NHE DEFLATOR—INTERMEDIATE SUMMARY

National Health Expenditures

National Health Expenditures (NHE) in the United States include all spending related to the purchase of health care goods and services during the year and the amount invested to procure future health services.[1] Historically, U.S. health care spending has grown faster than most other sectors of the economy. Differences in the annual growth rates of the NHE reflect trends in the factors that drive health care spending, including:

1. Increases in technological developments
2. Changes in the age and sex composition of the population (demographic effect)
3. Changes in the use and mix (or intensity) of health care services
4. Changes in prices for health care goods and services

The NHE has traditionally been reported in nominal terms (current dollar) and has not been adjusted to remove the impact of changes in health care prices (constant or real dollars). Although a price index for Personal Health Care (PHC) goods and services has been available for many years, there has not been, until now, a corresponding price index for the aggregate NHE. The Office of the Actuary in the Centers for Medicare and Medicaid Services (CMS) released its new chain-weighted NHE price deflator with the publication of the 2011 NHE Accounts (NHEA). The new chain-weighted NHE price deflator, which is available for 2004 – 2011, allows for the analysis of total health spending in real terms. Real estimates of health sending can now be compared to trends in underlying non-price factors such as population, utilization, intensity, mix of goods and services, and demographics. This document briefly describes the method used to develop the chain-weighted NHE price deflator.

NHE Deflator Calculation

The NHE price deflator is a chain-weighted index that uses a wide range of detailed price indexes from the Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) and Producer Price Index (PPI) programs. The NHE Deflator is an aggregate price index; therefore, it's critical that it not capture the biases that can occur when aggregating individual price indexes. The chain-weighted 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 prior period quantity weights, and a Paasche index, which uses current period quantity weights. As a result, chain-weighted price measures typically yield lower inflation rates than standard indexes (such as Laspeyres or Paasche) since substitutions are made over time to purchase less of the goods or services that experience faster price growth. Equation (1) below is the formulation of the NHE Deflator using a Fisher Ideal index, where the first term represents the Laspeyres price index change and the second term represents the Paasche rice index change:

$$(1)\quad P(NHE)_t = \sqrt{\left(\sum_i \frac{P^i{}_t Q^i{}_{t-1}}{P^i{}_{t-1} Q^i{}_{t-1}}\right) * \left(\sum_i \frac{P^i{}_t Q^i{}_t}{P^i{}_{t-1} Q^i{}_t}\right)}$$

t	= time period t
i	= NHE categories
$P(NHE)$	= NHE deflator
P^i	= Price index for category i
Q^i	= Quantity Index for category i

[1] For further information, see National Health Expenditure Accounts: Methodology Paper, 2011 [Definitions, Sources, and Methods] Page 6 "What are the National Health Expenditures?" http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/dsm-11.pdf

Chaining together the period-by-period changes in the NHE Deflator (i.e. the Fisher ideal formulation) ensures that compositional changes in the quantity weights are kept distinct from the price changes. Under the chain-weight method this occurs because the base period quantity weights for the Laspeyres formulation is always only one period prior to the base period quantity weights for the Paasche formulation. The chain-weighted percent change for period t+1 is determined as $P(NHE)_{t+1}/P(NHE)_t$, the percent change for period t+2 is determined as $P(NHE)_{t+2}/P(NHE)_{t+1}$, and so on. This chain-weighted method is the preferred index formulation used by the Bureau of Economic Analysis (BEA) when deflating the National Income and Product Accounts.

NHE Components

The NHE can be divided into two major components: PHC and Non- PHC. PHC measures the total amount spent to treat individuals with specific medical conditions and includes 10 categories of goods and services (Table 1) 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.

Table 1: NHE, PHC and Non-PHC categories

Sub-aggregate	Price Series Availability	Matches NHE Concept
Personal Health Care		
Hospital Care	Yes	Yes
Physician & Clinical	Yes	Yes
Other Professional Services	Yes	Yes
Dental Services	Yes	Yes
Other Health, Residential, and Personal Care Services	Yes	Yes
Home Health Care	Yes	Yes
Nursing Home Care	Yes	Yes
Prescription Drugs	Yes	Yes
Other Non-Durable	Yes	Yes
Durable Medical Products	Yes	Yes
Non-Personal Health Care		
Government Administration	No	No
Net Cost of Insurance	Yes	No
Government Public Health	No	No
Research	Yes	Yes
Structures and Equipment	Yes	Yes

In instances where price indexes aren't readily available (or the indexes do not match the NHE concept) for the Non-PHC components of NHE, we have constructed composite input price indexes that match the spending categories within each Non-PHC component. These new composite indexes, described in detail later, are used to deflate each Non-PHC component.

Personal Health Care

The PHC deflator is calculated as a chain-weighted price index for the various goods and services that account for PHC spending. Table 2 lists the detailed price series that are used for each component of PHC expenditures.

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 mental retardation 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
Durable Medical Products	1%	Composite Index: • CPI, eyeglasses and eye care • CPI, medical equipment and supplies
Total	84%	

CY2011 weights are shown in Table 2, but in formulating the NHE Deflator, weights are varied by year as part of the chain weight calculation.

Table 3 shows the average annual growth in nominal and real PHC spending and growth in the chain-weighted PHC price index.

Table 3: PHC–Average Annual Percent Change from Preceding Year shown for Nominal PHC Spending, Aggregate PHC Price Index, and Real PHC Spending

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
PHC—Chain Weighted Price Index	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

In Table 3, 1990 data reflects average annual growth from 1980 to 1990.

Non-Personal Health Care

Unlike the PHC deflator, where one price series is normally used to represent the pure price change associated with the entire category, the non-PHC categories are typically deflated by an input price index that represents the price increases associated with the expenses underlying the production of these categories (the notable exceptions are non-commercial research and structures and equipment). Because of the unique nature of the non-PHC categories, there are typically not publicly available price series for these categories, or those that are available do not adequately capture the concepts appropriate for the given non-PHC category. Instead, alternative data sources are used to decompose these categories into the key underlying inputs used in their production, such as compensation or capital costs, and then publicly available price series are used to deflate those input costs. A brief description of each price deflator follows.

Non PHC—Government Administration

Government administrative spending is deflated using a composite input price index that chain-weights together price indexes for wages and salaries, benefits, professional fees, claims processing services, office rent and other expenses. The input weights reflect six sub-categories of government administrative spending: Medicare, Department of Defense (DOD), Veteran Affairs (VA), Medicaid, Children's Health Insurance Program (CHIP) and other third party payers (OTP).

The government administrative input price index is composed of two sub-aggregate indexes: a federal input cost index (Medicare, DOD and VA costs) and a state and local input cost index (Medicaid, CHIP and OTP costs). The cost weights for these indexes are determined using data from the Medicare Trustees Report, Medicaid administrative data, and Congressional budget justifications for CMS and SSA. The price series (Table 4) used for each of the categories represent proxies for their respective concepts, such as federal civilian pay, Employment Cost Indexes (ECIs) for state and local government workers, ECIs for other relevant occupations, PPIs and CPIs.

Cost weights for the federal index are calculated based on Medicare data; we assume that the DOD and VA costs reflect a similar distribution as that calculated for Medicare. Cost weights for state and local administration are calculated based on Medicaid data; we assume that the CHIP and OTP costs reflect a similar distribution as that calculated for Medicaid.

Table 4: Government Administration—Components, Nominal Share of 2011 NHE, and Associated Price Proxies

Sub-aggregate	Price Series
Federal Costs *(0.4% nominal share of 2011 NHE)*	
Wages	Federal Civil Service Pay Adjustments (Congressional Research Service)
Benefits	ECI for Total Benefits, All Workers, Private Industry (BLS)
Security, IT, Training, and Other Services	ECI for Total Compensation, Professional, Scientific and Technical Services (BLS)
Claims Processing and Financial Intermediaries	ECI for Total Compensation, Insurance Carriers, and Related Activities (BLS)
Rent	PPI for Leasing of Professional and Office Buildings (BLS)
Other	CPI-Urban for All Items (BLS)
State and Local Costs *(0.8% nominal share of 2011 NHE)*	
Compensation	ECI for Total Compensation, State and Local Government, Public Administration (BLS)
IT and Other Services	ECI for Total Compensation, Professional, Scientific and Technical Services (BLS)
Claims Processing and Eligibility Determination	ECI for Total Compensation, Insurance Carriers, and Related Activities (BLS)
Other	CPI-Urban for All Items (BLS)

CY2011 weights are shown in Table 4, but in formulating the NHE Deflator, weights are varied by year as part of the chain weight calculation.

Table 5 Government Administration–Average Annual Percent Change in Nominal Spending from Preceding Year shown, Aggregate Price Index, and Real Spending

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
Government Administration—Nominal	10.0	9.1	12.8	7.6	7.4	1.5	2.4	2.9	1.8	0.7	4.7
Government Administration—Chain Weighted Price Index	-	-	-	3.6	3.4	3.1	3.3	3.6	1.1	1.8	2.4
Government Administration—Real	-	-	-	3.9	3.8	-1.5	-0.9	-0.6	0.7	-1.1	2.2

In Table 5, 1990 data reflects average annual growth from 1980 to 1990.

Non PHC—Net Cost of Health Insurance

The net cost of health insurance input price deflator is a chain-weighted composite index of input costs and price proxies designed to measure the price growth associated with the net cost of insurance, which is the difference between health insurance premiums earned and benefits incurred. This difference includes costs such as administrative services, taxes, and changes to reserves and underwriting gains or losses. The types of private health insurance for which net cost is estimated include: fully-insured group/commercial, individually-purchased or non-group, self-insured group, and the health portion of property and casualty. We also included the net cost from the following types of insurance: Medicare Advantage and stand-alone Medicare Part D plans; Medicaid managed care plans; CHIP managed care plans; the majority of worker's compensation insurance; and, in 2010, the pre-existing condition insurance plan.

Cost categories for net cost of health insurance are determined using data primarily from AM Best, which is based on National Association of Insurance Commissioners (NAIC) insurance statements. These cost categories are: compensation of the employees that are administering the insurance; capital costs; taxes; other costs (such as rent, advertising, certain commissions, etc.); and, in some cases, changes to reserves and underwriting gains or losses. We developed an input price index for the net cost of health insurance using these five cost categories. A blended index of price proxies—typically ECIs, PPIs, or in some cases price indexes from the Gross Domestic Product accounts—are weighted together by the respective input costs for three of these general cost components (compensation, capital, and other costs). All changes in taxes, reserves, or underwriting gains or losses are treated as price changes. We then combined these price changes to create a composite net cost of health insurance input price deflator.

Table 6: Net Cost of Health Insurance—Components and Associated Price Proxies
(5.8% nominal share of 2011 NHE)

Sub-aggregate	Price Series
Compensation	ECI for Total Compensation, Insurance and Related Activities
Other Expenses	Composite Index: • ECI for Total Compensation, Insurance and Related Activities • PPI, Commissions from Insurance • PPI, Legal Services • PPI, Advertising • CPI, Postage • GDP, Implicit Price Deflator
Capital Related Expenses	Price Index, Non-Residential Equipment & Software (BEA Table 5.5.4)
Taxes	None (no change to price in real terms)
Changes in Reserves and Underwriting Gains or Losses	None (no change to price in real terms)

CY2011 weights are shown in Table 6. In formulating the NHE Deflator, weights are varied by year as part of the chain weight calculation.

Table 7: Net Cost of Health Insurance–Average Annual Percent Change in Nominal Spending from Preceding Year shown, Aggregate Price Index, and Real Spending

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net Cost of Health Insurance—Nominal	13.1	7.3	18.7	6.9	6.9	11.7	4.0	-2.0	-1.7	9.8	4.0
Net Cost of Health Insurance—Chain Weighted Price Index	-	-	-	2.7	7.7	4.8	3.6	-6.8	1.5	7.4	7.2
Net Cost of Health Insurance—Real	-	-	-	4.1	-0.7	6.5	0.4	5.1	-3.2	2.2	-3.0

In Table 7, 1990 data reflects average annual growth from 1980 to 1990.

Non PHC—Government Public Health Activities

Public Health spending in NHEA is deflated using a composite index that chain-weights together price indexes for state and local and federal public health, with state and local expenditures accounting for roughly 80 percent of the index. State and local public health expenditures are deflated using the price index for gross state and local government consumption expenditures for health from the National Income and Product Accounts produced by the BEA. Federal public health expenditures are deflated using an input price index that weights together the input costs of Health Resources and Services Administration, Food and Drug Administration, and Centers for Disease Control and Prevention; and appropriate price proxies from the BLS. Together these three organizations account for over 75% of federal public health spending.

Table 8: Government Public Health Activities—Components and Associated Price Proxies
(2.9% nominal share of 2011 NHE)

Sub-aggregate	Price Series
Federal	
Wages	Federal Civil Service Pay Adjustments (Congressional Research Service)
Benefits	ECI for Total Benefits, All Workers, Private Industry (BLS)
Security, IT, Training, and Other Services	ECI for Total Compensation, Professional, Scientific and Technical Services (BLS)
Rent	PPI for Leasing of Professional and Office Buildings (BLS)
Other	CPI-Urban for All Items (BLS)
State and Local	
[none]	BEA Price Index for Gross State and Local Government Consumption Expenditures

CY2011 weights are shown in Table 8, but in formulating the NHE Deflator, weights are varied by year as part of the chain weight calculation

Table 9: Government Public Health Activities–Average Annual Percent Change in Nominal Spending from Preceding Year shown, Aggregate Price Index, and Real Spending

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
Government Public Health Activities—Nominal	12.0	8.0	7.5	0.5	4.1	11.2	10.3	5.8	4.1	4.9	-0.5
Government Public Health Activities—Chain Weighted Price Index	-	-	-	4.0	4.8	4.2	4.1	5.1	0.4	2.5	3.4
Government Public Health Activities—Real	-	-	-	-3.4	-0.7	6.8	5.9	0.6	3.7	2.4	-3.7

In Table 9, 1990 data reflects average annual growth from 1980 to 1990.

Non PHC—Non Commercial Research

We deflate non-commercial research using the Biomedical Research and Development Price Index (BRDPI), which is developed and updated annually by the BEA under an interagency agreement with the National Institutes of Health (NIH). The BRDPI is designed to measure changes in the weighted-average of the price of all the inputs (wages, equipment, nondurables, etc.) purchased with the NIH budget in support of extramural research. Over two-thirds of non-commercial research in the NHEA is conducted by NIH, making this index a reasonable choice for the deflation of non-commercial research. There are no sub-aggregate cost categories for non-commercial research.

In order to deflate non-commercial research spending, the nominal level of spending is adjusted by the BRDPI index to produce real non-commercial research spending.

Table 10: Non Commercial Research—Components, Nominal Share of 2011 NHE, and Associated Price Proxies

Item	Nominal Share of 2011 NHE	Price Series
Non-Commercial Research	1.8%	Price Index, NIH Biomedical Research and Development

CY2011 weights are shown in Table 10, but in formulating the NHE Deflator, weights are varied by year as part of the chain weight calculation

Table 11: Non Commercial Research–Average Annual Percent Change in Nominal Spending from Preceding Year shown, Aggregate Price Index, and Real Spending

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
Non-Commercial Research—Nominal	8.9	7.2	11.0	10.5	4.7	2.6	1.3	3.5	4.3	8.2	1.7
Non-Commercial Research—Chain Weighted Price Index	-	-	-	3.7	3.9	4.4	4.0	4.5	3.4	2.9	2.8
Non-Commercial Research—Real	-	-	-	6.5	0.8	-1.7	-2.6	-1.0	1.0	5.2	-1.1

In Table 11, 1990 data reflects average annual growth from 1980 to 1990.

Non PHC—Structures & Equipment

Investment in structures and equipment is deflated using a composite index that chain-weights together price indexes associated with private fixed investment in structures and equipment by asset category. The nominal investment levels by asset category serve as the component weights. These detailed investment levels are obtained by decomposing overall private and public nominal investment in structures and equipment in the NHEA using primarily the BEA's Capital Flow Table (CFT) and Fixed Asset Accounts (FAA).

Five categories of investment in Structures and twenty-two categories of investment in Equipment are derived. The largest categories can be seen below in Table 13. Price indexes are then selected for each of these Structures and Equipment categories. The price indexes for private investment are from BEA Table 5.4.4. "Price Indexes for Private Fixed Investment in Structures by Type" and from BEA Table 5.5.4. "Price Indexes for Private Fixed Investment in Equipment and Software by Type."

Table 12: Structures and Equipment—Components, Nominal Share of 2011 NHE, and Associated Price Proxies
(3.8% nominal share of 2011 NHE)

Sub-aggregate	Price Series
Structures *(1.7% share)*	
Hospital and institutional buildings	BEA Price Index, Table 5.4.4 Line 5
Other	BEA Price Index, Table 5.4.4 Lines 4, 14, 17, and 23
Equipment *(2.2% share)*	
Computers and Peripheral Equipment	BEA Price Index, Table 5.5.4 Line 5
Total Software	BEA Price Index, Table 5.5.4 Line 6
Medical Equipment and Instruments	BEA Price Index, Table 5.5.4 Line 8
Light trucks (including utility vehicles)	BEA Price Index, Table 5.5.4 Line 21
Other	BEA Price Index, Table 5.4.4 Lines 7, 9, 10, 11, 13-18, 22-24, 28, 30, 32-34

CY2011 weights are shown in Table 12, but in formulating the NHE Deflator, weights are varied by year as part of the chain weight calculation.

Table 13: Structures and Equipment–Average Annual Percent Change in Nominal Spending from Preceding Year shown, Aggregate Price Index, and Real Spending

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
Structures and Equipment—Nominal	9.4	5.6	6.6	5.1	9.2	3.9	13.6	8.6	-8.7	-0.7	3.6
Structures and Equipment—Chain Weighted Price Index	-	-	-	2.0	3.0	3.4	2.0	1.1	-1.6	-3.0	0.7
Structures and Equipment—Real	-	-	-	3.0	6.0	0.5	11.3	7.4	-7.2	2.4	2.9

In Table 13, 1990 data reflects average annual growth from 1980 to 1990.

NHE Deflator

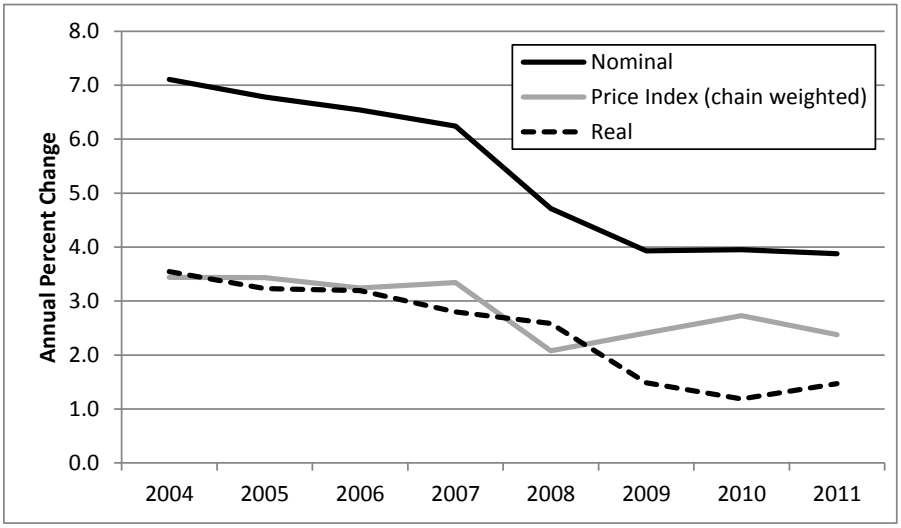
As previously described, the PHC and Non-PHC components are chain-weighted together in order to calculate the NHE Deflator. Table 14 shows the final chain-weighted NHE Deflator, as well as nominal NHE and the resulting real NHE. Figure 1 shows the same data graphically from 2004 to 2011.

Table 14: NHE Deflator–Average Annual Percent Change in Nominal Spending from Preceding Year shown, Aggregate Price Index, and Real Spending

Item	1990	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011
NHE—Nominal	11.0	6.6	8.8	7.1	6.8	6.5	6.2	4.7	3.9	3.9	3.9
NHE Deflator—Chain Weighted Price Index	-	-	-	3.4	3.4	3.2	3.3	2.1	2.4	2.7	2.4
NHE—Real	-	-	-	3.5	3.2	3.2	2.8	2.6	1.5	1.2	1.5

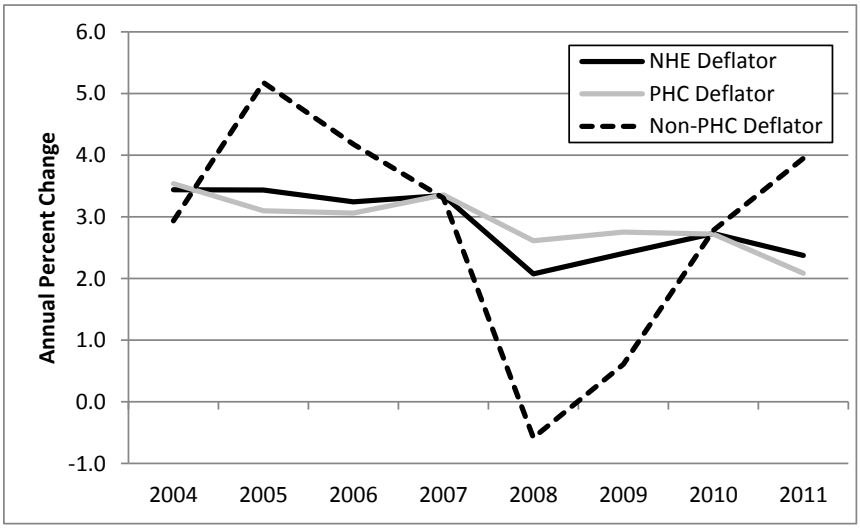
In Table 14, 1990 data reflects average annual growth from 1980 to 1990.

Figure 1: Annual Percent Change in Nominal NHE, NHE Price Index, and Real NHE, 2004 to 2011



As Figure 1 indicates, health care price growth as measured by the NHE Price index accounts for slightly more than half of the growth in nominal health spending from 2004 to 2008. From 2008 to 2011, health care price growth accounts for approximately two-thirds of growth in nominal health care spending. The contribution of prices to NHE growth fluctuates by year, from a low of about 45% in 2008 to a high of almost 70% in 2010. The variations in these trends are heavily influenced by the Non-PHC prices that underlie the NHE deflator, as shown in Figure 2.

Figure 2: Annual Percent Change in the NHE Price Index, the PHC Price Index, and the Non-PHC Price Index, 2004 to 2011



Growth in the non-PHC deflator outpaced growth in the PHC deflator during the 2005-2006 period, in large part due to the rapid price growth for the net cost of insurance, government public health, and research. However, this trend reversed in 2008 and 2009. Prices for non-PHC decreased in 2008, mainly the result of declines in the net cost of insurance as the overall economic recession impacted underwriting gains, losses, and reserves. In 2009, the cost of government administration; government public health, structures and equipment; and the net cost of insurance grew slowly or decreased. In 2011, price growth for non-PHC was higher than PHC, mainly due to increased price growth of net cost of insurance due to the economic recovery.