Trends in Spending Across Key Chronic Health Care Conditions among Privately Insured Adults, 2000-2015

December 3, 2019

Growth in health care spending in the United States has slowed considerably over the past decade. Starting soon after the recession in 2007, growth in real per capita spending has fallen to an annual rate of 0.5 percent. This slowdown has occurred at the same time that we have observed an increase in the share of the U.S. adult population with one or more chronic diseases, driven in part by an increasing rate of obesity. Given that 90 percent of health care spending goes to treat people with chronic disease, changes in the utilization and price of health care devoted to treating chronic disease can have a dramatic effect on total health care spending. In this paper, we examine trends in spending on privately insured adults with some of the more common chronic diseases to determine how those trends might have affected total spending.

In spite of the recent slowing trend, national spending on health care is still high. Recent estimates from the Office of the Actuary at the Centers for Medicare & Medicaid Services (CMS) show that national health expenditures were nearly $3.7 trillion in 2018, some 18.2 percent of gross domestic product (GDP). This compares to $1.37 trillion in health spending in 2000, some 13.3 percent of GDP. Holding general inflation constant, real per capita spending on health care has increased at an average annual rate of 2.9 percent since 2000. As noted above, however, spending over the past decade has grown quite slowly by comparison.

The growth in private health insurance premiums has followed a similar pattern (Table 1). Between 2000 and 2007, the average annual growth in (nominal and real) premiums increased at an average annual rate of 8.9 percent (6.4 percent inflation adjusted). Between 2007 and 2015, the average annual growth in premiums decreased to about 4.2 percent (2.6 percent inflation adjusted). Trends in the average annual growth in premiums continues to slow, falling to 3.3 percent (1.7 percent inflation adjusted) between 2015 and 2018.

Table 1. Average Annual Increase in Single Private Health Insurance Premiums, 2000 – 2018

Time Period	Percent Increase
2000 – 2005	10.2%
2005 – 2010	4.6%
2010 – 2015	4.3%
2015 – 2018	3.3%

Source: *Kaiser Family Foundation Employer Health Benefits, 2018*

Several papers have attempted to identify the factors associated with this lower rate of growth.[i] Two widely cited factors are the recession (which began in 2007) and structural changes in the payment and delivery of health care. Another contributing factor may be the rise in high deductible plans (with and without a health retirement or savings account). In 2004, only 4 percent of workers were enrolled in these plans compared to 29 percent in 2018.[ii] Studies have shown that these benefit design changes account for about 20 percent of the reduced growth in health care spending since 2010.[iii] These analyses have focused on trends in per capita national health care spending.

However, a more granular look may be required to better identify the factors associated with lower cost growth. To build on previous work, this paper separately identifies how much of the change in private health insurance spending is due to price increases, to changes in the prevalence of certain major chronic diseases, and to changes in the cost of treatment per case for those diseases.

The paper specifically addresses four effects on spending for treating chronic diseases among adults covered by private health insurance:

- Increasing prices and use of services
- Increasing rates of obesity and treatment intensity
- Chronic medical conditions that might have contributed to the slower growth in health care spending starting in 2010
- Slowing growth in prescription drug spending and, in particular, medications whose patents expired after 2010

In general, the findings are that increases in the cost per case of treating many common chronic diseases and rising prevalence of obesity both played roughly similar roles in the rise in overall health spending over time. If the prevalence of obesity had not risen considerably, spending increases could have been much smaller.

Data and Methods

We examine trends in overall spending among adults with private health insurance as well as in per case annual treatment costs for the following expensive chronic conditions:

- Depression
- Hypertension
- Hyperlipidemia
- Heart Disease
- Diabetes
- Cancer
- Back Problems
- Pulmonary Disease
- Asthma
- Arthritis

Collectively, these conditions accounted for approximately 45 percent of noninstitutionalized health care spending among those with private health insurance during the study timeframe.

Study Data and Methods

The *Medical Expenditure Panel Survey-Household Component* (MEPS) is the main data source for the analysis, including demographic, medical and pharmacy data from 2000 to 2015.[1] (Please see the Appendix for more information on the MEPS.)

For each of the conditions studied, we estimated total health care spending by condition per patient, summing inpatient, outpatient, emergency department (ED), office-based, home health and prescription drug expenditures for all privately insured adults. We pooled 15 years of data (2000-2015) into three five-year periods (2000-2005, 2006-2010, and 2011-2015) to avoid instances in which we would have an inadequate number of observations to draw statistically significant conclusions. Our study is designed to estimate whether spending was lower in the 2010-2015 time period compared to the earlier time periods. In addition, we attempt to understand some of the factors that accounted for changes in condition-specific spending over time. We estimate how much of the change is due to changes in price and the use of services (intensity and mix of services). We also examine measures of changes in how services are delivered, which are outlined below. (Please see the Appendix for more information on data and methods.)

Results

Factors Affecting the Change in Private Health Insurance Spending

What accounts for the changes in the growth in private insurance spending over time, as presented in Table 1 (above)? We begin by splitting growth in spending into the growth in the prevalence of treated disease and the growth in spending per case treated (holding enrollment constant). We examined three time periods, 1987-2015, 2000-2015 and the most recent period—post-recession 2008-2015 (Table 2). Between 1987 and 2015, the impacts of rising prevalence and spending per treated person were very similar (53 percent and 47 percent, respectively). The role of prevalence fell somewhat in later years, so that spending per treated person accounted for roughly 60 percent, while growing prevalence accounted for the remaining 40 percent of the growth in spending.

Table 2. Decomposition of the Per Insured Adult Growth in Private Health Insurance Spending

	Percent of Per Capita Growth in Spending Due to:	
Time Period	**Increase in Treated Prevalence of Disease**	**Increase in Spending Per Person Treated**
1987 – 2015	53%	47%
2000 – 2015	37%	63%

2008 – 2015	43%	57%
Source: *Tabulations from The Medical Expenditure Panel Survey and NMES, 1987*		

Rising prevalence is a strong factor in health care spending growth. As shown in Table 3, which reports prevalence of common chronic diseases among people with private health insurance, most of these diseases (other than heart disease and pulmonary disease) have seen an increase in prevalence over the time period covered in this study. The increase in prevalence can be linked to some degree to the increasing prevalence of obesity and the impact that obesity has on chronic disease, which is potentially preventable through lifestyle interventions, like diabetes prevention programs. But there are also other possible causes for rising prevalence, such as changes in clinical criteria for treating patients and improved diagnosis of disease. Changes in clinical criteria and improved diagnosis factors may be desirable if they produce better health outcomes, but they might also lead to exaggerated estimates of growth in disease prevalence.

Table 3. Prevalence of Key Chronic Conditions among Privately Insured Adults, 2003-2015			
Condition	2003	2008	2015
Pulmonary Disease	14.4%	12.4%	10.4%
Hypertension	12.5%	17.0%	16.9%
Depression	11.6%	12.3%	14.9%
Back Problems	8.5%	7.3%	8.8%
Hyperlipidemia	8.3%	14.3%	12.4%
Arthritis	7.4%	10.8%	10.7%
Heart Disease	5.1%	4.8%	4.6%
Diabetes	4.1%	6.2%	6.5%
Cancer	3.3%	0.0%	4.1%
Asthma	3.1%	4.0%	4.2%

Source: Agency for Healthcare Research and Quality. Number of people with care in thousands by condition, United States, 1996-2015. Medical Expenditure Panel Survey. Generated interactively: Mon Aug 05 2019

To start to understand the factors associated with the slower growth in per person spending, we separately calculate the impact of changes in prices paid to providers (referred to as “price effect” in Table 4) and the impact of changes in the utilization of health care services (referred to as “use effect”). Table 4 reports changes in the 2006-2010 time period and the 2011-2015 time period relative to the 2000-2005 time period. For six of the eight conditions examined, spending per case by condition either decreased or was constant in the 2011-2015 time period compared with the 2000-2005 time period. While a similar pattern was observed in the 2006-2010 time period, the magnitude of the decreases in the six conditions was larger in the latter time period. In general, these decreases appear to have been fueled by a decrease in the use of services—for most of the conditions examined, the use of services decreased in the 2011-2015 time period. These decreases were larger than those observed in the 2006-2010 time period.

The only exception was the treatment of cancer services, for which the impact of utilization (use effect) was 29 percent.

Table 4. Percent Change in Private Health Insurance Spending per Case Treated Relative to 2000-2005						
	2006 – 2010			2011 – 2015		
Condition	**Total Change**	**Price Effect**	**Use Effect**	**Total Change**	**Price Effect**	**Use Effect**
Cancer	41.2%	21.5%	19.7%	69.4%	40.6%	28.8%
Diabetes	17.8%	-17.8%	0.0%	32.7%	-32.7%	0.0%
Asthma	17.8%	17.8%	0.0%	14.8%	27.1%	-12.3%
Pulmonary Disease	8.9%	16.3%	-7.4%	0.0%*	22.0%	-22.0%
Hyperlipidemia	0.0%*	14.1%	-14.1%	-40.5%	13.8%	-54.3%
Heart Disease	0.0%*	13.0%	-13.0%	0.0%*	26.6%	-26.6%
Back Problems	0.0%*	10.1%	-10.1%	0.0%*	21.2%	-21.2%
Arthritis	0.0%*	15.2%	-15.2%	6.9%	25.3%	-18.4%
Depression	-5.9%	14.0%	-19.9%	-34.1%	29.6%	-49.5%
Hypertension	-22.2%	11.6%	-33.8%	-47.7%	12.3%	-60.0%
Medical Sector Price Increase		14.3%			23.4%	

* *The net estimated growth was small and not statistically significant; hence, we cannot report growth different from 0.0 percent. There was, however, statistically significant growth in prices, and with overall growth of 0.0 percent, the use effect had to exactly offset that price effect.*

Next, we calculated the impact of obesity on growth in spending, overall and by condition. According to the MEPS data, 13 percent of privately insured adults were obese in 1987 compared to over 30 percent by 2015. The rise in obesity is associated with growing prevalence of several expensive chronic conditions such as depression, Type 2 diabetes, heart disease and arthritis, and this growing prevalence of chronic disease has, in turn, led to increased health care spending over time.

Overall, the increase in obesity accounted for 8.6 percent of the growth in per capita private insurance spending from 1987 to 2015 (Table 5). Over the most recent period (2008-2015), the growth in obesity (from 28 to nearly 31 percent) was associated with nearly 5 percent of the growth in private insurance spending.

Table 5. Contribution of Obesity to Increases in per Spending Privately Insured Adults Overall and by Condition, 1987–2015			
	Year		
Condition	**1987 – 2015**	**2000 – 2015**	**2008 – 2015**
Total Private Insurance	8.6%	4.5%	4.8%
Mental Health	12.2%	9.1%	10.7%
Hypertension	95%	78%	28%
Hyperlipidemia	20%	18%	5%
Diabetes	39%	21%	20%
Arthritis	23%	11%	33%
Source: *Tabulations from the 1987 National Medical Expenditure Survey and 2000, 2008, 2015 Medical Expenditure Panel Survey*			

The role that obesity assumes in driving spending growth varies by different chronic conditions. Depending on the time period, rising rates of obesity accounted for 9 to 12 percent of the growth in spending on mental health care. Not surprisingly, obesity has played an even bigger role in the growth in spending on diabetes. Between 1987 and 2015, the growth in obesity prevalence accounted for nearly 40 percent of the growth in spending on diabetes. More recently, obesity accounted for 20 percent of the growth in diabetes spending. Between 1987 and 2015, obesity accounted for nearly all of the growth in spending on hypertension and approximately 20 percent of the growth in spending for hyperlipidemia and arthritis.

We now examine trends in real (holding the price effect constant) private insurance spending per insured adult between 2000 and 2015 (Table 6). Overall, the growth in per capita spending increased $644 between the 2000-2005 time period and the 2006-2010 time period and then decelerated, growing by $495 going from the 2006-2010 time period to the 2011-2015 time period. Spending per case treated fell for seven of the top 10 chronic health conditions examined. Only treatment for cancer, pulmonary disease and diabetes showed an increase in spending after 2011.

The decline in the cost of treating hypertension, hyperlipidemia and heart disease in the 2011-2015 time period relative to the previous five-year period contributed significantly to the slower growth in real spending. While our earlier table showed how the prevalence of depression contributed to the growth in spending, the increase in spending to treat depression and other mental health disorders, in general, fell sharply by the 2011-2015 period (increasing by $9 billion) compared to the change (nearly $32 billion) in 2000-2005 to 2006-2010.

Table 6. Trends in Real Private Health Insurance Spending for Adults with Key Chronic Health Conditions (in $ billions)			
Condition	**2000 – 2005 To 2006 – 2010**	**2006 – 2010 To 2011 – 2015**	**2000 – 2005 To 2011 – 2015**
Overall	$644	$495	$1,139
Mental Health Disorders	$31.8	$9.4	$41.2
Hypertension	$18.1	-$18.0	$0
Hyperlipidemia	$42.4	-$7.5	$34.9
Heart Disease	$8.2	-$34	-$25.8
Diabetes	$38.6	$76.3	$114.9
Cancer	$18.8	$59.2	$78
Back Problems	$33.4	$6.5	$39.9
Pulmonary Disease	$8.6	$30.8	$35.4
Asthma	$15.5	$6.7	$22.2
Arthritis	$560	$190	$750
Total Condition Change	$775.4	$319.4	$1,090
Source: *Tabulations from The Medical Expenditure Panel Survey 2000 – 2015.*			

Segmenting spending by type of care, spending on hospital care and prescription drugs each declined in the 2011-2015 time period for four of the conditions examined (Table 7). For example, the use of hospital care to treat heart disease decreased sharply starting in the 2006-2010 time period ($200 per case less than in 2000-2005) and fell even further (an additional $149) in the 2011-2015 time period compared to the previous five-year period. Spending on prescription drugs also decreased over time for several diseases, including the treatment of mental disorders and cardiovascular disease. Spending for four conditions fell in the last time period relative to the 2006-2010 time period, including depression ($177 per case lower), hypertension ($113 per case lower), hyperlipidemia ($180 per case lower) and back problems ($11 per case lower).

Table 7. Change in Real Spending per Treated Case, among those with Private Health Insurance, by Medical Condition, (Comparing Spending in 2006-2015, with Spending in 2000-2005)								
	Hospital*		**Office–Based**		**Prescription Drugs**		**Total**	
Condition	2006 - 2010	2011 - 2015	2006 - 2010	2011 - 2015	2006 - 2010	2011 - 2015	2006 - 2010	2011 - 2016
Depression	-$30	$1	-$22	$10	$160	-$177	$102	-$146
Hypertension	-$7	-$17	-$12	-$10	-$105	-$113	-$114	-$136
Heart Disease	-$200	-$149	$82	$19	-$45	$1	-$71	-$183
Hyperlipidemia	$1	-$14	-$1	-$14	$3	-$180	$3	-$163
Diabetes	$76	$31	$49	$31	$290	$614	$425	$665
Cancer	$72	-$278	$1,107	-$706	$272	$233	$1,446	-$753
Back Problems	$27	$28	$72	-$39	-$6	-$11	$60	$5

Pulmonary Disease	$57	$148	$71	$21	$13	$25	$166	$204
Asthma	-$30	$36	$11	-$10	$166	$102	$354	$109
Arthritis	$354	-$229	$134	$102	$66	$310	$560	$190

Source: Tabulations from the Medical Expenditure Panel Survey, 2000-2015

Note: * Includes inpatient and outpatient hospital

What accounts for the decrease in drug spending for these conditions? One explanation is the large number of drug patent expirations in recent years. Between 2009 and 2015, nearly $50 billion worth of brand medications prescribed in treating mental disorders, cardiovascular disease and other chronic conditions lost their patents (Table 8). Two disease areas—mental disorders and cardiovascular disease—had some of the biggest selling medications that came off patent. Drug sales were nearly $8 billion lower between 2011 and 2012 for the cholesterol medications. By 2012, brand drugs to treat hyperlipidemia (Lipitor) and other cardiovascular diseases had declined by $14 billion. Declining prices for medicines also could have played a role in the slowdown in hospital spending—lower prices lead to improved adherence to prescriptions, which, in turn, might have helped prevent unnecessary hospitalizations.

Table 8. Impact of Key Patent Expiration on Drug Spending, 2009–2015, In Year of Patent Expiration (Billions)

Therapeutic Class and Medication	Year of Patent Expiration	Change in Sales Year Before and After Patent Expiration
Mental Disorder		
Cymbalta	2013	$5.1
Abilify	2015	$4.6*
Seroquel	2011	$3.4
Zyprexa	2011	$2.9
Concerta	2011	$1.4
Total	---	$17.4
Cardiovascular Disease		
Lipitor	2011	$7.4
Plavix	2011	$6.6
Total	---	$14
Other		
Singulair	2012	$4.4
Prevacid	2009	$3.3
Actos	2012	$3.3
Symbicort	2009	$3.1
Celebrex	2014	$2.5
Total	---	$16.6
Overall Total	---	$48

Source: *Data from Data.com and verywellhealth.com*
*Worldwide sales

Similar trends were observed during the same period for the treatment of mental disorders. Overall, spending on brand medications used to treat mental disorders decreased by over $17 billion between 2011 and 2015. During this period, five major medications: Zyprexa, Concerta, Seroquel, Cymbalta and Abilify came off patent. Medications for a variety of other conditions coming off patent, including Prevacid, Singulair, Plavix and Actos, collectively accounted for nearly $17 billion in sales compared to the year before they went off patent.

Discussion

The growth in private insurance spending per adult was significantly lower in the 2011-2015 period compared to earlier years. For several conditions, the growth in prevalence and the role played by rising rates of obesity remain a challenge to the longer-term growth of spending on health care services and medicines and the growth of private insurance premiums. While earlier work has examined the role played by structural changes in how we pay and deliver health care services, we drill down to the condition level to see where the changes are occurring. Substantial reductions in hospital and prescription drug spending starting after 2005 and accelerating starting in 2011 have played a role in the slower growth in private insurance spending. Part of this slower rate of growth is traced to nearly $50 billion worth of brand prescription drugs that came off patent starting in 2009 and peaking in 2012. Two conditions appear to have contributed to the slower growth in private insurance spending over time—mental disorders and treatment for cardiovascular disease (including heart disease, hyperlipidemia, and hypertension). These findings are similar to those explaining the slowdown in the growth in Medicare spending.[iv] Generic prescribing rates continue to rise over time as well, contributing to the slowdown in private insurance spending.

Other factors not discussed in this paper may also account for the ongoing reduction in the growth in private insurance spending. In particular, value-based payments and delivery system innovations may also have contributed to the slower growth rate. The percent of private insurance revenue paid through these models is currently low, but it is growing. Among large purchasers, approximately half of all revenue is now paid through a value-based arrangement.[v] Whether the ongoing transformation of our payment and delivery systems models will result in the continuation of these downward trends will be important to track over time.

APPENDIX

The Medical Expenditure Panel Survey

The Medical Expenditure Panel Survey (MEPS) tracks individual and household demographic, socioeconomic and health-related characteristics, providing a nationally representative sample of the U.S. civilian noninstitutionalized population (the study population of inference). The sampling frame is drawn from respondents to the National Health Interview Survey, which is conducted by the National Center for Health Statistics. The MEPS collects data from a nationally representative sample of households through an overlapping panel design. A new panel of sample households is selected each year, and data for each panel are collected for two calendar years. The two years of data for each panel are collected in five rounds of interviews that take place over a 2.5 year period. This provides continuous and current estimates of health care expenditures at both the person and household level for two panels for each calendar year. To provide estimates that are representative of a national U.S. population, the MEPS-HC panels have oversampled subgroups of individuals such as Hispanics, African Americans, Asians, low-income households and those likely to incur high medical expenditures. At the time of the analysis, the most recent available file was for 2015.

For each of the conditions, we estimate condition-specific and total spending for patients with the specific condition and for total spending including the condition and all other medical events for the patient per year. There are several approaches for developing these condition-specific estimates when the patient has multiple chronic conditions.[vi] The first approach allocates all spending to the primary diagnosis listed as the reason for a provider visit. The alternative approach allocates spending across all conditions listed in the visit weighted by the estimated treatment costs for each condition. In this approach, total spending for each condition included all spending on health care events that occurred during a given calendar year and were directly related to treating the condition. In this report, we summed inpatient, outpatient, emergency department (ED), office-based, home health and prescription drug expenditures. When the health care event was associated with multiple conditions, the expenditures for that event were split in two ways: (1) evenly across the conditions; and (2) using the relative treatment costs of each of the conditions listed. In our statistical analysis, we attempted to control for this using measures of the number of additional conditions treated. Other approaches include decomposing spending throughout the year using regression analysis and, more recently, using propensity scores as another attribution method. Our claims-based approach, however, compares favorably to these other approaches.

While the MEPS surveys 30,000 households per year there may be some medical conditions with small sample sizes. We address this in three ways. First, we chose the most prevalent and expensive chronic conditions for the analysis. Second, we pooled 15 years of data (2000-2015) and grouped the data into three five-year periods.

The study examines condition-specific private health insurance spending between 2000 and 2015 for all adults. The empirical design estimates whether spending is lower in the 2010-2015 period compared to the earlier time periods. In addition, we attempt to understand some of

the factors that account for changes in condition-level spending over time. We estimate how much of the change is due to changes in price and the use of services (intensity and mix of services). We also examine measures of changes in how services are delivered, which are outlined below.

Methods

We decomposed the change in spending by privately insured patients into the rise in the prevalence of treated disease, spending per case treated, and the increase in covered lives.[vii] This was done by evaluating the change in spending that would be generated by the observed changes in one of these components, leaving the others constant. Total expenditures for a particular disease in any time period (2000-2005, 2006-2010, or 2011-2015) is the product of cost per case in that time period, treated prevalence in that time period, and the population in that time period. Change in total expenditures in the 2011-2015 time period (or the 2006-2010 time period) compared with the 2000-2005 time period can be further decomposed as follows, holding population growth constant:

$$E_{2\_}E_1 = (CPC_2 - CPC_1) \times TPV_1 + (TPV_2 - TPV_1) \times CPC_1 + (CPC_2 - CPC_1) \times (TPV_2 - TPV_1),$$

Where E_i is total cost in time period *i*, CPC_i is cost per treated case in time period *i*, and TPV_i is treated prevalence in time period *i*.

We also estimate the role that rising prices and the quantity of services provided has played in the change in private health insurance spending. Our estimates of the impact of price and utilization of services relies on two regression models. For both models, the dependent variable is the log of condition-specific spending (pooled over the 15 years) for each of the conditions listed above. The models control for patient demographics and region of country (age, body mass index, number of comorbid conditions and income as percent of poverty) and year dummies for 2006-2010 and 2011-2015.

The coefficients on the dummy variables would estimate the change in real spending relative to 2000-2005. The first regression model estimates yearly spending per condition over time in nominal dollars ,and the second regression model controls for changes in medical sector prices over time (real spending) using the personal health care (PCE) deflator developed by CMS.[viii] Estimating the change in per condition spending over time, using nominal dollars, measures both changes in price and use of services. Estimates from the real spending regressions hold industry prices constant with the PCE measuring changes in the use and intensity of services. Differences between the two regressions provide an estimate of the role of price changes over time.

We further break this down by looking at the impact that rising rates of obesity, increased treatment intensity and their combined impact have had on the growth in private insurance spending.[ix] To evaluate the contribution of rising obesity rates and changes in the relative

spending of underweight, normal-weight, obese and seriously obese people, we decomposed the actual per capita spending increase between 1987, 2001 and 2015 into a portion attributable to these factors and a portion attributable to other causes. The decomposition was performed by computing a "counterfactual" per capita spending level equal to what per capita spending would have been in 2015 if obesity rates and relative per capita spending levels by weight category had remained unchanged from 1987 levels. Using this counterfactual level, we then computed how much per capita spending levels would have increased if none of these factors had changed and compared it with the actual spending increase, thus deriving an "obesity-attributable" share of spending growth.

Once these bigger picture estimates are presented, we drill down by estimating changes in spending over time by site of care (hospital, prescription drugs) by condition. The results show a decrease in both nominal and inflation adjusted premiums between 2000 and 2015 that have persisted into 2018. The condition-level analysis will provide insight into where the reductions in private insurance spending are occurring.

---

[i] J. Vistnes, T. Seldon, A. Zawacki. "Several Factors Responsible for the Recent Slowdown in Premium Growth in Employer-Sponsored Insurance." Hlth Aff. 34(12) 2015: 2036-2043.
[ii] Accessed from: http://files.kff.org/attachment/Report-Employer-Health-Benefits-Annual-Survey-2018.
[iii] Accessed from: https://www.healthaffairs.org/doi/10.1377/hlthaff.2012.1297.
[iv] D Cutler, et al. "Explaining the Slowdown in the Medical Spending Growth Among the Elderly 1999-2012." Hlth Aff. 38(2) (2019): 222-229.
[v] https://healthpayerintelligence.com/news/47-of-payer-provider-business-tied-to-value-based-care.

[vi] David Cutler, et al. "Attributing Medical Spending to Conditions: A Comparison of Methods. NBER Working Paper No. 25233. Cambridge Mass. November 2018.
[vii] K Thorpe et al. "The Rising Prevalence of Treated Disease: Effects on Private Insurance Spending." Hlth Aff. July 2005.
[viii] Accessed from: https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/NHE-Deflator.pdf . The PCE health deflator adjusts for general medical price changes and is the recommended index for health care prices, see Dunn A. Grosse S, Zuvekas S. "Adjusting Health Expenditures for Inflation: A Review of Measures for Health Services in the United States: 2016 Health Services Research 53(1):175-196.
[ix] KE Thorpe and M. Philyaw. "The Medicalization of Chronic Disease and Costs" Annu. Rev. Public Health 33, (2012): 409-423.