BONE HEALTH AND HIV DISEASE

information on how to prevent and treat osteopenia and osteoporosis

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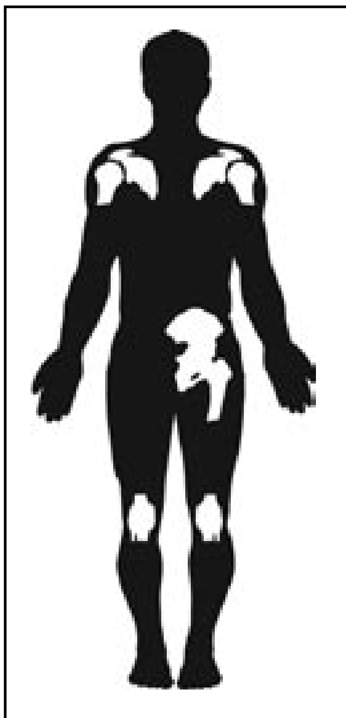
As people living with HIV take HIV drugs over time, a growing list of conditions has become a concern for those who try to manage their overall health. One of these is bone loss, which occurs more often in HIV-positive people. Research has not found the exact cause or causes for this higher rate.

The research and health service communities are trying to find answers to ensuring bone health in people with HIV. We already know a good deal about bone loss, much because of research done in postmenopausal women. Things can be done to improve bone health, and many of those are under the control of the patient.

The loss of bone mineral density, or BMD, can occur anywhere in your body. However, weight-bearing joints and bones are more prone than others including your hip, knee, ankle, shoulder, spine and wrist. This publication will focus on the two most common types of bone loss, osteopenia and osteoporosis, with some information on osteonecrosis.



AREAS OF CONCERN:
hips, shoulders, knees

What is bone?

Bone is living tissue and is in constant change during your life. It's made of several materials, mainly collagen and minerals. Collagen gives your bones a soft flexible framework. The minerals, like calcium and phosphorus, help harden the framework for strength. Vitamin D is also important, as it helps the body absorb calcium and slows the kidneys from removing it. Together these materials help bones withstand stress. Bone also has an outer layer of nerves and small blood vessels.

To keep bones healthy, your body removes old bone (*bone resorption*) as it adds new bone (*bone formation*). The peak bone mass usually occurs around age 30. After that, bone density naturally declines over time. The ageing process can remove more bone tissue than it replaces—making it less dense, weaker and more prone to injury. Having the right amount of minerals in your body as well as good bone formation and resorption will help maintain healthy bones.

Who is at risk for bone loss?

Simply put, everyone. Although bone loss occurs naturally as people age, other factors can contribute to it. In general, the following factors make it more likely that you'll face bone loss.

- **Age**—the older you are, the higher the risk.
- **Sex**—women face bone loss more often than men, though older men have increased risk.
- **Race**—all races are at risk, but Caucasians and Asians are more likely to face bone loss.
- **Lifestyle**—several things contribute to bone loss: smoking, drinking alcohol, excess caffeine, and not staying active.
- **Diet**—not eating the right type or amount of foods that have calcium or vitamin D in them raises your risk.
- **Body size**—in general, the smaller your bones and the thinner you are, the more at risk you are.
- **Menopause**—this is a risk factor for all women, including those whose periods stop before menopause.
- **Hormone levels**—increased bone loss can be due to low levels of testosterone, common in men with HIV.
- **Medicines**—certain drugs have been shown to increase bone loss, especially some that treat chronic health conditions. However, HIV drugs may or may not contribute to bone loss.
- **HIV**—HIV's activity in the body appears to increase bone loss to some degree. Some study results point to this, though it's not confirmed. For more information see the section, Research on bone loss, below.

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What is osteopenia?

Osteopenia is a loss of bone density, and over 18 million Americans have it. It is not the same as osteoporosis, which is explained below. Importantly, having osteopenia doesn't mean you'll develop osteoporosis. In fact, most people do not.

While a diagnosis of osteopenia may be upsetting, it's perhaps a small wakeup to do something about it. It's a condition that can be stopped and even reversed. First, osteopenia may be due to having a natural lower bone density. Second, there are ways to improve your bone health. These are found in the section, *Preventing bone loss*, on page 5.

Generally osteopenia has no symptoms. You likely will not notice any pain or change in your bones. The only way to know you have this condition is by getting a bone density test done. Although the bone loss in osteopenia is generally less severe, it still means the bone has weakened and may be prone to fractures.

What is osteoporosis?

Osteoporosis is a loss of bone mass and is the most common bone disease. Over 10 million Americans live with it, and 3 out of 4 of them are women. It causes over a million bone fractures each year, most in the spine and hip. Primary osteoporosis is the natural loss of bone, especially in women after menopause. Secondary osteoporosis occurs from taking medicines or having a chronic condition. This may be more of an issue for people with HIV because of chronic illness, weight loss, lengthy bed rest, etc.

Osteoporosis is not the same as osteopenia, which is explained above. It's is a more serious condition, and people who have it are more prone to bone fractures and breaks. It results from too much bone resorption and not enough formation. In this condition, holes (*lacunas*) develop in the bone further weakening its structure.

Osteoporosis is a condition that many older adults know. So its diagnosis at an earlier age, especially for those with HIV, can feel especially upsetting. You can help prevent it through better nutrition and staying active. These and other ways to improve your bone health are found in the section, Preventing bone loss, below.

Many men don't think they're at risk for osteoporosis, or osteopenia. In general, men have larger frames and their bodies start losing bone later in life and at a slower rate. However, men are still at risk, probably later in life and for men with low levels of testosterone. Many men with HIV have low testosterone and may want to talk to their doctors about their bone health.

Symptoms of osteoporosis may not appear before a fracture happens. If they do, they may include joint pain and tenderness, backache, feeling of weakness and loss of height. After a fracture, the pain may be much more severe. The only way to know you have this condition is by getting a bone density test done. Dental x-rays sometimes show bone loss, which may mean osteoporosis in other body parts.

What is osteonecrosis?

Osteonecrosis is the death of bone tissue. Bone can die if its blood supply is cut off. This is called *avascular necrosis*, a condition that has been seen in the hips of people with HIV. It may occur in any bone though it most often occurs at the ends of a long bone. It may affect one or more bones or joints at the same time.

It's not known what causes avascular necrosis in people with HIV. Possibilities include bone and blood vessel damage, long-term use of certain medicines, chronic conditions like rheumatoid arthritis or lupus, and excessive use of alcohol.

Symptoms of osteonecrosis may include pain—sometimes severe—in the affected area, especially in joints like the hip, wrist or spine. This may occur only when you bear down on the bone or joint or it may be constant. Other signs are joint stiffness, soreness, less range of motion, muscle spasms, a feeling of weakness, arthritis, and bone damage and collapse.

The goals for treating the condition are to stop any more damage and to improve the person's ability to move. A person with less severe osteonecrosis may be given pain killers or medicines to improve bone density as well as support tools like a cane or crutches. In more severe cases, a person may need surgery, which could include reshaping, grafting or replacing the bone or joint.

How is bone loss diagnosed?

Unfortunately, many find out they have bone loss only after they've fractured or broken a bone. To detect bone loss before this happens, several bone density tests are available. Most are painless and they vary in cost and length of time to take. However, there are no standards of care for using them in people with HIV. In general, the longer you've lived with HIV and the more risk factors you have, the more likely bone tests may be needed.

DEXA SCAN

The DEXA (*dual energy x-ray absorptiometry*) scan is a kind of x-ray and is the most common and accurate way to measure BMD. It can detect as little as 2% of bone loss per year, and it uses only 10% of the radiation used in a routine x-ray. It's painless and takes 10–15 minutes.

CT SCAN

The CT (*computer tomography*), or CAT, scan uses x-rays and a computer to make images of the bone. It can detect osteopenia, osteoporosis and osteonecrosis. The scan is painless and gives more detail than an x-ray, though it uses radiation. A scan can last from 5–30 minutes.

X-RAY

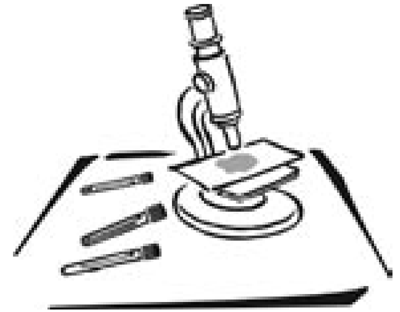
A standard x-ray is not useful in diagnosing osteopenia or osteoporosis because it's not sensitive enough to detect minor bone loss. It's used mostly to detect osteonecrosis, showing the amount of severe damage to the bone. An x-ray is painless and quick to take, though it uses radiation.

MRI

The MRI (*magnetic resonance imaging*) scan can detect osteopenia, osteoporosis and osteonecrosis. It uses magnets and radio waves to create detailed pictures of the bone. It's painless and can last up to 45 minutes. An MRI does not use radiation like an x-ray or CT scan.

BONE BIOPSY

A biopsy is usually done to detect osteonecrosis. A sample of bone is removed during surgery or with a needle and local anesthesia. This is an invasive test that takes time, causes discomfort, and may need recovery time.



Bone density test results

Your test result is written as a *T-score* and *Z-score*. The T-score compares women and men to a "normal" healthy person of their own sex. A normal T-score, or healthy bone density, is a number above -1.0. A score for osteopenia will be between -1.0 and -2.5, while osteoporosis is less than -2.5.

The Z-score compares your BMD to someone of your own age, sex, weight and ethnic origin. This can provide helpful information for your doctor as well. A T-score is better used for detecting osteoporosis.

Preventing bone loss

Almost 80% of your bone density is determined by your heredity. The other 20% can be affected by changes in lifestyle. In general, many of the ways to prevent bone loss in people with HIV are the same for postmenopausal women. Some strategies have been tested in HIV-positive people.

LIFESTYLE

Changing your lifestyle can help prevent bone loss. Keeping a normal body mass is one important way—keeping your weight in proportion to your height and body frame. Smoking and drinking alcohol also contributes to bone loss, as well as excessive caffeine use. So reducing tobacco, caffeine and alcohol use is likely to benefit your bone health.

Bone loss can also occur from injuries to the bone, like a fracture or break. By reducing your risk of falling or tripping, you can help prevent bone injuries. Adults may need to safeguard their lives as they get older. Being aware of your surroundings, clearing clutter from your home, and carefully walking up and down stairs or hills are just a few ways to lower your risk.

DIET

In general, Americans do not get enough calcium or vitamin D to maintain their bone health. This also applies to people with HIV of all ages. Most adults should get between 1,000–1,200mg of calcium a day. Pregnant and postmenopausal women should get 1,500mg. Daily amounts should not exceed 2,000mg. You can get calcium from eating milk products, tofu, and vegetables and leafy greens like broccoli and spinach. Some foods are enriched with added calcium, like orange juice.

Some people, including older adults, may not get enough vitamin D due to a lack of physical activity or exposure to sunlight. The daily amount for most adults is 200 IU. For men and women 50 and above, the amount should increase to 400–600 IU a day. People with osteoporosis may need up to 800 IU daily.

Vitamin D is found in eggs, liver, some fish oils, and fish like salmon and swordfish. You can also get enough vitamin D by getting about a half hour of sunlight each day, as your body makes it from the contact of sun to your skin. This may be more difficult for people with low physical activity or during winter months.

Phosphorus is another mineral important to maintain bone health. It's found in milk products, peanuts and beans, though most people do not need to take extra amounts of it.

EXERCISE

Being active day to day and getting exercise helps make bones denser and stronger. Weight-bearing activities force your body to work against gravity. These include power walking, jogging, climbing stairs, dancing or running, where your legs and feet support your body's weight. Resistance exercises include stretching and lifting weights to help strengthen your muscles and bones. Before beginning an exercise routine, talk to your doctor or a certified trainer to learn the type of exercise that would be best for your health.

SUPPLEMENTS

Supplements can help support your body's ability to stop and reverse bone loss. Many people do not get enough calcium or vitamin D in their diets. Some cannot tolerate milk products or consume foods high in calcium. Still others, including older adults who go without direct sunlight for periods of time, may not get enough vitamin D. Taking supplements may be an option in these cases.

Many drugstores and health food stores sell calcium tablets, and some come packaged with vitamin D. Discuss with your health provider all supplements you take or want to take to ensure you're getting the right daily amount. High levels of calcium and vitamin D can cause problems of their own. If you take a multivitamin, check the label as many already contain calcium and vitamin D.

PRESCRIPTIONS

Certain prescription drugs can increase bone loss, especially when used over time or at high doses. Avoiding or switching from these medicines can help. Some of these are HIV-related drugs like pentamidine, steroids like cortisone and prednisone, or other drugs like phenobarbital and ketoconazole. Talk to your health provider or pharmacist about which increase bone loss and discuss your options.

Treating bone loss

Currently, there are no standards of care for using bone density tests or treating bone loss in people with HIV. What we know about treating bone loss comes from research on postmenopausal women and older men and men with low levels of testosterone.

Pain killers

Your doctor may prescribe pain killers like aspirin and ibuprofen. These help control any discomfort you may be having but will not correct actual bone loss.

Medicines used for resorption problems

A few medicines called bisphosphonates lower the rate of bone resorption, thereby stabilizing bone density. Little is known about how they affect people with HIV. They may be prescribed with calcium and vitamin D supplements. Side effects can include difficulty swallowing, inflammation of the esophagus, and gastric ulcer.

Bisphosphonates

This type of drug is often prescribed for bone less. However, early results from a large study reported in January 2008 show some evidence of *aseptic osteonecrosis*—a bone condition that results from poor blood supply causing bone death. Though the rate for this side effect is relatively low, it may be an issue for some people, notably older adults. Bisphosphonates have a long half-life of up to 10 years, which may allow them to reside in bone tissue and cause bone damage.

DRUG	DOSE	APPROVED TO	NOTE FOR PEOPLE WITH HIV
Actonel (risedronate)	5mg once a day or 35mg once a week, taken on empty stomach and remain upright for 30 minutes.	Prevent and treat postmenopausal osteoporosis and osteoporosis in women and men due to using corticosteroids. Lowers the rate of spine, hip and other fractures.	No studies have been done in people living with HIV.
Boniva (ibandronate)	150mg once a month on the same day of the month, taken on empty stomach and remain upright for 30 minutes. An injection is also available, given once every 3 months.	Prevent and treat postmenopausal osteoporosis. Lowers the rate of spine fractures.	No studies have been done in people living with HIV.
Fosamax (alendronate)	Prevention: 5mg once a day or 35mg once a week; treatment: 10mg once a day or 70mg once a week, taken on empty stomach and remain upright for 30 minutes.	Prevent and treat postmenopausal osteoporosis; treat osteoporosis in men; treat osteoporosis in women and men due to using corticosteroids. Lowers the rate of spine, hip and other fractures.	Only one study has been done in people with HIV. The results showed, over a one-year period, that the BMD of the spine had significantly improved while other body parts stayed about the same.

Medicines used for hormone therapy

Short-term hormone therapy is used to relieve hot flashes and other symptoms of menopause. However, in postmenopausal women, it also prevents bone loss and fractures and improves bone density. Many brands come as a pill or skin patch.

Estrogen therapy is usually given with progesterone, which lowers the risk of cancer of the uterus. Its long-term use can increase the chances for heart attack, blood clots, stroke and breast cancer. Therefore, weigh the pros and cons of hormone therapy with your health provider when considering it for bone loss.

Another type of estrogen is called a SERM (*selective estrogen receptor modulator*). Evista (raloxifene) prevents and treats postmenopausal osteoporosis, improving the density of the spine and neck. Unlike other estrogen therapy, Evista is less likely to cause cancer of the uterus. Side effects can include hot flashes, leg cramps, blood clots, vaginal dryness, swelling, pain or tenderness, muscle and joint aches, and weight gain.

As for men, taking testosterone will help prevent or treat bone loss, especially in the spine. It's not used in women. One small study in men with HIV showed that the density of the spine had significantly improved. Several brands come as an injection (taken every 2–3 weeks), gel (rubbed on skin daily) or skin patch. Many men who take this therapy report feeling better and having more energy. It should not be taken by men with prostate cancer. Side effects can include swelling in the hands and feet and enlarged prostate gland and breasts.

Medicines used to form bone tissue

Parathyroid hormone helps your body store a healthy amount of calcium and phosphorus in your bones. A rather new form of this, Forteo (teriparatide), improves bone density in men and women. It's given by injection once a day, is currently approved for only 24 months of use, and costs more than other bone loss therapy.

Forteo lowers the risk of fractures in postmenopausal women and likely also in men. It's used for treating postmenopausal osteoporosis, and for primary osteoporosis and secondary osteoporosis caused by low testosterone in men. No studies have been done in people with HIV. The most common side effects include headache, nausea, vomiting, leg cramps and dizziness.

Concerns for people over 50

Bone loss is a process that happens as you age. Older adults are more prone to bone problems because of ageing and other factors like poor nutrition, lack of activity, lower levels of sex hormones, and medications. Anyone, including people over 50, can try to improve their bone health through the ways found in the section, Preventing bone loss. Talking to your health provider about other ways, including bone scans and medicines, can help encourage stronger bone and overall health.

Access to medicines

The medicines used to treat bone loss are available by prescription through a health provider. People who lack coverage for meds can sometimes gain access to them through the manufacturers' Patient Assistance Programs. A good resource for this is *www.rxassist.org*, though you must sign in for the service. Another online resource is *www.pparx.org*.

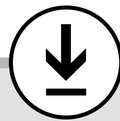
Research on bone loss

Much of what we know about bone loss has come from the research done in postmenopausal women and older men. Although this helps, it doesn't answer the unique issues that people living with HIV face, especially as they begin to confront bone loss earlier. Unfortunately, the results so far have tended to contradict one another.

One belief is that HIV itself affects bone loss. In general, people with HIV face more bone loss than HIV-negative people of the same sex and age. Why this happens is not clear. HIV activates the immune system, which in turn may affect bone health. Since it infects different cells in the body, it may also affect bone marrow cells which may then affect bone health. HIV can also increase the level of proteins which may add to the loss of bone tissue.

Another belief is that HIV drugs help cause bone loss, specifically protease inhibitors. A couple of studies have reported this, but others have not. Protease inhibitors also tend to deplete the body of vitamin D, which is key to keeping bones strong. Recent research showed that Viread (tenofovir) contributed to some bone loss, but it's not confirmed by other studies. Some data point to NRTIs in general. Yet another study compared two different HIV class regimens and found that neither affected bone loss.

These studies stress the need for more research on finding the underlying reasons for bone mineral loss and other bone disorders in people with HIV. This will help people living with HIV and their doctors get ahead of this issue before serious bone damage can occur.



the bottom line on bone health and hiv disease

- Everyone is at risk for bone loss, though some more than others. A complete list is found in *Who is at risk for bone loss?*
- Detecting possible bone problems early can create better outcomes.
- Bone tissue constantly changes during a person's life, and naturally declines after age 30.
- Three out of four people with osteoporosis are women.
- Despite the fact that some risk factors are beyond a person's control, like age and sex, there are many things you can do to improve your bone health.
- People living with HIV have a higher rate of both osteopenia and osteoporosis.
- There are no standards of care for testing and treating bone loss in people with HIV.
- Though HIV appears to contribute to some bone loss in people with HIV, we do not know for sure. We also don't know if HIV drugs affect bone loss.
- Painless and fairly quick tests that detect bone density can give accurate results on bone loss.
- The best way to prevent bone loss is by staying active and getting enough calcium and vitamin D in your diet or through supplements. Other lifestyle changes include stopping smoking, drinking less alcohol and caffeine, and talking to your doctor about any other medicines you take that affect bone loss.