RESEARCH BRIEF

The nation's most experienced provider of workers compensation information, tools, and services

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MEDICAL PRICE INDEX FOR WORKERS COMPENSATION

"Medical costs are the tapeworm of American economic competitiveness." Warren Buffett[1]

INTRODUCTION

Medical expenditure in the United States has been an increasingly complex and intriguing topic of interest with ramifications to every business entity. As medical expenditure approaches the 20% mark of the US gross domestic product, and by far exceeds other industrialized nations in that measure, the growth rate of medical costs becomes of even greater relevance. Whereas workers compensation indemnifies injured workers for their resulting disability from workplace injuries, the medical benefit costs associated with treating injured workers have taken on a progressively more prominent role, partly resulting from faster inflationary trends in medical prices as compared to wages.

There are multiple measures of price inflation for commodities and services. The US Bureau of Labor Statistics (BLS) provides an abundance of price indexes that can be as general as the US Consumer Price Index (CPI) for all items, to the CPI for Medical Care (CPI-M) with several subcategories for services such as physicians' services, hospital inpatient services, and prescription drugs. Economic forecasters and others use several indexes to project medical price inflation. In this paper, we explore some of the indexes as they relate to the workers compensation industry, and reflect on alternative uses of these indexes. We consider differences between the CPI-M and the Producer Price Index by Commodity for Health Care Services (PPI-HC), and compare these to the Chain-Weighted Personal Healthcare (CW-PHC) index, a blend of CPI and PPI indexes for medical subcategories, as a measure of medical price inflation.

KEY FINDINGS

- The CW-PHC closely mirrors the mix of medical services experienced in workers compensation (WC)
- A comparison of the CPI-M for subcategories to corresponding PPI-HC indexes illustrates the lower inflationary measure experienced by the PPI-HC, most notably for hospital services
- Because the CW-PHC, a blend of CPI and PPI indexes for medical subcategories, is a "chain-weighted" index, it can approximate year-over-year changes that reflect an evolving mix of services, especially as people alter their utilization of medical and prescription services
- One property of chain-weighted price indexes is that they exhibit a lower inflation rate than standard inflation rates as substitutions are made over time to purchase fewer goods that are experiencing more rapid price growth
- From 2010 to 2016, the CPI-M has grown 19%, the PPI-HC has grown 10%, and the CW-PHC has grown 9%
- To measure changes in the medical prices paid in WC, the PPI commodity family of individual price indexes and the CW-PHC are more appropriate price indexes than the CPI family
- The CW-PHC is the medical price deflator of choice to infer the share of medical cost changes in WC that is caused by medical price inflation and that which is due to changes in claim mix and utilization or intensity of medical services

[1] www.fortune.com/2017/05/07/warren-buffett-gop-health-care-bill/

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THE US CPI

The **Consumer Price Indexes** (CPI) program produces data on changes in the prices paid by consumers for a representative basket of goods and services. The CPI measures inflation at the place of service level (for example, the pharmacy where a prescription drug is sold or the physician's office where a medical visit takes place), and reflects the average price change over time for a constant quality, constant quantity market basket of goods and services. It generally represents what individual consumers spend out of pocket on goods and services, either directly or through an indirect financial instrument such as a health insurance policy, used for daily living. Therefore, medical care CPIs are limited to items with an out-of-pocket expenditure. In the case of medical care, the term "out of pocket" includes any health insurance premium amounts that are deducted from employee paychecks.

The CPI has 38 geographic areas and 211 categories (referred to as item-strata). It is calculated in two main steps:

1. *Basic* indexes are calculated for each of the 8018 (8018 = 38 x 211) CPI item-area combinations
2. *Aggregate* indexes are calculated by averaging subsets of the basic indexes, using weights that are derived from the Consumer Expenditure Survey (CE), and updated every two years

A primary use of the CPI is to adjust income and expenditure streams for changes in the cost of living. One example may be to measure how the price paid by consumers for a basket of physician services changes over time. Consumers do not directly bear the burden for workers compensation (WC) claims. Similarly, consumers do not bear the burden of other commercial liabilities such as general or product liability. Payments for medical services resulting from such exposure would not be directly reflected in the CPI measure. While Medicare and group health plan payments to medical service providers would be reflected in the CPI as well as any out-of-pocket copays, payments from Medicaid would not.[2] This is because an individual consumer is not directly responsible for any part of the Medicaid program or payments.

THE US PPI

The **Producer Price Index** (PPI) is a measure of the price of a commodity or service from the producer's perspective. In the case of medical service providers, these are amounts that physicians or hospitals are paid for the services they provide. The BLS produces PPI price indexes for some 500 industries, producing more than 7,000 indexes for specific products, over 3,000 indexes for commodity prices, and almost 1,000 indexes for services.

As described on the PPI home page of the BLS[3]:

- The PPI sample includes over 25,000 establishments providing approximately 100,000 price quotations per month for products specified through a process called *disaggregation*
- Establishments are selected for the PPI survey via systematic sampling of a list of all firms in the industry
- Participation by firms is completely voluntary
- Participating establishments report price data through mail or fax
- Goods and services included in the PPI are weighted by value-of-shipments data contained in the 2007 economic censuses
- Industries and products undergo systematic resampling as needed, to account for changing market conditions

A primary use of the PPI is to deflate revenue streams to measure real growth in output. One example may be to deflate dollars paid to a physician's office over time, to measure the amount of services provided, thus arriving at a measure of the change in utilization and intensity of services over time.

The PPI-HC includes medical services that are paid for by third parties such as employers or the federal government. Any payments made by WC insurers or employers, payments by governmental agencies such as state payments for Medicaid-covered services, or CMS payments for Medicare services as well as any out-of-pocket payments (copays or deductibles) are included. Health insurance premiums are not included since they are not paid to healthcare providers.

CPI-PPI COMPARISONS

The CPI-M and PPI-HC differ in the services that they cover, the payers who pay for the services provided, and the weights for the underlying categories of payments (physicians, hospitals, etc.). The BLS provides ample information on the

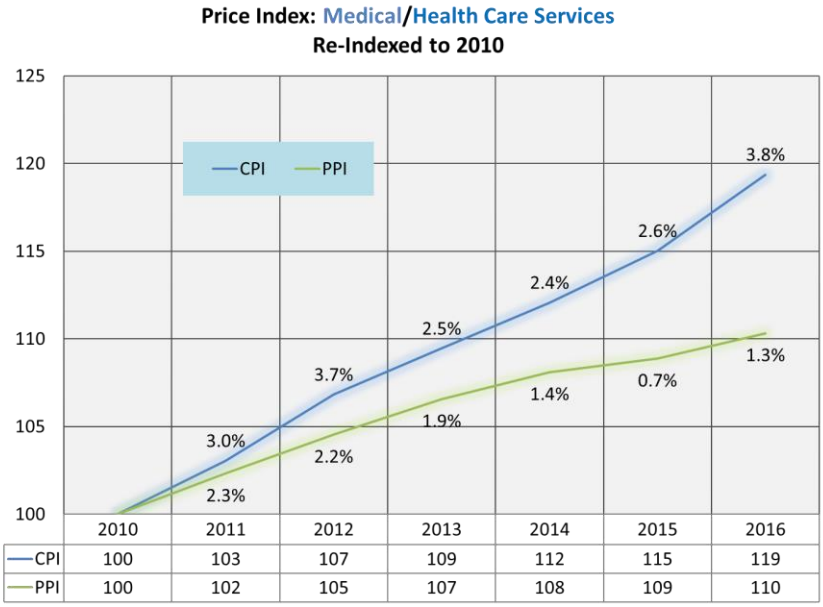
[2] Additional nuances of what is and isn't included can be found in the BLS's comparison of methodologies at www.bls.gov/ppi/ppicppi.htm

[3] www.bls.gov/ppi/ppiover.htm#source

differences. The overall resulting price indexes and the associated indexes for subcategories of health services, therefore, exhibit different patterns.

The two price index families provide starkly different cumulative growth rates over time. Chart 1 shows the annual growth rate for each of the CPI-M and PPI-HC for 2011 through 2016. Since 2010, CPI-M has grown by 19% (2.9% annually), whereas the PPI-HC has grown 10% (1.6% annually). The difference in annual growth rates (AGRs) is more prominent in 2015 and 2016 than in earlier years.

Chart 1



	2010	2011	2012	2013	2014	2015	2016
CPI	100	103	107	109	112	115	119
PPI	100	102	105	107	108	109	110

Source: Bureau of Labor Statistics

Subcategories of medical services such as professional or hospital services exhibit similar differences between the CPI family and the PPI family of price indexes (see the Appendix for additional details.) The largest difference between the CPI and PPI price series is for hospital prices. This appears to be due to the sampling and measurement of prices from conceptually similar populations. The PPI's measurement more closely resembles prices paid by workers compensation. For other medical cost categories, there are not necessarily comparable indexes. For example, for prescription drugs the CPI reflects the transaction price received by the pharmacy for physician-prescribed prescription and nonprescription drugs. The corresponding PPI for pharmaceutical preparations reflects the manufacturer's first transaction price. As such, the PPI does not closely correspond to the retail price for that commodity. Thus, for prescription drug experience, the CPI remains the most dependable price index for use in WC, reflecting changes in prices for consumers and others.

THE NHE AND THE PHC

The price of medical services is only one component of how much society spends on healthcare. Neither the CPI-M or PPI-HC provides the change in medical expenditure over time. **National Health Expenditures** (NHE) in the United States include all spending related to the purchase of healthcare goods and services during the year and the amount invested to provide future health services. Differences in the AGRs of the NHE over time reflect trends in the factors that drive healthcare spending, including:

- Technological developments
- Demographic changes (age and sex composition of the population)
- Changes in the use and mix (or intensity) of healthcare services
- Changes in prices for healthcare goods and services

The NHE has traditionally been reported in nominal terms (current dollars) and has not been adjusted to remove the impact of changes in healthcare prices (to produce constant or real dollars). In 2011, the Office of the Actuary at the Centers for Medicare and Medicaid Services (CMS) released a new chain-weighted NHE price deflator with the publication of the 2011 NHE Accounts (NHEA). The chain-weighted NHE price deflator allows for the analysis of total health spending in real terms.

It uses a wide range of detailed price indexes from the Bureau of Labor Statistics' CPI and PPI programs. The NHE Price Index, or NHE Deflator, is an aggregate price index. As the *National Health Expenditure Accounts Methodology Paper, 2015*[4] explains:

> The chain-weight method used in the NHE deflator attempts to control for any aggregation bias by using a Fisher Ideal formulation. The Fisher Ideal index formulation reflects the geometric mean of a Laspeyres index, which uses a prior period quantity weights, and a Paasche index, which uses the current period quantity weights.

In other words, the "chain-weighted" index can approximate year-over-year changes that reflect an evolving mix of services, especially as people change their utilization of medical and prescription services.

Healthcare expenditure represented by the NHE can be divided into two major components:

- **Personal Healthcare (PHC)**—Measures the total amount spent to treat individuals with specific medical conditions and includes 10 categories of goods and services such as hospital care, physician and clinical services, and retail prescription drugs
- **Non-PHC**—Includes government administration, the net cost of private health insurance, government public health activity, investment in research, and investment in structures and equipment

The components of PHC can be deflated using specific price indexes from the BLS that are associated with the medical goods and services provided. However, estimation of prices for the non-PHC components of the NHE are more complicated because there may not be available price indexes for these types of health spending, as they typically don't involve market transactions made by an individual or on an individual's behalf.

The PHC deflator (or CW-PHC) is calculated as a chain-weighted price index for the various goods and services that account for PHC spending. The PHC components make up 84% of the Nominal Share of NHE (see Table 2 in the Appendix for additional details). In developing the CW-PHC, weights are varied by year as part of the chain-weight calculation.

Table 1, adapted from CMS's *NHE Deflator—Intermediate Summary,*[5] shows the average annual growth in nominal and real PHC spending and growth in the chain-weighted PHC price index (CW-PHC). Note that 1990 data reflects average annual growth from 1980 to 1990. The table illustrates the use of the CW-PHC deflator to determine the change in personal healthcare spending net of price inflation over time, or in other terms, the change in utilization or intensity of services in personal healthcare spending. For example, for 2011,

PHC Real = (1.000 + PHC-Nominal) / (1.000 + CW-PHC) – 1.000
= (1.000 + 0.041) / (1.000 + 0.021) – 1.000
= 2.0%

Table 1: PHC–Average Annual Percent Change from Preceding Year shown for Nominal PHC Spending, Aggregate PHC Price Index, and Real PHC Spending[6]

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011	1960-2011
PHC—Nominal	11.0	6.6	8.3	7.4	6.8	6.3	6.1	5.0	5.0	3.7	4.1	9.4
CW-PHC	7.1	3.0	3.2	3.5	3.1	3.1	3.4	2.6	2.8	2.7	2.1	4.9
PHC—Real	3.7	3.5	4.9	3.7	3.6	3.2	2.6	2.4	2.2	1.0	2.0	4.2

Similarly, by using the CW-PHC, one can segregate the change in medical prices from the change in average medical severity in WC to observe changes in factors other than medical prices such as changes in WC claim mix and utilization or intensity of medical services. By breaking down the change in medical severity, one can gain better insight into medical cost drivers in WC, and thus understand and forecast medical cost trends.

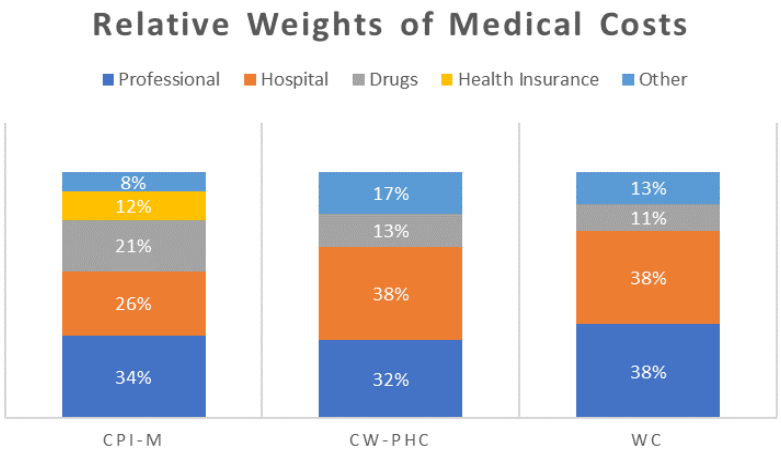
While medical inflation as measured by the CPI-M provides a perspective of changes in the price of medical services from a consumer's perspective, the PPI-HC relies on prices paid to service providers regardless of the type of payor—consumer or

[4] www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/dsm-15.pdf
[5] www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/NHE-Deflator.pdf
[6] Note that historical estimates of the CW-PHC may occasionally change slightly with subsequent releases

otherwise. The CW-PHC makes full use of the availability of the PPI indexes for professional services and hospitals, and further uses a chain-weighting mechanism that responds more readily to changes in the propensity to use certain services relative to others.

Chart 2 displays the relative weights underlying the CPI-M and the CW-PHC in comparison to the 2015 Service Year medical cost distribution of services in WC. Hospital weights of 38% in both the CW-PHC and in WC considerably exceed the weight of 26% afforded under the CPI-M. Both the CPI-M and the CW-PHC have slightly lower weight for professional services. The CW-PHC gives a comparable weight to drugs in WC, while the CPI-M provides almost double the weight observed in service year payments. Finally, the CPI-M has a provision for health insurance premiums while the CW-PHC does not. Clearly, the relative weights underlying the CW-PHC mirror more closely the medical cost distribution observed in WC.

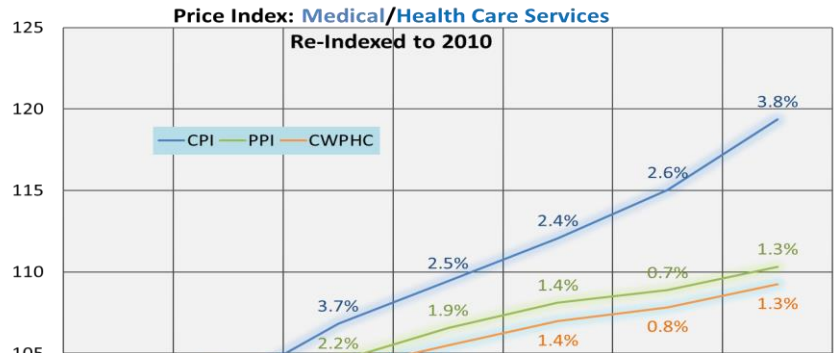
Chart 2



Source: Bureau of Labor Statistics, Centers for Medicare & Medicaid Services–Office of the Actuary, NCCI Medical Data Call.
Note that for WC we included the facility costs of Ambulatory Surgical Centers in the Hospital category.

Consequently, the CW-PHC is the medical price deflator of choice to infer the share of medical cost changes in WC that is caused by medical price inflation and that which is due to changes in claim mix and utilization or intensity of medical services.

Chart 3



	2010	2011	2012	2013	2014	2015	2016
CPI	100	103	107	109	112	115	119
PPI	100	102	105	107	108	109	110
CWPHC	100	102	104	105	107	108	109

Source: Bureau of Labor Statistics and Centers for Medicare & Medicaid Services–Office of the Actuary

Chart 3 compares the AGRs for each of the CPI-M, PPI-HC, and CW-PHC for 2011 through 2016.[7] Since 2010, the CW-PHC has followed closely changes in the PPI-HC with a growth rate of 9% over the period, considerably lower than the growth in the CPI-M of 19%. One property of chain-weighted price indexes is that they would exhibit a lower inflation rate than standard inflation rates if substitutions were made over time to purchase fewer goods that were experiencing more rapid price growth.

DIFFERENT INDEXES, DIFFERENT USES

Depending on the purpose of the analysis being conducted, different indexes may serve such purpose more closely.

If one wishes to measure changes in the prices paid to the service providers and deflate payments for medical services in WC to deduce changes in utilization. For example, the PPI commodity family of individual price indexes and the CW-PHC are more appropriate measures than the CPI-M. The **State of the Line Report** at NCCI's ***Annual Issues Symposium (AIS) 2017*** illustrates the use of the CW-PHC at an aggregate level, separating medical inflation from other changes impacting WC medical severity changes.

WC is a long-tail line of insurance with claims extending far into the future. Price inflation forecasts thus play a starring role in expected costs of medical services and, thereby, any pricing models. Similarly, predictive models of claims can use assumptions regarding medical price inflation to determine the potential cost benefit of settling a claim or the cost of future medical services.

One example where using the PPI is a more suitable price deflator than the CPI is when calculating the cost impact of an implementation of or a change in a medical fee schedule in WC. Typically, the experience used to calculate the price impact of a change in fee schedules is a year or two prior to the time when the change will take place. Thus, projecting historical medical payments to that future point in time requires some inflationary estimate for the historical payments underlying the calculation. Similarly, conducting a post-reform analysis subsequent to a fee schedule change would also more appropriately use the PPI family or CW-PHC to compare emerged experience to the expected change in medical prices.

The PHC can also be used to compare medical severity in WC to the per capita personal healthcare spending, as was shared at NCCI's ***AIS 2017*** during the "Research Focus on Medical Cost Drivers" session.

CLOSING REMARKS

Medical inflation is of interest to all stakeholders in WC. The PHC can arm carriers with more accurate and valuable information that they can then use to help determine rates, develop predictive models, and assist in negotiations with provider networks and pharmacy benefit managers (PBMs). It can also help better prepare carriers to determine reserves needed for long-tailed claims and to develop an economic outlook.

For regulators, the PHC provides a better measurement of year-over-year changes in price within a state and at the macro level. It can also help track fee schedule adequacy, ensuring that it is keeping up with inflation, to guarantee access to care. Ultimately, this method will provide a better understanding of why WC loss costs need to change over time.

The PHC better serves employers, too, by showing why the loss costs/rates might change from one year to the next.

[7] The 2016 CW-PHC is projected by the Office of the Actuary at CMS

ACKNOWLEDGMENTS

Many thanks to Len Herk from NCCI's Actuarial & Economic Services Division, for valuable contributions to this study.

REFERENCES

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[2] Comparing the Producer Price Index for Personal Consumption with the United States. All Items CPI for All Urban Consumers www.bls.gov/ppi/ppicpippi.htm

[3] Measuring Price Change for Medical Care in the CPI www.bls.gov/cpi/cpifact4.htm

[4] National Health Expenditure Projections, 2015–25: Economy, Prices, and Aging, Joseph M. Lizonitz, Andrew J. Madison, Devin A. Stone, Christian J. Wolfe, Sean P. Keehan, John A. Poisal, Gigi A. Cuckler, Andrea M. Sisko, Sheila D. Smith content.healthaffairs.org/content/early/2016/07/12/hlthaff.2016.0459

DETAILED DESCRIPTION OF DATA SOURCES USED IN THIS STUDY

Personal Healthcare Spending per Capita

Personal Healthcare Spending included in National Health Expenditure Data as published by CMS and available at www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html. Personal Healthcare includes professional services, hospital care, prescription drugs, durable medical equipment, and other nondurable medical products

National Health Expenditure Data, Historical (Includes CW-PHC Price Index)

Multiple tables www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html

Consumer Price Index: Relative Importance of Components in the Consumer Price Indexes

Table 1 (2013–2014 Weights) www.bls.gov/cpi/relative-importance-2016.txt

BLS series used are the following:

Medical Service Category	CPI Series ID	PPI Series ID
Medical/Healthcare	CUUR0000SAM	WPU51
Professional/Physician	CUUR0000SEMC	WPU511101
Hospital Outpatient	CUUR0000SS5703	WPU511104
Hospital Inpatient	CUUR0000SS5702	WPU512101
Prescription Drugs	CUUR0000SEMF01	WPU063

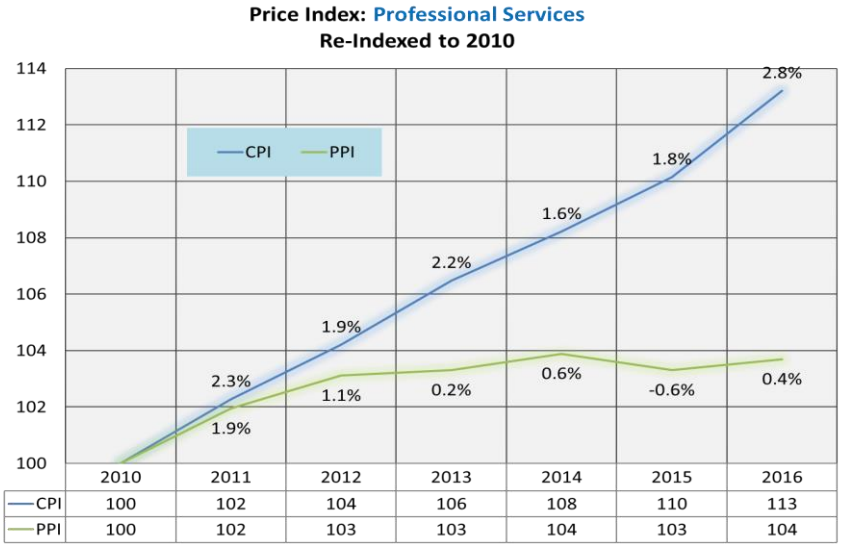
CPI series: www.bls.gov/cpi/

PPI series: www.bls.gov/ppi/

APPENDIX

From NCCI's Medical Data Call, we observe that physician or professional services encompass almost 40% of payments in a calendar year's WC medical spending. Chart 4 shows the AGR for the corresponding CPI and PPI for 2011 through 2016. Since 2010, the CPI for physician (professional) services has grown by 13% (2.1% annually), whereas the PPI has grown 4% (0.7% annually). The difference in annual growth rates (AGRs) was more pronounced in 2015 and 2016 than in earlier years.

Chart 4

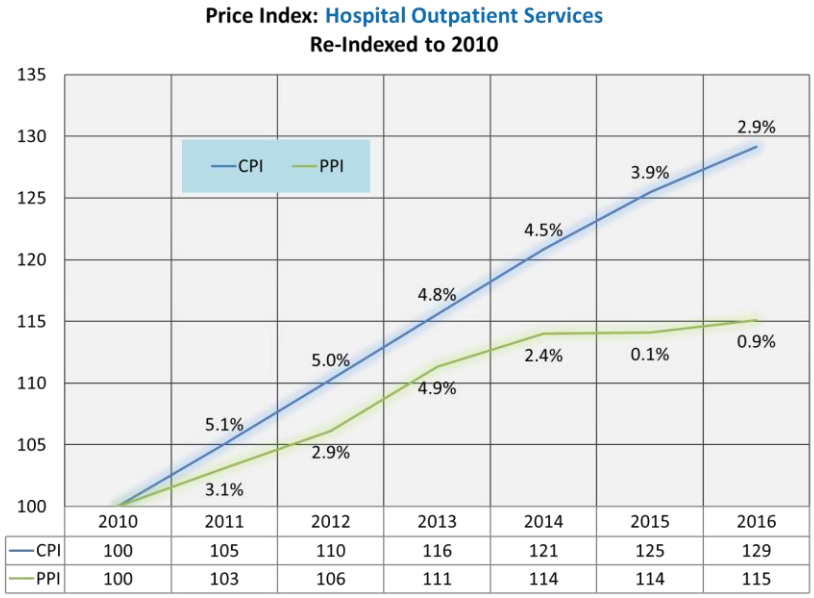


	2010	2011	2012	2013	2014	2015	2016
CPI	100	102	104	106	108	110	113
PPI	100	102	103	103	104	103	104

Source: Bureau of Labor Statistics

From NCCI's Medical Data Call, we observe that hospital outpatient services comprise about 18% of payments in a calendar year's WC medical spending. Chart 5 shows the AGR for the corresponding CPI and PPI for 2011 through 2016. Since 2010, the CPI for hospital outpatient services has grown by 29% (4.3% annually), whereas the PPI has grown 15% (2.4% annually). Except for 2013, where both measures reflect roughly the same AGR, the difference in AGRs is consistently 2% and beyond across the years.

Chart 5

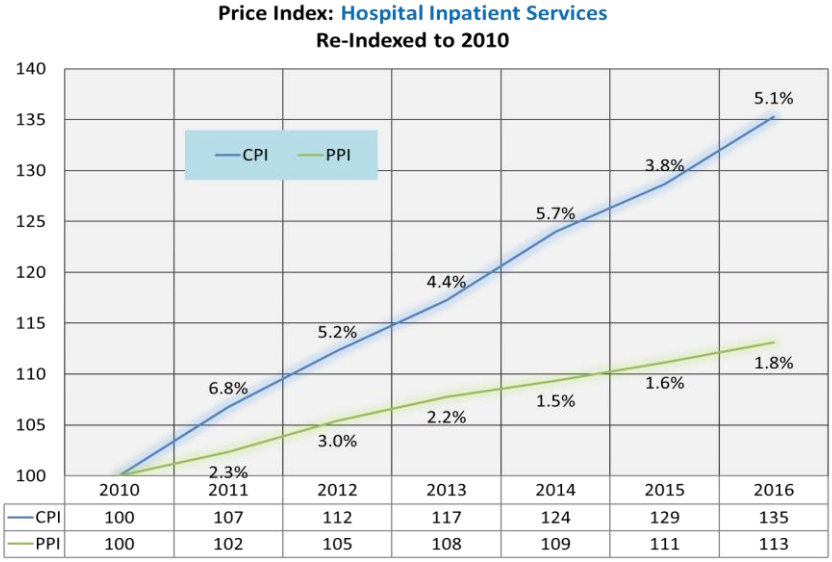


	2010	2011	2012	2013	2014	2015	2016
CPI	100	105	110	116	121	125	129
PPI	100	103	106	111	114	114	115

Source: Bureau of Labor Statistics

From NCCI's Medical Data Call, we observe that hospital inpatient services comprise about 13% of payments in a calendar year's WC medical spending. Chart 6 shows the AGR for the corresponding CPI and PPI for 2011 through 2016. Since 2010, the CPI for hospital inpatient services has grown by 35% (7.0% annually), whereas the PPI has grown 13% (2.1% annually). The two measures reflect widely differing growth rates across the years, generating the most significant difference among medical service categories.

Chart 6



	2010	2011	2012	2013	2014	2015	2016
CPI	100	107	112	117	124	129	135
PPI	100	102	105	108	109	111	113

Source: Bureau of Labor Statistics

Table 2: PHC Spending Components, Nominal Share of NHE, and Associated Price Proxies		
Sub-aggregate	**Nominal Share of 2011 NHE**	**Price Series**
Hospital Care	31%	PPI, hospitals
Physician & Clinical	20%	Composite Index: • PPI, offices of physicians • PPI, medical and diagnostic laboratories
Other Professional Services	3%	CPI, services by other medical professionals
Dental Services	4%	CPI, dental services
Other Health, Residential, and Personal Care Services	5%	Composite Index: • CPI physician services • CPI care of invalids and elderly at home • CPI All Items • PPI residential intellectual disability[8] facilities
Home Health Care	3%	PPI, home health care services
Nursing Home Care	6%	PPI, nursing care facilities
Prescription Drugs	10%	CPI, prescription drugs
Other Non-Durable	2%	CPI, non-prescription drugs

[8] A term in this document has been updated in accordance with Rosa's Law (2010), which replaced "mental retardation" with "intellectual disability" in federal usage.

Durable Medical Products	1%	Composite Index: • CPI, eyeglasses and eye care • CPI, medical equipment and supplies