# Medicare cost of osteoporotic fractures in West Virginia

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**Commissioned by the National Osteoporosis Foundation (NOF)**

Milliman

Osteoporosis is a disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased risk of osteoporotic fractures.[1] Osteoporotic fractures are bone fractures associated with the weak bones caused by osteoporosis and are not caused by high-impact or high-trauma events. A common example of an osteoporotic fracture is a fracture resulting from a fall from standing height.

In the United States, more than 53 million people either already have osteoporosis or are at high risk of bone fractures due to low bone mass.[1] The total national annual expense of osteoporotic fractures among Medicare beneficiaries, including direct medical costs and indirect societal costs, has been estimated at $57 billion in 2018, with an expected increase to over $95 billion in 2040.[2] The clinical burden of osteoporosis is also significant, with osteoporotic fractures often leading to hospitalizations, subsequent fractures, or death.[3,4]

The burden of osteoporosis may be reduced through both primary prevention efforts, like targeted intervention and treatment programs that aim to improve screening and treatment for osteoporosis,[5] and secondary prevention efforts, which include targeted interventions to reduce future fracture risk after a sentinel osteoporotic fracture.[6]

The NOF engaged Milliman to quantify the economic and health impact of osteoporotic fractures on Medicare beneficiaries and the Medicare program. Using medical claims data for Medicare beneficiaries in West Virginia, we:

- Identified the incidence of new osteoporotic fractures in 2016
- Determined the incidence of key events after the new fracture
- Estimated the incremental cost to the Medicare program for subsequent fractures

Figure 1 highlights the key findings from our analysis.

**FIGURE 1: KEY FINDINGS FROM ANALYSIS OF OSTEOPOROTIC FRACTURES SUFFERED IN 2016 BY MEDICARE BENEFICIARIES IN WEST VIRGINIA**

We estimate that over 13,000 beneficiaries covered by Medicare FFS or Medicare Advantage in West Virginia suffered 15,900 osteoporotic fractures in 2016.

Among the estimated 9,600 Medicare FFS beneficiaries with both Parts A and B coverage in West Virginia who suffered a new osteoporotic fracture, the incremental medical cost in the year following the initial fracture was over $17,800, or 197% higher than the nationwide allowed medical cost for a typical Medicare FFS beneficiary in 2016 after adjusting for differences in age and sex.

An estimated 2,200 Medicare FFS beneficiaries covered by both Parts A and B in West Virginia suffered a subsequent fracture during a follow-up period that lasted up to three years and survived for at least 180 days after the subsequent fracture, which would account for over $40.6 million in allowed cost to Medicare FFS (95% CI: $36.5 million to $45.3 million). Extrapolating the estimated cost of Part A services associated with a subsequent fracture to the beneficiaries with a subsequent fracture covered only by Part A would add an estimated $2.3 million in cost, for a total of over $43.0 million.

Preventing subsequent fractures could lead to cost savings. Every subsequent fracture that can be prevented among Medicare FFS beneficiaries in West Virginia covered by both Parts A and B could lead to an estimated savings of $18,300 in the six-month period following the subsequent fracture.

About 20% (or 2,000) of Medicare FFS beneficiaries in West Virginia died within one year following a new osteoporotic fracture. Among beneficiaries with a hip fracture, 30% died within one year.

About 7% of West Virginia Medicare FFS beneficiaries received a BMD test within the first six months following a new osteoporotic fracture. We do not have credible data to report BMD testing within six months by race for West Virginia.

**FIGURE 2: INCIDENCE OF NEW OSTEOPOROTIC FRACTURES AMONG MEDICARE BENEFICIARIES IN 2016, WEST VIRGINIA**

| | MEDICARE PROGRAM | | |
|---|---|---|---|
| | FFS* | MA | TOTAL |
| Estimated Medicare Beneficiaries | 300,000 | 111,000 | **410,000** |
| Percent of Total Medicare Beneficiaries | 73% | 27% | **100%** |
| Rate of New Osteoporotic Fractures per 10,000 | 346.9 | 290.4 | **331.7** |
| Estimated Beneficiary Count with at least One New Osteoporotic Fracture in 2016 | 10,400 | 3,200 | **13,600** |
| Estimated Osteoporotic Fractures in 2016 | 12,200 | 3,700 | **15,900** |
| *Nationwide Age- and Sex-Adjusted Rate of New Osteoporotic Fractures per 10,000*** | *333.2* | *297.1* | ***323.4*** |

* Includes beneficiaries covered by both Parts A and B or Part A alone.
** Nationwide rate of new osteoporotic fractures is age- and sex-adjusted to West Virginia.

## West Virginia's osteoporotic fracture incidence

In total, we estimated 331.7 new osteoporotic fractures per 10,000 beneficiaries among West Virginia residents covered by Medicare, totaling over 13,000 beneficiaries who have Medicare FFS or Medicare Advantage (MA) with at least one new osteoporotic fracture (Figure 2). A beneficiary's first new osteoporotic fracture (the "anchor fracture event") was used as the trigger event for the analysis, including our analysis of subsequent osteoporotic fractures.

Figure 2 shows that the estimated incidence of new osteoporotic fractures among MA beneficiaries is 16% lower than Medicare FFS beneficiaries. This difference could be driven by multiple factors, including incentives for MA plans to engage in primary and secondary prevention as well as demographic differences in the populations or differences in the prevalence of comorbidities.

We show the incidence for 10 regions of the body (i.e., fracture types) in Figure 3. Osteoporotic fractures of the spine were the most common type of fracture among Medicare FFS beneficiaries in West Virginia, accounting for 25% of the estimated total osteoporotic fractures among these beneficiaries (Figure 3). Fractures of the hip were also common, at 17% of the total fractures.

Figure 4 illustrates the differences in fracture incidence among Medicare FFS beneficiaries by sex, age, and race/ethnicity in West Virginia. The rate of new osteoporotic fractures per 10,000 Medicare FFS beneficiaries was higher in beneficiaries who were female, aged 85 or older, or white.

After adjusting for differences in age, the overall osteoporotic fracture rate for female Medicare FFS beneficiaries was 97% greater than the fracture rate for males. Approximately 10,000 Medicare FFS beneficiaries suffered at least one osteoporotic fracture in 2016. Of these, 70% were female, 30% were aged between 75-84, and 98% were white.

**FIGURE 3: INCIDENCE OF OSTEOPOROTIC FRACTURES AMONG MEDICARE FFS BENEFICIARIES BY FRACTURE TYPE IN 2016, WEST VIRGINIA**

| FRACTURE TYPE | OSTEOPOROTIC FRACTURE RATE PER 10,000 BENEFICIARIES | ESTIMATED OSTEOPOROTIC FRACTURES IN 2016* |
|---|---|---|
| Hip | 67.5 | 2,000 |
| Distal Femur/Femur | 23.3 | 700 |
| Pelvis/Sacrum | 19.9 | 600 |
| Tibia/Fibula | 43.6 | 1,300 |
| Humerus | 37.5 | 1,100 |
| Radius/Ulna | 15.6 | 500 |
| Distal Radius/Ulna | 37.7 | 1,100 |
| Clavicle | 9.0 | 300 |
| Spine | 102.1 | 3,100 |
| Rib | 51.5 | 1,500 |
| **Total** | **407.6** | **12,200** |

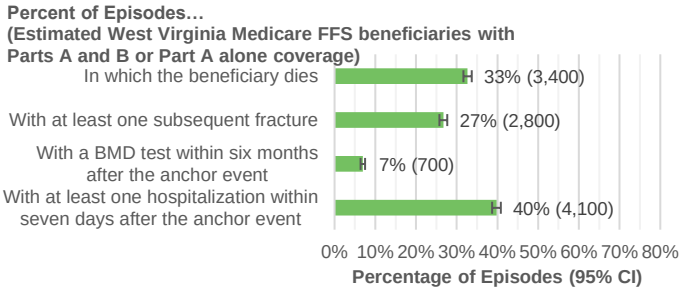
* Includes beneficiaries covered by both Parts A and B or Part A alone.

**FIGURE 4: INCIDENCE OF NEW OSTEOPOROTIC FRACTURES AMONG SUBSETS OF MEDICARE FFS BENEFICIARIES IN 2016, WEST VIRGINIA**

| POPULATION | NEW OSTEOPOROTIC FRACTURE RATE PER 10,000 BENEFICIARIES | ESTIMATED BENEFICIARY COUNT WITH AT LEAST ONE NEW FRACTURE IN 2016† |
|---|---|---|
| **Total Population** | **346.9** | **10,400** |
| **Sex** | | |
| Female | 461.8 | 7,300 |
| Male | 217.9 | 3,100 |
| **Age Band** | | |
| Less than 65 | 238.3 | 1,700 |
| 65-74 | 250.5 | 3,000 |
| 75-84 | 420.9 | 3,100 |
| 85+ | 788.3 | 2,500 |
| **Race/Ethnicity** | | |
| White | 354.0 | 10,200 |
| Black | 161.3 | 100 |
| Hispanic | * | * |
| Asian | * | * |
| N. American Native | * | * |
| Other | 143.1 | <100 |

† Includes beneficiaries covered by both Parts A and B or Part A alone.
* Episodes underlying these results are masked due to CMS small cells size suppression policy.
Note: Studies have identified limitations in Medicare enrollment database race variables.[7]

**FIGURE 5: PROPORTION OF MEDICARE FFS BENEFICIARIES WITH A NEW OSTEOPOROTIC FRACTURE IN 2016 WHO HAD KEY POST-FRACTURE EVENTS DURING THEIR OSTEOPOROTIC FRACTURE EPISODES, WEST VIRGINIA**




Note: Metrics were not adjusted to exclude beneficiaries who died during the osteoporotic fracture episode from the denominator of the proportions (i.e., beneficiaries were not required to survive for the length of the osteoporotic fracture episode). Confidence intervals for the proportion of beneficiaries who had key post-fracture events during their osteoporotic fracture episodes were calculated based on the mean and standard deviation of the sampling distribution of each proportion.

# Key events following a fracture

Analysis of Medicare claims data shows that osteoporotic fractures frequently lead to adverse and costly health consequences, including hospitalization, additional bone fractures, and death.

Figure 5 shows the proportion of Medicare beneficiaries in West Virginia who had key post-fracture events during their osteoporotic fracture episodes, which began with their anchor fracture event in 2016 through December 31, 2018, or death if earlier.

### DEATH

Figure 5 shows that 33% of Medicare FFS beneficiaries died within three years of a new osteoporotic fracture. The risk of death was highest in the months immediately following a fracture; nearly 19% of beneficiaries died within 12 months following a fracture, compared to only 6% of an age- and sex-adjusted population of all West Virginia Medicare FFS beneficiaries. For beneficiaries with a hip fracture, 30% died within 12 months of the fracture.

Based on the total number of West Virginia Medicare FFS beneficiaries covered by Parts A and B or Part A alone in 2016, we estimate that approximately 2,000 Medicare FFS beneficiaries died within 12 months after suffering a new fracture.

### SUBSEQUENT FRACTURES

Over 1,500 West Virginia Medicare FFS beneficiaries covered by Parts A and B or Part A alone, or 15% of beneficiaries with an anchor fracture event, had a subsequent fracture within one year of their initial fracture. We found that the age- and sex-adjusted one-year rate of subsequent fractures among beneficiaries who had a new osteoporotic fracture was over 3.8 times the one-year rate of new osteoporotic fractures among Medicare FFS beneficiaries, highlighting the increased risk of subsequent fractures.

Beneficiaries with an initial anchor fracture of the pelvis/sacrum were most likely to suffer another fracture of a different body part; 21% of these beneficiaries experienced a subsequent fracture within one year. Refractures of the spine were the most common subsequent fracture for the same body part; 8% of Medicare FFS beneficiaries with a new osteoporotic fracture of the spine refractured their spine within 12 months.

### BMD TESTING

Bone mineral density (BMD) tests can be used to predict an individual's risk for future bone fractures.[8] Studies show that many beneficiaries remain unscreened with a BMD test following their fracture.[9,10] We found that only 7% of West Virginia FFS beneficiaries who had a new osteoporotic fracture received a BMD test within the first six months following a new osteoporotic fracture. In the same period, only 8% of female beneficiaries and 4% of male beneficiaries received a BMD test. We do not have credible data to report BMD testing within six months by race for West Virginia.

### HOSPITALIZATIONS

In West Virginia, over 40% of beneficiaries experienced at least one acute inpatient hospitalization within a week of their anchor fracture event and 58% of beneficiaries were hospitalized at least once within their fracture episode 8 days or more after the anchor fracture event. Of beneficiaries with a hip fracture, 93% were hospitalized within seven days. Care for common post-fracture events, like hospitalizations, can lead to significant cost increases for individuals with osteoporotic fractures.

# The cost of fracture care

Medical care required after an osteoporotic fracture is expensive. The estimated 9,600 West Virginia Medicare FFS beneficiaries with both Parts A and B coverage who suffered a new osteoporotic fracture in 2016 incurred $37,900 per beneficiary in Medicare and beneficiary medical cost ("allowed cost") in the year following the fracture. This cost is, on average, over $17,800 higher than the cost for these beneficiaries from the year prior to the fracture. This is 197% higher than the nationwide allowed medical cost for a typical Medicare FFS beneficiary in 2016 ($12,800) after adjusting for differences in age and sex.

In the six-month period prior to the new osteoporotic fracture event, the average allowed per patient per month (PPPM) was 75% higher than the average 2016 per member per month (PMPM) for Medicare FFS beneficiaries in West Virginia, after adjusting for differences in sex and age. The higher cost of the

beneficiaries with fracture is likely due to differences in pre-fracture health status between the beneficiaries with and without fractures.

The average allowed costs in the year following the new osteoporotic fracture were over 90% greater than the cost in the year prior to the fracture. Increases in annual costs for inpatient services (+112%) and skilled nursing facility (SNF) services (+253%) contributed the most to the higher costs in the year following the fracture.

The cost of a subsequent fracture after a new osteoporotic fracture is also high in West Virginia. The estimated incremental allowed medical cost of a subsequent fracture following a new osteoporotic fracture was $18,300 (95% CI: $16,425 to $20,366) during the 180-day period following the subsequent fracture. An estimated 2,200 Medicare FFS beneficiaries covered by both Parts A and B suffered a subsequent fracture during a follow-up period that lasted up to two to three years and survived for at least 180 days after the subsequent fracture, which would account for over $40.6 million (95% CI: $36.5 million to $45.3 million) in allowed cost to the West Virginia Medicare FFS program and beneficiaries. Extrapolating the estimated $12,800 cost of Part A services associated with a subsequent fracture to the estimated 180 West Virginia beneficiaries with a subsequent fracture covered only by Part A would add an estimated $2.3 million in cost, for a total of over $43.0 million for subsequent fractures suffered by Medicare FFS beneficiaries with an initial fracture in 2016.

Secondary fracture prevention models of care, like fracture liaison services (FLS), may lead to Medicare cost savings by preventing a modest percentage of subsequent fractures after a new osteoporotic fracture. See additional details in our full report.

## Methodology and data sources

In administrative medical claims data from the Medicare 100% Research Identifiable Files (RIF), we identified 8,100 new osteoporotic fractures in 2016 among Medicare FFS beneficiaries with both Parts A and B coverage residing in West Virginia. We analyzed post-fracture medical service utilization and cost, as well as the occurrence of key events such as death or subsequent fractures, for a post-fracture follow-up period that lasted up to December 31, 2018 or until death, if earlier.

We extrapolated our results to an age- and sex-adjusted population of beneficiaries covered by Medicare Advantage in 2016.

In addition, we used regression models to quantify the incremental cost of a subsequent fracture. We used the model results, as well as the data from our analysis on the incidence of new osteoporotic fractures, to estimate the aggregate cost to Medicare FFS of subsequent fractures.

Additional details on our methodology and data sources can be found in our full report. The appendix to this report provides a summary of statewide and nationwide findings.

## APPENDIX: SUMMARY OF KEY FINDINGS BETWEEN WEST VIRGINIA AND NATIONWIDE

| | WEST VIRGINIA | NATIONWIDE* |
|---|---|---|
| Estimated count of osteoporotic fractures suffered among Medicare FFS and Medicare Advantage beneficiaries in 2016 | 15,900 | 2.1 million |
| Estimated count of Medicare FFS beneficiaries who suffered one or more subsequent fractures within 12 months of an initial osteoporotic fracture in 2016 | 1,500 | 177,300 |
| Estimated count of Medicare FFS beneficiaries who died within 12 months after a new osteoporotic fracture in 2016 | 2,000 | 244,700 |
| Estimated incremental medical 180-day cost of a subsequent fracture following a new osteoporotic fracture suffered by a Medicare FFS beneficiary with both Parts A and B coverage in 2016 | $18,300 | $20,400 |
| Estimated total incremental medical 180-day cost of all subsequent fractures following new osteoporotic fractures during a follow-up period of up to two to three years following a new osteoporotic fracture in 2016 for Medicare FFS beneficiaries covered by both Parts A and B or Part A alone who survived for at least 180 days after the subsequent fracture** | $43.0 million | $5.7 billion |
| Potential direct medical cost savings from preventing between 5% and 20% of subsequent fractures during a follow-up period of up to two to three years after a new osteoporotic fracture suffered by Medicare FFS beneficiaries covered by both Parts A and B or Part A alone, net of the cost of performing BMD tests on an additional 10% to 50% of new osteoporotic fracture patients** | N/A† | $272.4 million to $1.1 billion |

* Additional details on nationwide findings, including methodology and data sources, can be found in our full report.
** Includes the total cost of subsequent fractures among beneficiaries covered by Medicare Part A alone, which is calculated by extrapolating the estimated cost of Part A services associated with a subsequent fracture to the estimated count of beneficiaries with a subsequent fracture covered by Part A alone.
† Estimated cost savings are not calculated at state level due to a lack of credible data.

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