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# Medicare Claims Paid by the Federal Black Lung Benefits Program:

## US Medicare Beneficiaries, 1999 to 2016

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## Abstract

**Objective—**To establish the burden of totally disabling respiratory impairment among coal miners, we identified the healthcare utilization and cost for Medicare claims where the Federal Black Lung Program (FBLP) was the primary payer.

**Methods—**We extracted FBLP claims fromn 1999 to 2016 institutional Medicare data along with beneficiary, comorbidity, and claim cost information. Healthcare utilization was evaluated and compared to the 2016 Medicare population.

**Results—**The FBLP was the primary payer on 75,690 claims from 19,700 beneficiaries and paid an increasing percentage of the total paid to providers annually. Claims decreased from 1999 to 2016 but cost per claim increased. Beneficiaries were hospitalized and visited the ER for respiratory and cardiovascular conditions.

**Conclusions—**Medicare beneficiaries with FBLP primary payer claims have higher healthcare utilization and comorbidities compared with Medicare enrollees, indicative of increased financial and healthcare burden.

### Keywords

compensation; lung disease; pneumoconiosis

Respirable coal mine dust causes coal workers' pneumoconiosis (ie,black lung), which is a progressive disease that can be disabling.[1] Coal miners with completely disabling respiratory impairment arising from coal mine employment are eligible to receive monthly financial compensation and medical coverage for services and supplies related to their respiratory condition through The Federal Black Lung Program(FBLP).The FBLP was initially created with the Federal Coal Mine Health and Safety Act of 1969 to provide financial compensation to qualifying miners based on total disability due to pneumoconiosis.[2,3] The Act was later amended to include medical benefits, and FBLP eligibility was extended to coal miners with totally disabling respiratory impairment.[2,3]

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The US Department of Labor operates the FBLP, which manages these financial compensation and medical benefits for eligible coal miners.[4] Present and former coal miners may apply for the FBLP by submitting an application including the details of their coal mine employment and medical examination.[5] The Department of Labor reviews the application and medical examination results and makes a determination of the miner's eligibility for the FBLP based on totally disabling respiratory impairment arising out of coal mine employment (ie, the miner is unable to perform work as a coal miner because his/her breathing has been permanently impaired to a severely disabling level as a result of their coal mine employment).[2,5]

The US Centers for Medicare and Medicaid Services (CMS) administers Medicare, the primary federal health insurance for US citizens and permanent legal residents aged more than or equal to 65 years, those aged less than 65 years receiving disability insurance benefits from the Social Security Administration for 24 consecutive months, and those of all ages with end stage renal disease.[6] In 2016, about 57 million people were enrolled in Medicare.[7] Medicare claims data include claims for which specific non-Medicare insurance programs, such as the FBLP, have primary responsibility for claim payment.[8] The FBLP is designated as the primary payer when a Medicare beneficiary, who is also receiving medical benefits from the FBLP,accesses health care services and supplies related to the i rtotally disabling respiratory impairment·[2,8]

There is a resurgence of black lung disease, but the burden of disabling lung disease among coal miners is not well described.[9] Limited national morbidity information is available on pneumoconiosis and totally disabling respiratory impairment outside of medical screenings offered to miners by the National Institute for Occupational Safety and Health (NIOSH) as part of the Coal Workers Health Surveillance Program, and even less is known regarding miners' comorbidities and healthcare utilization related to their disabling respiratory disease.[10] Since pneumoconiosis is progressive and has no cure, it contributes to occupational morbidity and has financial costs for insurance programs such as Medicare and the FBLP. Therefore, it is important to help establish the financial and healthcare burden of totally disabling respiratory impairment among coal miners by identifying the healthcare utilization and payment made for institutional Medicare claims from 1999 to 2016 where the FBLP was the primary payer and describe the demographic characteristics of these beneficiaries.

## METHODS

We accessed two types of de-identified Medicare data files through the CMS Virtual Research Data Center: Medicare claim files and Master Beneficiary Summary File (MBSF) (base segment and chronic conditions segment).[11–13] From approximately 3 billion Medicare claims,we extracted final action fee-for-service (also known as Medicare Parts A and B) claims for which the FBLP was listed as the primary payer and the FBLP made a payment (full or partial) to an institutional provider.[2,8] Institutional providers include: Community Mental Health Centers, Comprehensive Outpatient Rehabilitation Facilities, Critical Access Hospitals, End-Stage Renal Disease Facilities, Federally Qualified Health Centers, Histocompatibility Laboratories, Home Health Agencies, Hospice Organizations, Hospitals, Indian Health Service Facilities, Organ Procurement Organizations, Outpatient

Physical Therapy/Occupational Therapy/Speech Pathology Services, Religious Non-Medical Health Care Institutes, Rural Health Clinics, and Skilled Nursing Facilities.[14] Claims from non-institutional providers, that is, durable medical equipment claims and carrier claims (physician/supplier Part B), were not included.[13]

To describe the healthcare utilization of these beneficiaries, we identified the five types of institutional claims: inpatient hospital provider claims, outpatient claims (eg, hospital outpatient department, rural health clinics, renal dialysis facilities), skilled nursing facility claims, home health agency claims, and Medicare hospice provider claims. The inpatient hospital provider claims were used to capture the beneficiary ID, date of admission, discharge date, admitting diagnosis code, and provider number. The beneficiary ID, date of admission, and provider number were used to identify distinct hospitalizations, and for each hospitalization, we calculated the length of stay (in days) as the difference between the discharge date and date of admission plus one day.[15] We also used the inpatient hospital provider claims and outpatient claims to identify emergency room (ER) visits using ER Revenue Center Codes.[16]

Claims include International Classification of Diseases, Clinical Modification (ICD-CM) diagnosis codes that are populated using the Ninth Revision ICD-CM (ICD-9-CM) through September 30, 2015 followed by the Tenth Revision ICD-CM (ICD-10-CM) starting in October, 2015.[17] To have consistent coding under the same ICD-CM revision for all data between 1999 and 2016, all diagnoses with ICD-10-CM codes were converted to ICD-9-CM codes. We summarized the ICD-9-CM admitting diagnosis code on all distinct hospitalization claims to identify the beneficiary's initial diagnosis at inpatient admission. ICD-9-CM principal diagnosis codes were available for all ER visit claims and summarized to specify the diagnosis or reason chiefly responsible for the ER visit.[16]

For each claim, the total paid was calculated as the sum of the amounts paid to providers by three possible payers: the primary payer (ie, FBLP), Medicare, and the beneficiary. The total paid and amounts paid by the primary payer, Medicare, and the beneficiary were calculated using technical guidance published by the Chronic Conditions Data Warehouse.[18] Annual payments and number of claims were calculated. All payment values were expressed in 2016 US dollars to adjust for medical care inflation using the Medical Care Consumer Price Index (http://www.in2013dollars.com/Medi-cal-care/price-inflation/). When billing dates for a claim spanned across 2 years, we used the year of the first day of the claim billing statement for the services rendered to calculate annual totals.

The institutional medical claims for which the FBLP was listed as the primary payer were linked to beneficiaries in the MBSF base and chronic conditions segments using the beneficiary ID. The MBSF base segment includes beneficiary-level demographic and Medicare enrollment data for all beneficiaries alive for any part of the calendar year that were enrolled in Medicare for at least 1 month of the year.[12] Information on age, sex, race/ethnic origin, and state of residence was extracted from a beneficiary's first claim where the FBLP was listed as the primary payer during 1999 to 2016. We limited our analysis to those 18 years and older. Race/ethnic origin groupings included white, black, other (Asian, Hispanic, North American Native, and other), and unknown. A beneficiary's original reason

for Medicare entitlement (aged more than or equal to 65 years, Social Security Administration disability insurance benefits, or end stage renal disease/end stage renal disease and disability insurance benefits) was identified as well as the current reason for entitlement at the time of their first FBLP primary payer claim.

As part of the MBSF chronic conditions segment, CMS identifies beneficiaries with specific chronic conditions using CMS-developed chronic condition algorithms based on diagnosis and procedure codes on a beneficiary's claims.[19] We used the chronic conditions segment to determine the frequency of beneficiaries with the following chronic condition comorbidities potentially associated with pneumoconiosis and totally disabling respiratory impairment: asthma, chronic obstructive pulmonary disease, lung cancer, acute myocardial infarction, atrial fibrillation, heart failure, hyperlipidemia, hypertension, ischemic heart disease, chronic kidney disease, diabetes, and rheumatoid arthritis, or oste-oarthritis.[1]

SAS Enterprise Guide 7.1 (SAS Institute, Cary, NC) was used to produce counts and percentages. Pearson's chi-square tests were used to compare frequencies between the 2016 Medicare population and FBLP primary payer Medicare population and were considered significant at $P < 0.05$. The NIOSH Human Subjects Review Board determined no additional human subjects review was required for this research study.

## RESULTS

The FBLP was the primary payer for 75,690 (0.1%) Medicare fee-for-service institutional claims during 1999 to 2016: 41,706 inpatient hospital provider claims, 32,357 outpatient claims, 848 skilled nursing facility claims, 594 home health agency claims, and 185 Medicare hospice provider claims. These claims were from 19,700 Medicare beneficiaries. The demographic characteristics and comorbidities of these beneficiaries are shown in Table 1. Most FBLP primary payer beneficiaries were aged more than or equal to 65 years (88.1%), men (94.2%), white (95.3%), and over 75% were residents of four states: Pennsylvania (22.1%), West Virginia (20.8%), Kentucky (18.3%), and Virginia (14.1%). The original reason for Medicare entitlement for about half of these beneficiaries (55.1%) was they had received Social Security Administration disability insurance benefits for 24 consecutive months and the current reason for entitlement at the time of their first FBLP primary payer claim for most (88.1%) beneficiaries was age more than or equal to 65 years. There was a higher percent of FBLP primary payer beneficiaries originally enrolled in Medicare due to disability compared with all Medicare fee-for-service enrollees in 2016 (16.0%) ($P < 0.05$).[7]

During 1999 to 2016, chronic obstructive pulmonary disease (87.6%), hypertension (81.6%), and ischemic heart disease (80.0%) were common comorbidities in this FBLP primary payer patient population (Table 1). The prevalence of all selected respiratory and cardiovascular comorbidities in the study population was significantly higher ($P < 0.05$) than the 2016 period prevalence among all Medicare beneficiaries with fee-for-service cover-age.[20,21] For example, the prevalence of chronic obstructive pulmonary disease among Medicare beneficiaries for which the FBLP was the primary payer was 87.6% compared with 11.6% among all Medicare beneficiaries.

For the 41,706 inpatient hospital provider claims, there were 41,676 distinct hospitalizations from 15,062 beneficiaries (76.5%). This was significantly higher than the percent of Medicare fee-for-service enrollees in 2016 with a hospitalization (17.3%) ($P < 0.05$).[7] The mean length of stay for all distinct hospitalizations was 7.5 days and length of stay ranged from 1 to 162 days (data not shown). Figure 1 summarizes the most common ICD-9-CM admitting diagnoses for these hospitalizations. The top three were obstructive chronic bronchitis with (acute) exacerbation (15.3%) (ICD-9-CM diagnosis code 491.21); pneumonia, organism unspecified (12.8%) (ICD-9-CM diagnosis code 486); and congestive heart failure, unspecified (6.3%) (ICD-9-CM diagnosis code 428.0). Approximately 13,052 beneficiaries (66.3%) accounted for 32,083 ER visits where the top three ICD-9-CM principal diagnoses were obstructive chronic bronchitis with (acute) exacerbation (19.8%); pneumonia, organism unspecified (14.5%); and congestive heart failure, unspecified (7.1%) (data not shown). The percent of beneficiaries in the study population utilizing the ER was significantly higher than the 28% of Medicare fee-for-service enrollees with an ER visit in 2016 ($P< 0.05$).[7]

Figure 2 shows the annual payment by payer type and annual number of FBLP primary payer claims for 1999 to 2016. There was a total of $668,801,703 paid to providers for these 75,690 Medicare claims. Of the total paid to providers, the FBLP paid $423,095,720 (63.3% of the total paid), Medicare paid $207,160,607 (31.0%), and beneficiaries paid $38,545,376 (5.8%) (Fig. 2). The percentage of the total paid by the FBLP increased from 56.7% in 1999 ($53,456,860) to 86.6% in 2016 ($4,060,270). The percentage of the total paid by Medicare decreased from 36.7% in 1999 ($34,586,854) to 8.8% in 2016 ($413,820) and the percentage of the total paid by the beneficiary stayed consistent throughout the study period ranging from 4.2% in 2014 to 7.1% in 2000. The total number of claims declined during the study period from 11,096 claims in 1999 to 473 claims in 2016 as did the total paid annually from $94,263,215 in 1999 to $4,689,299 in 2016 (Fig. 2). However, the total cost per claim increased in recent study years from $8495 in 1999 to $9913 in 2016.

## DISCUSSION

We identified 19,700 Medicare beneficiaries with an institutional claim where the FBLP was the primary payer. In order to receive payment by the FBLP for these medical claims, a Medicare beneficiary was determined eligible to receive Federal Black Lung Benefits due to totally disabling respiratory impairment resulting from coal mine employment.[4] These claims represent healthcare services paid for (in part or full) by the FBLP.[22,23] Medicare beneficiaries with FBLP primary payer claims were predominantly white and man, which is similar to the demographic characteristics of workers in the US coal mining industry.[24] Slightly over half (55.1%) of coal miners with FBLP primary payer claims were originally enrolled in Medicare due to disability and received Medicare benefits before age 65. Original enrollment due to disability is an important factor to consider in future studies examining occupational disease among Medicare beneficiaries as 11.1% were still enrolled in Medicare due to disability at the time of their first FBLP primary payer claim and beneficiaries enrolled in Medicare due to disability account for disproportionately higher Medicare spending.[25]

The Medicare beneficiaries for which the FBLP was the primary payer had a higher prevalence of selected respiratory and cardiovascular comorbidities than the 2016 period prevalence among all Medicare beneficiaries with fee-for-service cover-age.[20,21] The high prevalence of respiratory and cardiovascular comorbidities associated with pneumoconiosis and totally disabling respiratory impairment in this population is suggestive of poor overall health status and indicates increased financial and healthcare burden.

Furthermore, the higher percent of inpatient hospitalizations and ER visits in the study population compared with all Medicare fee-for-service enrollees in 2016 indicates that beneficiaries in this study population could experience more severe and acute healthcare issues leading to hospitalizations and ER visits compared with all fee-for-service Medicare enrollees. Many beneficiaries with FBLP primary payer claims had multiple hospitalizations and ER visits indicating difficulty managing their disease resulting in frequent need for inpatient and often emergency care. The ICD-9-CM admitting and principal diagnoses summarized on all distinct hospitalization and ER visit claims provides insight into the respiratory and cardiovascular diagnoses among those with totally disabling respiratory impairment and indicate FBLP beneficiaries often seek healthcare related to acute symptoms.

In 2015, the average Medicare cost per enrollee for hospital insurance (Part A Medicare) was $4856 ($5040 adjusted to 2016 dollars for medical care inflation).[25] Considering the average total cost per beneficiary for FBLP primary payer claims was $33,949 and the average cost to Medicare was $10,516 per beneficiary, these claims place a financial burden on the FBLP, Medicare, and the beneficiary. While the annual percent of total paid to the provider by Medicare for these medical claims decreased during the study period, Medicare still paid $207,160,607 (31.0% of the total paid). The provider was paid, on average, $21,477 per beneficiary by the FBLP, $10,516 per beneficiary by Medicare, and $1957 per beneficiary by the beneficiary (Fig. 2).

Despite the increase in prevalence of black lung disease since 2000 and the recent resurgence of the most severe form of the disease, the annual number of FBLP primary payer Medicare claims declined during the study period from 11,096 in 1999 to 473 in 2016.[9] This decline is consistent with the annual decline in the number of FBLP beneficiaries (from 97,660 in 2007 to 27,593 in 2016).[26]

## Limitations

The study population is limited to beneficiaries enrolled in Medicare with at least one Medicare claim where the FBLP was the primary payer. While our results describe the demographic and medical characteristics of the FBLP beneficiaries with totally disabling respiratory impairment enrolled in Medicare, they are not inclusive of all FBLP beneficiaries or all totally disabling respiratory impairment Medicare claims and may not be representative of the FBLP and Medicare populations. Medicare claims presented in this analysis only include claims where the FBLP was the primary payer. Medicare outlines specific provider guidance when payment of services may be the responsibility of the FBLP and offers model admission questions for providers to ask Medicare beneficiaries upon admission to help identify when beneficiaries are entitled to FBLP benefits.[22] Our analysis

did not include non-institutional claims submitted by professional providers (eg, physicians, physician assistants, clinical social workers, nurse practitioners, and some organizational providers) or durable medical equipment suppliers, and claims for individuals enrolled in Medicare Advantage.

Our analysis did not include claims where the last day of the claim billing statement was prior to 1999 or the first day of the claim billing statement was after 2016. Since final action fee-for-service Medicare claims were available for analysis starting with claims from 1999, we cannot assume a Medicare beneficiary's first claim where the FBLP was listed as primary payer during 1999 to 2016 is their true first FBLP claim (as it may have occurred prior to 1999) due to truncated data.

Furthermore, follow-up information regarding the final source of payment (eg, reimbursement by the responsible coal mine operator or reimbursement to the beneficiary) was not available. Payment of FBLP benefits is usually the responsibility of the coal mine operator identified as the miner's last employer.[2] However, the FBLP pays an eligible miner's benefits from the Black Lung Disability Trust Fund if for example, the miner's last coal mine employment was before 1970, no responsible coal mine operator can be identified (eg, the responsible operator went out of business or a miner had multiple employers so a responsible operator cannot be determined), or the responsible operator does not pay.[2,3] A responsible operator was liable for 77% to 87% of all approved (Part C) Black Lung claim adjucations each year during 2007 to 2016, and the Black Lung Disability Trust Fund was responsible for 13% to 23% of all approvals during 2007 to 2016.[26]

Additional limitations in this analysis are related to characteristics of Medicare claims data. Medicare data are not collected for the purpose of healthcare research, rather they are collected for payment purposes (eg, reimbursing providers) and may be prone to misclassification or variables may be incomplete.[27] CMS chronic condition definitions are broad and may underestimate the actual prevalence of these conditions among this population.[28]

## CONCLUSION

This study describes the demographics and medical characteristics of a group of Medicare beneficiaries with totally disabling respiratory impairment and uses Medicare claims where the FBLP was the primary payer to help establish the financial and healthcare burden of totally disabling respiratory impairment among coal miners during 1999 to 2016. These beneficiaries had a higher prevalence of comorbidities and a higher percent of hospitalizations and ER visits related to their disabling respiratory impairment compared with all 2016 Medicare fee-for-service beneficiaries. The claims from this group of Medicare beneficiaries accessing healthcare for which the FBLP was the primary payer cost Medicare more on average per beneficiary, and despite the decline in the number of FBLP primary payer claims, the cost per claim increased in recent study years. The higher claim cost, comorbidities, and healthcare utilization among FBLP Medicare beneficiaries compared with all Medicare fee-for-service beneficiaries may reflect the increase in

pneumoconiosis among this population and supportive care treatment efforts for pneumoconiosis and other totally disabling respiratory diseases.

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### Clinical Significance

Medicare beneficiaries with medical claims where the Federal Black Lung Program was the primary payer have increased healthcare utilization and comorbidities compared with all Medicare enrollees indicating they may be experiencing more severe and acute healthcare issues than other Medicare enrollees.

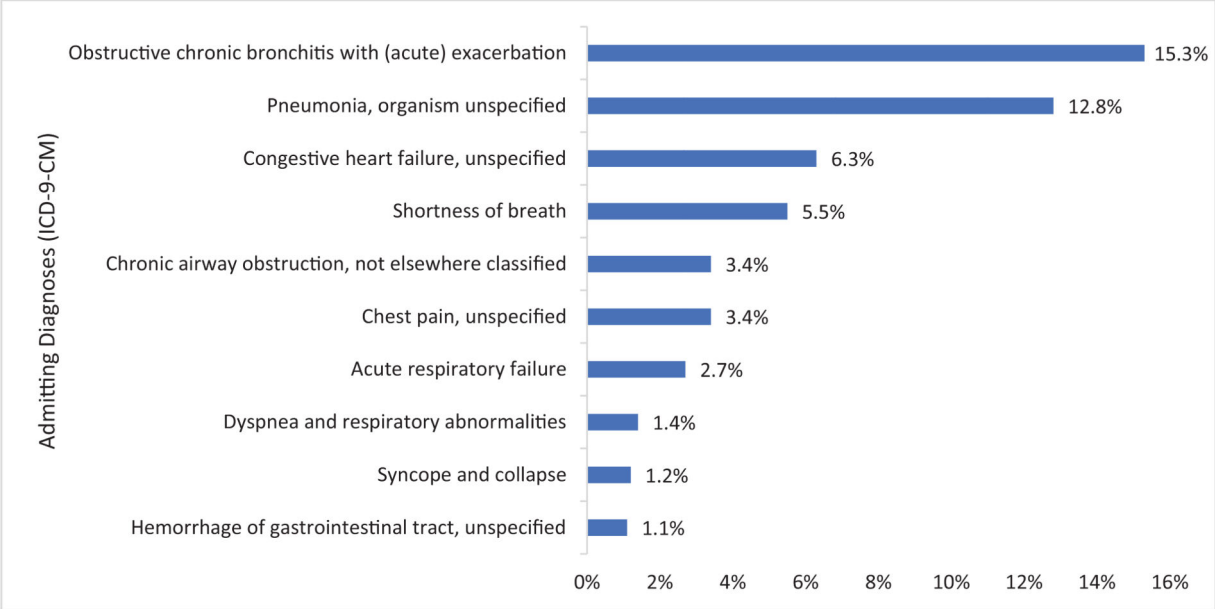


**FIGURE 1.**

Top 10 admitting diagnoses for distinct hospitalizations ($N$ = 41,676) among beneficiaries accessing healthcare for which the FBLP was the primary payer, 1999 to 2016. FBLP, Federal Black Lung Program.

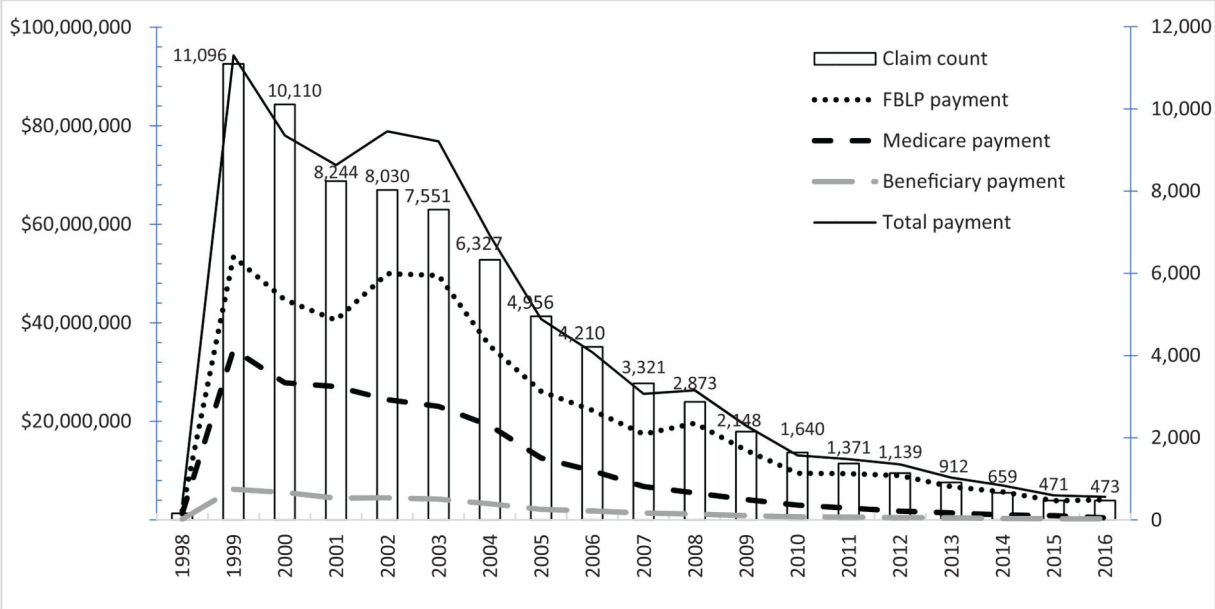


**FIGURE 2.**

Total amount paid to the provider, amount paid by FBLP, Medicare, and Beneficiary, and claim count annually. *Amount paid to the provider by the beneficiary was not available in Medicare claims data for hospice and home health agency claims. **There were 159 claims where the first day of the claim billing statement was in 1998 but services rendered on these claims covered multiple days that spanned into 1999. ***All values are presented in 2016 US dollars to adjust for medical care inflation using the Medical Care Consumer Price Index. FBLP, Federal Black Lung Program.

**TABLE 1.**

Demographic Factors, Comorbidities, and Healthcare Utilization of Medicare Beneficiaries Accessing Healthcare for Which FBLP is the Primary Payer, 1999 to 2016

| | FBLP Primary Payer Beneficiaries *n* = 19,700 | % | 2016 Medicare Original Enrollment Beneficiaries *n* = 38,610,384 | % |
|---|---|---|---|---|
| Demographic factors | | | | |
| Age group (yrs) | | | | |
| 18–44 | 291 | 1.5 | 1,507,958 | 3.9 |
| 45–64 | 2,046 | 10.4 | 4,896,638 | 12.7 |
| 65–74 | 4,259 | 21.6 | 18,422,814 | 47.7 |
| 75–84 | 7,661 | 38.9 | 9,241,719 | 23.9 |
| 85+ | 5,443 | 27.6 | 4,539,670 | 11.8 |
| Sex | | | | |
| Male | 18,565 | 94.2 | 17,967,676 | 46.5 |
| Female | 1,135 | 5.8 | 20,642,708 | 53.5 |
| Race/Ethnic origin * | | | | |
| White | 18,766 | 95.3 | 29,879,444 | 77.4 |
| Black | 645 | 3.3 | 3,777,833 | 9.8 |
| Other | 259 | 1.3 | 4,372,471 | 11.3 |
| Unknown | 30 | 0.2 | 580,636 | 1.5 |
| State of residence | | | | |
| Pennsylvania | 4,363 | 22.1 | 1,548,833 | 4.0 |
| West Virginia | 4,090 | 20.8 | 310,597 | 0.8 |
| Kentucky | 3,598 | 18.3 | 639,581 | 1.7 |
| Virginia | 2,785 | 14.1 | 1,133,636 | 2.9 |
| Other | 4,864 | 24.7 | 34,977,737 | 90.6 |
| Original entitlement reason | | | | |
| Aged ≥65 years | 8,669 | 44.0 | 32,005,572 | 82.9 |
| Disability | 10,852 | 55.1 | 6,177,008 | 16.0 |
| End stage renal disease | 179 | 0.9 | 427,804 | 1.1 |
| Current entitlement reason | | | | |
| Aged ≥65 years | 17,345 | 88.1 | – | – |

| | FBLP Primary Payer Beneficiaries *n* = 19,700 | % | 2016 Medicare Original Enrollment Beneficiaries *n* = 38,610,384 | % |
|---|---|---|---|---|
| Disability | 2,186 | 11.1 | – | – |
| End stage renal disease | 169 | 0.9 | – | – |
| Comorbidity[†] | | | | |
| Chronic obstructive pulmonary disease | 17,267 | 87.6 | 3,943,019 | 11.6 |
| Hypertension | 16,073 | 81.6 | 19,341,186 | 56.9 |
| Ischemic heart disease | 15,751 | 80.0 | 9,177,716 | 27.0 |
| Heart failure | 13,918 | 70.6 | 4,724,824 | 13.9 |
| Hyperlipidemia | 9,875 | 50.1 | 15,330,185 | 45.1 |
| Chronic kidney disease | 9,317 | 47.3 | 7,580,113 | 22.3 |
| Rheumatoid arthritis/osteoarthritis | 9,317 | 47.3 | 11,387,166 | 33.5 |
| Diabetes | 8,443 | 42.9 | 9,279,690 | 27.3 |
| Atrial fibrillation | 6,208 | 31.5 | 2,821,298 | 8.3 |
| Asthma | 3,365 | 17.9 | 1,733,569 | 5.1 |
| Acute myocardial infarction | 3,393 | 17.1 | 339,915 | 1.0 |
| Lung Cancer | 2,168 | 11.0 | 339,915 | 1.0 |

[*] Other race/ethnic origin included Asian, Hispanic, North American Native, and other.

[†] Beneficaries enrolled at any time during 2016 in Medicare Advantage or Part A only or Part B only were excluded from the denominator for 2016 Medicare Original Enrollment Beneficiaries comorbidity calculations. Total Medicare fee-for-service beneficiaries for comorbidity calculations was *n* = 33,991,540. Comorbidity percentages for 2016 Medicare fee-for-service beneficiaries are found on the CMS website[21] except for percentages for rheumatoid arthritis/osteoarthritis, acute myocardial infarction, and lung cancer, which are found in the CCW charts.[20]