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# Prevalence of recognized bone metastases in the U.S. adult population

## Introduction

- ◆ Bone is a common site of metastatic cancer, most prevalent in cancers of the breast, prostate, and lung.
- ◆ Bone metastases (BM) can cause serious skeletal complications, reducing quality of life and increasing medical costs.
- ◆ The prevalence of BM is not well documented, and understanding the burden of this disease is important given its devastating consequences.
- ◆ We estimated the prevalence of BM in the U.S. adult Medicare fee-for-service (FFS) and the MarketScan commercially insured populations for December 31, 2008.
- ◆ Age- and sex-specific prevalence estimates were multiplied by 2008 Census data to quantify the number of prevalent cases of BM in the total U.S. adult population.

## Methods

- ◆ Two point-prevalent cohorts were assembled, according to insurance coverage on December 31, 2008:
  - ◆ Persons aged 18-64 years enrolled in a commercial plan (MarketScan database)
  - ◆ Persons aged ≥65 years enrolled in FFS Medicare (Medicare 5% sample).
- ◆ Study period: 2004-2008 to identify patients with evidence of BM.

- ◆ Definition of recognized BM (both required):
  - ◆ Had one inpatient claim or 2 outpatient claims on different days in any 12-month interval with an ICD-9 diagnosis for secondary malignant neoplasm of bone or bone marrow (198.5) OR ≥1 claim with HCPCS codes for IV bisphosphonate zoledronic acid (J3487) or pamidronate (J2430) with ≥1 qualifying code on the same claim. Qualifying codes included primary cancer, metastatic cancers, and V-codes for antineoplastic chemotherapy and immunotherapy administration.
  - ◆ Had primary cancer during a 12-month interval centered on the earliest date of BM diagnosis or treatment. Cancer type-specific codes were required on 1 inpatient claim or 2 outpatient claims on different days during the 12-month interval.
- ◆ The number of prevalent cases of BM in the national commercially insured population aged 18-64 years was calculated by multiplying the within-cohort prevalence estimates from the MarketScan data set by vendor-provided weights.
- ◆ The number of prevalent cases in the entire FFS Medicare population aged ≥65 years was calculated by multiplying the number of prevalent cases in the Medicare 5% sample by 20.
- ◆ Age- and sex-specific prevalence estimates from the commercially insured (18-44, 45-64) and FFS Medicare (65-74, 75-84, ≥85) populations were applied to the 2008 U.S. population, as estimated by the Census Bureau, to calculate the estimated total number of patients living with BM in the U.S. adult population on December 31, 2008.

## Results

- ◆ We identified 9,505 MarketScan patients (in 18.2 million) and 6,427 FFS Medicare patients (in 1.3 million) with BM (Table 1).
- ◆ In the MarketScan cohort, 29%, 28%, and 43% were identified from BM diagnosis code only, qualified IV bisphosphonate codes only, or both, respectively. In the FFS Medicare cohort, the corresponding distribution was 37%, 20%, and 43% (Table 1).
- ◆ For breast, prostate, and lung cancer, the majority of patients were identified from diagnosis codes (with or without IV bisphosphonate codes), whereas most multiple myeloma patients were identified only through qualified IV bisphosphonate codes (Table 1).
- ◆ Based on counts derived from the MarketScan and Medicare 5% data sets, we estimated 60,411 prevalent cases of BM in the national commercially insured population aged 18-64 and 128,540 in the national FFS Medicare population aged ≥65 on December 31, 2008 (Table 2).
- ◆ Applying age- and sex-specific prevalence estimates (Table 3) to corresponding population counts from the Census Bureau (Table 4), we estimated 279,679 U.S. adults with recognized BM on December 31, 2008 (Table 5).

Table 1. Number of persons meeting the BM definition in the study cohorts

Cancer Type	Commercially Insured Cohort (n = 18,218,583)				Medicare 5% Sample Cohort (n = 1,297,538)			
	Definition Sources*				Definition Sources*			
	n (%)	Code Only	Codes Only	Both	n (%)	Code Only	Codes Only	Both
All cancers	9,505 (0.052)	28.9	27.9	43.3	6,427 (0.495)	37.0	20.1	43.0
Female breast	4,006 (0.022)	17.7	23.7	58.5	1,771 (0.136)	27.6	18.0	54.5
Prostate	744 (0.004)	32.9	13.7	53.4	1,813 (0.140)	41.3	11.0	47.7
Lung	1,235 (0.007)	49.6	9.7	40.7	786 (0.061)	58.1	6.2	35.6
Multiple myeloma	1,760 (0.010)	5.6	67.4	27.0	1,126 (0.087)	4.3	55.4	40.3
Other	1,760 (0.010)	61.1	16.5	22.3	931 (0.072)	68.3	10.5	21.2

\*Percent of row total.

Table 2. Estimated number of prevalent cases of BM in the national commercially insured population aged 18-64 years and fee-for-service Medicare population aged ≥65 years

Cancer Type	U.S. Commercially Insured		U.S. Fee-for-Service Medicare	
	Age 18-64 yr (n = 120,694,145)	Age ≥ 65 yr (n = 25,950,760)	Age 18-64 yr (n = 120,694,145)	Age ≥ 65 yr (n = 25,950,760)
All cancers	60,411 (59,134-61,689)	128,540 (125,485-131,595)	60,411 (59,134-61,689)	128,540 (125,485-131,595)
Female breast	25,564 (24,724-26,404)	35,420 (33,813-37,027)	25,564 (24,724-26,404)	35,420 (33,813-37,027)
Prostate	4,782 (4,428-5,137)	36,260 (34,634-37,886)	4,782 (4,428-5,137)	36,260 (34,634-37,886)
Lung	7,769 (7,314-8,223)	15,720 (14,649-16,791)	7,769 (7,314-8,223)	15,720 (14,649-16,791)
Multiple myeloma	10,838 (10,312-11,365)	22,520 (21,238-23,802)	10,838 (10,312-11,365)	22,520 (21,238-23,802)
Other	11,458 (10,895-12,021)	18,620 (17,455-19,785)	11,458 (10,895-12,021)	18,620 (17,455-19,785)

Note: Data presented as estimated number of patients with bone metastasis (95% confidence interval).

Table 3. Age- and sex-specific prevalence estimates of BM in the U.S. commercially insured and Medicare FFS populations

Sex	Age, yr	Insured Populations*, n	Estimated Prevalence of Bone Metastasis (Standard Error), per 100,000 Population					
			All Cancers	Female Breast	Prostate	Lung	Multiple Myeloma	Other
Men	18-44	32,978,252	6.4 (0.4)		0.3 (0.1)	0.9 (0.2)	1.3 (0.2)	3.8 (0.3)
	45-64	26,686,875	6.9 (1.4)		17.5 (0.7)	13.2 (0.6)	20.6 (0.8)	18.3 (0.8)
	65-74	6,043,760	419.9 (11.8)		187.0 (7.9)	70.2 (4.8)	88.4 (5.4)	74.5 (5.0)
	75-84	3,686,380	734.1 (19.9)		444.3 (15.5)	81.4 (6.6)	113.9 (7.9)	94.4 (7.2)
	≥ 85	1,210,060	907.4 (38.6)		709.1 (34.1)	39.7 (8.1)	71.1 (10.8)	87.6 (12.0)
Women	18-44	32,729,023	14.1 (0.6)	9.9 (0.5)		1.0 (0.2)	0.7 (0.1)	2.6 (0.2)
	45-64	28,299,994	124.0 (1.9)	78.9 (1.5)		12.8 (0.6)	16.5 (0.7)	15.8 (0.7)
	65-74	7,076,540	403.9 (10.7)	221.9 (7.9)		61.9 (4.2)	68.4 (4.4)	51.7 (3.8)
	75-84	5,269,160	506.3 (13.8)	269.5 (10.1)		54.3 (4.5)	102.5 (6.2)	80.1 (5.5)
	≥ 85	2,664,860	370.0 (16.6)	207.1 (12.5)		28.5 (4.6)	70.5 (7.3)	63.8 (6.9)

\*National commercially insured population aged 18-64 years and fee-for-service Medicare population aged ≥ 65 years.

Table 4. Age- and sex-specific population counts in 2008, from Census Bureau estimates

Sex	Age, yr	U.S. Adult Population (n=230,118,000)
		18-44
	45-64	38,104,000
	65-74	9,265,000
	75-84	5,336,000
	≥ 85	1,864,000
Women	18-44	55,666,000
	45-64	39,956,000
	65-74	10,858,000
	75-84	7,689,000
	≥ 85	3,858,000

Table 5. Estimated number of prevalent cases of recognized BM in the U.S. adult population on December 31, 2008

Cancer Type	U.S. Adult Population* (n = 230,118,000)
	All cancers
Female breast	89,829 (87,038-92,621)
Prostate	61,112 (58,559-63,666)
Lung	34,796 (32,999-36,592)
Multiple myeloma	49,222 (47,091-51,352)
Other	44,720 (42,718-46,723)

\*in 2008, according to Census Bureau estimates

## Conclusions

- ◆ Approximately 280,000 U.S. adults (~0.12% of the entire adult population) were living with recognized BM on December 31, 2008, with most cases occurring in patients with primary breast, prostate, or lung cancer or in patients with multiple myeloma.
- ◆ The strength of this study is the utilization of representative samples of two large components of the U.S. adult population.
- ◆ Limitations:
  - ◆ Results may be underestimates of the true frequency of bone metastasis
    - ◆ Not all cohort members were continuously insured from 2004-2008
    - ◆ Not all patients with BM are diagnosed, and among those diagnosed, not all manifest with a diagnosis code and not all are treated with IV bisphosphonates.
  - ◆ Our use of qualified IV bisphosphonate codes probably improved the sensitivity of BM ascertainment, but the validity of our claims-based algorithm should be further explored.
  - ◆ Age- and sex-specific prevalence estimates applied to 2008 U.S. Census counts were based on findings in the commercially insured and Medicare FFS populations, which may not be generalizable to the remaining U.S. adult population.

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