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RESEARCH ATICLE

Osteoporosis Screening Disparities in The Inland Empire of Southern California

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ABSTRACT:

Introduction: Osteoporosis (OSP) is a common disease with high morbidity and mortality for fragility fractures. Effective treatments can be initiated prior to the first fracture if osteoporosis is diagnosed by Dual Energy X-Ray screening. This screening is recommended in women aged 65 or older and in men aged 70 or older. Disparities exist in the rates of screening based on ethnicity and gender. The aim of this study was to determine if there are disparities in osteoporosis screening on the basis of ethnicity, gender or primary language spoken.

Methods: A retrospective chart review was performed utilizing the Slicer Dicer tool in Epic to determine the rate at which osteoporosis screening is documented as being performed. Demographic data such as gender, age, ethnicity and preferred language were recorded.

Results: 93% of women aged 65 or greater were documented as being screened for osteoporosis. 40% of those screened and 52.3% of those not screened were white. 39.1% of women who were screened and 28% of those not screened were Hispanic. 97.4% of men aged greater than 70 years were not screened. The percentage of men screened who identify as Hispanic were lower than those who were not screened (26.3% vs 39.3%) and there were similarly differences in those who identify as White in men, 57.5% of those screened vs. 41.4% of those not screened. Language proficiency was the same in all groups (men and women, screened and not screened). Differences between ethnic groups were calculated using Chi-Square testing and were found to be not statistically significant.

Conclusion: Women are documented as having been screened for osteoporosis at a far greater rate than men. In women, Hispanic, White and Black patients were screened at similar rates. Language proficiency did not change the likelihood of being screened for osteoporosis. There are fewer Hispanics in the age groups studied than expected for the general population of the counties.

Introduction:

Around the world, the proportion of those in the oldest age groups continues to rise, as do the diseases associated with aging. One such disease that has a higher incidence than heart attack, stroke and breast cancer almost by two-fold is osteoporosis (OSP)[1]. Characterized by a pathologic decrease in bone mineral density resulting in fragility fractures. Osteoporosis is diagnosed by Dual Energy X-ray scan (DXA) scans which are like a radiograph but use less radiation using a T score or by the presence of a fragility fracture. When osteoporosis is diagnosed via T-score calculated from a DXA scan and prior to the patient experiencing a fragility fracture, medications may be used to decrease the risk of a fracture. This is called primary prevention. If the fragility fracture is how osteoporosis is diagnosed, medications are then used for secondary prevention of subsequent fractures. The goal is to prevent the first fracture, however if patients do not have a DXA scan to diagnose osteoporosis then patients will not know that they have it. Osteoporosis is a silent disease, there are no symptoms until a fracture occurs.

Unfortunately, in the United States, approximately 64% of fragility fractures in women occur in patients who are not screened for osteoporosis and thus do not know that they have the disease.[2] In men this proportion is even higher, with 92.8% of men experiencing a fragility fracture as the first indicator of osteoporosis. This means that the screening gap in men is much wider than in women. Available anti-osteoporotic therapies can reduce the rate of fractures at the spine by about 70% and reduce the rate of other fractures including hip fractures by about 50%.[3] This means that many of the fractures that occur due to osteoporosis are preventable with appropriate screening practices and initiation of pharmacotherapy.

Fractures related to osteoporosis carry a very large economic burden. Direct costs of treating osteoporotic fractures in the United States, Canada and Europe alone are estimated to be between $500 and $6,500 billion USD. This does not account for lost productivity, downstream costs such as physical therapy, inpatient rehabilitation, nursing home care for the remainder of life and other costs.[4] In the United States, each fracture incurred by a Medicate beneficiary cost on average $31,129. When multiplied by the number of Medicare beneficiaries who experienced a fragility fracture, that equates to a whopping $6 billion USD per year.[2]

In addition to being monetarily burdensome, OSP related fractures result in death within the first year in up to 30% of patients. Most of those who survive are left with chronic pain and disability, limitations in mobility, loss of independence and an overall decrease in quality of life.[5] However, there are safe and cost-effective treatments that reduce the risk of fracture in individuals identified to have OSP by a screening bone mineral density (BMD) test by Dual Energy X-ray scan (DXA).[6,7] Screening for osteoporosis is recommended by the United States Preventive Services Task Force (USPTF) for all women aged 65 years or older. In addition to screening women, the Endocrine Society, the National Osteoporosis Foundation, the International Society for Clinical Densitometrists and others also recommend screening men 70 years or older.[8] Screening is critical to identifying osteoporosis cases prior to the first osteoporosis fracture so primary prevention strategies can be imitated.

In the United States, the screening rate between 2008 and 2014 was reported to be a dismal 12.8% to 26.5% in postmenopausal women.[7] Further, disparities in screening practices exist among ethnic groups. Black women are referred for bone mineral density screening (BMD) at 61% the rates white women are, despite having twice the risk of mortality after a hip fracture than white women.[7,9] Hispanic women have also been found to be 34% less likely to have OSP screening than similar white women.[6] There is a lack of awareness of these disparities, as illustrated by The US Study of Osteoporotic Fractures that occurred between 1985 and 2005. Only 5% of the included woman were non-whites.[10]

These disparities are particularly salient in regions of the country where there are large concentrations of these groups. The Inland Empire of Southern California is one such region, with 55.8% of San Bernardino County and 51.6% of Riverside County identifying as Hispanic or Latino.[11,12] This study aims to determine if there are disparities related to ethnicity in this region in osteoporosis screening by examining DXA screening examinations in 21 clinic sites. Most centers examined in this study are Federally Qualified Healthcare Centers (FQHCs) and therefore are expected to serve an underserved population with a goal of providing comprehensive services including preventative health screening like DXA MBD testing. Additionally, these centers allow for those without insurance to be seen on a sliding fee scale and are available to those who are undocumented immigrants. This study aims to add to the existing literature about osteoporosis screening practices of clinical sites within the Inland Empire of Southern California, an area which is comprised of approximately 50% Hispanic persons.

This study sought to determine the screening rates for osteoporosis in patients in the Inland Empire of Southern California. A retrospective chart review was utilized using the Slicer Dicer tool in Epic (electronic health record). The aim of the study was to determine if there were any differences between groups and screening rates. Groups included those stratified by gender and ethnicity as self-reported in the electronic health record. If disparities are found, aims to reduce those disparities can be designed and implemented.

Methods

A retrospective chart review was completed of multiple primary care and rheumatology clinics affiliated with the two large academic medical centers located in Inland Empire of Southern California and their satellite clinics for the duration of the electronic medical record's existence; 2007 to 2023 for one county's sites and 2018 to 2023 for the other county's sites. Women aged 65 years and older and men 70 years and older were included in the study as these are the guidelines suggested by the USPTF and other specialty societies. Women younger than 65 and men younger than 70 were excluded. Patients not seen in the clinics sampled could not be included in the analysis. Patients were grouped by the presence or absence of orders for DXA scan to screen for osteoporosis and by gender, ethnicity and primary language spoken according to health records.

The chart review was unable to determine if an order was completed, only that the order was placed, which only allows for the study of the ordering practices of physicians but does allow study of those who complete the testing. For the purposes of this study, non-Hispanic White were identified as White and Hispanic White were stratified as Hispanic. Unfortunately, insurance status, immigration status and socioeconomic status were not available via chart review.

15 of the 21 sites available for data analysis are FQHCs. 17 sites are primary care clinics and the remaining four are an osteoporosis clinic, a geriatrics clinic and two rheumatology clinics. Data were derived from the Slicer Dicer function in Epic electronic health records. Confidence intervals were calculated by this function. This study is a descriptive study and epidemiological statistics are outside the scope of this analysis. The primary aim of this study is to determine if there are differences in screening practices between groups based on ethnicity, gender and language proficiency.

Results:

41,199 women aged 65 years or older and 18,962 men aged 70 years or older were identified (Table 1). The average age of patients identified was 79. Most patients were either Hispanic (38.6%) or White (39.9%). In the catchment areas of this study, most people identify as Hispanic, 53.8% in San Bernardino County and 48.4% in Riverside County. The next most common ethnic group in both countries is Non-Hispanic White (27.6% and 35.9%) (Table 4).[8,9] Asians were screened and not screened at similar rates in both genders, around 6% of all groups. There were similar numbers of patients who identify as Black women in the screened and unscreened groups, 9.89% vs. 11.5%. In men, about 7% of patients in both the screened and unscreened groups identified as Black.

Table 1. Study Population

Patient Characteristics	**Study Population N = 60,161**
Average Age	79
Gender	
Women	41,199 (68.5%)
Men	18,962 (31.5%)
Ethnicity	
Asian	3,705 (6.1%)
Black	5,571 (9.2%)
Native American	158 (0.26%)
Hispanic	23,231 (38.6%)
White	24,020 (39.9%)
Other, prefer not to say	3,476 (5.7%)

Of the women, 38,711 (93%) were documented as being screened for osteoporosis with a DXA scan order and 2,488 (6.0%) were not documented as being screened (Table 2). The average age of screened women was 76 years (CI: +/- 0.09) and the average age of the unscreened population was 80 years (CI: +/- 0.39). The largest ethnic group in both screened and not screened populations was Non-Hispanic White, with 40% of those screened identifying as Non-Hispanic White and 52.3% of the non-screened female patients identifying as such. Hispanic women were the second largest group in the screened population, at 39.1% and 28% in the non-screened group. In both screened and non-screened groups, English was the primary language in the majority of patients, 77.8% and 80%, respectively. Differences between ethnic groups for women were calculated using the Chi-Square Test, with a *p* value of .173406, not statistically significantly different. 18.4% of the screened population spoke only Spanish and 15.3% of the non-screened group spoke only Spanish.

Table 2. Osteoporosis screening practices in female patients aged 65 years or greater

	Screened (n= 38,711, 93.0%)	Not Screened (n= 2,488, 6.0%)
Age	76 years (95% CI: +/- 0.09)	80 years (95% CI: +/- 0.39)
Ethnicity		
Asian	**2,326 (6.00%)**	**168 (6.75%)**
• Asian Indian	427	43
• East Asian	187	16
• Pilipino/a	783	38
• Other	929	71
Black	**3,828 (9.89%)**	**286 (11.5%)**
• African	332	12
• Black	3,496	274
Native American	**98 (0.25%)**	**12 (0.48%)**
Hispanic	**15,152 (39.1%)**	**695 (28%)**
White	**15,455 (40%)**	**1,302 (52.3%)**
Arab or Middle Eastern	140	19
Caucasian/European	15,315	1,283
Other	**1,276 (3.29%)**	**138 (5.55%)**
Prefer not to state/unknown	**576 (1.48%)**	**24 (0.96%)**
Primary Language		
• **English**	**30,100 (77.8%)**	**1,990 (80.0%)**
• **Spanish**	**7,088 (18.3%)**	**381 (15.3%)**
• **Arabic**	**129 (0.33%)**	**16 (0.64%)**
• **Vietnamese**	**100 (0.26%)**	**5 (0.20%)**
• **Tagalog**	**134 (0.35%)**	**19 (0.76%)**
• **Korean**	**92 (0.24%)**	**8 (0.32%)**
• **Other**	**1,068 (2.76%)**	**69 (2.78%)**

18,962 males aged 70 or older were identified for this study, the majority of whom were not identified in the electronic health record as being screened for osteoporosis, 18,461 (97.4%) (Table 3). Similar to the findings in the women, the largest ethnic group in both screened and not screened patients is Non-Hispanic White; 57.5% in the screened group and 41.4% in the not screened group. 26.3% of the screened men were Hispanic and 39.3% of the non-screened men were Hispanic. Differences between ethnic groups for women were calculated using the Chi-Square Test, with a *p* value of .0.72183, not statistically significantly different. As with the women, the primary language spoken by the majority of the male patients identified was English – 80% in both groups, with Spanish being the secondarily most spoken language.

Table 3. Osteoporosis screening practices in male patients aged 70 years of age or greater

18962	Screened (n= 501, 2.64%)	Not Screened (n= 18,461, 97.4%)
Age	**80 years (CI: +/- 0.6 years)**	**79 years (CI: +/- 0.11)**
Ethnicity		
Asian	**33 (6.59%)**	**1,178 (6.38)**
• Asian Indian	9	219
• East Asian	10	574
• Pilipino/a	14	385
Black	**36 (7.19%)**	**1,421 (7.70%)**
• African	3	126
• Black	33	1,295
Native American	**4**	**44**
Hispanic	**132 (26.3%)**	**7,252 (39.3%)**
White	**288 (57.5%)**	**7,646 (41.4%)**
Arab or Middle Eastern	6	108
Caucasian/European	282	7,538
Other	**19 (3.79%)**	**1,050 (5.69%)**
Prefer not to state/unknown	**5 (1.00%)**	**388 (2.1%)**
Primary Language		
• **English**	**401 (80.0%)**	**14,853 (80.5%)**
• **Spanish**	**81 (16.2%)**	**2,826 (15.3%)**
• **Arabic**	**3**	**69 (3.73%)**
• **Vietnamese**	**4**	**41 (0.22%)**
• **Tagalog**	**2**	**96 (0.52%)**
• **Korean**	**1**	**53 (0.29%)**
• **Other**	**9**	**523 (2.83%)**

Table 4. Demographic data of the Inland Empire of Southern California (2020)

2020 Demographic Data	San Bernadino County	Riverside County
Population Estimates	2,194,710	2,458,395
Non-Hispanic White	**27.6%**	**35.9%**
Hispanic	**53.8%**	**48.4%**
• Hispanic – White (28.5%/24.9%)		
• Hispanic – Black (0.45%/0.36%)		
• Hispanic – Other (24.85%/23.14%)		
Black	**7.71%**	**6.06%**
Asian	**7.18%**	**6.20%**
American Indian and Alaskan Native	**0.33%**	**0.42%**
Primary Language Spoken at Home		
• **English**	**51%**	**50.5%**
• **Spanish**	**29.2%**	**27.8%**

Sources:
US Data San Bernardino County. https://datausa.io/profile/geo/san-bernardino-county-ca#demographics [cited 2022 Dec 17].
US Data Riverside County. https://datausa.io/profile/geo/riverside-county-ca/#:~:text=In%202020%2C%20Riverside%20County%2C%20CA%20had%20a%20population,grew%20from%20%2467%2C005%20to%20%2470%2C732%2C%20a%205.56%25%20increase.
Census Language Data. https://www.census.gov/data/tables/2013/demo/2009-2013-lang-tables.html

Discussion:

This study showed no significant disparities were noted between the screened and non-screened patients based on their race and language proficiency, Hispanic patients were underrepresented at our clinic sites when compared to the general population in the counties studied, and men were screened at much lower rates than women. Interestingly, despite the catchment areas served by the clinics studied identifying as primarily Hispanic (53.8%), the study population was only 38.6% Hispanic. This may reflect a lack of access to healthcare services in Riverside and San Bernardino Counties, or other factors not included in this study such as employment status, transportation availability, childcare services utilization or cultural beliefs about the healthcare system. The sites selected for study are mostly Federally Qualified Healthcare Centers and do not deny care to undocumented or uninsured persons and have resources to provide Spanish language interpretation, meaning that barriers that may be in place at other places of healthcare delivery are not present at the sites studied. More work is needed to determine why Hispanic people utilize healthcare resources less frequently than expected in our region.

In the Inland Empire of Southern California, the documented rate of osteoporosis screening in women exceeded the average in the United States, 93% versus 12 - 26.5%. The screening rate in men, however, was far lower at 2.6%. Part of the reason for this may be the best practice alert system in the electronic health record. For women aged 64 years or older, the clinician must satisfy a best practice alert (BPA) popup for gaps in care. Some of these care gaps include vaccines and screening tests such as mammograms and DXA screenings. Men however do not have the same BPA in their charts as women do. If the data are to be believed for osteoporosis screening in women, the BPA is highly effective and should be instituted in men over the age of 70. Without knowing the completion rate of DXA scans, it is less clear if the alerts are effective in following up on completion of orders placed. 25% of men over the age of 50 will develop an osteoporosis fracture in their lifetime and men greater than 70 years of age should be screened universally. [13]

This study adds to the literature on osteoporosis screening in men. Most osteoporosis research is dedicated to women with osteoporosis. While osteoporosis is more common in women, it is underestimated, underdiagnosed and undertreated in men. Our study adds to this assertion; only 2.6% of eligible men were offered a DXA scan to screen for osteoporosis. However, of all osteoporotic fractures that occur in the United States, roughly 30% are in men. There is a large care gap in our region as well as throughout the world, with centers in Scandanavia and Asia reporting similar disparities in osteoporosis care.[14]

A limitation of this study is the inability to gather data on the orders that were actually completed by the patient. Judging by the low level of completion of osteoporosis screening reported nationwide, the reality of the completion of orders may be much grimmer than the ordering practices would lead one to believe. While the best practice alerts may provide some insight into the disparities of OSP screening orders between men and women, another explanation may simply be that men seek care far less frequently than women do. 68% of men regularly see a physician while 81% of women do.[15] This may explain why the sample sizes for women and men were so different in our study. Further, men don't live as long as women. The average life expectancy for a man is 73.2 years and 79.1 years for a woman. This means the study time captures on average 14 years of a woman's life and only 3 years of the average man's life.[16] Other studies have shown that the OSP screening rate for male patients is between 11 to 18%, meaning that the rates of screening in our clinics was still below the national average.[17, 18]

Conclusions:

In the Inland Empire of Southern California, DXA screening was reported as complete in the majority of eligible women and in very few eligible men. These results may be skewed due to the best practice alert reporting system in place in the electronic health record and true rates of completion of screening are not available. There are no differences in the number of patients who are screened based on their self-reported ethnicity or language proficiency as reported in the electronic health record. Fewer than expected Hispanic persons were represented in the overall study sample, which may reflect a lack of access to healthcare in this region, or other cultural or socioeconomic factors not studied as part of this research. More work is needed to determine the number of completed DXA scans in this population overall. Eligible men were screened almost not at all, and this is a significant gap in healthcare delivery that needs to be improved. Based on these results, efforts to screen men for osteoporosis are needed in this population.

Conflicts of Interest:

Neither author received any funding for this work. There are no conflicts to disclose for either author.

References

1. Burge R, Dawson-Hughes B, Solomon DH, Wong JB, King A, Tosteson A. Incidence and economic burden of osteoporosis-related fractures in the United States, 2005-2025. *J Bone Miner Res*. 2007;22(3):465-475. doi:10.1359/jbmr.061113
2. Williams SA, Daigle SG, Weiss R, Wang Y, Arora T, Curtis JR. Economic Burden of Osteoporosis-Related Fractures in the US Medicare Population. *Annals of Pharmacotherapy*. 2021;55(7):821-829. doi:10.1177/1060028020970518
3. Tu KN, Lie JD, Wan CKV, et al. Osteoporosis: A Review of Treatment Options. *P T*. 2018;43(2):92-104.
4. Rashki Kemmak A, Rezapour A, Jahangiri R, Nikjoo S, Farabi H, Soleimanpour S. Economic burden of osteoporosis in the world: A systematic review. *Med J Islam Repub Iran*. 2020;34:154. Published 2020 Nov 12. doi:10.34171/mjiri.34.154
5. US Preventive Services Task Force, Curry SJ, Krist AH, et al. Screening for Osteoporosis to Prevent Fractures: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2018;319(24):2521-2531. doi:10.1001/jama.2018.7498
6. Ruiz-Esteves KN, Teysir J, Schatoff D, Yu EW, Burnett-Bowie SM. Disparities in osteoporosis care among postmenopausal women in the United States. *Maturitas*. 2022;156:25-29. doi:10.1016/j.maturitas.2021.10.010
7. Gillespie CW, Morin PE. Trends and Disparities in Osteoporosis Screening Among Women in the United States, 2008-2014. *Am J Med*. 2017;130(3):306-316. doi:10.1016/j.amjmed.2016.10.018
8. Fan T, Duffy M. Screening for Osteoporosis to Prevent Fractures. *Am Fam Physician*. 2018;98(10):593-594.
9. Miller RG, Ashar BH, Cohen J, et al. Disparities in osteoporosis screening between at-risk African-American and white women. *J Gen Intern Med*. 2005;20(9):847-851. doi:10.1111/j.1525-1497.2005.0157.x
10. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB. Incidence and mortality of hip fractures in the United States. JAMA. 2009 Oct 14;302(14):1573-9. doi: 10.1001/jama.2009.1462. PMID: 19826027; PMCID: PMC4410861.
11. https://datausa.io/. US Data [Internet]. https://datausa.io/. [cited 2022 Dec 17]. Available at https://datausa.io/
12. https://www.census.gov/. Census [Internet]. https://www.census.gov/. [cited 2022 Dec 17]. Available at https://www.census.gov/
13. Willson T, Nelson SD, Newbold J, Nelson RE, LaFleur J. The clinical epidemiology of male osteoporosis: a review of the recent literature. *Clin Epidemiol*. 2015;7:65-76. Published 2015 Jan 9. doi:10.2147/CLEP.S40966
14. Rinonapoli G, Ruggiero C, Meccariello L, Bisaccia M, Ceccarini P, Caraffa A. Osteoporosis in Men: A Review of an Underestimated Bone Condition. *International Journal of Molecular Sciences*. 2021; 22(4):2105. https://doi.org/10.3390/ijms22042105
15. Manuel JI. Racial/Ethnic and Gender Disparities in Health Care Use and Access. *Health Serv Res*. 2018;53(3):1407-1429. doi:10.1111/1475-6773.12705
16. Arias E, Tejada-Vera B, Kochanek K, et al. Provisional Life Expectanct Estimates for 2021. NVSS Vital Statistics Rapid Release. 23. August 2022. https://www.cdc.gov/nchs/data/vsrr/vsrr023.pdf
17. Lim SY, Lim JH, Nguyen D, et al. Screening for osteoporosis in men aged 70 years and older in a primary care setting in the United States. *Am J Mens Health*. 2013;7(4):350-354. doi:10.1177/1557988313478826
18. Alswat K, Adler SM. Gender differences in osteoporosis screening: retrospective analysis. *Arch Osteoporos*. 2012;7:311-313. doi:10.1007/s11657-012-0113-0