

Smithsonian Institution Division of Physical Anthropology
Historic Causes of Osteoporosis

This research pertains to bone density in 17th and 18th century human skeletons from Maryland and Virginia. The study will help determine whether osteopenia, or low bone mass, is present in Colonial period remains. Preliminary results show that low bone density was present in remains from various archaeological sites dating to these periods.

Lead Agency:

Smithsonian Institution's National Museum of Natural History Department of Anthropology (Division of Physical Anthropology)

Agency Mission:

The Smithsonian Institution's Department of Anthropology is dedicated to advancing and sharing knowledge about humanity in all its dimensions, from the evolution and biological variation of the human species to the diversity of the world's cultures and languages, both past and present.

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Partner Agency:

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General Description:

Osteoporosis is a disease characterized by low bone density, or "porous bones," placing an individual at high risk for fractures by weakening the structural matrix of bones and diminishing their ability to withstand the day to day stresses and strains we place on them. The intermediate stage between normal bone and osteoporosis is classified as "osteopenia," which refers simply to low bone density.

Dual Energy X-ray Absorptiometry (DXA) scanning equipment was developed for clinical use and is currently the most widely used method for measuring bone density in patients at risk for osteoporosis. The scanner directs x-ray energy from two different sources towards the bone being examined. The mineral density weakens or prolongs the transmission of the x-ray energy through a filter onto a photon counter in a degree related to the amount of bone mass present. The greater the bone mineral density, the greater the signal picked up by the counter.

A DXA scan report compares the bone mineral density values with those of a young normal individual (T-score) and with an age-matched normal individual (Z-score). According to the World Health Organization standards, an individual with a T-score at or above -1.0 has normal bone density, while a T-score between -1.0 and -2.5 is osteopenic. Osteoporosis is clinically diagnosed when the T-score is at or below -2.5.

Various factors are linked to low bone density including a diet low in vitamin D, insufficient calcium, smoking, moderate alcohol consumption, sedentary lifestyle, genetics (sex, race, and family history), hormones, and pregnancy.

Nearly 150 historic and modern forensic specimens from various institutions and locations including the Smithsonian Institution, Jamestown, and Maryland Historical Trust collections have been included in this survey. Of the femora DXA scanned thus far, over twenty meet the World Health Organization's definition of osteopenia, and four classify as osteoporotic

DXA scanning has recently been used in a number of studies involving archaeological material (Lees et al, 1993; Ekenman et al, 1995; Mays et al, 1998; Poulson et al, 2001; González-Reimers et al, 2002) as it offers a precise and non-destructive method of quantitatively measuring bone mineral density.

Excellence: What makes this project exceptional?

This study provides temporal information on the frequency of low bone density in eastern North America.

Significance: How is this research relevant to older persons, populations and/or an aging society?

This is basic research designed to investigate the causes of osteopenia and osteoporosis in historic populations from Maryland and Virginia over the last four hundred years. It is one component of a multifaceted study of health and diet with emphasis on the transition from European and African diets following colonization of the New World.

Effectiveness: What is the impact and/or application of this research to older persons? This basic research provides a new long-term view of the implications of how we understand health and diet. As basic research it will articulate with other studies from areas of medical research.

Innovativeness: Why is this research exciting or newsworthy?

This research makes use of museum collections to provide answers to health issues of concern to millions of Americans.