FOREWORD BY DEAN ORNISH, M.D.

building bone vitality

A Revolutionary Diet Plan to Prevent Bone Loss and Reverse Osteoporosis

Why Calcium, Estrogen, and Drugs Are *NOT* the Answer

Amy Joy Lanou, Ph.D.

Michael Castleman

For years, doctors have been telling us to drink milk, eat dairy products, and take calcium pills to improve our bone vitality. The problem is, they're wrong.

This groundbreaking guide reveals the latest clinical studies and the most up-to-date medical information that you can use to help strengthen your bones, reduce the risk of fractures, and prevent osteoporosis. You'll learn why there's no proof of calcium's effectiveness, despite what doctors say, and why a low-acid diet and daily walking are the **only** effective ways to prevent bone loss.

> "This clear, convincing explanation of osteoporosis will change the way the world thinks about bone health. Lanou and Castleman prove beyond doubt that milk and dairy are the problem, not the solution." —Rory Freedman, coauthor of #1 *New York Times* bestseller *Skinny Bitch*

> "The authors have tackled an almost intractable myth: that calcium is the one and only key to bone vitality. It isn't! Everyone who cares about preventing osteoporosis should read this book."
> —Dr. T. Colin Campbell, author of *The China Study*

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To the four matriarchs in my family: my grandmothers, Dorothe Smith and Florence Stewart, the latter of whom suffered osteoporosis, and to my mothers, one by birth and one by marriage, Sandra L. Kinzie and Barbara Lee Smith, who instilled a love of vegetables and fruit and who model healthy bone maintenance lifestyles for their children and friends.

—Amy Joy Lanou

To the three most important women in my life: my mother, Mim Castleman, my wife, Anne Simons, and my daughter, Maya Castleman.

—Michael Castleman

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Countries That Consume the Most Milk, Dairy Foods, and Calcium Supplements Suffer the Most Fractures

OSTEOPOROSIS CAUSES 1.5 million fractures a year in the United States, making it the nation's leading cause of broken bones. It causes millions more fractures worldwide. These fractures are painful, debilitating, costly, and, in the case of hip fractures, often life-threatening (see the sidebar "The Staggering Toll of Osteoporosis in the United States," on page 15). As a result, the U.S. government has declared 2002–2011 the National Bone and Joint Disease Decade.

News coverage often implies that twenty-first-century Americans suffer so many osteoporotic fractures because we enjoy much longer life spans than our ancestors. If you live long enough, that is, the disease is inevitable.

It isn't.

Rates of osteoporotic fractures vary tremendously around the world. Some countries have hip fracture rates many times greater

than others. (These are "age-adjusted" rates, meaning that they compare people of the same age.) Since 1975, the year the medical literature became easily searchable by computer, four studies—published in 1985, 1992, 2000, and 2006—have documented osteoporotic hip fracture rates around the world. (See Tables 1.1–1.4.)

TABLE 1.1 1985, Mayo Clinic Researchers

Age-adjusted hip fracture rates per 100,000 population in women age 35 or older

Hip Fracture Rate	Location
421	Norway, Oslo
320	USA, Rochester, Minnesota
313	Indians living in Singapore
257	South Africa, Johannesburg (white)
237	Sweden, Malmo
232	USA, District of Columbia (white)
220	New Zealand (white)
213	Finland
202	Israel, Jerusalem (American- or European-born)
187	Netherlands
168	Israel, Jerusalem (native-born)
142	Israel, Jerusalem (Asian- or African-born)
142	United Kingdom, Oxford
119	USA, District of Columbia (African-American)
105	Croatia (low-calcium region)
104	New Zealand (Maori)
87	Hong Kong
59	Singapore (Chinese)
44	Croatia (high-calcium region)
24	Singapore (Malay)
14	South Africa, Johannesburg (black)

SOURCE: Melton, J. L. "Epidemiology of Fractures," in *Osteoporosis: Etiology, Diagnosis, and Management*, B.L. Riggs and L. J. Melton (eds.), Raven Press: New York, 1988.

TABLE 1.2 1992, Yale Researchers

Age-adjusted rates per 100,000 population for women over age 50

Hip Fracture Rate	Country	Data Collected During
221	Norway	1978–79
214	Sweden	1981
192	Sweden	1965–80
190	Norway	1983–84
188	Sweden	1972–78
165	Denmark	1971–76
165	Denmark	1973–79
149	Norway	1972–73
145	United States (white)	1974–79
131	United Kingdom	1983
122	Sweden	1950–60
119	New Zealand	1973–75
118	United States (white)	1980
118	United Kingdom	1977
116	United Kingdom	1978–79
111	Finland	1980
97	Finland	1970
93	Israel	1957–66
91	United Kingdom	1975
88	Netherlands	1967–79
77	United Kingdom	1954–58
76	Ireland	1968–73
72	Finland	1968
60	United States (nonwhite)	1980
52	Former Yugoslavia	1968–73
46	Hong Kong	1965–67
42	Spain	1974–82
34	United States (nonwhite)	1974–79

continued

TABLE 1.2 1992, Yale Researchers (continued)

Hip Fracture Rate	Country	Data Collected During
28	Former Yugoslavia	1969–72
22	Singapore	1955–62
21	Former Yugoslavia	1968–73
7	South Africa (black)	1957–63
3	Papua New Guinea	1978–82

SOURCE: Abelow, B. J. et al. "Cross-Cultural Association Between Dietary Animal Protein and Hip Fracture: A Hypothesis," *Calcified Tissue International* (1992) 50:14.

TABLE 1.3 2000, University of California, San Francisco, Researchers

Age-adjusted rates per 100,000 population for women over age 50

Hip Fracture Rate	Country
199	Germany
187	Norway
172	Sweden
165	Denmark
148	Argentina
139	New Zealand
130	Switzerland
125	Australia
120	United States
120	Portugal
117	United Kingdom
113	Crete
110	Canada
94	Finland
77	France
76	Ireland
76	Israel

TABLE 1.3 2000, University of California, San Francisco, Researchers (continued)

Hip Fracture Rate	Country
69	Hong Kong
67	Japan
65	Spain
61	Netherlands
57	Italy
57	Chile
47	Saudi Arabia
34	Former Yugoslavia
27	Malaysia
22	Singapore
12	South Korea
8	South Africa
5	Thailand
3	New Guinea
3	China
1	Nigeria

SOURCE: Frassetto, L. A. et al. "Worldwide Incidence of Hip Fracture in Elderly Women: Relation to Consumption of Animal and Vegetable Foods," *Journal of Gerontology: Medical Sciences* (2000) 55:M585.

TABLE 1.4 2006, Tehran University Medical School, Iran, Researchers

Age-adjusted rates per 100,000 population for women over age 50

Hip Fracture Rate	Country	Data Collected
764	Norway	1998
710	Sweden	1991
554	United States	1989
504	Australia	1996
497	Taiwan	2000

continued

TABLE 1.4 2006, Tehran University Medical School, Iran, Researchers (continued)

Hip Fracture Rate	Country	Data Collected
484	Hong Kong	1998
470	Greece	1992
432	Singapore	1998
418	England	1998
402	Kuwait (non-Kuwaitis)	1995
399	Germany (former West)	1996
355	Germany (former East)	1996
346	Switzerland	1992
316	Kuwait (Kuwaitis)	1995
297	Japan	1994
262	Thailand	1998
213	Malaysia	1998
168	Brazil	2000
165	Iran	2003
86	China, Beijing	1996
80	Morocco	2002

SOURCE: Moayyeri, A. et al. "Epidemiology of Hip Fractures in Iran: Results from Iranian Multicenter Study on Accidental Injuries," *Osteoporosis International* (2006) 17: 1252.

These studies take different approaches and use different source studies to calculate fracture rates. As a result, the four studies' findings differ. Nonetheless, their results are strikingly similar. By and large, the highest rates of hip fracture cluster among Western countries: North America, Europe (especially northern Europe), Australia, and New Zealand. Hip fracture is much less of a problem in Africa, Asia, and South America.

Clearly, osteoporosis is not inevitable. What, then, accounts for the vast differences worldwide?

Got Milk?

In common parlance, a theory is a hypothesis, an educated guess. In science, however, a theory is a widely accepted explanation for a great deal of observed reality, such as the theory of evolution or the germ theory of illness. The conventional wisdom on diet and osteoporosis might be called the calcium theory of bone health.

Our health authorities insist that the calcium triumvirate—drinking milk, eating dairy foods, and taking calcium pills—is the best dietary approach to preventing osteoporosis. But if the calcium theory were correct, we would expect countries that consume the most milk, dairy, and calcium to have the world's *lowest* hip fracture rates.

They don't. They suffer the world's *highest* rates of hip fracture.

According to the Food and Agriculture Organization of the United Nations, Americans and Western Europeans consume much more milk and dairy than Asians and Africans. Think of all the milk, cheese, yogurt, frozen pizza, and ice cream in the typical American refrigerator. Think of all the cheeseburgers, milk shakes, and lattes Americans consume. Think of Swiss cheese, French Brie and Camembert, Irish cheddar, Dutch Gouda, and Danish blue, not to mention all the cheese in Italian food. Finally, North Americans and Europeans take the lion's share of the world's calcium supplements. Yet hip fracture rates are highest in the United States and Western Europe.

Meanwhile, most people in Asia consume little or no milk after weaning. Many Asian cuisines—Chinese, Japanese, Thai, and Vietnamese—contain *no* milk or dairy products. The calcium theory predicts that elderly hips in these countries should be snapping like dry twigs. Yet their rates are among the world's lowest.

Put another way, total calcium consumption among women in China, Peru, Sri Lanka, and many other non-Western countries is only about 500 milligrams a day, yet fracture rates are very low. Meanwhile, calcium consumption in the United States and Western Europe is close to 1,000 milligrams a day, but in these countries older women face an epidemic of osteoporotic fractures.

The only Asian country with a high fracture rate is Indians living in Singapore (the 1985 study). Indian food is the only Asian cuisine that contains cheese.

In the four worldwide studies, the only glimmer of hope for the calcium theory is the 1985 study's findings about fracture rates in two regions of Croatia. One consumes much more calcium than the other. As the calcium theory predicts, the high-calcium region has a substantially lower rate of hip fracture. But a closer look at this study reveals that the Croatian trial investigated not just hip fractures but also osteoporotic wrist fractures, and the two regions' rates of wrist fracture are *the same*. If the calcium theory were correct, we would expect the high-calcium region to have low rates of both types of fractures. There are other reasons to question this study as well, discussed in Chapter 3.

There's no getting around it: the countries that consume the most calcium have the highest rates of osteoporotic fractures. The United Nations World Health Organization calls this the *calcium paradox*. Osteoporosis authorities have been scratching their heads about it for more than twenty years. They have suggested several possible explanations.

Vitamin D Deficiency

Vitamin D boosts the body's ability to absorb calcium. That's why most milk in the United States is fortified with vitamin D.

Vitamin D is unique among nutrients. It's the only vitamin we make ourselves. Although it's possible to obtain small amounts of vitamin D from food (fish liver oils and tuna, cod, halibut, sea bass, sable, and swordfish), most is produced by the skin when exposed to sunlight. Vitamin D deficiency was not an issue when our ancestors were hunter-gatherers. They spent most of their days outdoors. Nor was it a problem during the period from around 6000 B.C. until late in the nineteenth century, when the vast majority of people farmed. They, too, spent much of their lives outdoors.

But over the past 150 years, as urbanization has moved increasing numbers of people indoors for much of the day, vitamin D deficiency has become a problem, particularly for older people, the age group that spends the least time outdoors. In addition, fear of skin cancer has led to widespread use of sunscreens, which reduce the skin's abil-

ity to synthesize vitamin D. As a result, many people are deficient in this vitamin and don't absorb as much calcium as they might.

The Scandinavian countries lie far north of the equator. They get very little daytime sunlight for much of the year. Perhaps, experts speculate, vitamin D deficiency explains their high rate of fractures and the calcium paradox.

But it doesn't.

If vitamin D deficiency explained the high fracture rates in Scandinavia, we would expect the bone strength of Scandinavian-type people, white people, to increase as we move south from the Baltic. We would expect fracture rates among whites to decrease. They don't. Consider the 1985 study. Israel lies much closer to the equator than Scandinavia. Yet American- or European-born Israelis suffer hip fractures at rates almost as high as those in Sweden and Finland.

Consider Washington, DC. It receives much more daytime sunlight than Scandinavia, but according to the 1985 study, white people in the nation's capital suffer as many hip fractures as Scandinavians. In the 1992 report as well, whites in the United States have hip fracture rates similar to Scandinavia.

Or consider the 2000 study: Germany and the Netherlands are located at more or less the same latitude, but Holland's hip fracture rate is less than one-third of Germany's.

Finally, consider the 2006 study: the former East and West Germany lie at the same latitude, but hip fractures are more of a problem in the West than the East.

Perhaps vitamin D deficiency has something to do with worldwide differences in hip fracture risk. But by itself, vitamin D deficiency provides no compelling explanation for these differences or for the calcium paradox.

Exercise

Weight-bearing exercise plays a key role in bone strength and fracture resistance. Meanwhile, Americans are notoriously sedentary. According to the Centers for Disease Control and Prevention (CDC), only 48 percent of Americans get the recommended thirty to sixty

minutes of regular, moderate exercise (walking, biking, swimming, gardening, and so forth) every day. Some osteoporosis experts blame a sedentary lifestyle for America's high rate of hip fracture. This makes sense—until we look at the rates worldwide.

Consider Saudi Arabia. In Saudi society, women are largely confined to their homes. Many are not allowed to appear on the street without a male relative escort, and by U.S. standards their educational, employment, and activity opportunities are quite limited. It's hard to see how the typical Saudi woman could get much exercise. Yet, in the 2000 study, Saudi women's risk of hip fracture is less than half that of American women.

Now consider Singapore, a technologically advanced, densely urbanized country filled with motor vehicles where most people live in high-rise apartment towers and do as little physical labor as most Americans. In all four studies, Singaporeans' risk of hip fracture is considerably lower than Americans'.

Perhaps differing rates of exercise have something to do with worldwide differences in hip fracture risk. But by itself exercise provides no compelling explanation for these differences or for the calcium paradox.

Race/Genetics

Many studies show that hip fracture rates vary substantially among the races, with whites having higher rates than Africans or Asians. As a result, some researchers have suggested that racial genetic differences govern bone strength.

At first glance this appears plausible. Consider the 1985 study. Whites and African-Americans living in Washington, DC, have similar sun exposure, but the whites have almost twice the risk of hip fracture. The situation is similar for whites and the native Maori in New Zealand and for European- versus African-born Israelis. In every case the whites suffer considerably more hip fractures.

But if race determines bone strength, we would expect all whites, all Asians, and all Africans to have approximately the same fracture risk. This is not the case. In all four studies, Asian residents of Hong

Kong have higher rates than other Asians—in the 2000 study more than twenty times the rate in China. In addition, African-American women in Washington, DC, have much greater hip fracture risk than black African women.

Finally, in the 2000 study, Nigerians have a tiny hip fracture rate, just 1 per 100,000, much less than any figure for African-Americans. Meanwhile, the ancestors of most African-Americans were taken from the area around Nigeria. This happened only four hundred years ago, nowhere near long enough for genetic differences to have developed. In other words, Nigerians and African-Americans come from similar genetic stock, but African-Americans suffer much more osteoporosis.

While race may play some role in fracture risk, by itself it offers no compelling explanation for worldwide differences or for the calcium paradox.

Epidemiology: A Science of Insights—and Limits

As the four studies show, osteoporosis is *not* an epidemic in much of Asia, Africa, or Latin America. But it has reached epidemic proportions in the United States and much of Europe. As a result, it has attracted interest from epidemiologists, who focus on the big picture—the forest, not the trees.

Epidemiology's strength is its ability to discover associations. One of its greatest triumphs was the discovery of the association between smoking and lung cancer. An association may show scientific researchers where to look for cause-and-effect relationships, but it never *proves* a cause-and-effect link on its own. Epidemiologists first noticed an association between smoking and lung cancer during World War II. But it took hundreds of studies over twenty years before the U.S. surgeon general finally declared unequivocally in 1964 that smoking causes lung cancer.

Sometimes associations that look causal turn out not to be. Men living near the Gulf Coast have unusually high cancer rates. Does living near the Gulf of Mexico cause cancer? No. The men with cancer work in the many petrochemical plants in that area. It's long-

term exposure to petrochemicals, not simply residing near the gulf, that explains those cancer rates.

While associations are always intriguing, they must be approached skeptically. Before even mentioning cause and effect, we must ask whether the association is *real.*

The association between high rates of fractures and milk, dairy, and calcium certainly look real. After all:

- We're not dealing with just one study, but four.
- The four studies were conducted by four different groups of investigators on two continents.
- They consider fracture rates in dozens of countries.
- They were conducted not at just one point in time but over a period of twenty-one years.
- Finally, despite their differences, all four studies share the same basic finding: the countries that consume the most milk, dairy, and calcium suffer the most hip fractures.

The association appears real.

In fact, based on the four studies, one might even speculate that milk, dairy foods, and calcium supplements *cause*—or at least contribute to—fractures. But this would be jumping to a conclusion. It's possible that, like the association between a Gulf Coast address and cancer, some other factor might explain *both* high calcium intake and our epidemic of osteoporotic fractures.

To determine what causes osteoporosis, what prevents it, and the role that milk, dairy foods, and calcium play in the condition, we have to go beyond the big picture. Epidemiology isn't enough. We need to focus more narrowly on the people who suffer osteoporotic fractures and how they differ from those who don't. Researchers use four types of studies to do this. We discuss them—briefly—in the next chapter.

The Staggering Toll of Osteoporosis in the United States

- Currently 10 million Americans over age fifty have osteoporosis—8 million women and 2 million men. Another 34 million have osteopenia, bone mineral density considerably below normal but not low enough to be diagnosed as osteoporosis.
- Every year 1.5 million Americans, overwhelmingly women, suffer an osteoporotic fracture.
- Every year osteoporosis causes 300,000 hip fractures; 700,000 vertebral fractures; 250,000 wrist fractures; and 300,000 other fractures.
- Currently, 40 percent of white women over age fifty suffer a hip, wrist, or vertebral fracture at some point.
- Currently, one woman in six—17 percent—fractures a hip during her lifetime. That risk is as high as women's risk of breast, uterine, and ovarian cancer *combined*. Six percent of older men suffer hip fractures—more than develop prostate cancer.
- Osteoporotic fractures result annually in 800,000 emergency room visits, 500,000 hospitalizations, and 2.6 million doctor visits.
- By themselves, osteoporotic fractures are rarely fatal. But they often trigger a downward spiral of deteriorating health that soon results in death. Compared with people with intact hips, during the three months after an osteoporotic hip fracture, risk of death *quadruples*.
- During the year after a hip fracture, 25 percent of people die.
- Only one-third of people who break a hip because of osteoporosis ever regain their independence. Those who survive hip fractures often become disabled. Almost half require canes or walkers.
- A broken hip is a leading cause of placement in nursing homes. Within a year of hip fracture, 20 percent of people—one in

continued

five—must move to a nursing home. Osteoporosis accounts for 180,000 nursing home placements per year.

- In 2002, in the United States alone, medical care for osteoporotic fractures cost $18 billion. That figure is so large that it's difficult to imagine.
- As the 77 million Americans of the baby boom generation grow older, the osteoporosis epidemic is predicted to grow. By 2020, experts predict that osteoporosis will increase 40 percent to 14 million Americans and that half of Americans over fifty will have weak bones at serious risk for fractures. By 2040, the number of hip fractures could double to 600,000 per year.

Not Just a Woman's Disease

Many people believe that osteoporosis is a woman's disease, that it's possible but rare in men. Not so. Plenty of men develop osteoporosis and suffer fractures.

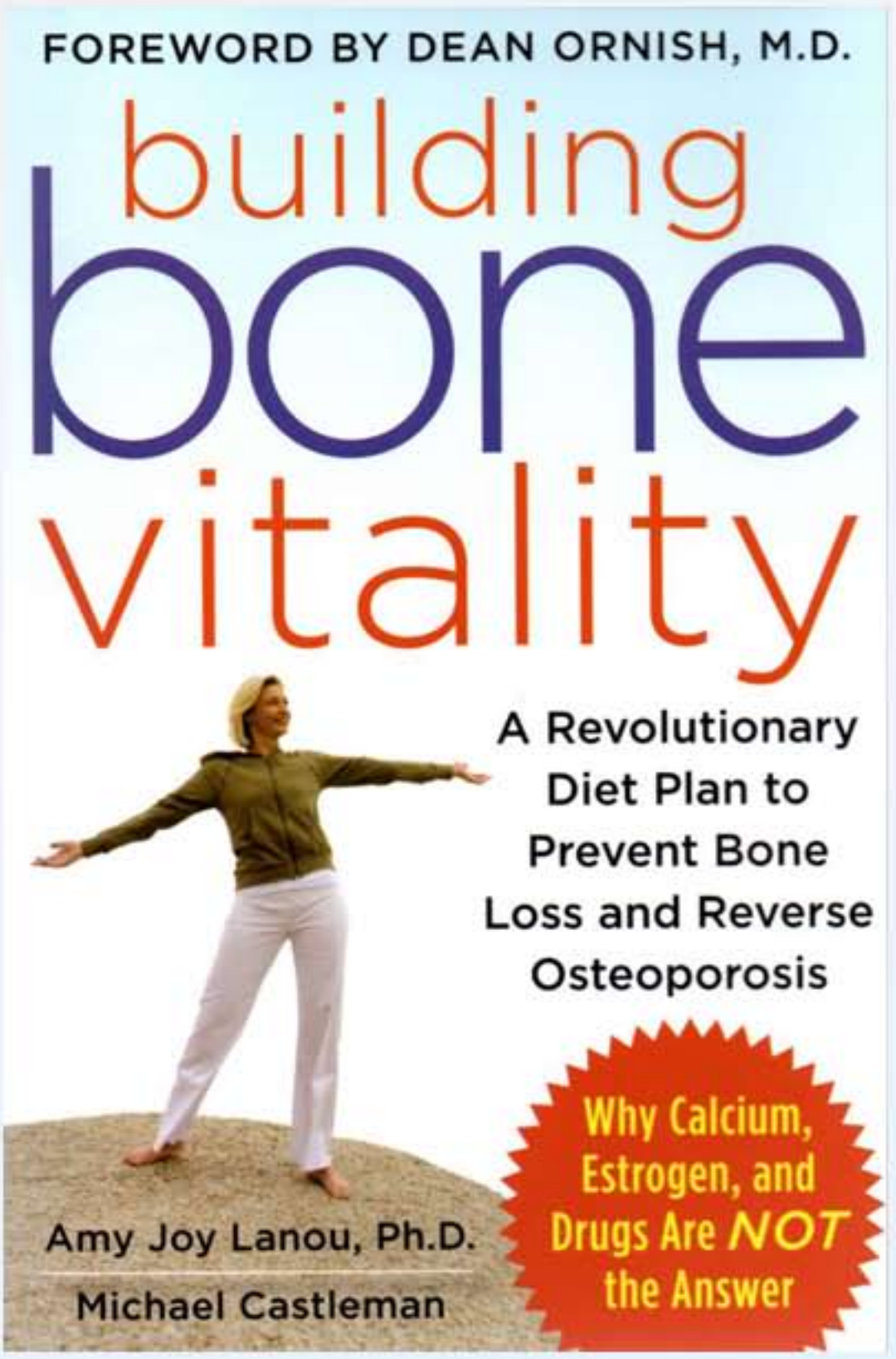
- Italian researchers estimate that men suffer 25 percent of all osteoporotic hip fractures.
- Australian researchers analyzed every fracture in one small city over a five-year period in people over age sixty. Approximately one-third of the fractures occurred in men.
- After osteoporotic hip fractures, men's death rate is higher than women's.

Women suffer more osteoporosis than men for several reasons:

- **Longevity.** Women live longer than men. Osteoporotic fractures are most prevalent among the oldest people. Compared with men, many more women live past eighty. Even if men and women over eighty suffer fractures at the same

rate, the population of women is much larger, so many more fractures occur in women.

- **Genetics.** In all racial and ethnic groups, men have greater bone mineral density (BMD) than women.
- **Hormones.** The female sex hormone estrogen suppresses bone loss. After menopause, estrogen declines and bone loss increases. That's why osteoporotic fractures become common after menopause. Compared with women who experience normal menopause, those who enter menopause early (usually because of ovary removal or chemotherapy) experience earlier bone loss and fractures at younger ages. (More on estrogen in Chapter 16.)
- **Exercise.** Men tend to be more physically active than women. Exercise builds and strengthens bone. (More on this in Chapter 13.)



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