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TRENDS

National Health Spending By Medical Condition, 1996–2005

Mental disorders and heart conditions were found to be the most costly.

by Charles Roehrig, George Miller, Craig Lake, and Jenny Bryant

ABSTRACT: This study responds to recent calls for information about how personal health expenditures from the National Health Expenditure Accounts are distributed across medical conditions. It provides annual estimates from 1996 through 2005 for thirty-two conditions mapped into thirteen all-inclusive diagnostic categories. Circulatory system spending was highest among the diagnostic categories, accounting for 17 percent of spending in 2005. The most costly conditions were mental disorders and heart conditions. Spending growth rates were lowest for lung cancer, chronic obstructive pulmonary disease, pneumonia, coronary heart disease, and stroke, perhaps reflecting benefits of preventive care.

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The national Health Expenditure Accounts (NHEA) provide official estimates of total annual U.S. health care spending for use by researchers and policymakers. They routinely track personal health spending by type of service (such as hospital, physician, and prescription drugs) and source of funds (such as private insurance, Medicare, and Medicaid), but they do not track spending by medical condition. Yet such information is critical to a more complete understanding of what lies behind the increase in spending, what Americans are getting in return, and where we should focus efforts to improve health and health care. For these reasons, participants at a recent conference to discuss improvements to the NHEA recommended that they be extended to include spending by disease.1 This was consistent with an earlier Institute of Medicine (IOM) recommendation that the Agency for Healthcare Research and Quality (AHRQ) identify at least fifteen priority conditions, “taking into account frequency of occurrence, health burden and resource use.”2

The information gap is largely attributable to the complexity of filling it. First is the conceptual problem of allocating spending to medical conditions.3 Second is the practical problem of identifying data and methods that cover the full range of expenditures in the NHEA. Previous researchers have made major

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progress toward addressing these complexities, but they have tended to focus on subsets of the population, subsets of conditions, or single years.4

Spending estimates for individual diseases are common in the literature but, because of variations in concepts, data, and methods, are often not comparable to one another. Furthermore, they often include substantial amounts of double counting, as when expenditures to target multiple conditions simultaneously are claimed in full by each condition. Estimates of how national spending is distributed across all conditions are rare in the literature; the most recent were for 1995.5 This study is the first to produce a time series of such estimates.

Our paper extends the existing literature by providing annual NHEA-consistent estimates of personal health spending by medical condition, using methods that allow for subsequent annual updates. Our methodology, which supplements the NHEA with data from other national sources, covers the entire U.S. population, addresses all medical conditions, and eliminates double counting of expenditures to target multiple conditions simultaneously. Our estimates address spending to treat a condition rather than spending attributable to a condition (including related complications) or spending for individuals with a condition.

These estimates should be useful to ongoing efforts to understand the sources of spending growth and the value received in return and should help policymakers develop policies to achieve sustainable cost growth without compromising population health. Their proper interpretation will require additional information on factors such as changes in condition prevalence, spending by population subgroups (including those with multiple chronic conditions), the effectiveness of various prevention and treatment interventions, and the complex causal interrelationships among conditions. Our findings should be helpful in identifying areas on which to focus such subsequent research.

Study Data And Methods

We decomposed NHEA personal health spending estimates for each year into cells defined by service type and population segment. Service types include hospital care, physician and clinical services, prescription drugs, home health care, nursing home care, dental care, and other professional services.6 Population segments include civilian noninstitutionalized, nursing home residents, other institutionalized populations, and active-duty military. For each year, we estimated how each cell’s personal health spending was distributed across medical conditions and added results across all cells to produce annual personal health spending by condition.7

Data. The NHEA does not provide information on population segments. We used a recently published study of the relationship between these data and the Medical Expenditure Panel Survey (MEPS) to estimate, for each service type, the distribution of expenditures across population segments.8 In the aggregate, we found that about 82 percent of personal health spending is attributable to the civilian noninstitutionalized population (the MEPS study population). Nursing home residents account for an additional 14 percent; the remaining 4 percent is scattered across other institutionalized people and active-duty military. Thus, the most important data requirements on spending by medical condition are for the civilian noninstitutionalized (covered by MEPS) and nursing home populations. Our primary source of information on nursing home residents was the National Nursing Home Survey (NNHS), which is available for 1995, 1997, 1999, and 2004. MEPS and the NNHS together cover about 92 percent of personal health spending.

About half of the remaining 8 percent consists of spending for nursing home residents that is not captured by NNHS (for example, acute care delivered outside the nursing home). We used data from the Healthcare Cost and Utilization Project (H-CUP) for information on nursing home residents admitted to hospitals. For institutionalized psychiatric pa-
tients, we used estimates developed by the Substance Abuse and Mental Health Services Administration (SAMHSA).9 We based estimates for care to active-duty military and prison populations on adjusted MEPS values. The 2000 National Home and Hospice Survey (NHHS) was used to allocate institutionalized hospice spending.

Methods. Following the precedent set in several recent studies, we based medical conditions upon the 260 categories defined in the AHRQ Clinical Classification Software (CCS), which groups the numerous International Classification of Diseases, Ninth Revision (ICD-9), codes into broader categories that are clinically meaningful.10 These categories are already incorporated into MEPS. For other data sets, we mapped ICD-9 codes into CCS categories. We added categories for prevention/exams (general checkups, well-child visits, immunizations, eye exams, and disease-specific screening procedures) and dental care.11

Civilian, noninstitutionalized population. For each cell in the civilian noninstitutionalized population spending data, we used MEPS data to estimate the distribution of expenditures across medical conditions. For example, one such cell is spending on hospital services by this population. MEPS provides condition and spending information at the patient level on every hospital spending event. Where multiple conditions were associated with an event, we distributed expenses across the conditions to eliminate double counting based on the relative costs of the conditions when each occurs alone.12 We summed across events for each person in the survey and summed across individuals, using sampling weights, to form the MEPS-based estimate of hospital spending by condition for the civilian noninstitutionalized population. The associated percentage distribution was applied to the personal health spending estimate of hospital spending by the civilian noninstitutionalized population to form the final estimate for this cell.13

Nursing home residents. For nursing home residents, we used information on charges from the NNHS to distribute spending for nursing home care across conditions for each year of the NNHS (using linear interpolation for the missing years). We assumed that spending for physician services would have this same distribution. We used data on charges from HCUP to distribute hospital spending for this population.

Other populations. We assigned institutional psychiatric spending to our mental disorders category. For prisoners and active-duty military, we used the age-sex composition and special characteristics of each subpopulation to estimate a distribution of spending across conditions based on MEPS. The distribution for hospice spending was calculated from the 2000 NHHS.

Strengths and limitations. One of the strengths of our approach is the use of a single, consistent data set—MEPS—to estimate the medical condition distributions for more than four-fifths of spending throughout the ten-year study period. However, there are also limitations associated with this approach. First, MEPS assigns conditions to health care events based on respondents’ self-reports, which are subject to various biases and reporting errors. Second, MEPS is known to undercount high-cost cases, which introduces a downward bias for some conditions.14 Third, spending for populations not covered by MEPS—notably, nursing home residents—is allocated to medical conditions using claims-like data. Thus, the spending aggregates that we report, although dominated by self-reported conditions, also contain elements of claims-based condition estimates.

Some health-related expenditures are not included in our estimates, either because they are not fully captured by the NHEA (such as complementary and alternative medicine) or because we have insufficient information to allocate them among medical conditions (for example, the NHEA category of “nondurables” that includes unspecified categories of over-the-counter medications).

Our choice of categories for medical conditions (using CCS codes based on organ systems rather than, for example, a method based on causes of disease) affects the amounts allocated to each condition. In addition, the ways
in which these detailed conditions are aggregated into broader condition categories affects expenditure rankings. Unless otherwise noted, we follow grouping schemes used by AHRQ.

Finally, our estimates address spending to treat a condition, but there is also interest in spending attributable to a condition or for those with a condition. The impacts of some of these choices are explored below.

**Study Results**

- **Spending by diagnostic category and medical condition.** The diagnostic categories we report here are largely equivalent to ICD-9 chapters. Medical conditions are based on definitions created by AHRQ using CCS aggregates. Among the diagnostic categories, circulatory system expenditures are the largest, accounting for 17 percent of expenditures in 2005 (Exhibit 1). The next seven largest cat-

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### EXHIBIT 1

**Personal Health Spending, By Diagnostic Category And Medical Condition, Selected Years 1996–2005**

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1996</td>
<td>2000</td>
<td>2005</td>
<td></td>
</tr>
<tr>
<td><strong>Circulatory system</strong></td>
<td>150.9</td>
<td>180.8</td>
<td>253.9</td>
<td>6%</td>
</tr>
<tr>
<td>Heart conditions</td>
<td>81.0</td>
<td>87.2</td>
<td>123.1</td>
<td>5</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>53.3</td>
<td>50.4</td>
<td>68.7</td>
<td>3</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>12.3</td>
<td>15.8</td>
<td>23.1</td>
<td>7</td>
</tr>
<tr>
<td>Dysrhythmias</td>
<td>12.6</td>
<td>13.6</td>
<td>21.9</td>
<td>6</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>22.9</td>
<td>24.6</td>
<td>26.8</td>
<td>2</td>
</tr>
<tr>
<td>Hypertension</td>
<td>22.6</td>
<td>32.8</td>
<td>50.2</td>
<td>9</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>4.6</td>
<td>9.4</td>
<td>22.8</td>
<td>19</td>
</tr>
<tr>
<td><strong>Mental disorders</strong></td>
<td>81.5</td>
<td>103.9</td>
<td>142.2</td>
<td>6</td>
</tr>
<tr>
<td>Anxiety and depression</td>
<td>30.5</td>
<td>41.4</td>
<td>63.2</td>
<td>8</td>
</tr>
<tr>
<td>Dementia</td>
<td>19.5</td>
<td>24.0</td>
<td>28.9</td>
<td>5</td>
</tr>
<tr>
<td><strong>Musculoskeletal</strong></td>
<td>57.9</td>
<td>78.6</td>
<td>121.8</td>
<td>9</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>23.5</td>
<td>30.2</td>
<td>48.0</td>
<td>8</td>
</tr>
<tr>
<td>Back problems</td>
<td>17.9</td>
<td>22.8</td>
<td>40.1</td>
<td>9</td>
</tr>
<tr>
<td><strong>Injury and poisoning</strong></td>
<td>65.5</td>
<td>80.9</td>
<td>110.9</td>
<td>6</td>
</tr>
<tr>
<td>Trauma</td>
<td>60.3</td>
<td>73.6</td>
<td>100.2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Digestive</strong></td>
<td>47.6</td>
<td>63.0</td>
<td>109.7</td>
<td>10</td>
</tr>
<tr>
<td>Upper GI</td>
<td>10.5</td>
<td>14.5</td>
<td>32.7</td>
<td>14</td>
</tr>
<tr>
<td><strong>Neoplasms</strong></td>
<td>59.4</td>
<td>65.6</td>
<td>106.7</td>
<td>7</td>
</tr>
<tr>
<td>Cancers</td>
<td>55.6</td>
<td>60.1</td>
<td>99.4</td>
<td>7</td>
</tr>
<tr>
<td>Colon</td>
<td>2.9</td>
<td>3.6</td>
<td>7.8</td>
<td>12</td>
</tr>
<tr>
<td>Lung</td>
<td>6.3</td>
<td>6.8</td>
<td>7.4</td>
<td>2</td>
</tr>
<tr>
<td>Prostate</td>
<td>2.7</td>
<td>4.5</td>
<td>6.8</td>
<td>11</td>
</tr>
<tr>
<td>Breast</td>
<td>5.0</td>
<td>6.6</td>
<td>14.6</td>
<td>13</td>
</tr>
<tr>
<td><strong>Respiratory</strong></td>
<td>64.1</td>
<td>79.7</td>
<td>97.7</td>
<td>5</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>38.0</td>
<td>50.5</td>
<td>64.6</td>
<td>6</td>
</tr>
<tr>
<td>COPD</td>
<td>11.8</td>
<td>11.9</td>
<td>16.5</td>
<td>4</td>
</tr>
<tr>
<td>Asthma</td>
<td>6.3</td>
<td>9.4</td>
<td>12.9</td>
<td>8</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>16.6</td>
<td>17.7</td>
<td>18.6</td>
<td>1</td>
</tr>
<tr>
<td><strong>Nervous system</strong></td>
<td>52.9</td>
<td>59.8</td>
<td>90.9</td>
<td>6</td>
</tr>
<tr>
<td>Eye problems</td>
<td>18.2</td>
<td>16.7</td>
<td>24.3</td>
<td>5</td>
</tr>
<tr>
<td><strong>Genitourinary</strong></td>
<td>33.6</td>
<td>44.0</td>
<td>76.6</td>
<td>10</td>
</tr>
<tr>
<td>Kidney</td>
<td>12.2</td>
<td>16.4</td>
<td>35.9</td>
<td>13</td>
</tr>
<tr>
<td><strong>Endocrine</strong></td>
<td>30.2</td>
<td>42.4</td>
<td>65.0</td>
<td>9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>18.2</td>
<td>25.2</td>
<td>35.8</td>
<td>8</td>
</tr>
</tbody>
</table>
egories account for about half of expenditures, ranging from mental disorders (9 percent) to nervous system disorders (6 percent).

Nearly half of circulatory system expenditures are attributable to heart conditions, which consist primarily of coronary heart disease, congestive heart failure (CHF), and dysrhythmias. Hypertension, cerebrovascular disease, and hyperlipidemia account for most of the remainder. Spending on circulatory systems grew at about 6 percent annually, somewhat more slowly than overall spending. This reflects the offsetting effects of rapid growth in spending for hypertension and hyperlipidemia with very slow growth in spending for coronary heart disease and cerebrovascular disease (Exhibit 2).

Among the larger diagnostic categories, digestive and genitourinary spending exhibited the highest annual growth at 10 percent, driven by rapid growth in spending on upper gastrointestinal (GI) and kidney problems, respectively. Spending within the respiratory category showed the lowest annual growth at 5 percent, primarily because of low growth for chronic obstructive pulmonary disease (COPD) and pneumonia.

The last column of Exhibit 1 displays the share of ten-year spending growth attributable to the various categories and conditions. Conditions with high annual spending growth rates may still account for a relatively small share of overall growth if their 1996 base is sufficiently small.

### Fifteen most costly conditions revisited

In response to a suggestion from the Institute of Medicine (IOM), AHRQ researchers published information on the fifteen most costly medical conditions in 1997 for the civilian noninstitutionalized population. Exhibit 3 presents a similar listing for national spending in 2005 using the same condition definitions as in the AHRQ study. We find that the most costly fifteen disease categories in 2005 are the same as reported by AHRQ in 1997, with the exception that hyperlipidemia replaces pneumonia in our list. Although heart conditions were most costly in the 1997 list, mental disorders are the most costly on the 2005 list, primarily because of our inclusion of...
institutionalized populations. It is important to recognize that the AHRQ condition groupings adopted for this exhibit are only one of many possible options, and the rankings depend importantly upon the groupings. For example, had AHRQ chosen to group hypertension with heart conditions, our ranking would list heart conditions first.

Discussion

As the nation seeks to achieve spending growth rates that are sustainable, emphasize value, and improve population health, it is important to develop approaches to tracking health care spending by categories that offer insight into the underlying health conditions...
driving this spending. Spending growth is determined by the prevalence of medical conditions (alone or in combination with others), prevailing standards of treatment for such conditions (including whether treatment is warranted), and payments per treatment. Tracking costs associated with medical conditions is also crucial to a better understanding of value, which is most often analyzed in the context of treatments for specific conditions, and of population health, which is closely related to changes in risk factors and condition prevalence. The ability to track national health spending by medical condition should help identify conditions that account for large shares of spending and growth and that, therefore, deserve particular attention in our quest to improve value, manage growth, and target prevention efforts.

**Spending growth.** Between 1996 and 2005, personal health spending grew by about 7 percent annually, while economywide price inflation averaged 2 percent and population growth averaged 1 percent. Thus, changes in prevalence, treatment patterns, and costs per treatment were responsible for about four percentage points of the annual growth in personal health spending.

Our estimated rates of spending growth vary widely across conditions, reflecting differing trends in these three factors. For example, we found rapid growth in spending on hyperlipidemia, which may be attributable to the combination of rising cholesterol levels associated with the rapid increase in obesity, the diffusion of new cholesterol treatments, and expanded guidelines for who should be treated. This increased spending coincides with progress in achieving national goals for cholesterol levels. In fact, for hyperlipidemia, as for hypertension (for which spending also rose quickly during the period), there is evidence that more aggressive treatment could yield lower total health spending.

Conversely, despite the increasing prevalence of diabetes, we found that the annual rate of increase in diabetes spending is only slightly above the 7 percent personal health spending average. Whether this could be due to improved treatments that have reduced the number of high-cost events, to changes in the age-mix of diabetics and other conditions they have (comorbidities), or to other causes represents an interesting research topic.

Finally, to illustrate the insights and hypotheses that can be generated from condition-specific data, we note that smoking is a risk factor for all of the conditions showing the lowest annual spending growth (coronary heart disease, cerebrovascular disease, lung cancer, COPD, and pneumonia). This could reflect, in part, the health benefits associated with reduced rates of smoking. However, the low rates of growth in coronary heart disease and cerebrovascular disease would seem to require additional explanation, given the rise in risk factors such as obesity and diabetes, perhaps indicating benefits of new treatments or changes in treatment patterns.

**Leverage.** The impact of interactions among medical conditions (with some conditions being implicated in the presence or severity of others) and of population risk factors (where a single factor, whether or not formally diagnosed by a physician, can affect multiple conditions) emphasizes the importance of leverage when considering how to best influence health and health spending. Control of diabetes, hypertension, and hyperlipidemia, and efforts to reduce smoking, inactivity, and obesity, are highly leveraged because they reduce the incidence of several conditions. Better knowledge of these complex interrelationships is essential to understanding the value of spending to prevent and treat these conditions.

**Alternative definitions of medical conditions.** One key factor influencing our results is how we define medical conditions. Although many researchers have adopted these definitions, there are numerous other possibilities. For example, Alzheimer’s disease is included as a mental disorder in our estimates based on CCS but is considered a nervous system condition in the ICD-9 codes. Adopting a definition based on the ICD-9 would reduce estimated spending on mental disorders and increase it within the nervous system category.
- **Treatment of comorbidities.** We define condition spending as that directly associated with treating each condition. An alternative approach would be to track spending at the person level, defining the cost of the condition as the total health care spending by patients with that condition, or a portion of patients’ total health care spending that could reasonably be attributed to the condition. To illustrate, Exhibit 4 shows estimates of spending by people with diabetes in the civilian noninstitutionalized population in 2004.

The exhibit shows that people with diabetes spent $190.4 billion for health care—nearly seven times the $27.9 billion they spent specifically to treat diabetes. However, a sizable portion of the total spending for these people went to the treatment of conditions that are common complications of diabetes. An estimate of spending attributable to diabetes would include the $27.9 billion spent on diabetes plus a large share of the spending on complications and a smaller share of the remainder.22 Alternatively, some researchers have used econometric methods to correlate a person’s total annual health care costs with diseases while controlling for other observed characteristics that are likely to affect costs.23

These differences in definitions are important when one is comparing our spending estimates with those from other sources; they highlight the fact that control of a condition such as diabetes has high leverage because of its impact on the incidence of other conditions. From a policy perspective, the cost implications related to comorbidities may suggest that policy interventions should be designed for targeted patient populations, leading to a need to understand national spending trends both at the level of specific conditions, as measured here, and at the person level. How best to track and account for patient-level spending changes (by number of chronic conditions, for common combinations of conditions, and so forth) is an important topic for future policy research and discussion.

This study provides, for the first time, annual estimates of national personal health spending by medical condition. The estimates provide a more complete picture of spending than the usual civilian noninstitutionalized population view, capturing, for example, the impact of high mental health spending by institutionalized populations. Eliminating double counting and controlling totals to the NHEA provides a rigorous framework for comparing spending across conditions.

The estimates reflect our definition of spend-
(which excludes indirect costs of illness and associates treatment cost with the condition being treated, regardless of cause) and the methodological choices we have made. By offering an alternative categorization of national health spending, the estimates provide a starting point for understanding spending growth and options for improving value. Important areas for future research on national health spending include integrating data on condition prevalence with cost estimates and developing methods to better understand spending patterns for patients with multiple conditions.

Portions of this work were presented to the Committee on National Statistics, National Academies, Washington, D.C., 14 March 2008; and at the 2008 Society of Government Economists Conference, Washington, D.C., 2 June 2008. Support for this project was provided by the Pharmaceutical Research and Manufacturers of America.

NOTES
3. For example, how should spending on eye problems caused by diabetes be assigned to a medical condition: to eye problems, to diabetes, or split somehow between the two?
5. Hodgson and Cohen, “Medical Expenditures.”
6. Roughly 9 percent of personal health spending goes for durable medical equipment, nondurables, and other personal care, for which there was insufficient information to allocate expenditures to medical conditions.
7. Details of our methodology are available online at http://content.healthaffairs.org/cgi/content/full/hlthaff.28.2.w358/DC2.
8. M. Sing et al., “Reconciling Medical Expenditure Estimates from the MEPS and NHEA, 2002,” Health Care Financing Review 28, no. 1 (2006): 25–40. MEPS is a nationally representative set of large-scale surveys of approximately 13,000 U.S. households representing about 33,000 individuals, as well as medical providers and employers, that offers researchers detailed data on health care costs and use. It provides annual information on spending and medical conditions for the civilian noninstitutionalized population.
9. Mark et al., “U.S. Spending.” We used this information to estimate the substance abuse component.
11. Exams included in this category are not exclusively preventive services, because many of them are follow-up visits associated with treatment for unspecified conditions. Detailed estimates of national expenditures on prevention can be found in G. Miller et al., “Quantifying National Spending on Wellness and Prevention,” in Beyond Health Insurance: Public Policy to Improve Health, ed. L. Helmcen, R. Kaestner, and A. Løhssø, Advances in Health Economics and Health Services Research no. 19 (Bingley, U.K.: Emerald Group Publishing, 2008), 1–24.
12. Our allocation method follows K.E. Thorpe, C.S. Florence, and P. Joski, “Which Medical Conditions Account for the Rise in Health Care Spending?” Health Affairs 23 (2004): w437–w445 (published online 25 August 2004; 10.1377/hlthaff.w4.437). Although there has been rapid growth in the number of people with multiple chronic conditions, our allocation of spending to conditions occurs at the level of specific health care events (outpatient visits, inpatient stays, prescriptions, and so on), and most of these are associated with a single condition, even though other conditions may also be present for the person being treated. This makes our results fairly robust with respect to the allocation method used.
13. We smoothed these annual percentages using three-year averages except for 1996 and 2005, for which we used two-year averages.


15. Information on expenditures for all years from 1996 through 2005 is available online, as in Note 7. We moved hyperlipidemia from endocrine to circulatory because of its close association with the latter. The AHRQ CCS moves Alzheimer’s from nervous system to mental disorders. Smaller ICD-9 chapters are subsumed under “Other Categories.”


17. Ibid. For illustrative comparison, our values for expenditures on heart disease and cancer in 1997 were $80.7 billion and $55.6 billion, respectively, compared with AHRQ’s values of $57.5 billion and $45.5 billion. Differences in values between the two studies can be attributed to the following: the AHRQ values are for the civilian noninstitutionalized population only, include all costs for events associated with more than one condition; and are not adjusted to be consistent with the NHEA.


20. Using MEPS data, we estimate that the treated prevalence of diabetes in the civilian noninstitutionalized population increased by more than 7 percent annually during this period.


22. For an example of such accounting, see T. Dall et al., “Economic Costs of Diabetes in the U.S. in 2007,” Diabetes Care 31, no. 3 (2008): 596–615. For 2007, Dall and colleagues estimate that $27 billion was spent on direct treatment of diabetes, $58 billion for chronic complications attributable to diabetes, and $31 billion for excess general medical costs among diabetics, for a total of $116 billion. For 2005, we estimate that $35.8 billion was spent on treating diabetes—higher than the $27 billion estimated by Dall and colleagues in 2007. However, their partitioning of expenditures is not completely consistent with our definitions. Furthermore, they used MEPS data for cost per treatment but used other data sets to estimate treatment volume (using primary diagnosis to assign treatments to conditions). This illustrates how valid alternative choices in definitions, data sets, and methods can affect spending estimates.