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Estimated prevalence and patterns of presumed osteoporosis among older Americans based on Medicare data

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Abstract

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Introduction—Estimates of osteoporosis (OP) prevalence based on bone mineral density testing and fracture occurrence may be imprecise for small demographic groups. Medicare data are a useful supplemental source of information on OP.

Methods—We studied people ages 65 years covered by Medicare 2005. Cases of presumed OP were beneficiaries with physician services or inpatient claims for OP or for an associated fracture (hip, distal forearm, spine) in 1999–2005.

Results—Among 911,327 beneficiaries with 6 or 7 years of Medicare coverage, the overall prevalence of OP and associated fractures was 29.7%. Prevalence was four times higher for women than men, increased with age, and was two times higher for whites, Hispanic Americans, and Asian Americans than African Americans. Among people with OP-associated fracture claims, the proportion with an OP diagnosis was 49.7% overall (women, 57.1%; men, 21.9%) and was lower for men than women and for African Americans than other ethnic groups.

Conclusions—The low proportion of beneficiaries who had an OP-associated fracture and also had an OP diagnosis, particularly among men and African American women, suggests suboptimal recognition and management of OP. Study limitations included lack of validation of our definition of OP and potential misclassification of race/ethnicity.

Keywords

Epidemiology; Fracture; Osteoporosis; Prevalence

Introduction

It is estimated that more than ten million people have osteoporosis in the US [1]. However, the prevalence of osteoporosis, based either on bone mineral density (BMD) or the occurrence of a fracture, remains uncertain because estimates from different studies vary by case definition and case ascertainment procedures [2, 3]. Case detection procedures used in studies of the burden of osteoporosis have included, in addition to BMD testing, the use of medical records to identify osteoporosis or osteoporotic fractures, the use of self-reports with or without medical record confirmation, and the use of administrative claims data to identify osteoporotic fractures [2, 4–13]. These methods may fail to detect osteoporosis that presents as a fracture not typically considered as osteoporotic and osteoporosis or osteoporotic fractures, particularly fractures of the spine that are not recognized by the patient or physician.

In the absence of fragility fractures, BMD measurement is currently the most common tool used for the diagnosis of osteoporosis in clinical practice. The World Health Organization (WHO) classification of BMD in women has been widely used for defining osteoporosis since it was proposed in 1994 [14]. Recently, Kanis et al. [15] recommended that the standard for a diagnosis of osteoporosis be based on measurement of BMD made at the femoral neck using dual-energy X-ray absorptiometry (DXA). However, the normal range of BMD may vary by gender and ethnic and regional groups, and a single cutoff point may not be adequate for measuring disease burden and for predicting outcomes such as osteoporosis-related fractures, morbidity, and mortality [16].

Also, data on the occurrence of cases of osteoporosis diagnosed on the basis of femoral neck measurements of BMD using DXA are limited in size and scope. In particular, the scarcity of data on variation in osteoporosis prevalence by gender and ethnic and regional subpopulations contributes to uncertainties about its current burden. Available osteoporosis prevalence estimates for men and nonwhites are based on small populations and are not recent [5, 7]. Because of the variation in case ascertainment procedures, it has not been possible to combine results across studies to obtain more stable estimates of the frequency of

osteoporosis in subpopulations. In a cross-sectional study of 6,469 participants 50 years of age or older in the Third National Health and Nutrition Examination Survey (NHANES III), Looker et al. [3-5, 7] used BMD testing to identify osteoporosis cases. The estimated prevalence of osteoporosis, based on femoral neck testing, was 20% for white women, 5% for African American women, 10% for Mexican American women, and 4–6% of for men [5]. Age-specific prevalence was not reported for subgroups other than white women, and the study did not present any data on Asian Americans because of an inadequate sample size available in NHANES to perform these stratified analyses.

We used Medicare claims data as an alternative source of information to estimate the US prevalence of presumed osteoporosis in 2005. These data allowed us to address some of the limitations of previous studies. Our purpose was to supplement rather than to supplant data on osteoporosis prevalence based on WHO and recently updated definitions. Specifically, the data for the present investigation pertain to a national sample of sufficient size to derive prevalence estimates for a number of important demographic subgroups. In addition, in identifying cases, we were able to consider separately both presumed diagnoses of osteoporosis and of fractures strongly associated with osteoporosis, including fractures of the hip, spine, and distal forearm [16-19]. These fractures are associated with low BMD and an increasing incidence after the age of 50 due to bone fragility and falls [17, 18]. Consideration of these fractures allowed us to assess the possible extent of incomplete recognition and testing of osteoporosis, under the assumption that osteoporosis may be present, but not recognized and treated, among people who experience a hip, distal forearm, or spine fracture but who do not receive a diagnosis of osteoporosis.

Methods

Data source

After approval of the study protocol by the University of Alabama at Birmingham institutional review board and the Center for Medicare and Medicaid Services (CMS), we obtained data from the Medicare Chronic Condition Data Warehouse (CCW). The CCW provided longitudinal data on a nationally representative expanded 5% random sample of all Medicare beneficiaries for the years 1999 through 2005. The data included demographic information on individual beneficiaries and Medicare hospital inpatient, hospital outpatient, and carrier (nonhospital physician services) claims data.

Beneficiary inclusion criteria and osteoporosis case definition

We studied beneficiaries who in 2005 were 65 years of age or older, had fee-for service Medicare parts A and B coverage, were not enrolled in a health maintenance organization (HMO), were included in the 5% national sample, and lived in the 50 states or the District of Columbia. Medicare part A pays for inpatient hospital expenses and Medicare part B covers outpatient health care expenses including doctors' fees. HMOs are private companies paid by the federal government to provide Medicare-covered health care. We excluded beneficiaries without both parts A and B coverage and those in HMOs at any time during the observation period in order to maximize the completeness of case ascertainment because such beneficiaries would not have all claims for medical services reported to CMS.

Cases of presumed osteoporosis were beneficiaries with at least one claim in any year from 1999 to 2005 for certain services (see below) and for a diagnosis code for osteoporosis (International Classification of Diseases (ICD), ninth revision 733.0x) or for fracture sites strongly associated with osteoporosis (i.e., hip fracture, ICD-9 codes 820, 73314; closed fracture of thoracic and lumbar vertebra, ICD-9 codes 8052, 8054; fracture of the distal forearm, ICD-9 codes 8134, 81341 through 81345, 81350 through 81354, 73312). To

minimize misclassification due to use of diagnostic services that fail to confirm a true case or services that entail minimal or no physician contact, we defined cases as beneficiaries who had claims with diagnosis codes for osteoporosis or for hip, spine, or distal forearm fracture and at least one of the following on the same date: (1) physician services; (2) procedures in private offices or hospital outpatient clinics; or (3) hospital inpatient services related to primary discharge diagnoses of osteoporosis or hip, spine, or distal forearm fracture.

To evaluate the sensitivity of osteoporosis prevalence estimates to changes in the case definition, we expanded the definition of presumed osteoporosis to include additional fracture sites that are sometimes considered osteoporotic, other than hip, thoracic, or lumbar spine or distal forearm. We assume that this procedure is more sensitive with regard to case ascertainment because it identifies a higher proportion of true osteoporotic fracture cases; however, it is probably less specific because it could incorrectly identify more false cases [17]. We expanded the fracture sites included in the analysis with two groups of cases: (1) those with at least one claim for fractures of the pelvis, humerus, radius/ulna, femur, tibia/fibula, clavicle, or wrist/carpal (expanded fracture group 1, EFX1); and (2) those with at least one claim for fractures of the ribs, scapula, patella, ankle, or ill-defined bones of trunk (expanded fracture group 2, EFX2; see “Appendix” for ICD-9 codes).

Statistical analysis

We classified beneficiaries according to age as of the end of 2005, gender, race (African Americans, Whites, Asian Americans, Hispanic Americans, and other), core-urban residential status, and number of years of Medicare coverage in the 5% sample during the period 1999–2005. We determined core-urban residential status by linking beneficiaries' zip codes to the corresponding rural–urban commuting area code (Morrill R; Rural–Urban Commuting Area Codes).

We calculated prevalence estimates as the number of presumed cases of osteoporosis or related fractures, divided by the number of eligible beneficiaries, overall and for each subgroup of interest. Confidence limits of prevalence were based on exact binomial distributions. We estimated prevalence ratios (PRs) for subgroups of interest using multiple binomial regression models that adjusted for other variables considered in the study [20, 21]. Given the differences in prevalence patterns, we estimated prevalence ratios using separate models for women and men, in addition to a model for all beneficiaries. We determined PRs for various age groups (referent, the youngest group), different ethnic/racial groups (referent, African Americans), urban–rural status (referent, nonurban areas), and number of years of Medicare coverage (referent, only 2005 coverage). Because the duration of Medicare coverage was an important determinant of observed prevalence, we restricted most analyses to beneficiaries who had at least 6 years of Medicare coverage. We used SAS for all the analyses (SAS Institute Inc., SAS OnlineDoc® 9.1.3, Cary, NC, USA: SAS Institute Inc., 2002–2005).

Results

The total group of 1,362,674 eligible beneficiaries were 88% white; 59% were women, and 33% were 80 years of age or older as of the end of 2005. Of the total eligible beneficiaries, 67% had Medicare data for at least 6 years ($n=911,327$). The prevalence of presumed osteoporosis was 24.8% overall (Table 1). Estimated prevalence increased with years of Medicare coverage. For beneficiaries with 6–7 years of Medicare coverage, the prevalence was 29.7% compared to 9.4% among those with only 1 year of coverage, and the adjusted PR for this comparison was 2.8 overall, 2.6 for women, and 5.2 for men.

All further analyses were restricted to beneficiaries with 6–7 years of Medicare coverage. In this group, crude prevalence was 42.5% among women compared to 10.1% among men and, after adjusting for other variables, was more than four times higher for women than for men (adjusted PR=4.1; Table 2). Prevalence increased with age such that the adjusted PRs comparing OP prevalence for the 70–74, 75–79, and 80+ age groups to OP prevalence for the 65–69-year reference age group were 1.0, 1.2, and 1.5, respectively. Prevalence was about two times higher for whites, Hispanic Americans, and Asian Americans than for African Americans and was 20% higher for urban compared to nonurban residents. The age-related, racial, and urban/nonurban patterns of prevalence were similar for women and men.

Within most gender- and age-specific groups, osteoporosis prevalence was lowest for African Americans and highest for Asian Americans (Table 3). Prevalence was about two to five times higher among women than among men within each age- and race/ethnicity-specific subgroup. Among white women, who accounted for a large proportion of all beneficiaries studied, age-specific prevalence rates were 32.8%, 35%, 41.8%, and 49.9% for ages 65–69, 70–74, 75–79, and 80+ years, respectively.

Analysis of the pattern of claims types for the presumed OP cases (Table 4) indicated that 63.4% of all cases had claims with diagnosis codes for osteoporosis only; 18.4% had claims with fracture codes but not with osteoporosis codes, and 18.2% had claims with both osteoporosis and fracture diagnosis codes (last row of Table 4). The proportion of all presumed osteoporosis cases having fracture claims but not osteoporosis claims (“fracture-only cases”) was 3.1 times higher for men than for women (44.6% vs. 14.3%). The proportion of fracture-only cases also was highest for African Americans and lowest for Asian Americans. These results remained robust and were unaffected by the multivariable adjustment for other demographic variables. The age- and race/ethnicity-adjusted PR for the proportion of fracture-only cases among men compared to women was 3.1. The age- and gender-adjusted PR for the proportion of fracture-only cases in African Americans compared to whites was 1.2; a similarly adjusted PR for Asian Americans compared to whites was 0.4 (data not displayed in a table).

Among beneficiaries with fracture claims, 50% overall (women, 57.1%; men, 21.9%) also had a diagnosis code for osteoporosis (Table 5). Among both women and men with a fracture, the proportion with a claim for osteoporosis was lowest for African Americans (women, 33.9%; men, 11.9%) and highest for Asian Americans (women, 70.3%; men, 35.8%). The proportion of fracture patients who also had an osteoporosis claim was lower among those under 75 years of age than among older groups. Among all beneficiaries with both fracture and osteoporosis claims, about 50% had their first osteoporosis claim after their fracture.

In our sensitivity analysis that considered additional types of fractures as satisfying our osteoporosis case definition, the overall prevalence estimates increased to 32.9% (95% CI=32.8%, 33.0%) with the addition of EFX1 (case definition 2) and 36.3% (95% CI=36.3%, 36.5%) with addition of EFX2 (case definition 3).

Discussion

To address limitations of previous research on the burden of osteoporosis and to provide updated epidemiologic data on the disease, we studied a large national sample of Medicare beneficiaries in the US. Because of the relatively large size of the study, we were able to estimate variations in osteoporosis prevalence among both women and men, among different ethnic/racial groups, and based on urban/nonurban geography. We anticipate that these

methods may be useful in future studies to quantify the burden of osteoporosis in various demographic subgroups.

Medicare-claims-based patterns of osteoporosis prevalence by gender, race/ethnicity, and age were similar to those found using other methodological approaches [2, 5, 7, 22]. Consistent with previous reports, we found that the prevalence of osteoporosis was higher among whites and Hispanic Americans than among African Americans and that prevalence was substantially higher in women than in men. In addition, we found that the prevalence of osteoporosis and related fractures was highest among Asian Americans, especially for ages 70 and older, an observation that has not been reported previously. The latter result could reflect better detection and reporting of osteoporosis, a higher risk of developing osteoporosis, better survival after osteoporosis among Asian Americans compared to other ethnic groups, or a combination of these factors.

Based on the consistency of Medicare-claims-based patterns of osteoporosis with patterns reported in other studies [5, 7], Medicare claims data appear to be valid for assessing factors associated with osteoporosis, but several methodological issues need to be considered. First, the use of multiple years of claims data considerably enhanced the identification of prevalent cases of osteoporosis, especially for men. Because repeated medical services for osteoporosis are not always necessary in clinical practice, claims for osteoporosis in previous years may be the only evidence of a prevalent case. Our results suggest that 5 years of claims data need to be considered at a minimum when estimating the prevalence of osteoporosis, particularly for men.

Estimates of osteoporosis prevalence appear to be modestly sensitive to the case definition used. In our study, osteoporosis-related fractures account for a substantial proportion of presumed osteoporosis cases, particularly among men. If we excluded fracture claims, 18% of presumed osteoporosis cases would not be identified. Also, when we expanded the case definition by adding EFX1 or EFX2 osteoporosis-associated fractures, the estimated prevalence of presumed osteoporosis increased from the initial 29.7% to 32.9% to 36.3%. Although some of these fractures may not be fragility fractures, excluding them in the case definition may underestimate prevalence. There is controversy about what constitutes a fragility fracture, and even high-trauma fractures may be associated with low bone mass among older adults [23].

Our estimate of osteoporosis prevalence among white women was similar to those reported by Looker and colleagues [7] based on NHANES BMD data for ages 80 years or older (49% versus 47%, respectively) but were higher for ages 70–79 (37% versus 29%, respectively). Also, we estimated a prevalence of 20% for white women ages 65–69 years, in contrast to the 16% for ages 60–69 years reported by Looker et al. [7]. The fact that our age-specific prevalence estimates for white women were somewhat higher than those reported by Looker et al. contrasts with the expectation that claims data would miss more true cases of osteoporosis than BMD tests. Our use of claims-based methodology, as opposed to BMD test results, to detect cases could explain these differences. The lower estimates based on the NHANES data may be due in part to the fact that NHANES subjects are voluntary participants. Frail unhealthy persons may be underrepresented in such a subject group, particularly given the participation rate of 63%. Our study is not vulnerable to selection bias stemming from low participation. Other factors may have contributed to the observed difference in results. Our case identification methods may have led to the inclusion of false-positive cases. Our youngest age category, 65–69 years, was restricted to beneficiaries 5 years older than those in the overlapping age group of 60–69 years reported by Looker et al. [7]. The estimates in the current study were based on a substantially larger sample size, and

our data were from a more recent time period (i.e., 1999–2005) than those of Looker et al. (i.e., 1988–1994).

The low proportion of fracture patients with an osteoporosis diagnosis code may reflect the previously reported low rates of osteoporosis recognition and testing among fracture patients [24]. Of potential clinical relevance, had these cases been diagnosed before the occurrence of the fracture, many of them could have been treated, and some of the fractures might have been prevented. This possibility is reinforced by our finding that only 57.1% of women and 21.9% of men with fractures typically associated with osteoporosis had any osteoporosis diagnosis. This problem appears to be larger among men than among women, larger among younger beneficiaries and, among women, may disproportionately affect African Americans. Among patients with both diagnoses of fracture and diagnoses of osteoporosis, 50% had their first osteoporosis claim after their fracture occurred. These findings are of concern because fracture history is a well-known strong predictor for subsequent fractures [25]. Indeed, national health care performance measures indicate that even after fracture less than 25% of patients get either tested or treated for osteoporosis [24]. If, at a minimum, osteoporosis could be diagnosed after the occurrence of an initial fracture, future fractures might be prevented with appropriate secondary prevention efforts.

Despite the many strengths of this national population-based study with a very large sample size, there are potential limitations to our findings. Although we conducted uncertainty analysis to provide upper and lower bounds for our estimates, we were not able to validate the definition of osteoporosis used in this study. We identified presumed osteoporosis cases from physician service, procedure, and inpatient claims for osteoporosis or strongly associated fractures (i.e., hip, spine, and distal forearm), an approach that reduces false positives compared with including also as cases people whose osteoporosis or fracture claims did not entail physician contact, such as those for skilled nursing or home health services or durable medical equipment. Despite this conservative assumption, our case identification methods may still lead to the inclusion of residual false positives. Alternatively, the methods we used may underestimate the number of true cases in those instances where physician or inpatient services or surgical procedures were not obtained or where they were obtained but were not coded as osteoporosis-related health care in the claims data. Others have noted that the accuracy of case ascertainment based on Medicare claims is high for hip fractures but may be less optimal for other fractures, particularly spine fractures [26–28]. Similar validation data are not available for osteoporosis diagnoses *per se*. Formal validation of our case identification approach will require further research.

An additional limitation was potential misclassification of race/ethnicity data in Medicare administrative files [29]. CMS receives beneficiary self-reported race/ethnicity data on Medicare enrollees from various sources; and consequently these data are subject to misclassification [29, 30]. This misclassification could have distorted the prevalence patterns that we observed in some of our analyses particularly for self-reported Hispanic and Asian Americans than for other race/ethnicity groups. [29].

In conclusion, we used Medicare claims data to assess the prevalence of osteoporosis. These data have potentially important limitations, including lack of validated diagnoses of osteoporosis and likely misclassification of subjects by race/ethnicity, and should be regarded as supplementing rather than replacing prevalence data based on the BMD-based reference standard for diagnosis [15]. In our study, osteoporosis prevalence varied demographically as previously reported. These results suggest that, although our estimates of the absolute prevalence of osteoporosis may be inaccurate because of the limitations stated above, patterns of prevalence based on these data may be valid. These data provide statistically stable prevalence estimates for demographic subgroups. We observed that

approximately 30% of Medicare beneficiaries 65 years of age or older had osteoporosis or a history of osteoporosis-associated fractures. Among various ethnic/racial subgroups, prevalence was highest among Asian Americans. Finally, based on these nationally representative estimates, a considerable proportion of people with osteoporotic fractures has not received a diagnosis of osteoporosis. Among fracture patients, the proportion with diagnosis of osteoporosis was particularly low among men, African Americans, and younger beneficiaries.

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Appendix

Table 6

Expanded fracture group 1 (EFX1): fracture sites possibly considered OP-related and corresponding ICD-9 codes

Site	ICD-9 codes
Pelvis	808
Humerus	812, 73311
Radius/ulna	813 except distal forearm
Femur	821, 73315
Tibia/fibula	823, 73316
Clavicle	810
Wrist/carpal	814

Table 7

Expanded fracture group 2 (EFX2): fracture sites sometimes considered OP-related and corresponding ICD-9 codes

Site	ICD-9 codes
Rib	8070, 8071
Scapula	811
Patella	822
Ankle	824
Ill-defined bones of trunk, other	809, 818, 819, 827, 828, 829, 806, 805 except closed thoracic and lumbar spine, 73313

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Table 1

Number of beneficiaries and of presumed cases of osteoporosis (OP), prevalence estimates, and prevalence ratios (PR) by number of years of Medicare coverage using Medicare claims data for 1999–2005^a

Variable	No. of years of Medicare coverage	Number of beneficiaries (%)	OP or strongly associated fracture		Crude PR		Adjusted PR ^b		
			Cases (%)	Prevalence (95% CI)			Model 1 All	Model 2 Women	Model 3 Men
1		85,687 (6.3)	8,035 (2.4)	9.4 (9.2, 9.6)	1.0		1.0	1.0	1.0
2–3		172,837 (12.7)	22,683 (6.7)	13.1 (13.0, 13.3)	1.4		1.6	1.6	1.8
4–5		192,823 (14.2)	36,114 (10.7)	18.7 (18.6, 18.9)	2.0		2.2	2.1	3.1
6–7		911,327 (66.9)	270,907 (80.2)	29.7 (29.6, 29.8)	3.2		2.8	2.6	5.2
Total		1,362,674	337,739	24.8 (24.7, 24.9)	–		–	–	–

^aData included beneficiaries who had 12 months of Medicare parts A and B coverage in 2005, who were not enrolled in an HMO, who were 65 years or older (65+) in 2005, who lived in the 50 states plus DC, and who were in the 5% sample in 2005. The percentages in the table are column percents

^bPrevalence ratios (PR) were estimated with multiple binomial regression. All models included age, race/ethnicity, urban–rural status, and years of Medicare coverage; for model 1 only, gender also was included. All estimates of PR were statistically significant. Model 1 for all beneficiaries was based on data of all 1,362,674 beneficiaries. Model 2 for women was based on data restricted to 798,583 women. Model 3 for men was based on data restricted to 564,091 men

Table 2

Number of beneficiaries and of presumed cases of osteoporosis (OP), prevalence estimates, and prevalence ratios (PR) according to selected characteristics in 2005 using Medicare claims data for 1999–2005, analysis restricted to beneficiaries with at least 6 years of Medicare coverage^a

Variable	Number of beneficiaries (%)	OP or strongly associated fracture		Crude PR		Adjusted PR ^b		
		Cases (%)	Prevalence (95% CI)			Model 1 All	Model 2 Women	Model 3 Men
Total	911,327	270,907	29.7(29.6, 29.8)	–	–	–	–	–
Race/ethnicity								
Afr. Amer.	66,540 (7.3)	10,960 (4.1)	16.5 (16.2, 16.8)	1.0	1.0	1.0	1.0	1.0
White	810,123 (88.9)	248,541 (91.7)	30.7 (30.6, 30.8)	1.9	1.9	2.0	2.0	1.7
Asian Amer.	9,919 (1.1)	3,857 (1.4)	38.9 (37.9, 39.9)	2.4	2.3	2.2	2.2	2.8
Hispanic Amer.	13,699 (1.5)	4,442 (1.6)	32.4 (31.6, 33.2)	2.0	2.0	2.0	2.0	2.0
Other	11,046 (1.2)	3,107 (1.2)	28.1 (27.3, 29.0)	1.7	1.8	1.9	1.9	1.7
Gender								
Men	359,733 (39.5)	36,426 (13.5)	10.1 (10.0, 10.2)	1.0	1.0	–	–	–
Women	551,594 (60.5)	234,481 (86.6)	42.5 (42.4, 42.6)	4.2	4.1	–	–	–
Age								
65–69	29,077 (3.2)	5,360 (2.0)	18.4 (18.0, 18.9)	1.0	1.0	1.0	1.0	1.0
70–74	216,686 (23.8)	46,544 (17.2)	21.5 (21.3, 21.7)	1.2	1.0	1.1	1.1	0.8
75–79	255,911 (28.1)	69,038 (25.5)	27.0 (26.8, 27.2)	1.5	1.2	1.3	1.3	1.0
80+	409,653 (45.0)	149,965 (55.4)	36.6 (36.5, 36.8)	2.0	1.5	1.5	1.5	1.7
Mean (median; min, max)	79 (79; 65, 115)	80 (81; 65, 112)		–	–	–	–	–
Urban–rural residential status								
Nonurban core	354,443 (38.9)	93,194 (34.4)	26.3 (26.2, 26.4)	1.0	1.0	1.0	1.0	1.0
Urban core	556,884 (61.1)	177,713 (65.6)	31.9 (31.8, 32.0)	1.2	1.2	1.2	1.2	1.2

^aData included beneficiaries who had 12 months of Medicare parts A and B coverage in 2005, who were not enrolled in an HMO, who had six or more years of Medicare coverage through 2005, who were 65+ years of age in 2005, who lived in the 50 states plus DC, and who were in the 5% sample in 2005

^bPrevalence ratios (PR) were estimated with multiple binomial regression models including all the variables in the table. All estimates of PR were statistically significant. Model 1 for all beneficiaries was based on data for 911,327 beneficiaries. Model 2 for women was based on data restricted to 551,594 women. Model 3 for men was based on data restricted to 359,733 men

Table 3

Gender-, age-, and race-specific number of cases of presumed osteoporosis in 2005, prevalence and 95% confidence interval (CI) based on Medicare claims data for osteoporosis or associated fractures in 1999–2005, analysis restricted to beneficiaries with at least 6 years of Medicare coverage

Age ^a	African Americans			Whites			Asian Americans			Hispanic Americans			Others		
	Cases	Prevalence (95% CI)		Cases	Prevalence (95% CI)		Cases	Prevalence (95% CI)		Cases	Prevalence (95% CI)		Cases	Prevalence (95% CI)	
Women															
65–69	465	16.7 (15.3, 18.1)		3,397	32.8 (31.9, 33.8)		26	30.6 (21.1, 41.5)		166	42.2 (37.3, 47.3)		78	32.2 (26.4, 38.5)	
70–74	1,837	17.5 (16.8, 18.2)		36,851	35.0 (34.7, 35.3)		520	48.7 (45.7, 51.8)		528	41.5 (38.8, 44.2)		701	36.3 (34.1, 38.4)	
75–79	2,326	21.1 (20.3, 21.9)		54,852	41.8 (41.6, 42.1)		1,112	53.7 (51.5, 55.8)		1,167	43.0 (41.1, 44.9)		611	38.0 (35.6, 40.5)	
80+	4,966	26.4 (25.7, 27.0)		120,274	49.9 (49.7, 50.1)		1,475	54.7 (52.8, 56.6)		1,856	51.1 (49.5, 52.8)		1,273	46.4 (44.5, 48.3)	
All women	9,594	22.2 (21.8, 22.6)		215,374	44.1 (44.0, 44.3)		3,133	52.9 (51.7, 54.2)		3,717	46.4 (45.3, 47.5)		2,663	40.8 (39.6, 42.0)	
Men															
65–69	106	4.9 (4.0, 5.9)		1,058	8.6 (8.1, 9.1)		8	8.6 (3.8, 16.3)		35	8.1 (5.7, 11.1)		21	8.3 (5.2, 12.5)	
70–74	328	4.6 (4.1, 5.1)		5,455	6.4 (6.2, 6.5)		111	14.3 (11.9, 16.9)		92	9.2 (7.5, 11.1)		121	7.0 (5.9, 8.3)	
75–79	346	5.4 (4.8, 6.0)		8,073	8.4 (8.2, 8.6)		225	16.4 (14.5, 18.5)		228	11.1 (9.7, 12.5)		98	8.8 (7.2, 10.6)	
80+	586	7.7 (7.1, 8.3)		18,581	14.6 (14.4, 14.8)		380	21.6 (19.7, 23.6)		370	16.7 (15.4, 18.6)		204	14.3 (12.5, 16.2)	
All men	1,366	5.8 (5.6, 6.2)		33,167	10.3 (10.2, 10.4)		724	18.1 (16.9, 19.3)		725	12.8 (11.9, 13.6)		444	9.8 (9.0, 10.7)	
All beneficiaries	10,960	16.5 (16.2, 16.8)		248,541	30.7 (30.6, 30.8)		3,857	38.9 (37.9, 39.9)		4,442	32.4 (31.6, 33.2)		3,107	28.1 (27.3, 29.0)	

^aData are presented for beneficiaries who were ages 65+ years in 2005, who had at least 6 years of Medicare coverage, who had 12 months of Medicare parts A and B coverage in 2005, who were not enrolled in an HMO, who lived in the 50 states plus DC, and who were in the 5% sample in 2005

Table 4

Number of cases of presumed osteoporosis (OP) in 2005 based on Medicare claims data for osteoporosis or associated fractures of hip, spine, and distal forearm in 1999–2005, by claims pattern, among beneficiaries with at least 6 years of Medicare coverage^a

	Claims pattern					
	Total: OP or fracture ^b		OP only		Fracture only	
	No. of cases	% ^c	No. of cases	% ^c	No. of cases	% ^c
Women	234,481		156,120	66.6	33,614	14.3
African Amer.	9,594		6,900	71.9	1,781	18.6
White	215,374		142,214	66.0	30,815	14.3
Asian Amer.	3,133		2,483	79.3	193	6.2
Hispanic Amer.	3,717		2,675	72.0	447	12.0
Other	2,663		1,848	69.4	378	14.2
Men	36,426		15,652	43.0	16,226	44.6
African Amer.	1,366		600	43.9	675	49.4
White	33,167		13,846	41.8	15,051	45.4
Asian Amer.	724		545	75.3	115	15.9
Hispanic Amer.	725		419	57.8	230	31.7
Other	444		242	54.5	158	35.6
All beneficiaries	270,907		171,772	63.4	49,843	18.4

^aData are presented for beneficiaries who were ages 65+ years in 2005, who had at least 6 years of Medicare coverage, who had 12 months of Medicare coverage, who had 12 months of Medicare parts A and B coverage in 2005, who were not enrolled in an HMO, who lived in the 50 states plus DC, and who were in the 5% sample in 2005

^bTotal refers to the total number of cases, i.e., “OP or fracture” diagnosis claims

^cThe percentages presented are the row percent (%) of total cases, i.e., “OP or fracture” diagnosis claims for each stratum

Table 5

Gender-, age-, and race-specific proportion of cases with osteoporosis claims among cases with fracture claims, based on Medicare claims data for osteoporosis or associated fractures in 1999–2005, among beneficiaries with at least 6 years of Medicare coverage

Age ^a	African American	White	Asian American	Hispanic American	Other	All beneficiaries
Women						
65–69	24.0	48.1	28.6	52.9	24.0	45.1
70–74	29.9	52.1	56.9	53.9	52.8	51.2
75–79	32.4	57.4	68.8	56.1	50.8	56.5
80+	36.0	59.1	73.8	58.3	55.9	58.4
All women	33.9	57.9	70.3	57.1	53.6	57.1
Men						
65–69	10.5	10.7	–	25.0	27.3	20.0
70–74	9.6	16.4	35.0	9.8	20.4	16.0
75–79	12.1	20.1	32.6	29.1	17.5	20.0
80+	13.3	24.3	38.1	26.5	23.5	24.1
All men	11.9	22.1	35.8	24.8	21.8	21.9
All beneficiaries	29.0	50.4	62.8	50.0	47.3	50.0

^aData are presented for beneficiaries who were ages 65+ years in 2005, who had at least 6 years of Medicare coverage, who had 12 months of Medicare parts A and B coverage in 2005, who were not enrolled in an HMO, who lived in the 50 states plus DC, and who were in the 5% sample in 2005