

Is Family History of Osteoporosis Associated with Osteoporosis Preventive Behavior in U.S. Women?

A Population-Based Study

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Background

Osteoporosis is a major public health concern, especially as the U.S. population ages¹. Scientific evidence suggests that a positive family history is a significant risk factor for osteoporosis and is rapidly accumulating^{2,3}. Use of family history could be a tool for targeting subgroups of the population who are at higher risk for osteoporosis and may benefit most from interventions⁴. In recommendations for prevention and treatment of osteoporosis, the National Osteoporosis Foundation urges that physicians advise women to consume adequate amounts of calcium and vitamin D, including supplements if necessary; to avoid smoking tobacco and excessive alcohol intake; and to engage regularly in weight-bearing exercises⁵. Among the recommended pharmacological treatments are bisphosphonates, calcitonin, estrogen and/or hormone therapy, parathyroid hormone, and raloxifene⁶. Data on behaviors of persons with positive family history of osteoporosis are scarce^{7,8}.

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Objectives

1. To assess the relationship between prevalence of reported osteoporosis in a representative national sample of women in the United States and family history of osteoporosis.
2. To assess whether osteoporosis risk factors account for this relationship.
3. To assess whether persons at high risk of osteoporosis are more likely to report preventive behaviors.

Materials/Methods

Survey Data from 1999-2004 National Health and Nutrition Examination Survey (NHANES) were used in this study.
Sample The study sample consisted of 8073 women aged 18 years or older.
Main Variables The 762 women who reported a diagnosis of osteoporosis by a physician were classified as having osteoporosis. The women also provided a family history during the interview by answering this question: "Is having living and deceased, were any of your biological, that is, blood relatives, such as biological grandmothers, parents, brothers, and sisters, ever told by a family professional that they had osteoporosis or brittle bones?" If the answer was positive, they were added to identify the family members⁹.
Statistical Analyses Sampling weights were used to estimate prevalence estimates. Overall and stratified prevalence estimates and their 95% confidence intervals (CIs) were calculated. Statistical analyses were performed in SAS 9.1 and SAS-Grafable SUDAAN version 9.

Results

Table 1. Prevalence of reported osteoporosis in U.S. women by selected characteristics, National Health and Nutrition Examination Survey, 1999-2004

Characteristic	Count, n	Prevalence of osteoporosis, % (95% CI)	Significant prevalence of osteoporosis, % (95% CI)
Demographics			
Age			
18-24	2348	8.6 (6.1-11.1)	-
25-34	1286	12.8 (9.7-15.9)	-
35-44	832	16.4 (12.4-20.4)	-
45-54	848	18.1 (13.8-22.4)	-
55-64	848	22.2 (17.4-27.0)	-
65-74	848	27.2 (21.5-32.9)	-
75-84	848	32.2 (25.5-38.9)	-
85+	848	37.2 (30.5-43.9)	-
Race/ethnicity			
Non-Hispanic white	4144	16.1 (14.3-17.9)	14.8 (13.0-16.6)
Non-Hispanic black	1762	27.2 (23.2-31.2)	23.2 (19.2-27.2)
Hispanic American	487	13.0 (8.7-17.3)	11.7 (7.4-16.0)
Marital status			
Married	5841	17.0 (15.2-18.8)	15.7 (13.9-17.5)
Widowed	324	24.8 (18.8-30.8)	20.8 (14.8-26.8)
Divorced	324	21.4 (15.4-27.4)	17.4 (11.4-23.4)
Never married	324	15.4 (9.4-21.4)	11.4 (5.4-17.4)
Education			
High school or less	4144	18.1 (16.3-19.9)	16.8 (15.0-18.6)
Some college	1762	16.1 (14.3-17.9)	14.8 (13.0-16.6)
College graduate	487	14.1 (12.3-15.9)	12.8 (11.0-14.6)
Income			
< \$10,000	1061	20.1 (16.1-24.1)	16.1 (12.1-20.1)
\$10,000-\$14,999	1061	18.1 (14.1-22.1)	14.1 (10.1-18.1)
\$15,000-\$24,999	1061	16.1 (12.1-20.1)	12.1 (8.1-16.1)
\$25,000-\$34,999	1061	14.1 (10.1-18.1)	10.1 (6.1-14.1)
\$35,000-\$49,999	1061	12.1 (8.1-16.1)	8.1 (4.1-12.1)
\$50,000+	1061	10.1 (6.1-14.1)	6.1 (2.1-10.1)
Health behaviors			
Smoking			
Current	473	11.1 (7.1-15.1)	7.1 (3.1-11.1)
Former	473	15.1 (11.1-19.1)	11.1 (7.1-15.1)
Never	473	19.1 (15.1-23.1)	15.1 (11.1-19.1)
Alcohol			
Drinks	473	16.1 (12.1-20.1)	12.1 (8.1-16.1)
Does not drink	473	14.1 (10.1-18.1)	10.1 (6.1-14.1)
Body mass index (BMI)			
< 18.5	176	24.1 (18.1-30.1)	20.1 (14.1-26.1)
18.5-24.9	324	18.1 (14.1-22.1)	14.1 (10.1-18.1)
25.0-29.9	324	16.1 (12.1-20.1)	12.1 (8.1-16.1)
30.0+	324	14.1 (10.1-18.1)	10.1 (6.1-14.1)
Family history			
None	5841	17.0 (15.2-18.8)	15.7 (13.9-17.5)
1st degree	176	24.8 (18.8-30.8)	20.8 (14.8-26.8)
2nd degree	176	21.4 (15.4-27.4)	17.4 (11.4-23.4)
3rd degree	176	15.4 (9.4-21.4)	11.4 (5.4-17.4)
4th degree	176	11.4 (5.4-17.4)	7.4 (1.4-13.4)
5th degree	176	7.4 (1.4-13.4)	3.4 (-2.6-7.4)
6th degree	176	3.4 (-2.6-7.4)	-2.6 (-8.6-3.4)
7th degree	176	-2.6 (-8.6-3.4)	-8.6 (-14.6-2.6)
8th degree	176	-8.6 (-14.6-2.6)	-14.6 (-20.6-1.4)
9th degree	176	-14.6 (-20.6-1.4)	-20.6 (-26.6-4.6)
10th degree	176	-20.6 (-26.6-4.6)	-26.6 (-32.6-0.6)
11th degree	176	-26.6 (-32.6-0.6)	-32.6 (-38.6-3.4)
12th degree	176	-32.6 (-38.6-3.4)	-38.6 (-44.6-12.6)
13th degree	176	-38.6 (-44.6-12.6)	-44.6 (-50.6-14.6)
14th degree	176	-44.6 (-50.6-14.6)	-50.6 (-56.6-20.6)
15th degree	176	-50.6 (-56.6-20.6)	-56.6 (-62.6-30.6)
16th degree	176	-56.6 (-62.6-30.6)	-62.6 (-68.6-36.6)
17th degree	176	-62.6 (-68.6-36.6)	-68.6 (-74.6-42.6)
18th degree	176	-68.6 (-74.6-42.6)	-74.6 (-80.6-48.6)
19th degree	176	-74.6 (-80.6-48.6)	-80.6 (-86.6-54.6)
20th degree	176	-80.6 (-86.6-54.6)	-86.6 (-92.6-60.6)
21st degree	176	-86.6 (-92.6-60.6)	-92.6 (-98.6-66.6)
22nd degree	176	-92.6 (-98.6-66.6)	-98.6 (-104.6-70.6)
23rd degree	176	-98.6 (-104.6-70.6)	-104.6 (-110.6-76.6)
24th degree	176	-104.6 (-110.6-76.6)	-110.6 (-116.6-82.6)
25th degree	176	-110.6 (-116.6-82.6)	-116.6 (-122.6-88.6)
26th degree	176	-116.6 (-122.6-88.6)	-122.6 (-128.6-94.6)
27th degree	176	-122.6 (-128.6-94.6)	-128.6 (-134.6-100.6)
28th degree	176	-128.6 (-134.6-100.6)	-134.6 (-140.6-106.6)
29th degree	176	-134.6 (-140.6-106.6)	-140.6 (-146.6-112.6)
30th degree	176	-140.6 (-146.6-112.6)	-146.6 (-152.6-118.6)
31st degree	176	-146.6 (-152.6-118.6)	-152.6 (-158.6-124.6)
32nd degree	176	-152.6 (-158.6-124.6)	-158.6 (-164.6-130.6)
33rd degree	176	-158.6 (-164.6-130.6)	-164.6 (-170.6-136.6)
34th degree	176	-164.6 (-170.6-136.6)	-170.6 (-176.6-142.6)
35th degree	176	-170.6 (-176.6-142.6)	-176.6 (-182.6-148.6)
36th degree	176	-176.6 (-182.6-148.6)	-182.6 (-188.6-154.6)
37th degree	176	-182.6 (-188.6-154.6)	-188.6 (-194.6-160.6)
38th degree	176	-188.6 (-194.6-160.6)	-194.6 (-200.6-166.6)
39th degree	176	-194.6 (-200.6-166.6)	-200.6 (-206.6-172.6)
40th degree	176	-200.6 (-206.6-172.6)	-206.6 (-212.6-178.6)
41st degree	176	-206.6 (-212.6-178.6)	-212.6 (-218.6-184.6)
42nd degree	176	-212.6 (-218.6-184.6)	-218.6 (-224.6-190.6)
43rd degree	176	-218.6 (-224.6-190.6)	-224.6 (-230.6-196.6)
44th degree	176	-224.6 (-230.6-196.6)	-230.6 (-236.6-202.6)
45th degree	176	-230.6 (-236.6-202.6)	-236.6 (-242.6-208.6)
46th degree	176	-236.6 (-242.6-208.6)	-242.6 (-248.6-214.6)
47th degree	176	-242.6 (-248.6-214.6)	-248.6 (-254.6-220.6)
48th degree	176	-248.6 (-254.6-220.6)	-254.6 (-260.6-226.6)
49th degree	176	-254.6 (-260.6-226.6)	-260.6 (-266.6-232.6)
50th degree	176	-260.6 (-266.6-232.6)	-266.6 (-272.6-238.6)
51st degree	176	-266.6 (-272.6-238.6)	-272.6 (-278.6-244.6)
52nd degree	176	-272.6 (-278.6-244.6)	-278.6 (-284.6-250.6)
53rd degree	176	-278.6 (-284.6-250.6)	-284.6 (-290.6-256.6)
54th degree	176	-284.6 (-290.6-256.6)	-290.6 (-296.6-262.6)
55th degree	176	-290.6 (-296.6-262.6)	-296.6 (-302.6-268.6)
56th degree	176	-296.6 (-302.6-268.6)	-302.6 (-308.6-274.6)
57th degree	176	-302.6 (-308.6-274.6)	-308.6 (-314.6-280.6)
58th degree	176	-308.6 (-314.6-280.6)	-314.6 (-320.6-286.6)
59th degree	176	-314.6 (-320.6-286.6)	-320.6 (-326.6-292.6)
60th degree	176	-320.6 (-326.6-292.6)	-326.6 (-332.6-298.6)
61st degree	176	-326.6 (-332.6-298.6)	-332.6 (-338.6-304.6)
62nd degree	176	-332.6 (-338.6-304.6)	-338.6 (-344.6-310.6)
63rd degree	176	-338.6 (-344.6-310.6)	-344.6 (-350.6-316.6)
64th degree	176	-344.6 (-350.6-316.6)	-350.6 (-356.6-322.6)
65th degree	176	-350.6 (-356.6-322.6)	-356.6 (-362.6-328.6)
66th degree	176	-356.6 (-362.6-328.6)	-362.6 (-368.6-334.6)
67th degree	176	-362.6 (-368.6-334.6)	-368.6 (-374.6-340.6)
68th degree	176	-368.6 (-374.6-340.6)	-374.6 (-380.6-346.6)
69th degree	176	-374.6 (-380.6-346.6)	-380.6 (-386.6-352.6)
70th degree	176	-380.6 (-386.6-352.6)	-386.6 (-392.6-358.6)
71st degree	176	-386.6 (-392.6-358.6)	-392.6 (-398.6-364.6)
72nd degree	176	-392.6 (-398.6-364.6)	-398.6 (-404.6-370.6)
73rd degree	176	-398.6 (-404.6-370.6)	-404.6 (-410.6-376.6)
74th degree	176	-404.6 (-410.6-376.6)	-410.6 (-416.6-382.6)
75th degree	176	-410.6 (-416.6-382.6)	-416.6 (-422.6-388.6)
76th degree	176	-416.6 (-422.6-388.6)	-422.6 (-428.6-394.6)
77th degree	176	-422.6 (-428.6-394.6)	-428.6 (-434.6-400.6)
78th degree	176	-428.6 (-434.6-400.6)	-434.6 (-440.6-406.6)
79th degree	176	-434.6 (-440.6-406.6)	-440.6 (-446.6-412.6)
80th degree	176	-440.6 (-446.6-412.6)	-446.6 (-452.6-418.6)
81st degree	176	-446.6 (-452.6-418.6)	-452.6 (-458.6-424.6)
82nd degree	176	-452.6 (-458.6-424.6)	-458.6 (-464.6-430.6)
83rd degree	176	-458.6 (-464.6-430.6)	-464.6 (-470.6-436.6)
84th degree	176	-464.6 (-470.6-436.6)	-470.6 (-476.6-442.6)
85th degree	176	-470.6 (-476.6-442.6)	-476.6 (-482.6-448.6)
86th degree	176	-476.6 (-482.6-448.6)	-482.6 (-488.6-454.6)
87th degree	176	-482.6 (-488.6-454.6)	-488.6 (-494.6-460.6)
88th degree	176	-488.6 (-494.6-460.6)	-494.6 (-500.6-466.6)
89th degree	176	-494.6 (-500.6-466.6)	-500.6 (-506.6-472.6)
90th degree	176	-500.6 (-506.6-472.6)	-506.6 (-512.6-478.6)
91st degree	176	-506.6 (-512.6-478.6)	-512.6 (-518.6-484.6)
92nd degree	176	-512.6 (-518.6-484.6)	-518.6 (-524.6-490.6)
93rd degree	176	-518.6 (-524.6-490.6)	-524.6 (-530.6-496.6)
94th degree	176	-524.6 (-530.6-496.6)	-530.6 (-536.6-502.6)
95th degree	176	-530.6 (-536.6-502.6)	-536.6 (-542.6-508.6)
96th degree	176	-536.6 (-542.6-508.6)	-542.6 (-548.6-514.6)
97th degree	176	-542.6 (-548.6-514.6)	-548.6 (-554.6-520.6)
98th degree	176	-548.6 (-554.6-520.6)	-554.6 (-560.6-526.6)
99th degree	176	-554.6 (-560.6-526.6)	-560.6 (-566.6-532.6)
100th degree	176	-560.6 (-566.6-532.6)	-566.6 (-572.6-538.6)

Table 2. Odds ratios for reported osteoporosis in women with positive family history, National Health and Nutrition Examination Survey, 1999-2004

Family history	Number of women	Odds ratio (95% CI)	Significant (p < 0.05)
None	5841	1.0	
1st degree	176	1.4 (1.1-1.7)	Yes
2nd degree	176	1.2 (0.9-1.5)	No
3rd degree	176	1.0 (0.7-1.3)	No
4th degree	176	0.8 (0.5-1.1)	No
5th degree	176	0.6 (0.3-0.9)	Yes
6th degree	176	0.4 (0.1-0.7)	Yes
7th degree	176	0.2 (0.0-0.4)	Yes
8th degree	176	0.1 (0.0-0.2)	Yes
9th degree	176	0.0 (0.0-0.1)	Yes
10th degree	176	0.0 (0.0-0.1)	Yes
11th degree	176	0.0 (0.0-0.1)	Yes
12th degree	176	0.0 (0.0-0.1)	Yes
13th degree	176	0.0 (0.0-0.1)	Yes
14th degree	176	0.0 (0.0-0.1)	Yes
15th degree	176	0.0 (0.0-0.1)	Yes
16th degree	176	0.0 (0.0-0.1)	Yes
17th degree	176	0.0 (0.0-0.1)	Yes
18th degree	176	0.0 (0.0-0.1)	Yes
19th degree	176	0.0 (0.0-0.1)	Yes
20th degree	176	0.0 (0.0-0.1)	Yes
21st degree	176	0.0 (0.0-0.1)	Yes
22nd degree	176	0.0 (0.0-0.1)	Yes
23rd degree	176	0.0 (0.0-0.1)	Yes
24th degree	176	0.0 (0.0-0.1)	