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Incidence of Hip Fracture in Native American Residents of U.S. Nursing Homes

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Abstract

Objectives: To compare the standardized incidence rates (IRs) of hip fracture for Native Americans versus other racial groups in U.S. nursing homes (NHs).

Methods: We studied Medicare fee-for-service NH residents aged ≥ 65 years who became long-stay (index date) between 1/1/2008 and 12/31/2009 (n=1,136,544). Residents were followed from the index date until occurrence of hip fracture, death, Medicare disenrollment, or study end (12/31/2013). We calculated hip fracture IRs by race and used inverse probability weighting to standardize the rates for baseline demographic and clinical characteristics collected from the Minimum Data Set and Medicare claims data. We compared characteristics of NHs used by residents of different races using Online Survey, Certification and Reporting (OSCAR) data.

Results: Among long-stay U.S. NH residents, the standardized IR of hip fracture per 100 person-years was highest in Native Americans [2.16; 95% confidence interval (CI) 1.91–2.44] and white

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Author contributions: All authors designed the study. S.D.B. acquired the data. T.Z. performed the data analysis. O.A. and T.Z. drafted the article. All authors critically revised, commented, and approved the final article.

Declaration of interest

Drs. Berry, Kiel and Zhang, and Mr. Amir report no conflict of interest. Dr. Zullo has received salary support paid directly to Brown University by Sanofi Pasteur for his work as a Co-Investigator on unrelated investigator-initiated studies of the incidence of pneumonia and influenza in U.S. long-term care facilities.

residents (2.05; 2.03–2.06), and lowest in black residents (0.82; 0.79–0.85). NHs caring for Native American residents were more likely to be rurally located as compared to other racial group.

Conclusions: In U.S. NHs, Native Americans and whites have the highest standardized IR of hip fracture and should receive particular attention in fracture prevention efforts.

Keywords

Native American; nursing home; hip fracture; incidence rate

Introduction

The U.S. nursing home (NH) population has become increasingly more racially diverse in recent years (1). Non-white minorities comprised 23.9% of NH residents according to the last National Study of Long-Term Care Providers in 2014.(2) As a population, older Native Americans comprise an understudied demographic, despite being one of the fastest growing groups of older adults in the United States.(3) Currently, Native Americans (either alone or in combination with other races) are living longer than ever before with a life expectancy now exceeding 73 years.(4) The number of Native Americans aged 65 years or older are projected to increase nearly 3.5 fold over the next few decades, reaching approximately 1.4 million by the year 2050.(5) Despite these gains in survival, older Native Americans appear to be living with disproportionately high rates of multi-morbidity, functional impairment, and disability compared to other racial groups indicating a growing need for long-term care services in this population.(6, 7)

Hip fracture is one of the most important causes of mortality, morbidity and functional decline in the NH population (8). Nearly 23,000 long-stay NH residents sustain a hip fracture every year in the U.S.(6). On average, one in every three residents who suffers a hip fracture in this setting will die within 6 months (8). Native Americans have high rates of diabetes, alcohol use, smoking, and cognitive impairment (9, 10) that may place them at particularly high risk for falls and fractures in the NH setting.

Recently, the first nationwide study to examine hip fracture rates by age, sex and race showed that older Native Americans suffered the highest incidence of hip fractures compared to whites, blacks, Asians and Hispanics of the same age(6). However, it is unclear if this racial difference would persist after accounting for differences in resident characteristics such as previous falls, functional and cognitive impairment, diabetes, and use of sedative and psychotropic medications.

Our objective in this study was to estimate the IR of hip fracture in U.S. Native American NH residents and compare it to the hip fracture rates in other racial groups. To explore reasons for differences in hip fracture rates among NAs, we also compared facility characteristics of NHs used by NA residents and residents of different races.

Methods

Study Design and Data Sources

We conducted a retrospective cohort study using linked 100% national Medicare Beneficiary Summary File (MBSF) and Medicare fee-for-service Parts A, B and D claims to the Minimum Data Set (MDS) version 2.0 between January 2008 and December 2013. The MBSF included person-level demographics, enrollment and death date data. The Medicare Part A claims data contain hospital admission and discharge dates, and diagnosis codes; and the Part B claims data contain outpatient diagnostic claims. The MDS is a federally mandated clinical assessment performed on all NH residents at the time of admission and quarterly thereafter(11). The MDS includes more than 400 resident characteristics including measures of demographics, function, cognition, previous fall, co-morbidities, and health behaviors. The reliability and validity of the MDS data is generally considered to be good to excellent (12, 13). This dataset containing Medicare claims and MDS data was linked with the OSCAR database, which describes NH facility level characteristics. Information in OSCAR is collected by state surveyors during Medicare/Medicaid mandated inspections of NHs at least every 15 months(14).

Study Participants and Follow-up

Participants included all long-stay NH residents in the U.S. who were 65 years of age or older between 1/1/2008 and 12/31/2009. An individual qualified as a long-stay after residing in the same facility for 100 days (with no more than 10 consecutive days outside the facility. Study participants were followed from the most recent dates of: 1/1/2008 or the long-stay qualification date (i.e., the index date) until death, Medicare fee-for-service (FFS) disenrollment, or end of study (12/31/2013). The six months before the index date were defined as the baseline. Study participants were required to have continuous enrollment in Medicare FFS Parts A during the baseline and follow-up periods to identify baseline characteristics and outcome events. We further required residents to have continuous enrollment in Part D to identify drug use status, and have at least one MDS assessment during the 100 days before the index date. Residents who were enrolled in hospice, had advanced dementia (Cognitive Performance Score of 6) or comatose status, or had unavailable race information were excluded from the analysis (Figure 1).

Study Outcome

The outcome of interest was a hospitalized hip fracture. Hip fractures were ascertained using the International Classification of Diseases, Ninth Revision (ICD-9) in the Medicare Part A database. Specifically, a hip fracture was defined as a hospitalization with the primary or secondary ICD-9 diagnosis of 820.xx or 733.14, with or without an accompanying procedure code.(15) A similar hip fracture definition (without ICD-9 code 733.14) has yielded a predictive positive value of 98%, and a sensitivity of 97% in a previous study involving Medicare and Medicaid duel enrollees.(15) We excluded fractures if the resident had a hospitalization for hip fracture in the 100 days prior to their index date, in order to avoid misclassifying complications from a previous fracture as an incident fracture during follow-up.

Resident and Facility characteristics

Information on demographic factors such as age, gender and self-reported race was collected from the Medicare Enrollment file. Race was determined initially using the MBSF, then the MDS checkbox. Race was categorized as white, black, Native American or "other" (Hispanic, Asian/Pacific Islander, and other minorities).

Other resident characteristics were ascertained from the MDS assessment during baseline that was closest to the index date. Functional status was assessed according to performance on the Katz hierarchical Activities of Daily Living (ADL) scale (16). Moderate to severe functional dependence was defined as a Katz hierarchical ADL score of 3–6. Cognitive status was categorized according to performance on the Cognitive Performance Scale (CPS), which ranges from 0–6, with higher scores indicating worse impairment.(17) Moderate to severe impairment was defined as a CPS score of 3–5. Additional baseline resident level characteristics derived from the MDS, such as previous fall, a history of using alcohol and/or tobacco products, and health conditions, were included based on their known association with fall and/or fracture risk in the literature and are summarized in Table 1. Because underreporting of co-morbidities is possible using the MDS, we considered a more sensitive definition for diabetes given its known high prevalence in Native Americans (9) and its strong association with fracture risk.(18) Residents were classified as having diabetes using the ICD-9 codes for diabetes (Table S1) in the Medicare Parts A and B claims data or if the MDS checkbox for diabetes was marked during the baseline period.

Medication usage for NH residents was ascertained using Medicare Part D claims during baseline. The medications included in the analysis were those known to be associated with falls, such as antidepressants and antipsychotics,(19) or with risk of osteoporosis, such as proton pump inhibitors (Table 1).(20) Since benzodiazepines are not fully captured in Medicare Part D data, these data under ascertain the use of benzodiazepines for all racial groups.

Using OSCAR data, we additionally considered facility characteristics at baseline that have been previously shown to be associated with quality of care or risk of hip fractures in the literature. These facility characteristics included location (rural vs urban), type of ownership (government, non-profit or for-profit), total daily direct care hours per resident, total certified nursing assistant hours per day per resident, frequency of antipsychotic and physical restraint use and counts of quality-of-life deficiency scores.(21) Quality-of-life deficiency scores greater than 0 indicate that a NH has violated federal requirements or standards.(22)

Statistical Analysis

Resident and facility level characteristics were described according to race. Descriptive statistics were calculated using means and standard deviations (SDs) for continuous variables and proportions for categorical variables. We compared baseline characteristics between Native Americans and other races, using *Student's t-tests* for continuous variables and *Chi-square tests* for categorical variables. Crude IR of hip fracture were calculated as the number of hip fractures among NH residents divided by person-years of follow-up time for each racial group, then scaled per 100 person-years. The 95% CIs for the IRs of each racial

group were calculated using the non-parametric bootstrap with 1,000 replicates. Since covariates differed between racial groups, we then used inverse probability weighting (IPW) to estimate the adjusted IRs for each racial group standardized to the distribution of covariates in the overall population(23). We estimated propensity scores by fitting a multinomial logistic regression model with age, sex, medication, and clinical covariates.(24) Propensity scores were then used to construct IP weights that allowed us to estimate the IRs under the hypothetical circumstance that each racial group had the same distribution of covariates as that in the entire study population.(25) We completed all analyses using Stata version 15.1 (StataCorp LLC, College Station, TX) and IBM SPSS Statistics for Windows, Version 24.0 (IBM Corp. Armonk, NY).

Results

Resident characteristics

A total of 1,136,262 long-stay residents in U.S. NHs met our eligibility criteria for the study (Figure 1). The mean age of residents was 84.1 (SD 8.0) years, and 71.7% were women. A total of 4,391 (0.4%) residents were Native American, 980,559 (86.3%) were white, 116,093 (10.2%) were black, and 35,219 (3.1%) were of “other” racial groups (Table 1).

Native American long-stay residents were on average younger, less likely to be functionally dependent, have bowel and urinary incontinence, or moderate-severe cognitive impairment compared to residents of all other races (Table 1). At baseline, Native American and white residents were more likely to have had a prior fall compared to residents who were black or of “other” races. The prevalence of diabetes was higher in Native American residents (43.5%) than in white residents (31.3%) but comparable to the prevalence in Black residents (46.3%) and those of “other” races (45.5%). Additional notable differences in co-morbidities included higher rates of arthritis, hypothyroidism and anxiety disorder among Native American and white residents compared to all others. The prevalence of cancer was lowest in Native American residents as compared with other races (Table 1).

With respect to medications or substances associated with fall and/or fracture risk, Native Americans had the highest rates of previous tobacco use (8.2%) and alcohol consumption (4.8%) among all racial groups. Native Americans also had the highest rates of using antihistamines (9.3%), and opioids (11.4%). Antidepressant use was higher in Native American (32.3%) and white (31.4%) residents compared to others (23.7% in black; and 27.0% in others). Native American residents or residents of “other” races were more likely to use proton pump inhibitors and thiazolidinediones. The use of anticonvulsants, antipsychotics, insulins, sulfonylurea and beta-blockers were similar across Native Americans, black and residents of “other” races, but lowest in white residents (Table 1).

Differences of all baseline characteristic between Native Americans and other races were statistically significant ($P<0.001$).

During the follow-up, 73.8% of Native American residents died, as compared to 78.9% in whites and 72.2% in black residents (Table 2).

IRs of hip fracture by race

Overall, 58,109 of residents (5.1%) experienced a hip fracture over a mean follow-up of 2.6 (SD 1.9) years. Among the 4,391 Native American long-stay NH residents, 273 residents (6.2%) sustained a hip fracture during follow-up (Table 2).

The crude IR of hip fractures per 100 person-years was 2.21 (95% CI 1.96–2.49) among Native American residents compared to 2.10 (95% CI 2.09–2.12) in whites, 0.87 (95% CI 0.84–0.90) in blacks and 1.44 (95% CI 1.37–1.51) in residents of "other" races (Table 2). After adjustment for baseline demographic characteristics, clinical risk factors and medications, standardized IRs remained similar, with Native American residents having the highest standardized IR of hip fracture per 100 person-years at 2.16 (95% CI 1.91–2.44) followed by white residents at 2.05 (95% CI 2.03–2.06) compared to those of "other" races at 1.35 (95% 1.29–1.42) and black residents at 0.82 (95% CI 0.79–0.85), as shown in Table 2.

Characteristics of facilities with Native American residents

Long-stay Native American residents in the U.S. were distributed across 1,805 NHs, which represented 11.4% of the total number of facilities in our study. Moreover, of the total Native American residents, 48.3% were clustered in only 177 facilities, each housing 5 or more Native American residents, together representing just 1.3% of the total number of facilities (Table S2).

Native Americans were more likely to reside in facilities in rural areas compared to long-stay residents of other races who were predominantly located in urban facilities. Native American residents were more likely to be in for-profit owned facilities than white residents. Additionally, Native American and white residents were more likely than black or "other" races to be in facilities that were government owned. There were no clear differences in publicly available quality metrics such as quality-of-life deficiency scores, total daily direct care hours per resident and frequency of antipsychotic and physical restraint use, when comparing facilities where different races resided (Table 3).

Discussion

We found that the incidence of hip fractures among long-stay NH residents in the United States varies markedly according to race. After adjusting for differences in demographic, functional and clinical characteristics between racial groups, the rate of hip fracture was still highest in Native American residents (2.16/100 person-years) and white residents (2.05/100 person-years), intermediate in residents of "other" (Hispanic, Asian/Pacific Islander and other minorities) races (1.35/100 person-years) and lowest in black residents (0.82/100 person-years) of U.S. NHs. We found that Native American residents were more likely to reside in facilities that were rurally located, but more likely to reside in for-profit owned facilities as compared to whites. We did not find any significant differences in quality of care metrics among facilities housing Native American residents.

This is the first U.S. nationwide study that examined hip fracture risk in a sizable Native American NH cohort. Literature on Native Americans in long-term and post-acute care is

severely lacking for many research questions. Our findings are consistent with previous investigations that reported racial variations in fracture risk in community dwellers.(26–28) The National Osteoporosis Risk Assessment study, which examined fracture and osteoporosis rates in a large cohort of post-menopausal women, found that white and Hispanic women had the highest risk for fracture followed by Native Americans, blacks and Asian Americans.(26) Meanwhile, the Women's Health Initiative (WHI) discovered that rates of fracture of all types in community dwelling Native American women were similar to those of non-Hispanic white women but significantly higher than the rates among other minority groups.(27) Another study from Canada found higher age and sex adjusted fracture rates in First Nations people compared to all other races.(28) However, none of these studies have accounted for differences in functional status, clinical risk factors, medications, and substance use in explaining the racial variation in hip fracture rates.

In our study, we found notable differences in resident characteristics associated with falls and fracture by racial groups. Despite Native Americans having similar unadjusted hip fracture rates as white NH residents, Native Americans were less likely to have characteristics associated with falls or fracture, such as dementia (including Alzheimer's disease) as compared to whites. In contrast, prevalence of diabetes, and a historical use of tobacco were significantly higher in Native Americans as compared to whites, and these clinical factors are known to be associated with elevated risk for hip fracture.(29, 30) Additionally, Native Americans and whites use medications associated with falls, such as opioids and antidepressants,(31, 32) more frequently than other races. However, our IPW standardized IRs for hip fracture were only slightly different from the crude IRs for each racial group, suggesting that there could be other unmeasured characteristics that explain the high incidence of hip fracture we observed in Native Americans.

It is possible that our observed differences in hip fracture rates between races is due to unmeasured risk factors for fracture that we could not fully capture. For example, we did not have information on bone mineral density (BMD). Previous studies have shown that racial differences in fracture incidence were partially attenuated when hip BMD was taken into account;(26, 27) however, studies are conflicting as to whether BMD is lower in Native Americans versus other races.(26, 27) Beyond BMD, other unmeasured differences in hip fracture risk such as hip geometry and genetic risk could also contribute to the racial variation in hip fracture rates in our study.(33) Although we adjusted for the historical weekly use of alcohol, we did not have detailed information on daily excess use or life-long patterns of alcohol consumption. Previous studies have suggested that moderate alcohol consumption may be protective (34) while excessive daily use or life-long alcoholism increases risk of hip fracture (35) and it is possible that adjusting for excess alcohol would have attenuated our results. Finally, it is possible that there are other behavioral or cultural factors not accounted for in our study that could influence racial differences in the risk of falls and fracture. For instance, staff from a rural NH in South Dakota (personal communication, May 2018) have observed that Native American residents at their facility greatly value their independence and are more hesitant to ask for help with ADLs including transfers when compared to residents of other races, which may predispose them to a higher rate of falls and injury.

A previous work postulated that racial disparities in hip fracture rates might be due to facility characteristics such as high resident to nursing staff ratio and other quality of care metrics (6). In the present study, we found that the Native American NH residents were largely clustered in relatively few facilities. The Native American residents in our cohort were more likely to be in NHs that were rurally located compared to residents of other racial groups; and less likely to reside in non-profit owned facilities as compared to whites. However, we did not find any notable differences in publicly reported quality metrics among the NHs in which residents of different races lived.

Our study is the largest one to date to examine racial variation in hip fracture incidence in the U.S. and the only one to provide standardized incidence rates accounting for important demographic, functional and clinical risk factors. It is one of the few studies to present specific information on hip fractures and other clinical characteristics of Native Americans, an understudied population in the NH, which is frequently collapsed into an “other” racial category. Strengths of our study include the use of national data with hospitalized hip fractures ascertained using claims data. Using the MDS, we were able to collect information on and standardize for a comprehensive set of baseline risk factors including important co-morbidities and medications.

There are also limitations of our study. First, as we have discussed above, unmeasured factors, such as BMD, may differ according to race and explain our findings. Second, it is possible that there was differential reporting of co-morbidities in the MDS according to race. If misclassification differed according to race, this could explain some of the variation in the standardized hip fracture rates we observed.

Conclusions

This study extends our previous work by showing that the elevated rate of hip fractures in Native Americans persisted despite adjustment for a comprehensive set of baseline demographics; clinical characteristics including cognitive, visual and functional impairment; previous fall history; co-morbidities such as diabetes; and use of medications associated with falls and fractures.(36) Hip fracture risk is greatest among white and Native American nursing home residents. Native American residents were more likely than white residents to have diabetes, with most other non-modifiable risk factors for fracture similar between these groups. Both Native American and white residents were more likely to receive drugs that could increase hip fracture risk through their effects on falls as compared with residents of other races. In particular, Native Americans received opioids more frequently than other races. Although we did not identify other measured modifiable facility practices that would contribute to the greater hip fracture risk among Native American residents as compared to other racial groups, over half of Native Americans resided in rural facilities, and facility differences may play a role. It is also possible that many of the modifiable facility practices were simply unmeasured. We recommend that in nursing homes, fracture prevention efforts should target white and Native Americans residents. Specifically, for Native American nursing home residents, effective fracture prevention strategies should include consideration of pain medications such as opioids, and medication review for drugs associated with greater fall risk. Finally, programs should consider culturally appropriate strategies to emphasize

patient-provider communication in efforts to prevent fracture among vulnerable Native American NH residents.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

ADL	Activities of Daily Living
BMD	Bone mineral density
CI	Confidence interval
CPS	Cognitive Performance Scale
FFS	Fee-for-service
ICD	International Classification of Diseases
IPW	Inverse probability weighting
IR	Incidence rate
MDS	Minimum Data Set
MBSF	Medicare Beneficiary Summary File
NH	Nursing home
SD	Standard deviations
OSCAR database	Online Survey, Certification and Reporting database
US	United States

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Highlights

- In United States nursing homes, Native Americans and whites have the highest risk for hip fracture compared to other races.
- Native Americans and whites have higher use of medications known to increase fall risk, such as opioids and antidepressants.
- Nursing home care providers should consider the same hip fracture risk for Native Americans and whites, and focus on modifiable risk factors identified in this study.

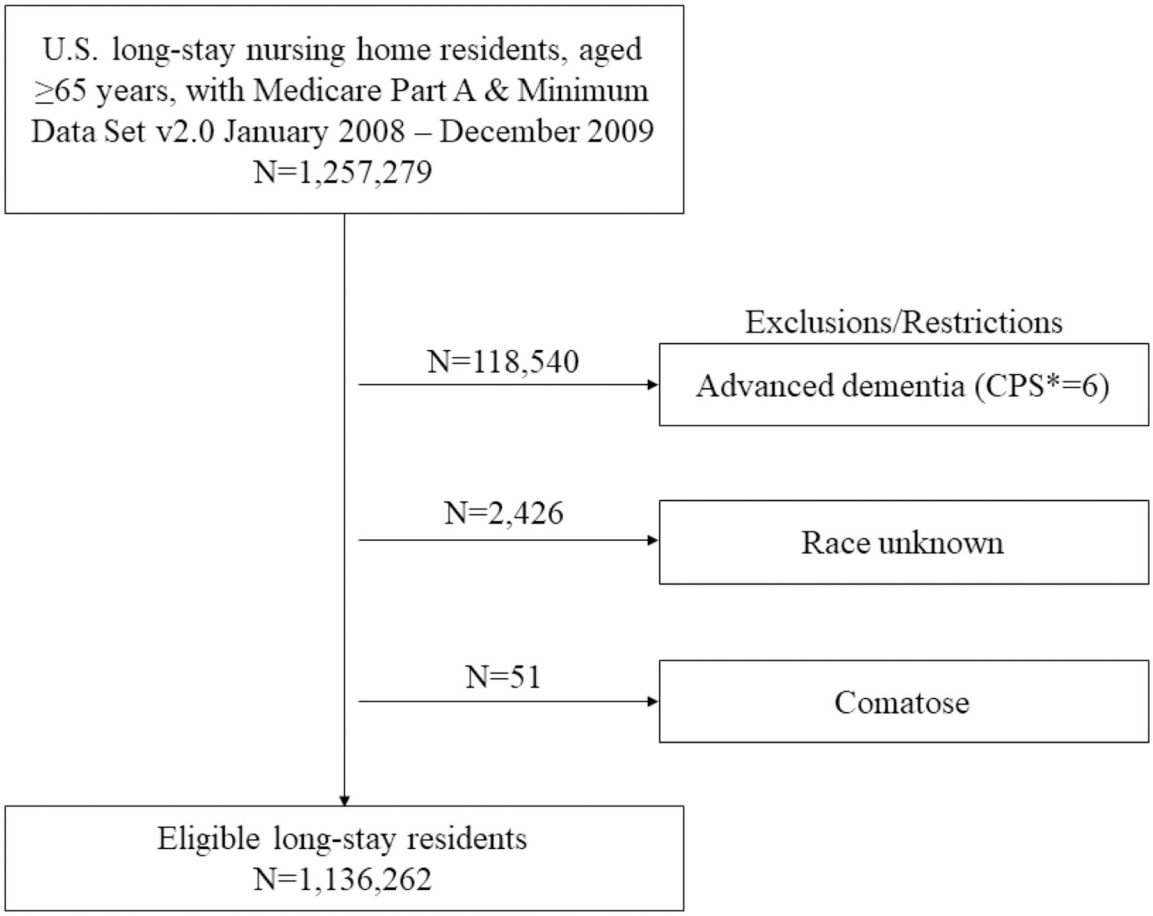

Figure 1.
Selection of eligible U.S. long-stay nursing home residents for the study (*N*=1,136,262)

Table 1.

Baseline characteristics by race among long-stay nursing home residents in the United States (*N*=1,136,262)

*Patient characteristics at baseline	*Native American (n=4,391)	White (n=980,559)	Black (n=l 16,093)	Other[b] (n=35,219)
Age, mean (SD)	80.6 (8.3)	84.5 (7.9)	81.3 (8.6)	83.0 (7.6)
Female (%)	2,784 (63.4)	715,064 (72.9)	74,917(64.5)	22,187 (63.0)
[a]Physical function, n (%), based on ADLs				
Independent/mild assistance	2,398 (41.1)	427,783 (43.6)	45,700 (39.4)	14,490 (41.1)
Extensive assistance/total Dependence	1,992 (45.4)	732,023 (56.4)	70,419 (60.6)	20,732 (58.9)
[c]Cognitive Impairment, n (%), based onCPS				
No/mild impairment	2,227 (50.8)	440,251 (44.9)	47,327 (40.7)	14,347 (40.8)
Moderate-severe	2,164 (49.3)	540,408 (55.1)	68,776 (59.2)	20,873 (59.3)
[a]*Urinary Continence, n (%)*				
Continent/occasional/frequent incontinent	3,414 (77.8)	732,023 (74.6)	71,113 (61.3)	22,593 (64.2)
Total incontinence	976 (22.2)	248,731 (25.4)	45,005 (38.8)	12,632 (35.9)
[a]*Bowel Continence, n (%)*				
Continent/occasional/frequent incontinent	3,500 (79.7)	759,150 (77.4)	71,102 (61.2)	23,175 (65.7)
Total incontinence	891 (20.3)	221,578 (22.6)	45,018 (38.8)	12,052 (34.2)
[d]*Self-transfer performance*				
Independent/mild assistance	2,513 (57.2)	475,788 (48.5)	51,255 (44.1)	16,743 (47.5)
Extensive assistance/total Dependence	1,877 (42.8)	505,008 (51.5)	64,869 (55.9)	18,484 (52.5)
[e]Presence of pressure ulcer, n (%)	343 (7.8)	74,955 (7.6)	10,591 (9.1)	2,625 (7.5)
Comorbidities, n (%)				
Diabetes	1,912 (43.5)	307,283 (31.3)	53,755 (46.3)	16,034 (45.5)
Hypothyroidism	670 (15.3)	139,392 (14.2)	6,410 (5.5)	2,894 (8.2)
Hypertension	1,973 (44.9)	444,311 (45.3)	54,373 (46.8)	16,330 (46.4)
Peripheral vascular disease	354 (8.1)	84,308 (8.6)	13,462 (11.6)	2,564 (7.3)
Arteriosclerotic heart disease	369 (8.4)	108,252 (11.0)	9,599 (8.3)	2,869 (8.1)
Cardiac dysrhythmias	313 (7.1)	120,018 (12.2)	7,081 (6.1)	2,387 (6.8)
Congestive heart failure	664 (15.1)	178,066 (18.2)	19,037 (16.4)	4,862 (13.8)
Arthritis	772 (17.6)	212,990 (21.7)	19,342 (16.7)	5,253 (14.9)
Emphysema/COPD	651 (14.8)	143,687 (14.7)	13,287 (11.4)	3,814 (10.8)
Cataracts/glaucoma/macular degeneration	510 (11.6)	122,031 (12.5)	13,219 (11.4)	3,569 (10.1)
Anemia	754 (17.2)	163,964 (16.7)	21,854 (18.8)	6,595 (18.7)
Dementia including Alzheimer's Disease	1,394 (31.8)	354,750 (36.2)	39,412 (33.9)	12,358 (35.1)
Cancer	161 (3.7)	47,843 (4.9)	5,328 (4.6)	1,401 (4.0)
[f]Previous fall	2,092 (47.6)	467,972 (47.7)	38,724 (33.4)	13,810 (39.2)

*Patient characteristics at baseline	*Native American (n=4,391)	White (n=980,559)	Black (n=l 16,093)	Other[b] (n=35,219)
Renal failure	275 (6.3)	47,848 (4.9)	9,298 (8.0)	2,391 (6.8)
Seizure	192 (4.4)	31,949 (3.3)	6,138 (5.3)	1,301 (3.7)
Pneumonia	262 (6.0)	66,611 (6.8)	5,523 (4.8)	2,488 (7.1)
Urinary tract infections	805 (18.3)	205,313 (20.9)	19,395 (16.7)	6,340 (18.0)
Depression	1,527 (34.8)	467,066 (47.6)	38,002 (32.7)	12,722 (36.1)
Bipolar	89 (2.0)	25,209 (2.6)	2,022 (1.7)	596 (1.7)
Schizophrenia	95 (2.2)	20,483 (2.1)	4,804 (4.1)	819 (2.3)
Anxiety	365 (8.3)	121,884 (12.4)	5,743 (4.9)	2,593 (7.4)
Use of prescription drugs, n (%)				
Anticonvulsants	853 (19.4)	152,891 (15.6)	23,452 (20.2)	6,123 (17.4)
Antidepressants	1,420(32.3)	307,665 (31.4)	27,504 (23.7)	9,509 (27.0)
Antihistamines	409 (9.3)	73,294 (7.5)	7,682 (6.6)	2,782 (7.9)
Antipsychotics	999 (22.8)	203,530 (20.8)	28,899 (24.8)	8,339 (23.7)
Thiazide	411 (9.4)	85,883 (8.8)	14,276 (12.3)	2,794 (7.9)
Opioids	499 (11.4)	88,515 (9.0)	8,509 (7.3)	2,196 (6.2)
Proton pump inhibitors	1,170 (26.6)	235,276 (24.0)	28,101 (24.2)	10,151 (28.8)
Insulins	803 (18.3)	99,889 (10.2)	22,468 (19.4)	6,940 (19.7)
Sulfonylurea	411 (9.4)	69,095 (7.0)	11,054 (9.5)	3,961 (11.2)
Thyroid Medications	914 (20.8)	186,520 (19.0)	10,976 (9.5)	4,863 (13.8)
Beta-blockers	304 (6.9)	51,502 (5.3)	7,602 (6.5)	2,736 (7.8)
Thiazolidinediones	226 (5.1)	24,052 (2.5)	4,793 (4.1)	1,831 (5.2)
Oral glucocorticoids	214 (4.9)	47,573 (4.9)	4,372 (3.8)	1,452 (4.1)
History of alcohol/tobacco use, n (%)				
Use of tobacco products daily	361 (8.2)	40,752 (4.2)	7,287 (6.3)	1,029 (2.9)
Alcoholic beverages at least weekly	212 (4.8)	31,584 (3.2)	3,492 (3.0)	672 (1.9)

Abbreviations: SD, standard deviation; CPS, cognitive performance scale; ADL, activities of daily living; COPD, chronic obstructive pulmonary disease.

[a]Baseline ADL scores were not available in 70 residents, urinary continence records were not available in 57 residents and bowel continence records were not available in 78 residents.

[b]Other racial groups included Asian/Pacific Islander and those reported as Hispanics but not white or black.

[c]Moderate to severe cognitive impairment was defined as a CPS score of 3–5.

[d]Extensive assistance/total Dependence of self-transfer performance was defined as the requirement of two or more persons' physical assistance in moving between bed, chair, wheelchair, standing position, or ADL activity itself did not occur during entire 7 days.

[e]Pressure ulcer: defined as stage II-IV pressure ulcer.

[f]Previous fall: defined as presence of fall between 31 to 180 days before the long stay qualification date (i.e., the index date).

[*]Differences of all baseline characteristic between Native Americans and other races were statistically significant (P<0.001).

Table 2.

Crude and standardized incidence rates (per 100 person-years) for hospitalized hip fracture by race among United States nursing home residents (*n*=1,136,262)

	Native American (n=4,391)	White (n=980,559)	Black (n=116,093)	Other[b] (n=35,219)
Hip fracture events (n)	273	53,185	3,126	1,525
Mean follow-up years (SD)	2.81 (1.92)	2.58 (1.86)	3.11 (1.98)	3.02 (1.96)
Death, n (%)	3,240 (73.8)	773,206 (78.9)	83,837 (72.2)	25,145 (71.4)
Crude IRs per 100 person-years (95% CI)[a]	2.21 (1.96–2.49)	2.10 (2.09–2.12)	0.87 (0.84–0.90)	1.44 (1.37–1.51)
IPW standardized IRs per 100 person-years (95% CI)[c]	2.16 (1.91–2.44)	2.05 (2.03–2.06)	0.82 (0.79–0.85)	1.35 (1.29–1.42)

Abbreviations: SD, standard deviation; IPW, inverse probability weight; IR, incidence rate; CI, confidence interval.

[a] 95% confidence intervals (CIs) for the IRs of each racial group were calculated using the non-parametric bootstrap with 1,000 replicates

[b] Other racial groups included Asian/Pacific Islander and those reported as Hispanics but not white or black.

[c] A total of 409 residents were not included in the estimation of IPW standardized incidence rates for hip fracture due to missing values in patient characteristics.

Table 3.

Characteristics of nursing home facilities used by long-stay United States nursing home residents stratified by race

Nursing home characteristics	Native American (n=4,391)	White (n=980,559)	Black (n=116,093)	Other[b] (n=35,219)
Rural location, n (%)[a]	2,296 (52.3)	306,039 (31.2)	20,636 (17.8)	3,741 (10.6)
Type of ownership, n (%)[a]				
For profit	3,146 (71.6)	642,949 (65.6)	89,653 (77.3)	27,537 (78.2)
Non-profit	915 (20.8)	268,666 (27.4)	21,046 (18.1)	5,961 (16.9)
Government	330 (7.5)	68,886 (7.0)	5,307 (4.6)	1,718 (4.9)
Percentage of residents physically restrained, mean (SD)[a]	4.8 (6.3)	4.2 (5.6)	4.6 (6.2)	5.5 (7.7)
Percentage of residents receiving antipsychotics, mean (SD)[a]	23.5 (13.0)	23.8 (11.5)	27.0 (13.0)	24.3 (13.5)
Total direct care hours per day per resident, mean (SD)[a]	3.3 (1.0)	3.4 (0.9)	3.3 (0.8)	3.4 (0.9)
Total CNA hours per day per resident, mean (SD)	2.2 (0.6)	2.3 (0.7)	2.2 (0.6)	2.3 (0.6)
Counts of quality-of-life deficiency scores, median (IQR)[a]	0 (0–1)	0 (0–1)	1 (0–1)	1 (0–2)

Abbreviations: SD, standard deviation; CNA, certified nursing assistant; IQR, interquartile range.

[a]Nursing home locations were unavailable for 70 residents, counts of quality-of-life deficiency scores were unavailable for 56 residents, type of nursing home ownership was unavailable for 148 residents, % of physically restrained residents was unavailable for 56 residents, % receiving antipsychotics was unavailable for 56 residents, total direct care hours per day per resident was unavailable for 95 residents; and total CNA hours per day per resident was unavailable for 86 residents.

[b]Other racial groups included Asian/Pacific Islander and those reported as Hispanics but not white or black.