BEA BRIEFING

Comparing Estimates of U.S. Health Care Expenditures by Medical Condition, 2000–2012

By Tina Highfill

THE BUREAU OF ECONOMIC ANALYSIS (BEA) released a new health care satellite account (HCSA) in January 2015. Following recommendations from economists and health experts, the HCSA redefines the commodity provided to patients by the health sector as a treatment of a condition, such as cancer, rather than as a specific medical service, such as a 15-minute office visit (National Research Council 2010). This new HCSA presents health care spending and price indexes by the type of medical condition treated. The HCSA differs from the current presentation of health care spending in the national income and product accounts (NIPAs), which shows the specific type of health care service purchased by an individual, such as a visit to a doctor's office. The details of the HCSA were described in the January 2015 SURVEY OF CURRENT BUSINESS (Dunn, Rittmueller, and Whitmire 2015).

The key methodological component of the new HCSA is the calculation of spending for specific medical conditions. It is critical to validate the new HCSA spending estimates through comparison with similar research on health spending, such as the recent project undertaken by the Altarum Institute's Center for Sustainable Health Spending (Roehrig forthcoming). Researchers at Altarum developed annual estimates of national health spending by medical condition that are consistent with statistics from the national health care expenditure accounts (NHEA), published by the Centers for Medicare and Medicaid Services. This paper compares estimates of spending by medical condition between 2000 and 2012 from the HCSA with those from Altarum. Potential improvements to the HCSA arising from Altarum's methodology are discussed.

The HCSA provides two vintages of spending estimates, which differ mainly because of differences in source data. One vintage relies solely on the Medical Expenditure Panel Survey (MEPS) from the Agency of Healthcare Research and Quality (AHRQ), part of the U.S. Department of Health and Human Services. The MEPS provides annual estimates of health care spending and utilization information for the majority of the U.S. population. The second vintage substitutes por-

tions of the MEPS with other data sources for certain segments of the population. The additional data in this "Blended Account" have much larger sample sizes than what is available in the MEPS, such as for Medicare beneficiaries, providing more reliable annual estimates. Supplementary data in the Blended Account often come with a significant cost, while a main advantage of the MEPS is that the data are free and publicly available. Dunn, Rittmueller, Whitmire (2015) provide a comprehensive and detailed comparison of the differences between the two vintages. For this paper, the focus is on the spending estimates in the first account, the "MEPS Account." This allows for a more direct comparison with the Altarum estimates, which also relies on the MEPS as its main data source.

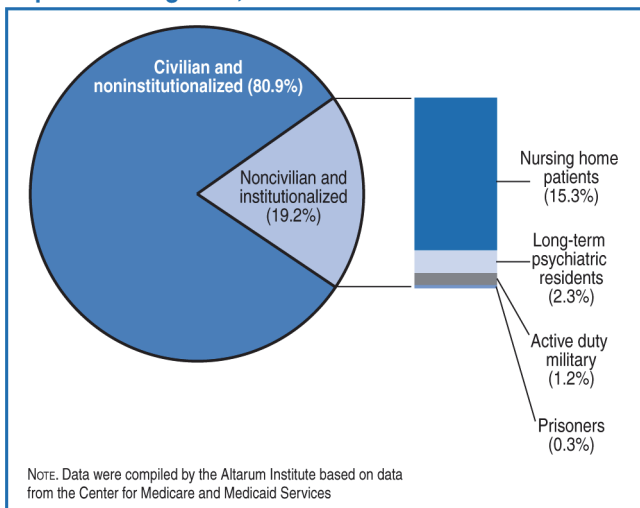### Measuring Health Care Spending by Medical Condition

The MEPS provides annual health care utilization and spending data on approximately 30,000 U.S. residents beginning in 1996. For every medical event reported in the MEPS, such as a visit to the doctor's office, the primary medical condition initiating the event is collected along with the corresponding spending from every payer (for example, Medicare and out-of-pocket payments). Medical conditions are reported using the Clinical Classification Software (CCS), which categorizes medical conditions into 260 exclusive groups. The CCS was developed by AHRQ to group together the thousands of existing disease types into meaningful aggregates (for example, cancers of the breast). The 260 CCS codes are often grouped into 18 exclusive "chapters" for ease of reporting, such as cancers, based on the *International Classification of Diseases*. See the appendix for a list of the 18 chapters and the major diseases in each group.

For most events in the MEPS, only one diagnosis is reported as the cause of the event. In that case, all of the spending associated with that event is assigned to the corresponding CCS code. When MEPS respondents report more than one CCS for an event, the HCSA uses a straightforward method of allocating all spending to the primary CCS code. Altarum's

methodology attempts to account for these co-occurrences, sometimes called comorbidities. It does this by splitting the money in proportion to each condition's relative average spending when there are no comorbidities. For example, if average annual spending for medical events with one diagnosis is $2,000 for people with diabetes and $1,000 for those with high blood pressure, then spending for medical events with both conditions is distributed so that diabetes receives twice the share of spending as high blood pressure.

Another important difference between the HCSA and Altarum estimates is that Altarum includes spending for the noncivilian and institutionalized populations. These populations accounted for approximately a fifth of health care spending in 2012 and include those in nursing homes, active military, psychiatric facilities, and prisons (chart 1). Altarum uses the National Nursing Home Survey (NNHS) and the nationwide inpatient sample to assign spending to diseases for nursing home patients, who make up the vast majority of the institutionalized population. Altarum allocates NNHS spending equally to each disease for which a patient is diagnosed. Since the NNHS is only available for 4 years (1995, 1997, 1999, and 2004), Altarum had to turn to alternative data sources to construct estimates in the later years. In particular, Altarum used estimates provided by Highfill and Johnson (2015) of nursing home spending that relied on the Medicare Current Beneficiary Survey (MCBS) to extrapolate the 2004 estimates forward. The MCBS is an annual survey that also collects information on nursing home spending and patient medical conditions, though it has a relatively small sample size of nursing home patients and is not nationally representative like the NNHS. For the rest of the noncivilian and institutionalized population, Altarum imputes

spending by using a subset of MEPS data that corresponds to the age and gender distribution of those populations, with some minor adjustments (Roehrig forthcoming).

Altarum's treatment of comorbidities and inclusion of the noncivilian and institutionalized population are the most significant differences between the two sets of estimates, but the methodologies also vary in other ways. First, the Altarum estimates are designed to match the NHEA annual totals, while the HCSA matches the NIPA totals. The NIPAs provide estimates of national health expenditures that differ slightly from the NHEA because of different data sources and coverage of services. Additionally, Altarum attempts to correct for a change in the MEPS beginning in 2007 that impacted the prevalence figures for a number of medical conditions. About 30 chronic conditions were singled out in the survey, such as diabetes, resulting in artificially large increases in prevalence for many of these conditions (Hall and Highfill 2013). For conditions affected by the MEPS change, Altarum used prevalence trends for 2007 forward to adjust their estimates for the earlier years and to make a more consistent time series. Lastly, the HCSA follows AHRQ's recommendation of pooling together 2 years of MEPS data to obtain better coverage of patients and medical conditions with small sample sizes, while Altarum uses a 3-year average.

Estimates of Health Care Spending by Medical Condition

Table 1 shows shares of 2012 spending by disease chapter for each set of estimates. Seven disease chapters with relatively small shares of spending are collapsed

Chart 1. Share of U.S. Health Care Expenditures by Population Segment, 2012

NOTE. Data were compiled by the Altarum Institute based on data from the Center for Medicare and Medicaid Services

Table 1. Share of U.S. Health Care Expenditures by Medical Condition, 2012

[Percent]

Disease categories	BEA HCSA	Altarum	
	MEPS account	Noninstitutionalized population	Total U.S. spending
Circulatory system	13.7	12.4	13.5
Musculoskeletal	12.3	11.1	10.3
Injury and poisoning	7.8	8.3	7.6
Neoplasms...................................	7.5	7.6	6.6
Digestive	7.0	8.0	8.3
Respiratory	6.8	7.0	7.1
Nervous system	6.6	6.2	6.3
Endocrine	6.6	6.1	6.3
Mental disorders	6.4	6.8	9.8
Genitourinary	3.9	4.9	4.9
Other categories	21.2	21.6	19.4
Total	100	100	100

HCSA Health care satellite account
MEPS Medical expenditure panel survey

into "other categories," such as maternal health care and blood diseases. In general, the shares of spending for medical conditions were relatively close between the HCSA and Altarum's civilian and noninstitutionalized populations. The biggest differences were in circulatory system and musculoskeletal diseases, reflecting the different methodologies. Many of the musculoskeletal and circulatory system diseases were impacted by both the treatment of comorbidities and the MEPS change in 2007. Events with a CCS code for circulatory system diseases were reported along with a comorbid condition at a higher rate than events with other diseases, suggesting that comorbidities contribute to the difference in estimates for these diseases. Additionally, events attributed to musculoskeletal diseases were also more likely to be reported with a comorbidity, though not necessarily as the primary condition. However, Altarum has noted that their MEPS adjustment was especially influential on the estimates for arthritis and coronary atherosclerosis (Roehrig and Lake 2015). Therefore, it is unclear what individual role these methodological differences played in Altarum's relatively lower shares of spending for musculoskeletal and circulatory system diseases.

Table 1 also provides Altarum's estimate for total U.S. spending, which shows how the disease distribution changes when the noncivilian and institutionalized population is included as part of spending. The largest difference is in mental illness; the share of spending for these diseases increases from 6.8 percent to almost 10 percent of total U.S. health care spending, reflecting high rates of mental Illness among nursing home patients. This corresponds with a recent BEA working paper that found more than a third of nursing home spending is attributable to mental illness (Highfill and Johnson 2015). Adding the institutionalized population also increases the share of spending for circulatory system diseases and decreases the share of spending for injury and poisoning, and other categories, reflecting the disease distribution of the relatively older nursing home population.

Table 2 shows the 2000–2012 compound annual growth rates (CAGRs) for each set of estimates. There are a number of significant differences in the CAGRs, though none are consistently higher or lower than the other, and the overall growth rate is essentially the same. The biggest difference is in circulatory system diseases, where Altarum finds growth to be almost half the rate of the HCSA (2.6 percent, compared with 5.0 percent). The growth rates in cancer were also lower in the Altarum estimate (6.0 percent, compared with 7.6 percent). Adding the noncivilian and institutionalized population did not impact growth rates substantially

for most conditions, aside from circulatory system diseases, which continued its trend of disagreement. These results, coupled with the large difference in the two vintages of HCSA estimates for circulatory system diseases (see Dunn, Rittmueller, and Whitmire 2015), suggest that these estimates are especially sensitive to the method of allocation. Special attention should be given to the measurement of these diseases because they represent such a large share of total spending.

Estimates of spending by disease are available from other sources, though they often focus on a single disease. Advocacy groups sometimes publish figures for their specific cause, such as the American Heart Association (AHA). For example, the AHA estimates spending on circulatory disease in 2010 was $320 billion (AHA 2010), about 11 percent higher than the Altarum estimate and more than 25 percent higher than the HCSA estimate. These types of estimates usually measure spending for people with a disease, instead of spending on treating the disease. This means all health care spending for someone with a disease is included in their estimate, not just the spending used to treat the individual disease, as with the HCSA. Sometimes the figures are more comparable, such as those from the American Cancer Society (ACS). The ACS, using data from the National Institutes of Health, stated that spending on cancer was about $102 billion in 2010, while an AHRQ summary table puts the figure around $82 billion (ACS 2010; Agency for Healthcare Research and Quality 2010). These numbers are very close to the HCSA figures, and the relatively lower MEPS figure is expected because it does not include the institutionalized population.

Table 2. Compound Annual Growth Rates of U.S. Health Care Expenditures by Medical Condition, 2000–2012

[Percent]

Disease categories	BEA HCSA	Altarum	
	MEPS account	Noninstitutionalized population	Total U.S. spending
Circulatory system	5.0	2.6	3.1
Musculoskeletal	8.4	8.3	8.0
Injury and poisoning	4.4	5.8	5.6
Neoplasms	7.6	6.0	6.0
Digestive	8.5	8.6	8.8
Respiratory	5.1	5.4	5.4
Nervous system	6.1	7.1	6.8
Endocrine	8.5	9.0	8.6
Mental disorders	5.2	5.7	5.6
Genitourinary	6.3	7.2	7.2
Other categories	6.3	7.5	7.2
Total	6.3	6.4	6.3

HCSA Health care satellite account
MEPS Medical expenditure panel survey

Potential Improvements to BEA's HCSA

Comparing BEA's estimates of spending in the new HCSA to Altarum's estimates provides insight into potential methodological weaknesses and opportunities for improvements. Incorporating the noncivilian and institutional populations may be the most significant opportunity to improve the HCSA. The Altarum estimates show that adding these populations impacts the distribution of spending shares, increasing share of spending to mental illnesses and circulatory system diseases and lowering the overall growth rates. However, the Altarum method in this area is subject to a few significant weaknesses. Specifically, the NNHS, the main data source used in their estimates for nursing home spending, was discontinued in 2004. Additionally, the NNHS is known to underrepresent short-term nursing home patients, whose share of nursing home spending have grown steadily to almost a third of total nursing home expenditures over the 2000s (Highfill and Johnson 2015). To account for these weaknesses, BEA has already begun work to incorporate nursing homes into the HCSA by using a variety of different data sources and techniques. Altarum's method for the rest of the institutionalized population, however, is relatively straightforward because it mostly relies on the MEPS distribution to allocate spending. Incorporating their method into the HCSA could be achieved with relatively little effort. The other potential area for improvement is the procedure for allocating spending. Comparing the HCSA and Altarum estimates shows conditions with comorbidities had the greatest diver-gence in share of spending and growth rates. Altarum's attempt to correct for the 2007 change in MEPS likely also plays a role in this divergence, because the same diseases were often impacted by both methodological differences.

While it is not clear whether the Altarum estimates are more accurate than those in the HCSA, this comparison shows which diseases differed the most and highlights areas for additional research. Perhaps most significantly, excluding the nursing home population from the HCSA appears to significantly understate the share of total health care spending allocated to mental illness. Growth rates for many diseases would also decline (slightly) if the HCSA included the entire U.S. population. However, despite the many differences between the estimates, spending shares and growth rates for many diseases were remarkably close. Future HCSA research may consider focusing specifically on the diseases that consistently differ across estimates. Given the apparent sensitivity of circulatory system diseases to different allocation methods, investigating the spending estimates for these diseases is particularly important, given their relatively large share of total health care spending. In general, this comparison finds that BEA's estimates of spending by medical condition mostly correspond with the research conducted by Altarum. By incorporating a few methodological changes into the HCSA, BEA has the potential to significantly improve its new estimates of U.S. health care spending by medical condition.

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Appendix: Description of *International Classification of Diseases* 9th Revision (ICD–9) Chapters

Chapter 1: Infectious and parasitic diseases—HIV infection, septicemia, and hepatitis

Chapter 2: Neoplasms—cancer (malignant and non-malignant)

Chapter 3: Endocrine; nutritional; and metabolic diseases and immunity disorders—hyperlipidemia and diabetes

Chapter 4: Diseases of the blood and blood-forming organs—anemia, sickle cell disease

Chapter 5: Mental Illness—dementia, depression, and alcohol and substance Abuse

Chapter 6: Diseases of the nervous system and sense organs—cataract, epilepsy, multiple sclerosis, Parkinson's disease, and meningitis

Chapter 7: Diseases of the circulatory system—hypertension, heart attack, chronic heart failure

Chapter 8: Diseases of the respiratory system—pneumonia, COPD, asthma

Chapter 9: Diseases of the digestive system—diverticulosis, gastrointestinal disease, and appendicitis

Chapter 10: Diseases of the genitourinary—renal failure, kidney disease, and diseases of the male and female reproductive system

Chapter 11: Complications of pregnancy; childbirth; and the puerperium—including contraceptives, deliveries, and abortions

Chapter 12: Diseases of the skin and subcutaneous tissue—infections and inflammatory conditions of skin

Chapter 13: Diseases of the musculoskeletal system and connective tissue—back problem, arthritis, osteoporosis,

Chapter 14: Congenital anomalies—cardiac, digestive, genitourinary, and nervous system conditions present from birth

Chapter 15: Certain conditions originating in the perinatal period—birth trauma, infections, hemorrhaging, and other issues that occur during the perinatal period

Chapter 16: Injury and poisoning—sprain, fractures, burns, poisoning (various agents)

Chapter 17: Symptoms; signs; and ill-defined conditions and factors influencing health status—preventive care, rehab, colds and flus, and allergies

Chapter 18: Residual codes; unclassified; all E codes—external causes of needing medical care, accidents