

## JAMA | Original Investigation

## Tracking US Health Care Spending by Health Condition and County

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**IMPORTANCE** Understanding health conditions with the most spending and variation across locations and over time is important for identifying trends, highlighting inequalities, and developing strategies for lowering health spending.

**OBJECTIVE** To estimate US health care spending for each of 3110 US counties, across 4 payers (Medicare, Medicaid, private insurance, and out-of-pocket payments), and according to 148 health conditions, 38 age/sex groups, and 7 types of care from 2010 to 2019.

**DESIGN, SETTING, AND PARTICIPANTS** Observational analysis using more than 40 billion insurance claims and nearly 1 billion facility records.

**EXPOSURES** Ambulatory care, dental care, emergency department care, home health care, hospital inpatient care, nursing facility care, and purchase of prescribed retail pharmaceuticals.

**MAIN OUTCOMES AND MEASURES** Health care spending and utilization (eg, number of visits, admissions, or prescriptions) estimates from 2010 through 2019.

**RESULTS** Between 2010 and 2019, 76.6% of personal health care spending was captured by this study. More spending was on type 2 diabetes (\$143.9 billion [95% CI, \$140 billion-\$147.2 billion]) than on any other health condition, followed by other musculoskeletal disorders, which includes joint pain and osteoporosis (\$108.6 billion [95% CI, \$106.4 billion-\$110.3 billion]), oral disorders (\$93 billion [95% CI, \$92.7 billion-\$93.3 billion]), and ischemic heart disease (\$80.7 billion [95% CI, \$79 billion-\$82.4 billion]). Of total spending, 42.2% (95% CI, 42.2%-42.2%) was on ambulatory care, while 23.8% (95% CI, 23.8%-23.8%) was on hospital inpatient care and 13.7% (95% CI, 13.7%-13.7%) was on prescribed retail pharmaceuticals. At the county level, age-standardized spending per capita ranged from \$3410 (95% CI, \$3281-\$3529) in Clark County, Idaho, to \$13 332 (95% CI, \$13 177-\$13 489) in Nassau County, New York. Across counties, the greatest variation was in age-standardized out-of-pocket spending, followed by private insurance spending. Cross-county variation was driven more by variation in utilization rates than variation in price and intensity of care, although both types of variation were substantial for all payers but Medicare.

**CONCLUSIONS AND RELEVANCE** Broad variation in health care spending was observed across US counties. Understanding this variation by health condition, sex, age, type of care, and payer is valuable for identifying outliers, highlighting inequalities, and assessing health care gaps.

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JAMA. 2025;333(12):1051-1061. doi:[10.1001/jama.2024.26790](https://doi.org/10.1001/jama.2024.26790)  
Published online February 14, 2025.

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**H**ealth care spending in the US totaled \$3.8 trillion in 2019 and is projected to reach more than \$7 trillion by 2031.<sup>1</sup> Within the US, spending varies dramatically across states, although many key drivers of health care spending, such as access to care, service prices, disease and injury prevalence, and underlying need for health care, vary at more local levels.<sup>2,3</sup> Understanding how health care resources are distributed across counties, types of care, and health conditions—and identifying the payers funding this care—is essential to informing policy decisions and driving areas of further research.

Currently, most local and disease-specific estimates of US health care spending are incomplete or out of date. Estimates of health care spending are available at the national level through National Health Expenditure Projections<sup>1</sup> and at the state level through State Health Expenditure Accounts,<sup>3,4</sup> but these estimates are broken down only by type of care and payer. Disease-specific spending estimates are available for certain conditions, such as diabetes<sup>5</sup> and Alzheimer disease,<sup>6</sup> but typically only for select years and most often for the US as a whole. Health care spending reports are also available for specific payers, such as employer-sponsored insurance<sup>7</sup> and Medicare,<sup>8</sup> but they lack further disaggregation. Previous work from the Institute for Health Metrics and Evaluation's Disease Expenditure Project has contributed to a more complete understanding of health care spending in the US: decomposing changes over time into key drivers of spending increases,<sup>9</sup> attributing spending to modifiable risk factors,<sup>10</sup> assessing spending effectiveness,<sup>11</sup> and considering spending and utilization (eg, the number of visits, admissions, or filled prescriptions) differences by race and ethnicity,<sup>12</sup> but in all of these cases, the analysis was conducted at the national level and is not detailed enough to provide a comprehensive view of health care spending.

This research contributes to filling the knowledge gap by updating prior investigations<sup>9</sup> at an increased level of resolution. Health care spending and utilization were estimated for 4 payer categories, 7 types of service, and 148 health conditions according to age group and sex from 2010 to 2019, and for each of 3110 US counties. Policymakers, advocates, and researchers can use these publicly available estimates to improve US health care, track spending changes over time, identify inefficiencies, assess effectiveness, inform investments, and adjust for age, costs, or disease burden.

## Methods

### Overview

This research consists of 4 steps used to generate spending and utilization estimates. Utilization was measured as the number of admissions (inpatient and nursing facility care), visits (ambulatory, emergency department, home health, and dental care), and prescriptions (retail pharmaceuticals). First, we collected and harmonized input data, primarily consisting of 40 billion insurance claims and administrative data from 836 million hospital admissions/visits, as well as survey data and official tabulated estimates of health care spending from the US government. Second, we assigned each health care

### Key Points

**Question** Which health conditions, types of care, and counties are associated with the highest levels of spending?

**Findings** This observational study showed considerable variation in spending across health conditions, types of care, age groups, payers, and counties—with spending being greatest for type 2 diabetes. Across counties, there was more variation in utilization rates rather than price and intensity of care.

**Meaning** Further investigation into unexplained variation in spending, focusing on the health conditions with the most spending, could help inform health care policies aimed at lowering costs and improving access to care.

encounter to 1 of 148 health conditions. Third, we adjusted for data imperfections, including reallocating spending to comorbidities that systematically increase spending and using a small-area model to estimate spending and utilization. Fourth, we adjusted our estimates to ensure they were internally consistent (across county, state, and national estimates) and in alignment with official US government estimates of health care spending. The output of these steps was a set of estimates tracking health care spending and utilization, stratified by US county and state, age and sex of the patient, health condition, type of care, payer, and year. These 4 steps are explained below and in greater detail in *Supplement 1*.

### Step 1: Collecting and Harmonizing Data

Claim- and encounter-level data were extracted from 7 sources. These data were primarily Medicaid, Medicare (inclusive of Medicare Advantage), commercial claims, and hospital administrative data. The commercial claims data were from MarketScan, Kythera, Health Care Cost Institute, and Fluent Dental Strategies, while hospital administrative data were from the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project. Household survey data from the Medical Expenditure Panel Survey were also extracted. Each claim or encounter was assigned 1 of 38 age and sex groups, 7 types of care, 8 payer profiles (such as only Medicare fee-for-service, only Medicare Advantage, Medicare fee-for-service with Medicaid, uninsured), and 4 payer categories, including Medicare, Medicaid, private insurance, and out-of-pocket. Spending on durable medical equipment, nondurable medical equipment (including over-the-counter drugs and products like bandages but excluding prescribed pharmaceuticals), medical transportation, and spending from other payers, such as Indian Health Services, Tricare, and Veterans Affairs, were not included, nor was health spending on nonpersonal health care (such as public health and research and development). Data were assigned 1 of 3110 counties based on the residence of person being treated.

Claims data were aggregated to reflect health system encounters (eg, visits, admissions, or prescriptions). All claims with the same type of care, person, and date of visit (or date plus or minus 1 day for hospital admission) were grouped together. The encounter diagnosis code order was determined by sorting the claim spending from highest to lowest.

## Step 2: Assigning Health Conditions

Each diagnosis was assigned to 1 of 163 intermediate health conditions, including nonspecific conditions (for instance, diabetes not classified as type 1 or 2) and a category for codes that were miscoded and/or impossible (such as males with uncomplicated labor and delivery, or children with dementia).<sup>13</sup> These health conditions are based on the cause list from the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019.<sup>14</sup> Health conditions were assigned based on *International Classification of Diseases (ICD)* version 9 or 10 or National Drug Codes. The *ICD* to health condition mapping used for this study is reported in eTable 8.2.1 in *Supplement 1*.

*ICD* codes that did not uniquely map to a health condition were probabilistically reassigned to more precise conditions. The redistribution was based on the GBD<sup>14</sup> methods and based on the frequency of each target code in our data. For injury codes, we calculated the frequency of co-occurrence between nature of the injury codes and external cause of the injury codes in our data and probabilistically mapped nature of injury codes to external cause of injury codes. From the 163 intermediate health conditions, we arrived at the finalized 148 health conditions.

## Step 3: Adjusting and Modeling Data

Some data sources only reported facility spending, rather than total spending, while others reported only charges, rather than paid amounts. To estimate total spending for these data, we modeled the ratio of facility spending to total spending (facility and professional combined) and the ratio of the amount charged to the actual amount paid using data that were more complete and then adjusted the incomplete estimates.

Because comorbidities increase the complexity and cost of care, some spending was reallocated from the primary diagnosis to comorbidities.<sup>15</sup> For each combination of a primary health condition and a comorbidity, we modeled the risk of increased spending due to the presence of that comorbidity using penalized linear regression. We calculated the fraction of spending attributed to each comorbidity and used it to reallocate spending from the primary health condition to its comorbidities.

Estimating health care spending by county requires modeling to borrow strength from existing data when underlying data for certain low-population areas are insufficient. Small-area modeling methods are designed to fill such data gaps.<sup>16</sup> We modeled spending and utilization separately for each combination of sex, type of care, health condition, payer profiles (as defined above), and payer category. The input data to our model were aggregated spending and utilization estimates for each combination of age and sex group, type of care, health condition, location, year, primary payer, and payer for each data source. For each of these aggregates, we estimated the standard error based on the number of observations and the standard deviation of the spending per encounter or encounter per beneficiaries across all locations prior to modeling. The small area model borrowed strength across counties, age groups, and time using a combination of structured random effects. Fifty fitted values for each aggregated point were simulated based on the estimated variance-covariance matrix of the fitted model.

## Step 4: Ensuring Internal Consistency

Modeled aggregates of spending per encounter and encounters per beneficiary (for each location, age and sex group, type of care, health condition, year, payer sequence, and payer) and estimates of the corresponding population were multiplied together to generate estimates of total number of visits, admissions, prescriptions, and total spending. We aggregated our health condition-specific state spending estimates to the State Health Expenditure Account reporting level (state-, payer-, and type-of-care-specific).

## Analysis

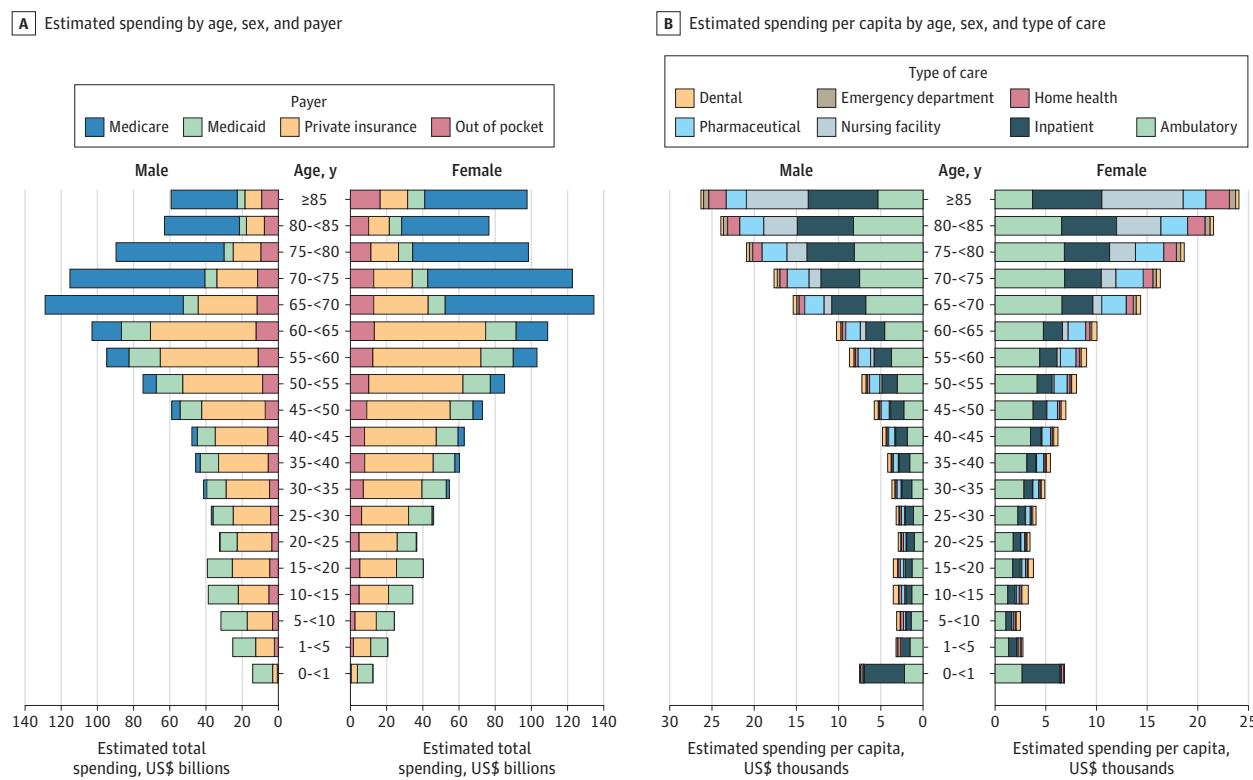
Each of the 148 health conditions was assigned to 1 of 24 aggregated health conditions. For example, “cardiovascular disease” was formed by combining the initial 13 cardiovascular diseases. Unless otherwise noted, all estimates are inflation-adjusted to reflect economy-wide prices from 2019. For analyses with age and sex standardization, spending and encounter estimates were standardized using direct standardization and with the 2019 all-US population as the reference. We calculated summary statistics of spending by health conditions, locations, payers, and types of care to identify and characterize areas of relatively high and low spending. Second, we calculated the coefficient of variation of age- and sex-standardized spending per capita and per beneficiary, spending per encounter, and encounter per beneficiary, across counties for each payer and type of care. The coefficient of variation is the standard deviation divided by mean and measures the degree of variability of each measure from the mean.

## Results

Between 2010 and 2019, 76.6% of personal health care spending was captured by this study. This spending reflects the spending of 97.3% of the population. We estimated an increase in spending from \$1.7 trillion in 2010 (not adjusted for inflation) to \$2.4 trillion in 2019. Of this spending, 11.5% (95% CI, 11.3%-11.8%) was estimated to be on individuals younger than 20 years and 40.5% (95% CI, 39.9%-41.4%) on individuals older than 65 years (**Figure 1**). Prior to age 65, 56.1% (95% CI, 55.8%-56.4%) was estimated to be paid by private insurance, 24.9% (95% CI, 24.6%-25.2%) paid by Medicaid, 12% (95% CI, 11.8%-12.1%) paid out of pocket, and 7% (95% CI, 6.8%-7.2%) paid by Medicare. After age 65, 62.8% (95% CI, 61.5%-63.8%) was estimated to be paid by Medicare, 18.5% (95% CI, 17.5%-19.8%) paid by private insurance, 11.5% (95% CI, 11.3%-11.7%) paid out of pocket, and 7.2% (95% CI, 7%-7.4%) paid by Medicaid. While more spending was on individuals aged 65 to 69 years than for any other age group, spending per capita was greatest for the oldest age group (85 years or older). The estimates reported in this article can be interactively explored at <https://vizhub.healthdata.org/dex/>.

We estimated that 42.2% (95% CI, 42.2%-42.2%) of health care spending was on ambulatory care (which includes all primary care and outpatient services), 23.8% (95% CI, 23.8%-23.8%) was on hospital inpatient care, 13.6% (95% CI, 13.6%-13.6%) on prescribed retail pharmaceuticals, 7.4% (95% CI,

Figure 1. Estimated Health Care Spending and Spending per Capita by Age, Sex, Type of Care, and Payer Category in 2019



A, Study captured \$2.4 trillion in spending in 2019, measured in 2019 US dollars. Medicare is inclusive of Medicare Advantage. B, National average spending per capita in 2019 was \$7374, measured in 2019 dollars.

Table 1. Estimated Health Care Spending in 2019 According to Type of Care and Payer Category, Along With Associated Annual Growth Rates<sup>a</sup>

	Annual growth rate, %					
	2019 Spending, US\$ billion	Fraction of spending, %	2010-2019	2010-2019 Inflation adjusted	2010-2019 Inflation adjusted per capita or per beneficiary	2010-2019 Inflation adjusted, age- and sex-standardized per capita or per beneficiary
<b>Type of care</b>						
Ambulatory	1027.92	42.2	5.3	3.5	2.8	2.1
Inpatient	578.43	23.8	3.3	1.5	0.8	0
Pharmaceutical	331.35	13.6	3.3	1.5	0.8	0.1
Nursing facility	179.24	7.4	2.5	0.7	-0.1	-1.4
Dental	135.92	5.6	3.4	1.6	0.8	0.9
Home health	124.71	5.1	5.3	3.4	2.7	1.8
Emergency department	55.70	2.3	6.1	4.3	3.5	3.1
<b>Payer</b>						
Private insurance	994.90	40.9	4.0	2.2	1.0	1.1
Medicare	720.99	29.6	5.0	3.2	0.3	0.1
Medicaid	430.46	17.7	4.5	2.7	0.2	-0.3
Out of pocket	286.92	11.8	2.7	0.9	0.2	-0.5

<sup>a</sup> Study captured \$2.4 trillion in spending in 2019. Measured in 2019 US dollars. Medicare is inclusive of Medicare Advantage.

7.4%-7.4%) on nursing facility care, 5.6% (95% CI, 5.6%-5.6%) on dental care, 5.1% (95% CI, 5.1%-5.1%) on home health care, and 2.3% (95% CI, 2.3%-2.3%) on emergency department care (Table 1). We estimated that the types of care with the fastest inflation-adjusted age-standardized per capita

growth rate from 2010 to 2019 were emergency department care (annualized rate of change, 3.1% [95% CI, 3.1%-3.1%]) and ambulatory care (annualized rate of change, 2.1% [95% CI, 2.1%-2.1%]). The payer with the fastest age-standardized per beneficiary growth rate (per capita for out of pocket) was private

insurance (annualized rate of change, 1.1% [95% CI, 1.1%-1.1%]).

We estimated that in 2019 the aggregated health conditions with the most spending were cardiovascular diseases (\$265.4 billion [95% CI, \$262.8 billion-\$268.6 billion]), neoplasms (\$258.8 billion [95% CI, \$252.5 billion-\$264.3 billion]), and musculoskeletal disorders (\$245.2 billion [95% CI, \$242.6 billion-\$248.9 billion]) (Table 2). For that same year we estimated that the single health condition with the most spending was type 2 diabetes, reaching \$143.9 billion (95% CI, \$140 billion-\$147.2 billion) in 2019 (Table 3). Between 2010 and 2019, spending on type 2 diabetes increased at a rate of 1.9% (95% CI, 1.5%-2.2%), after adjusting for inflation and age/sex and size of the population. Of the spending on type 2 diabetes, 57.5% (95% CI, 56.2%-58.9%) was specific to adults 65 years or older, 34.5% (95% CI, 33.9%-35%) was on ambulatory care, and 31.2% (95% CI, 30.7%-31.6%) was on prescribed pharmaceuticals care. Of all spending on type 2 diabetes, Medicare contributed 39.6% (95% CI, 38.7%-40.8%), which was more than any other payer. We estimated that the second through fifth health conditions with the largest spending were other musculoskeletal disorders (\$108.6 billion [95% CI, \$106.4 billion-\$110.3 billion]), which includes joint pain and osteoporosis; oral disorders (\$93 billion [95% CI, \$92.7 billion-\$93.3 billion]), which includes dental caries and orthodontia; ischemic heart disease (\$80.7 billion [95% CI, \$79 billion-\$82.4 billion]), and urinary diseases (\$72.2 billion [95% CI, \$71 billion-\$73.3 billion]). Between 2010 and 2019, the health conditions with the fastest age- and sex-standardized annualized per capita growth rate and at least \$5 billion of spending were autism spectrum disorders (12.7% [95% CI, 11.8%-13.5%]), opioid use disorders (8.7% [95% CI, 7.9%-9.4%]), alcohol use disorders (6.7% [95% CI, 6.2%-7.2%]), substance use disorders other than alcohol and opioid use disorders (6.3% [95% CI, 5.7%-7.1%]), and kidney cancer (6.1% [95% CI, 5.6%-6.4%]).

We estimated that after adjusting for age and sex (and excluding spending on durable medical equipment, Veterans Affairs, Indian Health Services, and Tricare), the states that had the lowest age- and sex-standardized personal health care spending per capita were Idaho (\$6028 [95% CI, \$6024-\$6032]), Utah (\$6147 [95% CI, \$6128-\$6166]), and New Mexico (\$6368 [95% CI, \$6359-\$6372]), while the states with the highest spending were Alaska (\$9282 [95% CI, \$9255-\$9305]), New York (\$9115 [95% CI, \$9110-\$9121]), and Massachusetts (\$9097 [95% CI, \$9090-\$9103]). We estimated that the counties that had the lowest age-standardized spending per capita were Clark County, Idaho (\$3410 [95% CI, \$3281-\$3529]), Loving County, Texas (\$3923 [95% CI, \$3793-\$4106]), and Kenedy County, Texas (\$4027 [95% CI, \$3745-\$4280]), while the counties with the highest age-standardized spending per capita were Nassau County, New York (\$13 332 [95% CI, \$13 177-\$13 489]), Suffolk County, New York (\$12 689 [95% CI, \$12 516-\$12 809]), and District of Columbia (\$12 534 [95% CI, \$12 489-\$12 582]) (Figure 2A).

We estimated that across US counties, age- and sex-standardized spending per beneficiary varied the most for private insurance spending, out-of-pocket spending, and Medicaid spending (eFigure 7.2 in Supplement 1). The types of care

with the most spending per encounter variation were emergency department visits and nursing facility stays. For all but 2 types of care and payer combinations, there was more variation across counties in visits/admissions/prescription per beneficiary than spending per visit/admission/prescription.

## Discussion

There was remarkable variation in spending levels across US counties, with a nearly 3-fold difference from low-spending counties (Clark County, Idaho; Loving County, Texas; and Kenedy County, Texas) to high-spending counties (Nassau County, New York; Suffolk County, New York; and District of Columbia), even after adjusting for age and size of the population. Across counties, the greatest variation in county-specific spending per capita was seen for out-of-pocket spending, private insurance spending, and Medicaid spending.

Across most payers and types of care, utilization rates (visits/admissions/prescriptions per beneficiary) explained a great deal of the variation in spending. This finding corroborates previous research showing that 50% to 60% of this variation was caused by place-based factors such as clinicians' practice style, fractions of the hospitals that are nonprofit, and the health of the general population.<sup>17</sup> Differences in health care provision and access to care may further explain some of this variation.<sup>18</sup> In addition to this, the variation in Medicaid spending per beneficiary across counties highlights that Medicaid expansion occurred in different ways across states and even within states, with some not expanding coverage at all.

Private insurance spending per beneficiary varied relatively more than all other payer categories, with spending variation driven by both utilization rates and the price and intensity of care. The private insurance market is known for having prices that are prone to cost growth, with large variation across clinicians and facilities.<sup>19</sup> Prices are based on market conditions and are known to differ by geographic region.<sup>20,21</sup>

Emergency department care was shown to be the type of care with the fastest age- and inflation-adjusted growth and with the most variation in spending per encounter across US counties. Although a sizable proportion of emergency department visits are for nonurgent conditions, emergency departments are designed for acute, unexpected care.<sup>22</sup> Use of emergency departments for conditions that could be treated in the primary care setting not only results in higher costs due to the intensive nature of emergency care but also reflects the inadequacies in access to primary and preventive care. With enhanced insurance coverage, individuals are more likely to engage in regular health checkups and manage health conditions early, reducing the need for emergency care. This shift could lead to better health outcomes and a more efficient allocation of health care resources.

Variation in health care spending across states, even after adjusting for age and payer mix, offers a rich dataset for identifying best practices and areas for improvement. Analysis of these differences can uncover drivers of health care spending and possibly strategies to improve the US health care system. Whether it is through innovative care models, more effective

Table 2. Estimated Health Care Spending for Aggregated Health Conditions in 2019<sup>a</sup>

Aggregated health condition	Annual growth rate (2010-2019), % (95% CI)	% Type of care						Coverage				
		Inflation adjusted, age- and sex-standardized spending per capita	<20	>65	Inpatient	Emergency department	Ambulatory	Drug <sup>b</sup>	Nursing facility	Medicare	Medicaid	Private insurance
Total 2019 spending US\$ billions (95% CI)		Unadjusted										
All causes	2433.26	4.2 (4.2-4.2)	0.9 (0.9 to 1)	11.5	40.5	23.8	2.3	42.2	13.6	7.4	29.6	17.7
Cardiovascular diseases	265.4 (262.8-268.6)	4 (3.9-4.2)	-0.1 (-0.2 to 0.1)	0.8	67.7	43.9	2.3	26.7	8.2	13.7	47.5	11.8
Neoplasms	258.78 (252.5-264.3)	6 (5.7-6.4)	2.2 (1.9 to 2.5)	3.0	49.1	15.2	0.3	67.4	15.0	0.6	37.4	6.1
Musculoskeletal disorders	245.25 (242.6-248.9)	4.6 (4.3-4.8)	1.1 (0.8 to 1.3)	4.4	42.7	18.8	1.6	59.5	10.4	4.6	32.2	8.2
Other noncommunicable diseases	237.12 (234.1-240.9)	3.5 (3.3-3.8)	0.7 (0.4 to 0.9)	19.9	31.0	20.5	2.6	51.6	12.8	6.6	22.2	19.7
Diabetes and kidney diseases	226.18 (222.2-229.3)	6 (5.8-6.2)	2.1 (1.9 to 2.3)	1.4	55.6	13.5	1.6	44.3	22.6	10.1	42.2	15.9
Mental disorders	166.42 (162.5-171)	5 (4.7-5.3)	2.5 (2.3 to 2.8)	31.3	9.5	20.6	1.0	44.4	13.5	10.8	10.6	49.6
Digestive diseases	134.83 (133.2-136.3)	3.3 (3.1-3.4)	0.1 (-0.1 to 0.2)	8.2	35.3	34.2	4.7	40.5	12.0	6.2	27.5	14.3
Neurologic disorders	129.11 (126.8-131.1)	4 (3.6-4.6)	0.6 (0.2 to 1.2)	7.6	53.7	13.8	2.9	23.7	16.5	36.4	32.1	22.6
Well care	107.53 (105.6-109.5)	3 (2.7-3.2)	0.8 (0.5 to 1)	35.6	10.8	11.1	0.2	41.4	2.4	0.0	5.0	29.0
Oral disorders	93.03 (92.7-93.3)	3.7 (3.7-3.7)	1.1 (1.1 to 1.2)	20.0	16.9	0.8	0.2	2.9	0.2	0.0	2.0	3.2
Injuries	91.16 (89.5-92.7)	2.4 (2.1-2.6)	-0.5 (-0.8 to -0.3)	15.4	39.9	38.1	11.0	34.2	0.8	9.7	29.1	13.6
Chronic respiratory diseases	78.12 (77.5-78.9)	3.1 (3.3-3.3)	-0.3 (-0.4 to -0.1)	13.2	45.2	16.0	2.3	32.9	27.6	2.2	34.9	17.0
Respiratory infections and tuberculosis	75.36 (73.3-77.1)	1.9 (1.6-2.1)	-0.7 (-0.9 to -0.5)	34.3	28.2	45.8	3.9	41.3	5.3	1.7	22.8	26.3
Skin and subcutaneous diseases	69.93 (68.5-71.1)	3.6 (3.4-3.9)	0.6 (0.4 to 0.8)	13.0	34.0	19.5	2.1	37.7	32.7	2.4	28.1	14.6
Other infectious diseases	66.61 (64.6-68.8)	6.2 (5.5-6.8)	2.7 (2 to 3.2)	6.9	47.2	79.9	1.3	6.2	8.9	1.8	40.3	18.8
Risk factors	63.61 (62.6-64.6)	2.6 (2.1-2.8)	-1 (-1.5 to -0.7)	1.3	48.1	7.6	4.2	40.8	38.2	2.5	34.6	12.7
Sense organ diseases	46.42 (45.3-47.4)	4.4 (4.1-4.8)	0.4 (0.1 to 0.8)	8.0	64.0	1.2	1.1	82.0	13.0	1.4	43.7	9.6
Substance use disorders	30.22 (29.2-31.2)	9.2 (8.7-9.6)	6.7 (6.2 to 7.1)	5.2	7.2	34.5	2.7	52.0	6.6	2.3	10.3	55.5
Maternal and neonatal disorders	26.27 (25.1-27.9)	3 (0.1-3.8)	0.9 (-2 to 1.8)	32.4	0.3	72.4	3.2	19.6	0.9	0.5	0.6	50.9
HIV/AIDS and sexually transmitted infections	15.61 (15.1-16.2)	3.8 (3.2-4.2)	1.4 (0.9 to 1.7)	1.5	10.9	5.1	0.9	10.7	81.4	1.2	19.3	19.9
Enteric infections	6.34 (6.2-6.5)	2 (1.6-2.3)	-0.9 (-1.3 to -0.6)	20.2	35.2	38.0	10.3	41.6	5.4	2.5	27.6	19.9

<sup>a</sup>Measured in 2019 US dollars. Medicare is inclusive of Medicare Advantage.<sup>b</sup>Prescribed retail pharmaceuticals.

Table 3. Estimated Health Care Spending for the 50 Most Expensive Health Conditions in 2019<sup>a</sup>

Health condition	Annual growth rate (2010-2019), % (95% CI)		Inflation adjusted, age- and sex-standardized spending per capita		>65		Type of care		Coverage			
	Total 2019 spending, US\$ billions (95% CI)	Unadjusted	<20	Inpatient	Emergency department	Ambulatory	Drug <sup>b</sup>	Nursing facility	Medicare	Medicaid	Private insurance	Out of pocket
Diabetes type 2	143.9 (140-147.2)	6 (5.6-6.3)	1.9 (1.5 to 2.2)	0.1	57.5	8.7	1.7	34.5	31.2	15.2	39.6	12.9
Other musculoskeletal disorders	108.55 (106.4-110.3)	5.6 (5.3-6)	2.4 (2.1 to 2.7)	8.6	34.2	10.0	1.6	68.7	12.4	3.4	26.1	9.2
Oral disorders	93.03 (92.7-93.3)	3.7 (3.7-3.7)	1.1 (1.1 to 1.1)	20.0	16.9	0.8	0.2	2.9	0.2	0.0	2.0	3.2
Ischemic heart disease	80.66 (79-82.4)	2.3 (2.1-2.7)	-1.8 (-2.1 to -1.5)	0.1	65.9	44.5	3.1	34.7	6.2	8.4	47.3	9.7
Urinary diseases	72.19 (71-73.3)	3.4 (3.3-3.6)	-0.1 (-0.3 to 0.1)	6.0	51.7	21.0	5.5	56.1	8.0	6.1	37.8	14.3
Skin and subcutaneous diseases	69.93 (68.5-71.1)	3.6 (3.4-3.9)	0.6 (0.4 to 0.8)	13.0	34.0	19.5	2.1	37.7	32.7	2.4	28.1	14.6
Heart failure	58.57 (57.5-59.7)	5.5 (5-6)	1.3 (0.8 to 1.8)	0.4	77.0	49.0	1.6	7.9	2.6	31.5	49.8	15.8
Acute kidney failure	55.44 (54.6-56.3)	6.9 (6.6-7.2)	2.9 (2.6 to 3.2)	0.8	55.5	25.6	1.2	69.6	1.3	0.9	51.2	23.4
Low back pain	52.89 (51.3-54.5)	3.4 (2.9-3.9)	-0.1 (-0.6 to 0.4)	1.5	45.9	20.2	2.9	65.7	2.7	2.8	36.8	8.1
Endocrine, metabolic, blood, and immune disorders	51.37 (50.6-52.1)	5.7 (5.3-6.1)	2.5 (2.2 to 2.9)	15.6	39.0	14.7	1.3	27.3	36.1	14.0	25.6	14.7
Gynecological diseases	51.17 (48.5-54.2)	2.1 (1.2-2)	-0.2 (-1.1 to 0.7)	4.0	6.5	3.8	1.8	88.5	5.6	0.0	5.4	10.4
Septicemia	50.98 (48.9-53.3)	7.7 (7.1-8.4)	3.8 (3.3 to 4.5)	4.1	52.0	95.1	0.8	1.3	0.2	1.6	44.3	18.0
Alzheimer disease and other dementias	49.09 (47.1-51.4)	3 (1.9-4.7)	-0.9 (-2 to 0.7)	0.0	92.1	8.3	0.8	6.2	1.8	78.4	38.6	27.2
Osteoarthritis	47.54 (45.3-50.1)	4.1 (2.9-5.1)	-0.1 (-1.3 to 0.9)	0.0	63.8	43.3	0.3	33.6	2.9	11.5	43.0	6.9
Lower respiratory tract infections	47.39 (46.1-48.6)	2.4 (2-2.7)	-0.5 (-0.9 to -0.3)	24.4	39.0	71.0	3.6	16.4	3.8	2.5	31.7	26.3
Well dental	46.8 (46.6-47)	3 (2.9-3)	0.7 (0.7 to 0.8)	38.4	10.9	0.0	0.0	0.0	0.0	0.0	1.1	24.6
Upper digestive system diseases	45.39 (44.4-46.2)	2.1 (1.8-2.4)	-1.2 (-1.5 to -0.9)	7.4	43.0	24.1	3.8	45.9	8.3	15.5	30.5	16.2
Breast cancer	44.59 (42.7-46.6)	5.1 (4.5-5.7)	1.6 (1.1 to 2.2)	0.0	35.1	2.6	0.1	84.1	12.1	0.3	27.3	6.1
Stroke	43.77 (43-44.3)	3.7 (3.5-4)	-0.3 (-0.6 to -0.1)	1.4	63.4	54.4	2.6	16.7	3.0	15.3	44.0	18.4
Falls	43.67 (42.9-44.4)	4.1 (3.7-4.4)	0.5 (0.2 to 0.8)	7.3	66.0	40.0	9.2	24.1	0.2	17.8	45.4	9.7
Depressive disorders	41.03 (39.4-43.8)	3.8 (3.2-4.4)	1.2 (0.6 to 1.7)	24.4	15.7	31.7	1.2	44.1	12.0	8.1	15.0	35.2
Anxiety disorders	38.85 (37.6-40.2)	6.5 (5.9-7)	3.9 (3.3 to 4.4)	29.2	12.1	9.0	2.1	68.9	9.6	7.4	9.7	31.8
Congenital birth defects	36.48 (35.1-38.1)	2.4 (1.9-2.9)	0.8 (0.4 to 1.3)	82.4	2.4	37.3	0.2	39.2	2.5	1.0	2.7	49.6
Treatment of hypertension	35.57 (34.9-36.2)	2.8 (2.5-3.1)	-1 (-1.3 to -0.7)	0.7	56.7	0.3	4.5	41.8	39.5	4.0	39.9	14.3
Blindness and vision loss	32.83 (31.9-33.6)	4.6 (4.1-5)	0.3 (-0.1 to 0.7)	5.0	72.3	0.9	0.6	89.9	6.1	1.9	50.3	8.7
Well person	32.15 (31.3-33)	4.5 (4.2-4.9)	2 (1.7 to 2.4)	31.1	19.9	0.0	0.2	98.3	0.0	0.0	14.7	20.4
Colon and rectum cancer	31.49 (29.8-32.9)	6.7 (6.1-7.3)	2.9 (2.4 to 3.5)	0.2	37.7	12.2	0.5	82.1	2.9	0.7	28.4	5.9

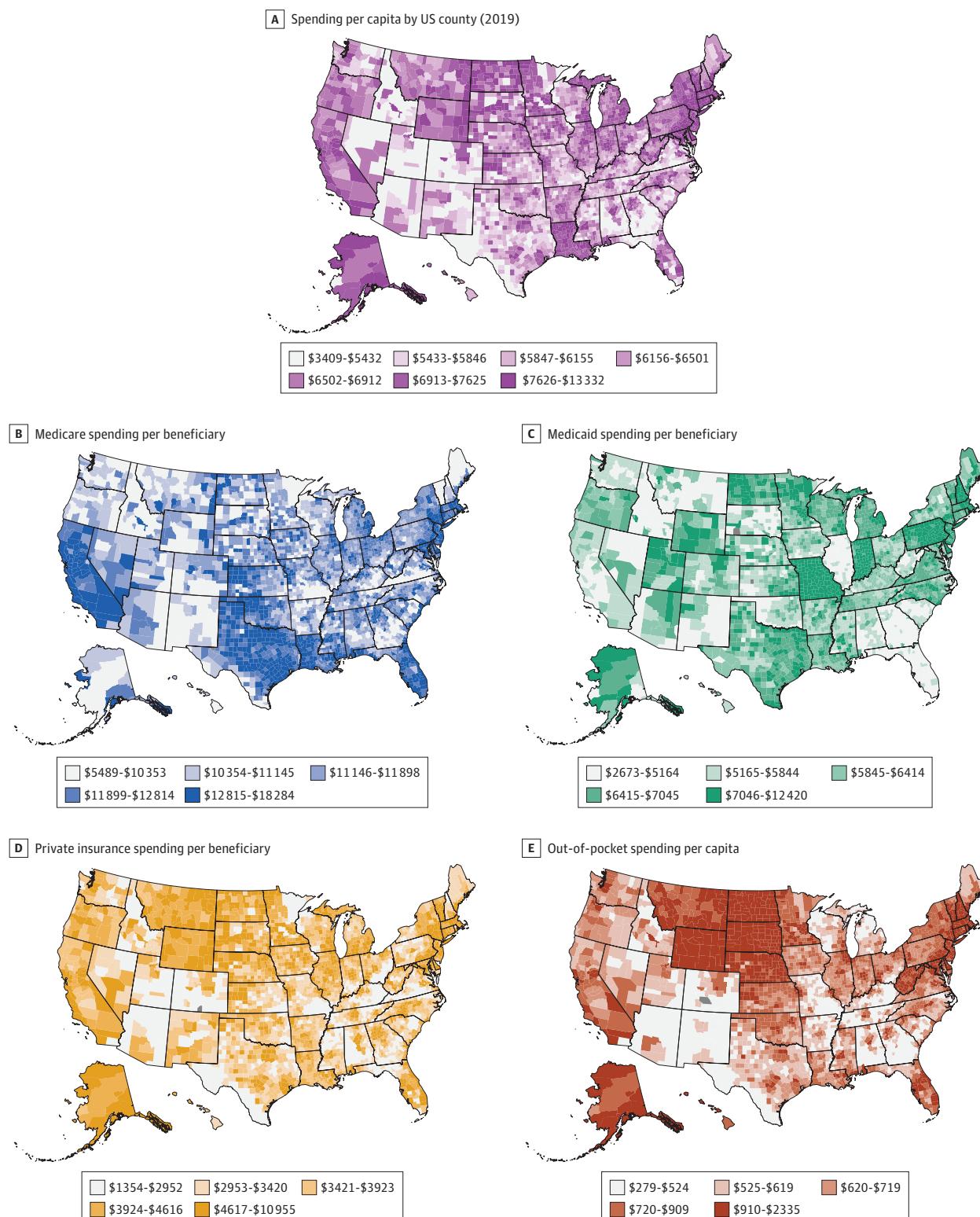
(continued)

Table 3. Estimated Health Care Spending for the 50 Most Expensive Health Conditions in 2019<sup>a</sup> (continued)

Health condition	Annual growth rate (2010-2019), % (95% CI)		Age, y		Type of care		Coverage					
	Inflation adjusted, age- and sex-standardized spending per capita	<20	>65	Inpatient	Emergency department	Ambulatory	Drug <sup>b</sup>	Nursing facility	Medicare	Medicaid	Private insurance	Out-of-pocket
Total 2019 spending, US\$ billions (95% CI)	29.99 (28.3-31.5)	6.8 (5.6-8)	2.4 (1.3 to 3.6)	0.0	78.2	25.9	2.6	28.2	29.9	10.3	54.1	6.5
Atrial fibrillation and flutter	29.1 (28.6-29.6)	2.9 (2.6-3.2)	-1.5 (-1.8 to -1.2)	0.3	71.4	25.6	3.6	18.8	24.2	4.1	55.0	15.9
Chronic obstructive pulmonary disease	26.59 (25.1-27.8)	7.8 (7.3-8.4)	3.2 (2.7 to 3.8)	0.1	66.3	14.5	0.4	69.0	13.3	1.0	52.4	6.2
Tracheal, bronchus, and lung cancer	26.21 (25.6-26.7)	3.7 (3.5-3.9)	0.3 (0.1 to 0.5)	5.4	42.2	15.5	0.4	66.4	16.4	0.4	32.7	6.4
Other neoplasms	23.63 (22.4-24.7)	6.3 (5.6-6.9)	3.5 (2.8 to 4)	13.1	20.1	15.1	4.2	47.2	27.9	1.0	16.9	9.9
Inflammatory bowel disease	23.19 (22.4-23.8)	3.2 (2.8-3.7)	0.7 (0.2 to 1.1)	27.5	23.2	15.4	2.7	40.8	37.1	0.3	19.2	23.0
Asthma	22.49 (22-23)	3 (2.7-3.3)	0.1 (-0.2 to 0.4)	16.9	30.9	2.5	0.4	44.3	20.5	2.0	23.0	13.8
Other chronic respiratory diseases	22.23 (21.5-23.1)	1.5 (1-1.9)	-0.6 (-1.1 to -0.2)	45.9	10.6	2.9	4.8	84.4	6.9	0.3	8.3	26.2
Upper respiratory infections	21.81 (21.3-22.2)	2.5 (2.2-2.7)	-0.1 (-0.4 to 0.1)	25.2	20.1	22.8	12.2	57.8	2.9	1.4	17.2	16.7
Other unintentional injuries	20.26 (19.9-20.5)	5.2 (5-5.3)	1.7 (1.5 to 1.9)	5.9	42.2	21.8	1.1	41.0	22.2	3.4	36.8	14.3
Other neurological disorders	19.42 (18.6-20.3)	2.8 (2-3.4)	-0.2 (-0.9 to 0.5)	2.2	29.2	19.1	2.4	71.3	3.2	1.2	24.1	7.6
Neck pain	19.25 (18.3-20.1)	6.4 (5.5-7.4)	3.5 (2.6 to 4.4)	0.5	19.0	2.3	0.2	33.1	54.9	4.7	27.0	10.4
Multiple sclerosis	18.81 (18.1-19.4)	5.5 (4.8-6.4)	2.9 (2.1 to 3.7)	4.0	8.6	52.9	0.8	22.0	10.5	6.5	20.5	56.9
Schizophrenia	18.18 (17.8-18.5)	5 (4.5-5.3)	2.4 (1.9 to 2.8)	35.2	20.8	37.6	2.2	17.0	14.6	19.1	20.8	67.2
Idiopathic epilepsy	17.94 (17.2-18.9)	5.9 (4.7-7.4)	3.5 (2.3 to 5)	11.1	3.4	0.9	0.1	21.7	0.3	46.3	0.7	67.2
Intellectual developmental disability	17.26 (16.5-18)	0.4 (-0.1 to 0.8)	-2 (-2.5 to -1.6)	18.4	13.0	53.7	10.1	27.4	0.0	3.3	11.3	14.7
Transport injuries	16.97 (16.2-17.9)	6.6 (6.1-7.3)	1.7 (1.1 to 2.3)	0.0	74.2	6.4	0.2	64.5	27.7	0.4	52.6	2.7
Prostate cancer	16.56 (16.1-17)	6.4 (6-6.8)	2.9 (2.6 to 3.3)	16.6	42.9	35.6	0.4	25.9	36.7	0.3	34.0	9.4
Leukemia	16.22 (15.4-17.1)	8.4 (7.6-9.3)	3.7 (2.9 to 4.5)	0.0	66.1	6.8	0.1	56.2	36.1	0.2	46.9	3.7
Multiple myeloma	15.42 (15.1-15.7)	3.8 (3.6-4.2)	0.5 (0.3 to 0.9)	13.7	44.2	41.1	2.4	25.3	7.0	21.6	28.7	23.3
Hemoglobinopathies and hemolytic anemias	14.86 (14.4-15.4)	6.2 (5.4-6.9)	2.5 (1.8 to 3.2)	1.1	42.3	1.3	0.1	42.6	51.7	1.2	35.1	6.8
Rheumatoid arthritis	14.72 (14.4-15)	5.2 (4.2-5.9)	1.2 (0.2 to 1.9)	1.8	68.5	12.7	2.0	69.8	6.6	1.8	55.4	15.6
Chronic kidney disease	14.59 (14.2-15)	2.3 (1.9-2.7)	-0.1 (-0.6 to 0.2)	12.0	16.2	8.1	18.0	54.5	13.5	5.4	16.9	17.3
Headache disorders												53.0

<sup>a</sup> Study captured \$2.4 trillion in spending in 2019. Measured in 2019 US dollars. Medicare is inclusive of Medicare Advantage.<sup>b</sup> Prescribed retail pharmaceuticals.

Figure 2. Estimated Age- and Sex-Standardized Health Care Spending per Capita and per Beneficiary by US County in 2019



Spending in each panel has been split by septiles (panel A) or quintiles (panels B, C, D, and E). Dark gray counties have estimates masked because the relative uncertainty for the estimates is greater than 1. Refer to eFigure 7.3 in *Supplement 1* for maps of the upper and lower uncertainty intervals for spending per capita. Study captured \$2.4 trillion in spending in 2019. Measured

in 2019 US dollars. For panel A, spending is inclusive of all personal health care spending, excluding spending on durable medical equipment and over-the-counter drugs, and from Veterans Affairs, Department of Defense, and Indian Health Services. Medicare is inclusive of Medicare Advantage. This map is a US National Atlas Equal Area projection.

use of technology, or superior preventive care initiatives, exploration of these data could inform efforts to maximize health outcomes while minimizing expenditures. Emulating successful approaches on a broader scale could lead to substantial savings and improvements in the quality of care received by US residents.

### Limitations

We acknowledge several limitations. First, no single data source captures health care spending comprehensively across the US. Data tend to be payer- and/or type-of-care-specific, and each has its own shortcomings. While input data were adjusted in an attempt to correct for biases and standardize for factors such as only reporting charges or only reporting spending on facility costs, these methods were not always county-specific and are imperfect. Second, estimates extend only through 2019, because more recent years of data were not available when the study began. Third, the specificity of the modeled estimates came at the expense of precision, which was hindered by a sparsity of data. The small-area model attempts to fill existing gaps and approximate levels of uncertainty, but this approach cannot replace the precision that would accompany a comprehensive all-payer claims database. Fourth, input data for durable medical equipment and nondurable medical equipment,

and from Veterans Affairs, Tricare, and Indian Health Services, were not available, so their associated spending was omitted from this study. Fifth, the uninsured population does not benefit from the ability to estimate spending using claims data, and estimates relied on hospital records and surveys, so out-of-pocket spending may be less precise than other estimates. Sixth, some data were available at the zip code level but not the county level, and the county needed to be assigned based on zip code information.

### Conclusions

This report introduces a powerful new dataset—publicly available to policymakers, researchers, and other stakeholders—that opens up rich opportunities for exploration and analyses. An initial review reveals striking county-level variation in utilization of health care services and in health care spending, notably in private insurance, out-of-pocket spending, and emergency care. Understanding this variation at a local level, by health condition, sex, age, type of care, and payer offers critical insights for identifying outliers, tracking growth patterns, highlighting inequities, and assessing health care performance.

### ARTICLE INFORMATION

Accepted for Publication: November 21, 2024.

Published Online: February 14, 2025.

doi:10.1001/jama.2024.26790

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**Obtained funding:** Dieleman, Mokdad.

**Administrative, technical, or material support:** Dieleman, Johnson, McHugh, Pollock, Swart, Taylor, Tsakalos, Mokdad, Roth, Murray.

**Supervision:** Dieleman, Tsakalos, Mokdad, Scott, Templin, Murray.

**Conflict of Interest Disclosures:** Dr Dieleman reported receiving grants from the National Pharmaceutical Council, Bill and Melinda Gates Foundation, and Massachusetts Center on Health Information and Analysis and receiving a contract from the Washington Health Care Authority outside the submitted work. Dr Sahu reported receiving grants from the National Pharmaceutical Council and receiving personal fees from the Pharmaceutical Care Management Association for data analysis completed in 2023 outside the submitted work. Dr Scott reported receiving funding from the Agency for Healthcare Research and Quality as principal investigator on grant K08-HSO28672 and from the National Institutes of Health as co-principal investigator on grant R01-DK137466 outside the submitted work. No other disclosures were reported.

**Funding/Support:** This study was supported by the Peterson Center on Healthcare and by Gates Ventures.

**Role of the Funder/Sponsor:** The Peterson Center on Healthcare and Gates Ventures had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

**Data Sharing Statement:** See [Supplement 2](#).

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