mass (NIH, 2021).

Most people reach their peak bone mass in their mid- to late-20s and slowly start losing bone mass around age 40 (NIH, 2021; NIH, 2022). It is normal to lose bone mass over time. But those who



have higher peak bone mass when young are better protected against fractures and osteoporosis in old age (NIH, 2021).

## What is Osteoporosis and Who Gets it?

Osteoporosis is a disease that causes bones to become porous (less dense), weak, and more prone to breaks. A bone with osteoporosis looks like a honeycomb. The spaces within the honeycomb become larger and the outer shell of the honeycomb becomes thinner.

A minor fall, a sudden movement, and even a sneeze, can break a bone in someone with osteoporosis.

Osteoporosis itself is not painful. Some people do not know they have weak bones or osteoporosis until a bone breaks. Because it happens over a long period of time and there are typically no symptoms in the early stages of bone loss, osteoporosis is called the “silent” or “invisible” disease (IOF, 2019; NIH, 2017). Bones most vulnerable to osteoporosis include the spine, hips, ribs, upper arms, and wrists.

Fractures and breaks can be painful, disfiguring, and life changing. There is no cure for osteoporosis but there are ways to prevent and treat it (IOF, 2019; NIH, 2017, 2018).

### Risk Factors and Causes

Osteoporosis affects people of any age, gender, and ethnicity. Some risk factors are preventable, and others are not. Understanding risk factors may help you prevent osteoporosis and fractures.

Preventable Risk Factors	Risk Factors You Cannot Control
<ul style="list-style-type: none"> <li>• Poor diet (low in calcium and vitamin D, excessive dieting, poor protein intake)</li> <li>• Lack of physical activity</li> <li>• Weight</li> <li>• Smoking</li> <li>• Excessive alcohol use</li> <li>• Various medications</li> <li>• Sedentary lifestyle</li> </ul>	<ul style="list-style-type: none"> <li>• Age (60+)</li> <li>• Sex (women are at greater risk)</li> <li>• Race/Ethnicity</li> <li>• Family history</li> <li>• Body size (slender, thin bones)</li> <li>• Hormonal changes</li> <li>• Various medical conditions</li> <li>• Certain medications</li> </ul>

References: IOF, 2019; NIH, 2017; NIH 2018

According to the Mayo Clinic (2021), non-Hispanic white, Asian, and older postmenopausal women are especially susceptible to osteoporosis. The NIH reports that the risk for developing osteoporosis is significant but lower for African and Hispanic women and that osteoporosis is more common in non-Hispanic white men.

### Diagnosing Osteoporosis

It is important to talk about bone health with a health-care professional throughout your life span. In addition to the risk factors, signs or symptoms that could indicate a problem include back pain, a change in posture, loss of height over time, or bones that break easily. If you are concerned, you can request bone health assessments, such as a fracture risk assessment and bone mineral density test, to further identify risk (IOF, 2019).

The International Osteoporosis Foundation (IOF) suggests the following list of specific questions to ask a health-care professional:

- “Do I have any risk factors for osteoporosis, including medical conditions or medicines, that cause bone loss?”
- “Do I need a bone mineral density (BMD) test?”
- If you have a BMD test, “What do the results mean, and do I need medicine to protect my bones?”
- “How can I get enough calcium and vitamin D?”
- “What kind of exercise should I do to help strengthen my bones and muscles?”

### What is Osteopenia?

When talking about osteoporosis, you might hear about a condition called osteopenia. Osteopenia means that your BMD is lower than normal and you are at increased risk of breaking a bone. Not everyone diagnosed with osteopenia will develop osteoporosis (IOF, 2019).

### Treating Osteoporosis

Treatment for osteoporosis varies depending on the person and risk (IOF, 2019). Various treatments have proven to reduce the risk of various types of fracture. Health-care professionals may also prescribe calcium

and vitamin D supplements. They may recommend weight-bearing and muscle-strengthening exercises to help maintain bone, strength, and balance. Health-care professionals may also encourage fall prevention measures, such as having your vision checked, regular exercise, managing medication, and making home modifications. Treatment for osteoporosis can be effective and contribute to life quality, including an active and independent life (IOF, 2019).

## Be Proactive: Bone Health at Every Age and Stage

To help improve bone health, consider bone-healthy nutrition, physical activity, and fall prevention.

### Nutrition to Support Bone Health

As people grow and age, bones are constantly changing. This means you should eat a diet that supports healthy bones. Calcium is a mineral your body needs to work the right way and helps to build and maintain your bones. It is essential to give your body the calcium it needs across the life span. Your need for calcium changes based on age and life stage.

### Meeting Calcium Needs

Below is a table that provides the Recommended Dietary Allowances (RDAs) for calcium for all ages.

Age and Life Stage	Daily Calcium Needs (mg)
0-6 months*	200 mg
7-12 months*	260 mg
1-3 years	700 mg
4-8 years	1,000 mg
9-18 years	1,300 mg
19-50 years	1,000 mg
51-70 years (male)	1,000 mg
51-70 years (female)	1,200 mg
Over 70 years	1,200 mg

\*Adequate intakes provided rather than RDAs

You can find calcium in plenty of foods but mostly in dairy items. For those who cannot tolerate cow's milk or animal-based dairy items, other foods and beverages can help you meet your daily calcium needs. Foods and beverages that are good sources of calcium include:

- Dairy-based milks (e.g., cow, goat, sheep)
- Plant-based milk-type beverages (e.g., almond, soy)
- Cottage cheese and yogurts
- Cheeses
- Almonds
- Sardines and salmon
- Leafy greens (e.g., collard, kale, turnip, spinach, mustard)
- Calcium-fortified products (e.g., orange juice, breakfast cereals)

From the age of 4 and throughout adulthood, every person should consume at least 1,000 mg of calcium each day. As an example, eating the following foods and beverages in one day would help you meet the minimum daily requirement of 1,000 mg of calcium. This does not represent the only food you should eat in one day but is one example of how you can get calcium throughout the day in a variety of foods. These suggestions equal approximately 1,082 mg of calcium.

- Cup (8 ounces) of calcium-fortified orange juice with breakfast,
- One serving of calcium-fortified breakfast cereal with one cup of nonfat milk,
- Cup (8 ounces) of yogurt for a snack, and
- Salmon (3 ounces) with ½ cup of spinach for dinner.

### Adding Calcium to the Diet

There are affordable and creative ways to add calcium to your diet each day if you find it difficult to reach your daily needs. Consider the following ideas:

- For snacks, consider cheese (e.g., mozzarella, cheddar), a handful of almonds, or dry, calcium-fortified breakfast cereals.
- Add cheese to sandwiches, vegetables, and main dishes.
- Add cottage cheese or ricotta to waffle or pancake batter.
- For those who do not like milk, consider drinking your calcium in a smoothie made with leafy greens, fruits, and calcium-fortified orange juice.

Vitamin D is another important nutrient for bone health. You need vitamin D to build and maintain strong bones and muscles. It also helps the body absorb calcium better when the nutrients are eaten together during the same meal or snack. There are a few foods naturally high in vitamin D. Some include salmon, canned tuna, egg yolks, cow's milk, and other vitamin D-fortified foods like orange juice and breakfast cereals.

## Physical Activity to Support Bone Health

According to the IOF, there is a strong relationship between bone health and physical activity at every age and stage of life. Exercise during childhood can establish healthy habits as well as strong bones for later in life. Young adults who regularly exercise achieve greater peak bone mass than those who are not active. Moving more and sitting less can increase bone and muscle strength, decrease risk of bone fracture, improve balance and posture, and relieve or decrease pain (Mayo Clinic, 2021). A lifetime of physical activity is associated with maintaining bone mineral density.

Experts recommend weight-bearing and resistance exercises for keeping bones healthy and strong.

- Weight-bearing exercises include walking, hiking, jogging, climbing stairs, skipping rope, dancing, and racquet sports like tennis and pickleball. According to the IOF, vigorous exercise that requires

short bursts of high-intensity and/or high-impact movement are more stimulating to bone cells than low-impact exercise. But even walking can reduce the risk of hip fractures. While aerobic activities like swimming and cycling are good for cardiovascular health, because they are not weight-bearing, they do not improve bone density (NIH, 2018).

- Resistance exercise includes weightlifting. Heavy weights lifted rapidly are more effective than light weights lifted slowly. The International Osteoporosis Foundation recommends targeting bones more prone to osteoporotic fracture — hip, wrist, and mid-spine.

If you are older than 40, have osteoporosis or other health conditions, such as heart trouble, high blood pressure, diabetes, or obesity, it is important to talk to a health-care professional to design a physical activity program appropriate for your ability (NIH, 2018). It is important to stretch and strengthen muscles safely, protect posture, and monitor progression of activity. You should also consider supervised exercise, especially your if balance is poor. Avoid exercise or activity associated with frequent injuries, like mountain biking or ice skating.

## Meeting Physical Activity Recommendations

Increasing physical activity at any point across the life span enhances bone health (Carter, et al., 2014). Below is a table summarized from the CDC's second edition of the Physical Activity Guidelines for Americans that provides the minimum recommended amount of daily physical activity for all ages (CDC, 2018; 2021). Activity associated with bone loading can help reduce the risk of fractures in later life (Carter, et al., 2014; Office of the Surgeon General, 2004). Bone loading is placing weight and tension on the bone which promotes healthy and normal bone growth. This is done through movement, weight-bearing exercises, and resistance exercises. Remember, some physical activity is better than none.

### 3-5 years

#### Recommended daily Physical Activity

Physical activity every day throughout the day

#### Example Activities for Bone Health

Active play through various physical activities that children enjoy such as running, jumping, skipping, and dancing

### 6-17 years

#### Recommended daily Physical Activity

60 minutes or more of moderate-to-vigorous-intensity physical activity daily

As part of the 60 minutes, on at least 3 days a week:

- Vigorous activity
- Muscle-strengthening activity
- Bone-strengthening activity

#### Example Activities for Bone Health

Weight-bearing aerobic activity such as racquet sports, soccer, basketball, volleyball, tennis, softball, baseball, aerobic dancing, running, and hiking

Muscle-strengthening activity like jumping rope and gymnastics

Bone-strengthening activity like climbing and pushups

**Recommended daily Physical Activity**

At least 150 minutes a week of moderate-intensity activity  
Or at least 75 minutes of vigorous-intensity aerobic physical activity in a week or an equivalent combination of moderate- and vigorous-intensity activity

At least two days a week of activities should include muscle strengthening that works all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms)

**Example Activities for Bone Health**

Weight-bearing aerobic activity such as brisk walking, running or jogging, stair climbing, elliptical training, dancing, and racquet sports

Weight training and resistance exercises like free weights, weight machines, pushups, planks, squats, and using a resistance band

Exercises that help with flexibility include stretching, tai chi, and yoga



**Recommended daily Physical Activity**

At least 150 minutes a week of moderate-intensity activity

Or do at least 75 minutes of vigorous-intensity aerobic physical activity on a weekly basis or an equivalent combination of moderate- and vigorous-intensity activity

At least two days a week of activities should include muscle strengthening that works all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms)

At least 3 days a week should include balance activities

**Example Activities for Bone Health**

Weight-bearing, low-impact aerobic activity such as brisk walking, dancing, elliptical training, stair climbing, and gardening

Weight training and resistance exercises like free weights, weight machines, resistance bands, and water exercises

Activities and stretches to improve balance and flexibility like standing on one foot, walking backward, using a wobble board, tai chi, or yoga

## Adults with chronic conditions and disabilities

### Recommended daily Physical Activity

At least 150 minutes a week of moderate-intensity aerobic physical activities a week, which can be broken down to 30 minutes a day, 5 days a week

At least 2 days a week should include muscle strengthening that works all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms)

If unable to meet recommendations, be as active as possible based on abilities and conditions - avoid inactivity

### Example Activities for Bone Health

Walking, wheelchair rolling, biking, swimming, water aerobics, some yoga postures, resistance bands, weight machines, hand-held weights

Talk to a health-care professional about appropriate exercises for weight-bearing, resistance, and flexibility

Avoid high-impact exercise and movements that include bending and twisting

## Pregnant and Postpartum Women

### Recommended daily Physical Activity

At least 150 minutes of moderate-intensity aerobic activity

If unable to meet recommendations, be as active as possible - avoid inactivity

Be under the care of a health-care provider to monitor your physical activity



The CDC reinforces that you should “aim for the recommended activity level but be as active as one is able.” Talk to your health-care provider if you are unsure about your bone health for physical activity.

**The International Osteoporosis Foundation recommends the following exercise program to increase bone density:**

- 1. “About 50 jumps (approx. 3 inches high, three to six days per week).”**
- 2. “Two to three sets of 10 repetitions of multiple weight-lifting exercises, three days per week.”**
- 3. “45 to 60 minutes of weight-bearing aerobic exercise three days per week (e.g., brisk walking).”**

## **Fall Prevention to Support Bone Health**

One fall can be life changing. Falls are the leading cause of injury and injury-related death among older adults (National Council on Aging, 2022). Falls can affect independence. They also create a fear of falling, which then limits physical and social activity. The effect of falls is compounded in people with osteoporosis (International Osteoporosis Foundation 2022).

Exercise helps prevent falls. Exercise before the age of 40 can help reduce the risk of falling in later life (International Osteoporosis Foundation, n.d.). Weight-bearing exercise contributes to improved gait speed, muscle strength, and balance (International Osteoporosis Foundation, n.d.). Exercises that target balance and lower and upper limb strength are best for reducing fractures and fall risk. For healthy individuals, exercises like tai chi, yoga, and Pilates

help improve balance.

Other ways to prevent falls include (NIH, 2022; International Osteoporosis Foundation, 2022):

- Managing medications
- Keeping glasses clean and getting vision checked yearly
- Taking safety precautions at home like installing proper lighting and grab bars in bathrooms
- Using mobility devices properly
- Wearing proper footwear
- Standing up slowly
- Being careful on stairs
- Taking extra precaution outdoors in bad weather

## **Leading a Healthy Bone Lifestyle**

Whether you are taking care of yourself, your children, or your grandchildren, there are things you can do across the life span in addition to choosing calcium-rich foods that will help prevent osteoporosis and build strong bones for life.

- Choose foods rich in calcium and vitamin D to build and maintain strong bones. Vitamin D makes it easier for the body to absorb calcium in the gut. Magnesium plays an important role in managing calcium and vitamin D in the body.
- Look for ways to move your body and add physical activity to your day. Walking, taking the stairs, or playing your favorite sport are all ways to add weight-bearing activity to your day. Find movement that you enjoy. Lifting light weights also strengthens bone.
- Take steps to reduce risks of falls. This could be increasing physical activity or looking around your home for safety hazards that could cause falling.

**“It is never too early or too late to take care of your bones.” NIH**

- Enjoy safe sunshine. The sun is a natural way for our bodies to increase vitamin D levels. It is still possible to increase vitamin D levels in the body while also using shade during sunny days, wearing sunscreen, or choosing protective clothing when outside.
- Some behaviors cause weak bones. Avoid smoking and excessive drinking. They are linked to increased risk of bone fractures and osteoporosis.
- Has anyone in your family had a broken bone, specifically a hip, forearm, wrist, or spine? Knowing the family history of close family members, like parents and siblings, can tell your health-care team if you need to be screened earlier for osteoporosis.
- Are you taking medications or supplements? Talk to your health-care team about the medications you are taking and if they affect bone health. Ask that a registered dietitian nutritionist (RDN) be added to your health-care team if you have concerns about calcium, vitamin D, and your diet.

## References

<https://www.osteoporosis.foundation/educational-hub#main>

## References/Resources

Carter M. I., Hinton P. S. (2014). Physical activity and bone health. *Mo Med.* Jan-Feb;111(1):59-64. PMID: 24645301; PMCID: PMC6179512. Retrieved Dec. 2, 2022 from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6179512/#:~:text=The%20American%20College%20of%20Sports,preserve%20bone%20health%20during%20adulthood>

Calcium. (2022). Retrieved Dec. 1, 2022, from

<https://www.eatright.org/health/essential-nutrients/minerals/calcium>

CDC. (2021). Physical Activity for Different Age Groups. Retrieved Dec. 2, 2022, from <https://www.cdc.gov/physicalactivity/basics/age-chart.html>

Hill, M. A. (Nov. 14, 2022) Embryology Musculoskeletal System - Bone Development Timeline. Retrieved from [https://embryology.med.unsw.edu.au/embryology/index.php/Musculoskeletal\\_System\\_-\\_Bone\\_Development\\_Timeline](https://embryology.med.unsw.edu.au/embryology/index.php/Musculoskeletal_System_-_Bone_Development_Timeline)

International Osteoporosis Foundation (IOF). (2022). Falls Prevention. Retrieved Dec. 1, 2022 from <https://www.osteoporosis.foundation/health-professionals/fragility-fractures/falls-prevention>

International Osteoporosis Foundation (IOF). (2016). Love your bones: Protect your future. Retrieved Nov. 14, 2022 from [https://www.osteoporosis.foundation/sites/iofbonehealth/files/2019-06/2016\\_KnowYourRiskBrochure\\_Brochure\\_English.pdf](https://www.osteoporosis.foundation/sites/iofbonehealth/files/2019-06/2016_KnowYourRiskBrochure_Brochure_English.pdf)

International Osteoporosis Foundation (IOF). (N.D.) Love your bones: Exercise Fact Sheet. Retrieved Dec/ 1, 2022 from [https://www.osteoporosis.foundation/sites/iofbonehealth/files/2019-04/2011\\_Exercise\\_FactSheet\\_English.pdf](https://www.osteoporosis.foundation/sites/iofbonehealth/files/2019-04/2011_Exercise_FactSheet_English.pdf)

International Osteoporosis Foundation (IOF). (N.D.). Reduce Your Risk of Falls and Fractures. Retrieved Dec. 1, 2022 from <https://www.osteoporosis.foundation/sites/iofbonehealth/files/2020-10/falls-prevention-fact-sheet-PRESSEN.pdf>

International Osteoporosis Foundation (IOF). (2019). That's Osteoporosis. Retrieved Nov. 14, 2022 from <https://www.osteoporosis.foundation/sites/IOFBoneHealth/files/2019-12/2019-Patient-Leaflet-english-PRESS.pdf>

Mayo Clinic. (2021). Exercising with osteoporosis: Stay active the safe way. Retrieved Dec. 2 2022 from <https://www.mayoclinic.org/diseases-conditions/osteoporosis/in-depth/osteoporosis/art-20044989#:~:text=Examples%20include%20walking%2C%20dancing%2C%20low,heart%20and%20circulatory%20system%20health.>

Mayo Clinic. (2021). Osteoporosis. Retrieved February 6, 2023 from <https://www.mayoclinic.org/diseases-conditions/osteoporosis/symptoms-causes/syc-20351968>

National Council on Aging. (2022). Get the Facts on Fall Prevention. Retrieved Dec. 1, 2022, from <https://ncoa.org/article/get-the-facts-on-falls-prevention>

NIH. (2018). Bone Health for Life: Health Information Basics for You and Your Family. Retrieved Nov. 14, 2022 from <https://www.bones.nih.gov/health-info/bone/bone-health/bone-health-life-health-information-basics-you-and-your-family>

NIH. (2018). Exercise for Your Bone Health. Retrieved Dec. 1, 2022 from <https://www.niams.nih.gov/health-topics/exercise-your-bone-health>

National Institutes of Health-Medline Plus. (2022). Fetal development. Retrieved Nov. 14, 2022 from <https://medlineplus.gov/ency/article/002398.htm#:~:text=Weeks%2031%20to%2034%20Your%20baby%20grows%20quickly,baby%27s%20body%20begins%20storing%20iron%2C%20calcium%2C%20and%20phosphorus.>

NIH. (2018). Kids and their bones: A guide for parents. Retrieved Nov. 14, 2022, from <https://www.niams.nih.gov/health-topics/kids-and-their-bones>

NIH. (2017). Osteoporosis. Retrieved Nov. 14, 2022, from <https://www.nia.nih.gov/health/osteoporosis>

NIH. (2022) Osteoporosis. Retrieved February 6, 2023 from <https://www.niams.nih.gov/health-topics/osteoporosis>

National Institutes of Health (NIH). (2021). (Dietary Supplement Fact Sheet: Calcium) ; Institute of Medicine of the National Academies (Dietary Reference Intakes for Calcium and Vitamin D). Retrieved Nov. 14, 2022 from <https://orthoinfo.aaos.org/en/staying-healthy/healthy-bones-at-every-age/>

Office of Dietary Supplements - Calcium. (2022). Retrieved Dec. 1, 2022, from <https://ods.od.nih.gov/factsheets/calcium-healthprofessional/#h3>

Office of the Surgeon General (US). (2004). Bone Health and Osteoporosis: A Report of the Surgeon General. Rockville (MD): Office of the Surgeon General (US). Table 7-6, Weight-Bearing Exercise for Kids and Teens. Available from <https://www.ncbi.nlm.nih.gov/books/NBK45523/table/ch7.t6/>

Vitamin D | International Osteoporosis Foundation. (2022). Retrieved Dec. 2, 2022, from [https://www.osteoporosis.foundation/patients/prevention/vitamin-d?utm\\_source=Enigma&utm\\_](https://www.osteoporosis.foundation/patients/prevention/vitamin-d?utm_source=Enigma&utm_)

Educational programs of Kentucky Cooperative Extension serve all people regardless of economic or social status and will not discriminate on the basis of race, color, ethnic origin, national origin, creed, religion, political belief, sex, sexual orientation, gender identity, gender expression, pregnancy, marital status, genetic information, age, veteran status, physical or mental disability or reprisal or retaliation for prior civil rights activity. Reasonable accommodation of disability may be available with prior notice. Program information may be made available in languages other than English. University of Kentucky, Kentucky State University, U.S. Department of Agriculture, and Kentucky Counties, Cooperating.