



DATE: January 19, 2016  
SUBJECT: Biomedical Research and Development Price Index (BRDPI): Fiscal Year 2015  
Update and Projections for FY 2016-FY 2021

### **Summary**

- The estimated growth in the BRDPI for FY 2015 is 2.2 percent.
- The updated rate for FY 2014 is 2.2 percent, an increase of 0.2 percent from the preliminary estimate of 2.0 percent posted last year. The higher than anticipated growth is driven primarily by unexpected growth in salaries, wages, fringe benefits and indirect costs.
- The following pattern of future growth in the BRDPI is projected: 2.3 percent for FY 2016, 2.4 percent for FY 2017, 2.8 percent for FY 2018, 3.0 percent for FY 2019, 3.2 percent for FY 2020, and 3.2 for FY 2021.
- The projected 2.3 percent growth for FY 2016 assumes a 1.3 percent increase for Federal salaries starting in January 2016, as well as an increase on the extramural investigator salary cap to \$185,100.
- Primarily because of the past freeze on Federal civilian employee salaries and the cap on compensation of extramural investigators, the rate of growth of the BRDPI during the years FY 2012 through FY 2015 continued to be relatively low compared to its historical relationship with general inflation as represented by the growth of the Gross Domestic Product (GDP) Price Index. The projections for each of the following years, FY 2016 through FY 2021, assume the growth of the BRDPI will gradually revert to the historical pattern observed from FY 2006 through FY 2015 of faster growth relative to the growth of the GDP Price Index.

### **Definition of the BRDPI**

The BRDPI measures changes in the weighted-average of the prices of all the inputs (e.g., personnel services, various supplies, and equipment) purchased with the NIH budget to support research. The weights used to construct the index reflect the actual pattern (or the proportion) of total NIH expenditures on each of the types of inputs purchased. Theoretically, the annual change in the BRDPI indicates how much NIH expenditures would need to increase, without regard to efficiency gains or changes in government priorities to maintain NIH-funded research activity at the previous year's level.

### **Background on the BRDPI Estimation Process**

In the early 1980s, the Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce developed the Biomedical Research and Development Price Index (BRDPI). Under an interagency agreement with the NIH, each December the BEA provides an estimate of the BRDPI for the most recently completed fiscal year. In December 2015, for example, BEA transmitted information for FY 2015. This estimate is referred to as “preliminary” because the initial data on prices available to the BEA in December are typically revised during the following year. Consequently, each December the BEA also provides a revised estimate for the prior fiscal year, i.e., the estimate for FY 2014 was revised in December 2015.

The Office of the Director at NIH projects future year values based on a methodology described below. An updated table of BRDPI annual estimates and future-year projections is posted on the NIH website each year shortly after the release of the President’s Budget (PB), typically in early February. Refer to the following link <http://officeofbudget.od.nih.gov/gbiPriceIndexes.html>, or use the search engine at <http://www.nih.gov/> to find “BRDPI.”

### **Adjusting the BRDPI for Changes in Federal Policies**

Beginning with the BRDPI estimate for FY 2011, which was developed in December 2011, NIH began making explicit adjustments for changes in federal policy regarding the cap on salaries on extramural awards.

Every year since 1990, Congress has legislatively mandated a provision limiting the direct salary that an individual may receive under an NIH grant.<sup>1</sup> The cap has been increased most years at a moderate rate. Although the increase is generally somewhat below the average growth in academic salaries, in past years the impact of the salary cap on the estimated growth of the BRDPI was negligible. However, for FY 2011 the NIH salary cap was frozen at the previous year’s level. The cap “freeze” has a noticeable effect on the estimated change of the BRDPI for FY 2011.

The limitation on the direct salary that an investigator may receive under an NIH award might not reduce the investigator’s effective income. The host institution or another funding source may make up the difference. However, changes in the cap affect what NIH pays for an investigator subject to the salary cap. Given the definition of the BRDPI as an input price index for the NIH budget, the effect of the cap on the price NIH pays for an investigator’s effort must be taken into account.

For FY 2012, the level of the cap actually dropped from \$199,700 to \$179,700. The reduction in the cap on investigator salaries, flat civilian Federal salary levels, and limits on the growth of fellowship and training stipends and related expenses on training awards combined to reduce the estimated BRDPI growth for FY 2012 and the projected growth for subsequent years.

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<sup>1</sup> [http://grants.nih.gov/grants/policy/salcap\\_summary.htm](http://grants.nih.gov/grants/policy/salcap_summary.htm) and <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-11-073.html>

NIH estimated the share of academic salaries subject to each of the two salary caps. Using a sample of successful applications for new competitive NIH awards and competitive renewals, NIH extracted data on salaries from the detailed budget requests submitted as part of each application. Our best estimate is that for NIH awards to academic institutions:

- 12.9% of requested salaries are subject to the original cap of \$199,700;
- 14.4% of requested salaries are subject to the lower cap of \$179,700;
- -10.7% is the average reduction due to lowering the cap (from \$199,700 to \$179,700) for the 14.4% of salaries subject to the lower cap.<sup>2</sup>

### **Revision of FY 2014 BRDPI Growth and the FY 2015 Update**

This year, the posted estimate for growth of the BRDPI adjusted for the cap on extramural salaries is 2.2 percent for FY 2014, and the preliminary estimate is 2.2 percent for FY 2015.<sup>3</sup> The revised estimate of 2.2 percent for FY 2014 is 0.2 percent higher than the preliminary estimate posted last year. Primary drivers in the change include increased costs associated with salaries and indirect costs in the extramural community.

The 1.3 percent rate of growth for FY 2012 is the lowest annual rate in the history of the BRDPI and the first time that the BRDPI increased at a slower rate than the GDP Price Index (1.9 percent). For FY 2014, the BRDPI estimate of 2.2 percent is still low by historical standards, however, it is growing at a higher rate than the GDP Price Index (1.7 percent) for the same year. The FY 2015 BRDPI preliminary estimate of 2.2 percent is increasingly higher than the GDP

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<sup>2</sup> Information on base salaries and requested salaries for each member of the proposed research staff can be found in the detailed budget tables included as part of the project proposal. The salary information must be extracted from a sample of PDF file copies of applications and placed in Excel files for analysis.

The sample of project budgets was stratified by types of award (e.g., “R01, R21, P01), whether the award was made to a medical school or to a non-medical component of a university, and whether the degree of the corresponding principal investigator (PI) was an MD (including dual MD and PhD degrees) or something else (primarily a PhD).

The results for each cell in the three-dimensional sampling strata were then aggregated to estimate the overall share of requested salaries subject to each cap. The relative weight for each combination of type of award, medical/nonmedical component, type of degree was based on the distribution of all award amounts to academic institutions for FY 2011.

BEA estimated the growth in academic salaries for the BRDPI at 2.82 percent for FY 2011 and 3.24 percent for FY 2012. These estimates were based on the AAMC survey of salaries of medical school faculty and the AAUP survey of university salaries. Adjusting for the freeze on the salary cap for FY 2011 and the reduction of the salary cap for FY 2012, the estimated growth in academic salaries was reduced to 2.46 percent and 1.23 percent respectively.

At the request of the NIH, the BEA re-estimated the BRDPI using the rates of growth of academic salary rates adjusted for the cap freeze and the cap reduction. The revised estimates of BRDPI growth captured the direct effects of reduced growth in academic salaries on the growth of the overall BRDPI. It also captured the indirect effects of academic salary growth through its effects on growth of fringe benefit rates, academic indirect costs and estimates of growth of compensation for consultants and for personnel on awards to non-academic institutions.

<sup>3</sup> As a reminder, the estimate for the most recent fiscal year (e.g., FY 2015 in December 2015) is referred to as “preliminary” because the initial data on prices available to the BEA each December are often revised during the following months. Consequently, each December the BEA also provides a revised estimate for the prior fiscal year (e.g., the estimate for FY 2014 was revised in December 2015).

Price Index of 1.1 percent, providing additional evidence that the BRDPI is returning towards its historical relationship with the GDP Price Index.

**Projections for FY 2016-2021**

The BRDPI provides the best historical estimate of inflation for the NIH budget for any completed fiscal year. However, development of future NIH budgets benefit from consideration of how prices of the goods and services NIH expects to purchase in future years might change. We could simply project that the rate of change for FY 2015 will hold for the next few years. However, it would be unrealistic to assume the BRDPI will change at a fixed rate when the general rate of economic activity and the average growth of prices is expected to change from year to year. Also, we might wish to adjust future year projections for any anticipated changes in Federal policy that might influence the prices NIH pays for goods and services used to support R&D.

A more sophisticated, but still simple, projection methodology for future annual changes in the BRDPI embodies two considerations. The first is the expected general rate of inflation of prices for the U.S. economy. The second is the expected relationship between the general rate of inflation and changes in the BRDPI.

NIH defers judgments on the general rate of inflation to the Office of Management and Budget (OMB). We use the most recently issued OMB projections of the annual rate of growth of the GDP Price Index. The GDP Price Index increased by 1.1 percent for FY 2015. OMB projects an increase of 1.2 percent for FY 2016, 1.8 percent for FY 2017, 1.8 percent for FY 2018, 2.0 percent for FY 2019, FY 2020, and FY 2021.

The historical relationship between the BRDPI and the GDP Price Index is summarized by a statistically estimated linear equation (by ordinary least squares regression) that relates the annual percent change in the BRDPI to the annual percent change in the GDP Price Index. Using the data for the most recent ten years (FY 2005 through FY 2014) the estimated equation is:

$$\begin{aligned} & \text{(Projected annual percent change in the BRDPI)} \\ & = 1.69 + 0.79 \times \text{(annual percent change in GDP Price Index)}. \end{aligned}$$

If we assume the historical relationship will persist in the future, we simply plug the OMB projected values of the GDP Price Index into the equation and use the predicted growth of the BRDPI as the corresponding out-year projections of the BRDPI.

However, for FY 2015 the estimated growth of 2.2 percent for the BRDPI, is 0.2 percentage points lower than the 2.4 percent growth predicted with the equation above based on the 1.1 percent growth in the GDP Price Index for FY 2015. Because of all the limits on investigator and trainee compensation in extramural awards and the slow growth of Federal salaries, there is reason to believe the BRDPI will grow at a rate lower than predicted by the historical relationship between the BRDPI and the GDP Price Index.

Consequently, we project a 2.3 percent growth in the BRDPI for FY 2016. This projection assumes a one point three percent growth in Federal salaries, and the cap on investigator salaries

remains fixed at the Executive Level II with an approximate one percent increase in 2016 (\$185,100). Notice that the fixed cap with a one percent increase does not have as severe an effect on the growth of investigator salaries as the reduction in the cap for FY 2012.

The projected growth for FY 2016 of 2.3 percent also includes an adjustment for the expected changes in the general rate of inflation. The GDP Price Index increased by 1.1 percent during FY 2015, and OMB projects an increase of 1.2 percent for FY 2016.

Primarily because of minimal increases in FY 2015 on Federal civilian employee salaries and the cap on compensation of extramural investigators, the rate of growth of the BRDPI during the years FY 2012 through FY 2015 has been relatively low compared with its historical relationship with general inflation as represented by the growth of the GDP Price Index. As the economy improves and the government resolves the various fiscal issues related to balancing overall Federal expenditures with tax revenues, we expect that growth of Federal salaries and the growth of caps on investigator and trainee salaries eventually will return to historical trend rates. Just when this will happen remains uncertain.

Thus, to generate reasonable projections of BRDPI growth to support budget planning, we assume that after FY 2016 the growth of the BRDPI will gradually revert to the historical pattern observed from FY 2006 through FY 2015 of faster growth relative to the growth of the GDP Price Index.

To summarize, the following pattern of growth in the BRDPI is projected: 2.3 percent for FY 2016; 2.4 percent for FY 2017; 2.8 percent for FY 2018; 3.0 percent for FY 2019, 3.2 percent for FY 2020 and FY 2021.

Forecasting the future path of price changes is an inherently imprecise exercise. We cannot expect OMB projections of growth in the GDP Price Index to be realized precisely each year. Likewise, the complex relationship between the general rate of inflation and the BRDPI can change from year to year. However, we strive for an unbiased process—i.e., the projections miss high roughly as frequently as they miss low.

### **Summary Tables**

Table A depicts values of the annual percent change in the GDP Price Index and the BRDPI for FY 1985 through FY 2015. Table B includes projected values of the BRDPI and the GDP Price Index for FY 2016 through FY 2021.

For the convenience of the reader, Table C illustrates how to translate annual changes into annual levels of the BRDPI. After designating a reference year, for which the value of the BRDPI is specified as 100, projections of the annual levels of the BRDPI can be constructed using the following recursive relationship:

$$\text{BRDPI (for year } t) = \text{BRDPI (for year } t-1) \times [1 + \{\text{Annual Percent Change (for year } t)\}]$$

In Table C, the calculations are presented for FY 1989 through FY 1992 using FY 1989 as the reference year (1989 = 100). To calculate the value for FY 1991, for example, the formula

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would be:  $110.5 = 105.4 \times 1.048$ . In other words, to derive the BRDPI value for FY 1991 (110.5), start with the FY 1990 BRDPI value (105.4) and multiply by one plus the annual change for FY 1991 ( $1 + [4.8/100] = 1.048$ ).

### Attachments

# ATTACHMENTS

- 1. Supplementary Tables**
- 2. References to BEA Price Index Methodology**
- 3. Modification of the Methodology Used to Estimate the BRDPI**

**TABLE A**  
**HISTORICAL ANNUAL PERCENT CHANGES**

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
1985	3.3%	5.6%
1986	2.3%	4.2%
1987	2.2%	5.3%
1988	3.2%	5.0%
1989	4.0%	5.2%
1990	3.6%	5.4%
1991	3.5%	4.8%
1992	2.4%	4.4%
1993	2.4%	3.4%
1994	2.2%	3.9%
1995	2.1%	3.5%
1996	1.9%	2.6%
1997	1.8%	2.8%
1998	1.2%	3.4%
1999	1.3%	3.2%
2000	2.1%	3.7%
2001	2.4%	3.3%
2002	1.6%	3.3%
2003	1.9%	3.5%
2004	2.5%	3.7%
2005	3.1%	3.9%
2006	3.3%	4.6%
2007	2.7%	3.8%
2008	2.1%	4.7%
2009	1.2%	2.9%
2010	0.9%	3.0%
2011	2.0%	2.9%
2012	1.9%	1.3%
2013	1.7%	1.9%
2014	1.7%	2.2%
2015	1.1%	2.2%

**TABLE B  
PROJECTED ANNUAL PERCENT CHANGES**

<b>Fiscal Year</b>	<b>GDP Price Index</b>	<b>BRDPI</b>
Col.(1)	Col.(2)	Col.(3)
2015	1.1%	2.2%
2016	1.2%	2.3%
2017	1.8%	2.4%
2018	1.8%	2.8%
2019	2.0%	2.8%
2020	2.0%	3.2%

**TABLE C**

**Conversion of Annual Changes into Annual Levels**

<b>Fiscal Year</b>	<b>Annual Percent Change</b>	<b>[1+(Percent Change/100)]</b>	<b>Previous Year Value</b>	<b>Annual Level BRDPI</b>
Col.(1)	Col.(2)	Col.(2)	Col.(3)	Col.(4)
1989				100.0
1990	5.4%	1.054	* 100.0 =	105.4
1991	4.8%	1.048	* 105.4 =	110.5
1992	4.4%	1.044	* 110.5 =	115.4

### **References to BEA Price Index Methodology**

Robert P. Parker and Eugene P. Seskin, "Annual Revision of the National Income and Product Accounts: Annual Estimates 1993-96, Quarterly Estimates 1993:1-1997:1," Survey of Current Business, 77, No. 8 (August 1997), pp 6-35.

J. Steven Landefeld and Robert P. Parker, "Preview of the Comprehensive Revision of the National Income and Product Accounts: BEA's New Featured Measures of Output and Prices," Survey of Current Business, 75, No. 7 (July 1995), pp 31-38.

Allan H. Young, "Alternative Measures of Change in Real Output and Prices, Quarterly Estimates for 1959-1992," Survey of Current Business, 73, No.11 (March 1993), pp 31-41.

Allan H. Young, "Alternative Measures of Change in Real Output and Prices," Survey of Current Business, 72, No. 4 (April 1992), pp 32-48.

Jack E. Triplett, "Economic Theory and BEA's Alternative Quantity and Price Indexes," Survey of Current Business, 73, No. 4 (April 1992), pp 49-52.

### **Modification of the Methodology Used to Estimate the BRDPI (2006)**

This section is included for users interested in more of the technical details regarding methods used to estimate annual values of the BRDPI.

As stated in the memo above, the weights used to construct the BRDPI reflect the actual pattern (or the proportion) of total NIH expenditures spent on each of the types of inputs purchased with the NIH budget (e.g., personnel services, various supplies, and equipment). In fact, the use of weights specific to the NIH budget is what distinguishes the BRDPI from other price indexes designed to reflect different patterns of expenditures.

Until FY 2006, the BEA estimated the BRDPI using a fixed weight (or Laspeyres) index. This type of index compares prices over several years using a fixed set of weights based on the composition of expenditures in a single, specified base year (say 1993 or 2003).

Beginning with the revised estimate for FY 2005 (published in December 2006) the BEA now estimates the BRDPI using a Fisher chain-weighted index methodology. The chain-weighted methodology improves the accuracy of the BRDPI and is consistent with the methodology BEA adopted in 1996 to estimate the Gross Domestic Product and its component series. For the interested reader, five articles in BEA's publication, *Survey of Current Business*, discuss the reasons BEA now uses the chain-weighted methodology. (See the references to BEA Price Index Methodology above.)

In less technical terms, the move to chain weighting means primarily that the expenditure weights used to estimate the BRDPI will be updated each year. Also, when estimating the growth of the BRDPI between two consecutive years (say 2005 and 2006) the Fisher Price Index reflects the average experience of two slightly different indexes: the first index uses first year weights (e.g., 2005) to estimate average growth in prices; the second index uses second year weights (e.g., 2006) to develop the estimate. To estimate growth over several years, the consecutive year indexes are multiplied, or chained. (As an analogy, think of calculating compound growth on your retirement portfolio over ten years as the mix of stocks and bonds changes from year to year.)

By contrast, to the chain weighting methodology, the previously used fixed-weight (or Laspeyres) index approach can result in a "substitution bias" that tends to overstate price increases for periods after the base year and understate price increases for periods before the base year. This bias occurs because use of the fixed-weight index implicitly assumes the composition of the items being priced does not change over time. In fact, the mix of items purchased and included in a price index tends to shift over the years. The shift in purchases may be a response to changes in relative prices or to advances in technology which provide new opportunities and new tools for investigation (e.g., more computers and automated test equipment and fewer laboratory assistants). Or the mix may reflect changes in policy with a larger share of the NIH budget allocated to support of extramural research and less to inside NIH activities, including intramural research and administration of extramural research.

During periods close to the base year, differences in the composition are usually fairly small, and a fixed-weight index provides a good approximation. Farther away from the base period, however, larger differences in expenditure composition are likely. Consequently, weighting formulas that allow for changes in composition over time provide a better measure of both year-to-year price changes and long-term trends.

In response to BEA recommendations, in past years the expenditure weights used to estimate the BRDPI were updated, or rebased, occasionally to overcome the problem of substitution bias. In the BRDPI Table of Annual Values listed on the NIH website and in the attached Table A, the values of the BRDPI for FY

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1999-2004 are constructed using the FY 2003 expenditure weights; the FY 1991-1998 values are based on FY 1993 weights; the FY 1986-1990 values are based on FY 1988 weights; and the FY 1979-1985 values are based on FY 1984 weights. The pre-1979 values of the BRDPI were estimated using a preliminary methodology with a less-detailed set of expenditure weights. As a result of the less precise methodology, the pre-1979 values are not likely to be as accurate as the later year values.