Effective Health Care Program

Economic burden of diabetic foot ulcers and amputations

Diabetic Foot Ulcers

Data Points #3

Diabetes mellitus is a significant illness, both from an individual point of view and a societal perspective. According to the Centers for Disease Control and Prevention in 2007, the number of people in the United States (U.S.) with diabetes mellitus reached 24 million, with another 57 million people estimated to have prediabetes.[1] From 1980 to 2008, the number of diabetic Medicare beneficiaries aged 65 or older increased from 2.3 million to 7.4 million.[2] In a population of beneficiaries with at least 12 months of continuous enrollment in Medicare Parts A and B fee-for-service (FFS) in 2008, 8.9 million all-age Medicare beneficiaries had diabetes mellitus, or nearly 28 percent of this cohort.[3] The actual national cost burden of diabetes is thought to exceed $174 billion, including the social cost of intangibles such as pain and suffering, care provided by nonpaid caregivers, medical costs associated with undiagnosed diabetes, and diabetes-attributed costs.[4] On average, medical expenditures are thought to be 2.3 times higher in people with diabetes as compared to those without diabetes.[4] Many of these expenditures are likely related to comorbidities associated with diabetes like diabetic foot ulcer (DFU) and lower extremity amputation (LEA).

Common complications of diabetes are foot ulcer and LEA. These complications can have dramatic effects on the patient's health and general well being and can be expensive to treat. For example, in 2001, diabetes-related foot ulcers and amputations were estimated to cost U.S. health care payers $11 billion.[5] Although much effort has been made to determine cost-effectiveness of the care of diabetic individuals with foot ulceration and those who require LEA, questions remain as to whether interventions such as hyperbaric oxygen therapy, negative pressure wound therapy, and specialized dressing materials are really beneficial. Concern for cost-effectiveness has also spurred interest in trying to better understand the potential benefits, if any, of special-needs programs that may be able to provide quality care in an effective and efficient manner for diabetic patients.[6]

Beneficiaries with a diabetic foot ulcer are seen by their outpatient health care provider about 14 times per year and are hospitalized about 1.5 times per year. The cost of care for these beneficiaries is substantial, at about $33,000 for total reimbursement of all Medicare services per year.

Beneficiaries with a lower extremity amputation are seen by their outpatient health care provider about 12 times per year and are hospitalized about 2 times per year. The cost of care for these beneficiaries is substantial, at about $52,000 for total reimbursement of all Medicare services per year.

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Since treatments are changing rapidly, especially for type 2 diabetes (the most common type of diabetes in the Medicare population), it can be difficult for clinicians to keep track of the most useful therapies. This is related, in part, to the fact that there is relatively little standardized data on the treatment or health outcomes for patients with diabetes mellitus. With this background in mind, the goal of this *Data Points* brief is to evaluate the utilization and costs of services among Medicare beneficiaries with DFUs and/or LEAs. To that end, we focused our analyses on Medicare beneficiaries with Parts A and B FFS or Parts A, B, and D coverage, as defined in the subsequent data source section, for the years 2006 through 2008. In previous *Data Points* briefs, we reported on the prevalence of diabetes, DFU, and LEA[3] and the incidence of DFU and LEA,[7] among the population of Medicare beneficiaries with Parts A and B FFS coverage.

FINDINGS

Utilization of Services

We used the population of beneficiaries who were continuously enrolled for at least 12 months in Medicare Parts A and B FFS and also continuously enrolled in the calendar year, hereafter referred to as the Medicare FFS population (see Data Source section). Among the Medicare FFS population with a prevalent DFU (see Definitions and Methodology section), the mean number of office visits was 13.5 (median: 11) in 2006, 13.7 (11) in 2007, and 13.8 (12) in 2008. Furthermore, the mean number of DFU hospitalizations for those with a prevalent DFU was 0.25 in 2006, 2007, and 2008. However, the mean number of hospitalizations for any reason was 1.43 in 2006, 1.42 in 2007, and 1.41 in 2008. In the prevalent DFU population, the rate for readmission for a DFU (i.e., any second hospitalization for a DFU in the same calendar year) was 5.0 percent in 2006, 5.0 percent in 2007, and 4.9 percent in 2008.

Table 1: Annual Reimbursement (in Thousands of U.S. Dollars) for All Services and Selective Services Per Beneficiary, Among Diabetic Medicare Parts A and B Fee for Service Beneficiaries with Foot Ulcer or LEA, 2006-2008

			Diabetic Foot Ulcer		Lower Extremity Amputation	
Variable		Year	All Medicare services	Selected services	All Medicare services	Selected services
Overall		2006	31.6	1.9	49.3	7.7
		2007	33.1	1.8	51.2	7.6
		2008	35.1	1.9	54.1	8.0
Age	Under 45	2006	40.5	2.6	58.9	7.8
		2007	41.9	2.6	61.9	8.1
		2008	45.0	2.5	64.0	8.0
	45 to 54	2006	38.3	2.9	54.0	7.8
		2007	40.0	2.8	55.4	7.6
		2008	42.1	2.9	58.7	7.6
	55 to 64	2006	38.3	2.9	53.5	7.5
		2007	39.9	2.8	55.1	7.4
		2008	42.3	2.9	58.0	7.9
	65 to 74	2006	30.3	2.0	49.1	7.7
		2007	31.7	1.9	51.1	7.8
		2008	33.5	2.0	53.9	8.1
	75 to 84	2006	30.6	1.6	47.2	7.8
		2007	31.9	1.5	49.0	7.6
		2008	33.7	1.6	51.7	8.1
	85 to 94	2006	28.7	1.3	42.4	7.7
		2007	30.2	1.2	44.1	7.8
		2008	32.3	1.2	47.1	7.8
	95 and over	2006	25.3	0.9	33.5	5.8
		2007	27.2	0.9	36.6	6.3
		2008	28.5	0.9	39.7	7.3
Gender	Male	2006	33.0	2.3	48.1	7.6
		2007	34.5	2.2	50.0	7.6
		2008	36.5	2.3	53.0	7.9
	Female	2006	30.5	1.5	51.1	7.8
		2007	31.9	1.4	53.0	8.2
		2008	33.9	1.5	55.8	8.0
Race or Ethnicity	White	2006	28.8	1.6	45.2	7.2
		2007	30.1	1.5	46.8	7.1
		2008	31.9	1.6	49.3	7.4
	African American	2006	44.7	3.3	58.2	8.7
		2007	47.2	3.2	61.4	8.9
		2008	49.9	3.4	65.3	9.2
	Asian	2006	32.7	1.8	57.8	10.3
		2007	37.7	1.9	61.6	11.8
		2008	35.5	1.9	63.6	11.7
	Hispanic	2006	41.4	2.7	59.1	8.7
		2007	43.5	2.4	61.2	8.1
		2008	47.2	2.6	64.8	8.8
	American Indian / Alaska Native	2006	35.5	2.9	47.7	7.1
		2007	37.3	3.0	48.5	7.3
		2008	39.1	3.0	52.0	7.4

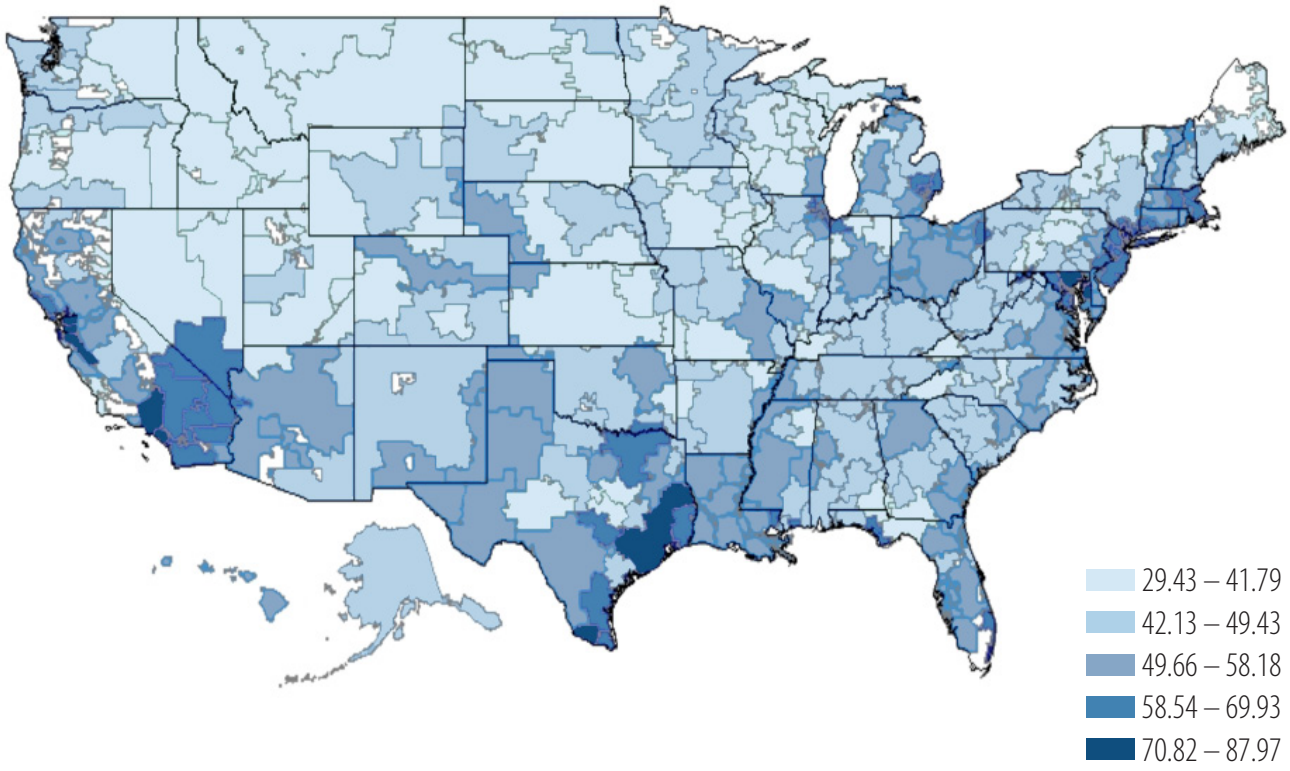
Interestingly, after a DFU admission, the rate of readmission for any reason (i.e., a second hospitalization after a hospitalization for a DFU in the same calendar year), was 34.0 percent in 2006, 33.8 percent in 2007, and 33.4 percent in 2008. These rates did not vary widely by gender or race/ethnicity, but did vary by age.

Among the Medicare FFS population (see Data Source section) with a prevalent LEA (see Definitions and Methodology section), the mean number of office visits for any reason was 11.8 (median: 9) in 2006, 12.0 (9) in 2007, and 12.2 (9) in 2008. Furthermore, the mean number of LEA hospitalizations for those with a prevalent LEA was 0.72 in 2006, 0.68 in 2007, and 0.66 in 2008. However, among beneficiaries who had a prevalent LEA, the mean number of hospitalizations for any reason was 2.08 in 2006, 2.03 in 2007, and 2.01 in 2008. In the prevalent LEA population, the rate of readmission for an LEA in the same calendar year was 16.3 percent in 2006, 15.4 percent in 2007, and 14.6 percent in 2008. However, after an admission for an LEA, the rate of readmission for any reason (i.e., a second hospitalization after a hospitalization for an LEA in the same calendar year) was 48.8 percent in 2006, 47.8 percent in 2007, and 47.2 percent in 2008. These rates did not vary widely by age, gender, or race/ethnicity.

Costs

Among Medicare FFS beneficiaries who had a prevalent DFU, the mean reimbursement for all Medicare services was $31.6 (median: $15.2) in 2006, $33.1 ($15.9) in 2007, and $35.1 ($16.7) in 2008, in thousands of U.S. dollars (**Table 1**). With respect to drug costs, in thousands of U.S. dollars, the mean total cost of all medications used by Medicare FFS beneficiaries with Part D coverage (as defined in the Data Source section) with a prevalent DFU was $5.0 ($3.8) in 2006, $4.8 ($3.5) in 2007, and $5.1 ($3.5) in 2008. The mean reimbursement for "selected services" for a beneficiary with a DFU (e.g., services likely specific to diabetic foot/lower extremity care, see Definitions and Methodology section) were $1.9 ($0.16) in 2006, $1.8 ($0.15) in 2007, and $1.9 ($0.16) in 2008, in thousands of U.S. dollars. In contrast, among diabetic Medicare FFS beneficiaries without a prevalent DFU, the mean reimbursement for all Medicare services was about one-third of the total reimbursement for diabetics with a DFU; $11.6 ($3.3) in 2006, $12.1 ($3.4) in 2007, and $12.7 ($3.6) in 2008, in thousands of U.S. dollars (**Table 1**). The costs seem to vary by race/ethnicity, with African Americans and Hispanics incurring greater costs than other groups (**Table 1**).

Figure 1: Total reimbursement (in thousands of U.S. dollars) for all services per diabetic Medicare beneficiary with prevalent DFU, 2008



Costs, stratified by quintiles, also varied by Hospital Referral Region (HRR) (e.g., **Figure 1** and **Figure 2**).

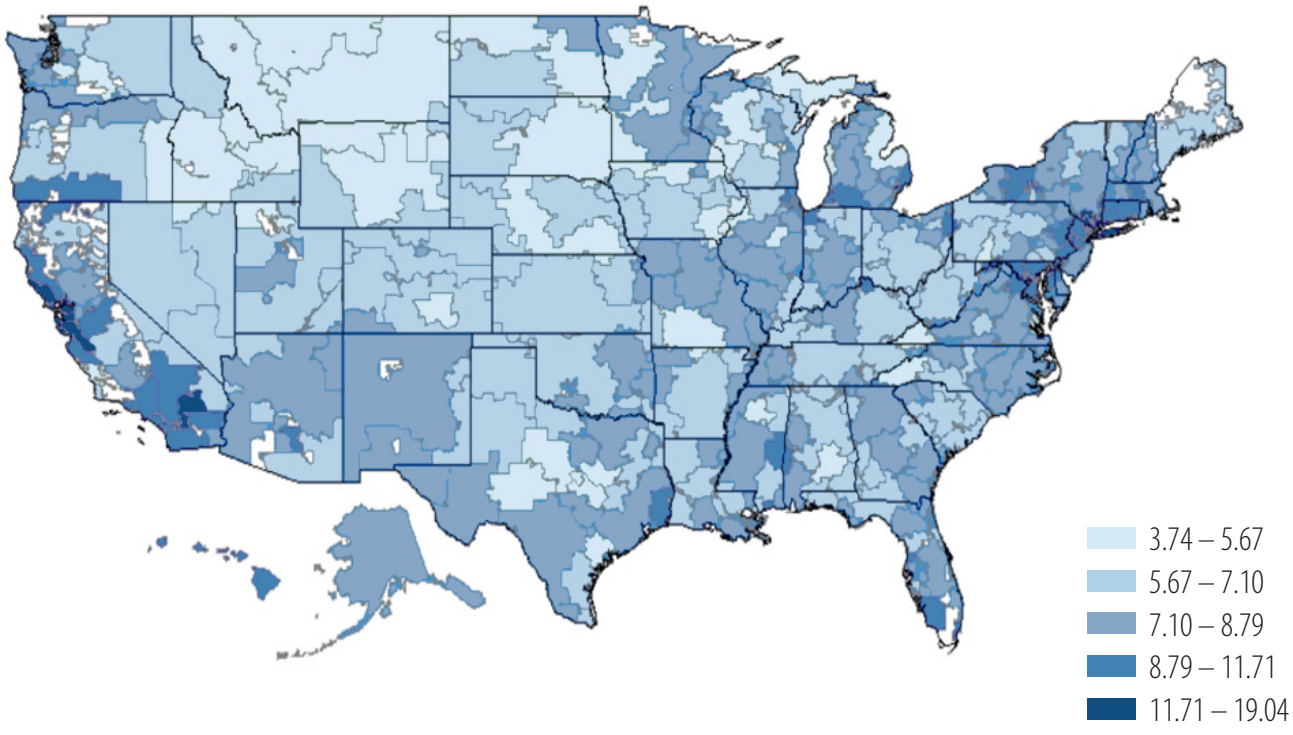
Among Medicare FFS beneficiaries who had a prevalent LEA, the mean reimbursement for all Medicare services was $49.3 ($33.7) in 2006, $51.2 ($34.8) in 2007, and $54.1 ($36.5) in 2008, in thousands of U.S. dollars (**Table 1**). With respect to drug costs, the mean total cost of all medications used by Medicare FFS beneficiaries with Part D coverage (as defined in the Data Source section) and a prevalent LEA was $4.8 ($3.7) in 2006, $4.8 ($3.5) in 2007, and $5.0 ($3.6) in 2008, in thousands of U.S. dollars. The mean reimbursement for "selected services" for individuals with diabetes and an LEA (e.g., services likely specific to diabetic foot/lower extremity care, see Definitions and Methodology section) were $7.7 ($0.40) in 2006, $7.6 ($0.33) in 2007, and $8.0 ($0.33) in 2008, in thousands of U.S. dollars. In contrast, among diabetic Medicare FFS beneficiaries without a prevalent LEA, the mean reimbursement for all Medicare services was about one-fifth of the total reimbursement for those with diabetes and a LEA; $12.5 ($3.6) in 2006, $13.1 ($3.7) in 2007, and $13.8 ($3.9) in 2008, in thousands of U.S. dollars (**Table 1**). The costs seem to vary by race/ethnicity with white and American Indian/Alaska Native apparently incurring lower LEA costs than other groups (**Table 1**). Costs also varied by HRR.

DATA SOURCE

Unless otherwise specified, beneficiaries in this *Data Points* brief were derived from the Medicare Parts A and B FFS population. A beneficiary was included in the enrollment population for a given year if he or she had at least a 12-month period of continuous enrollment centering on any one of the months in a given year and was continuously in Parts A and B FFS throughout the given year. Enrollment was determined using the Medicare Enrollment Database (EDB). A subpopulation was created to estimate the cost of medications. Eligibility for this subpopulation was based on individuals already determined to be part of the above data source that were also enrolled in Part D throughout the given calendar year.

The period of analysis for the results described herein was 2006-2008, for which 2005-2009 Medicare data provided by the Centers for Medicare and Medicaid Services were used.

Figure 2: Total reimbursement (in thousands of U.S. dollars) for selected services per diabetic Medicare beneficiary with prevalent DFU, 2008



DEFINITIONS AND METHODOLOGY

Definition and Prevalence of Diabetes

Consistent with our previous DFU *Data Points*, a beneficiary was determined to have diabetes if he or she had two or more claims with International Classification of Diseases (ICD-9) codes consistent with diabetes or at least one inpatient claim with ICD-9 codes consistent with diabetes (250.00-03, 250.10-13, 250.20-23, 250.30-33, 250.40-43, 250.50-53, 250.60-63, 250.70-73, 250.80-83, 250.90-93) in the 12-month period of continuous enrollment. Gender, race/ethnicity, and age were all extracted from the EDB.

Definition and Prevalence of Foot Ulcer

Beneficiaries with diabetes, as defined above, and a primary or secondary (i.e., nonprimary) diagnosis of foot ulcer during the given calendar year (based on the following ICD-9 codes: 681.9, 682.7, 707.10, 707.13, 707.14, 707.15, 707.8, 707.9, 730.06-09, 730.16, 730.19, 730.26-29, 891.0, 891.1, 891.2, 892.0, 892.1, 892.2) were defined as having a prevalent foot ulcer. Any beneficiary with diabetes and a venous leg ulcer (based on the following ICD-9 codes: 454.0, 454.1, 454.2, 454.9), another common chronic wound of the lower extremity, in the given calendar year was not defined as having a foot ulcer and was excluded. For these prevalence measurements, prevalence was calculated by dividing the number of beneficiaries identified with diabetes and a foot ulcer in the given year by the number of beneficiaries in the Medicare Parts A and B FFS population who were also continuously enrolled in Parts A and B FFS throughout the given year and identified with diabetes for that year.

Definition and Prevalence of Lower Extremity Amputation

Beneficiaries with diabetes, as defined above, and a primary or secondary (i.e., nonprimary) diagnosis of LEA during the given calendar year (based on the following Current Procedural Terminology and ICD-9 codes: 27590, 27591, 27592, 27594, 27596, 27598, 27880, 27881, 27882, 27884, 27886, 27888, 27889, 28800, 28805, 28810, 28820, 28825, 895.0, 895.1, 896.0-3, 897.0-7, V49.70-6, 84.10-17, 84.3) were defined as having an LEA. For these prevalence measurements, prevalence was calculated by dividing the number of beneficiaries identified with diabetes and an LEA in the given year by the number of beneficiaries in the Medicare Parts A and B FFS population who were also continuously enrolled in Parts A and B FFS throughout the given year and identified with diabetes for that year.

Definition of Office Visit

An office visit was defined in the prevalent DFU and prevalent LEA populations by the presence in an outpatient or carrier claim with one of the following procedure codes: 99201-5, 99211-5, 99241-5, D9430, D9440, or M0064.

Definition of Hospitalization

A hospitalization was defined in the prevalent DFU and prevalent LEA populations by inpatient stays unique by beneficiary, admission date, provider, and Diagnosis Related Group. DFU or LEA hospitalizations were defined by such inpatient stays with a DFU or LEA diagnosis or procedure code on the claim. These codes are listed in the above Definition and Prevalence of Foot Ulcer and Definition and Prevalence of Lower Extremity Amputation sections.

Definition of Medications Used

Medications were searched for within the prevalent DFU and prevalent LEA populations with continuous enrollment in Part D throughout the given calendar year. In this population, all Part D claims in the given year with a National Drug Code (NDC) corresponding to an anti-infective medication or separately to a diabetic medication were used to define anti-infective and antidiabetic medications, respectively (relevant to data available at www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=509&preview=1). All medications were defined as all Part D claims in the given year for each beneficiary, with no restrictions on NDCs. NDC code lists are available online (list dated 2-24-2010).

Medication Costs

Depending on the item, two different methods were used to estimate the cost applied to the antidiabetic (results online only), anti-infective (results online only), or all medication drug claims as defined above. First, the annual total drug cost was defined as the sum of the ingredient cost, dispensing fee, sales tax, and vaccine administration fee across all Part D claims in the year for a medication type of interest. The vaccine administration fee became effective starting in 2008 only. Second, the annual total out-of-pocket payment was defined as the sum of patient pay, other true out-of-pocket amount, and low-income cost-sharing subsidy amount across all Part D claims in the year for a medication type.

Definition of All Costs, General Services, and Selected Services

Total annual costs (as defined below) were accrued within a given fiscal year. Costs were then subcategorized as "general services" or "selected services."

The annual reimbursement for general services was defined at the beneficiary level as the total annual reimbursement minus the annual reimbursement for selected services aggregated across all file types. The total reimbursement (all costs) was calculated for the prevalent DFU or LEA population in inpatient (IP) claims as the sum of the payment amount and the total per diem amount (per diem rate multiplied by the number of days this rate was charged). In all other file types, total claim reimbursement was simply the total payment amount. The total reimbursement per beneficiary was summed across all file types in the given year.

The annual reimbursement for selected services was defined for each beneficiary in the prevalent DFU or prevalent LEA populations. Selected services were services likely specific to diabetic foot/lower extremity care. As an example, these services included the following broad categories of service: amputation-related procedures; wound care products such as dressings, advanced wound care such as the use of negative pressure wound therapy, hyperbaric oxygen therapy, skin substitute, electrical stimulation, etc.; local surgical such as primary wound closure, wound debridement, callous removal, tendon lengthening; deformity correction; casts, splints and footware; and assistive gait devices and wheelchairs. A full list of these services is available at www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=509&preview=1.

For selected services on IP claims, we calculated total reimbursement per claim as the sum of the payment amount and the total per diem amount (per diem rate multiplied by the number of days this rate was charged). For selected services on skilled nursing facility (SNF) claims, the total claim reimbursement was simply the total payment amount. The total reimbursement amount for each beneficiary was summed across all IP and SNF claims with selected services codes in the given year. For selected services on outpatient (OP), home health (HH), and hospice (HS) claims, total reimbursement per revenue center was the revenue payment amount. For each beneficiary, we calculated the annual reimbursement for selected services by summing the revenue payments from all line items with selected services codes in OP, HH, and HS files in the given year. For carrier and durable medical equipment (DME) files, total reimbursement per procedure code was the line payment. For each beneficiary, we calculated the annual reimbursement for selected services by summing the line payments from all line items with selected services codes in carrier and DME files in the given year.

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Acknowledgments: The authors wish to thank David Hsia for his critical review of this brief, Mary A. Leonard and Doreen Bonnett for their graphic design expertise, and Edmund Weisberg for his medical editing expertise.

Suggested Citation: Margolis DJ, Malay DS, Hoffstad OJ, et al. Economic burden of diabetic foot ulcers and amputations. Diabetic Foot Ulcers. *Data Points* #3 (prepared by the University of Pennsylvania DEcIDE Center, under Contract No. HHSA290200500411). Rockville, MD: Agency for Healthcare Research and Quality. January 2011. AHRQ Publication No. 10(11)-EHC009-2-EF.

ADDITIONAL FINDINGS AVAILABLE ONLINE

The following additional tables and maps are available at www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=509.

Annual Rate of DFU and Any Readmissions Among Diabetic Medicare Part A and B FFS Beneficiaries With DFU, 2006-2008

Annual Rate of LEA and Any Readmissions Among Diabetic Medicare Part A and B FFS Beneficiaries With LEA, 2006-2008

Average Number of DFU and Any Hospital Admissions Among Diabetic Medicare Part A and B FFS Beneficiaries With DFU, 2006-2008

Average Number of LEA and Any Hospital Admissions Among Diabetic Medicare Part A and B FFS Beneficiaries With LEA, 2006-2008

Average Number of DFU and Any Hospital Admissions Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Average Number of LEA and Any Hospital Admissions Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Annual Reimbursement Per Beneficiary Among Diabetic Medicare Parts A and B FFS Beneficiaries With and Without DFU, 2006-2008

Annual Reimbursement Per Beneficiary Among Diabetic Medicare Parts A and B FFS Beneficiaries With and Without LEA, 2006-2008

Average Drug Cost and Out-of-Pocket Expenses Per Beneficiary for Diabetic Medications, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Average Drug Cost and Out-of-Pocket Expenses Per Beneficiary for Diabetic Medications, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Average Drug Cost and Out-of-Pocket Expenses Per Beneficiary for Anti-Infective Medications, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Average Drug Cost and Out-of-Pocket Expenses Per Beneficiary for Anti-Infective Medications, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Average Drug Cost and Out-of-Pocket Expenses Per Beneficiary for All Part D Medications, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

MAPS

Count data for map files available online.

Average Drug Cost and Out-of-Pocket Expenses Per Beneficiary for All Part D Medications, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Average Number of Office Visits Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Average Number of Office Visits Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Annual Reimbursement Per Beneficiary for Selected Services in Inpatient and Skilled Nursing Facility Claims, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Annual Reimbursement Per Beneficiary, for Selected Services in Inpatient and Skilled Nursing Facility Claims, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Annual Reimbursement Per Beneficiary, for Selected Services in Outpatient, Home Health, and Hospice Claims, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Annual Reimbursement Per Beneficiary, for Selected Services in Outpatient, Home Health, and Hospice Claims, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Annual Reimbursement per Beneficiary, for Selected Services in Carrier and Durable Medical Equipment Claims, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Annual Reimbursement per Beneficiary, for Selected Services in Carrier and Durable Medical Equipment Claims, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

Annual Reimbursement Per Beneficiary, for Selected, General, and All Services Per Beneficiary, in All File Types, Among Diabetic Medicare Parts A and B FFS Beneficiaries With DFU, 2006-2008

Annual Reimbursement Per Beneficiary, for Selected, General, and All Services Per Beneficiary, in All File Types, Among Diabetic Medicare Parts A and B FFS Beneficiaries With LEA, 2006-2008

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This project was funded under Contract No. HHSA290200500411 from the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services as part of the Developing Evidence to Inform Decisions about Effectiveness (DEcIDE) program. The authors of this report are responsible for its content. Statements in the report should not be construed as endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.