



DATE: January 15, 2013
SUBJECT: Biomedical Research and Development Price Index (BRDPI): Fiscal Year 2012
Update and Projections for FY 2013-FY 2018

Summary

- The estimated growth in the BRDPI for FY 2012 is 1.4 percent.
- The updated estimate for FY 2011 remains at 2.8 percent, the same value as the preliminary estimate posted last year.
- The following pattern of growth in the BRDPI is projected: 2.5 percent for FY 2013; 2.7 percent for FY 2014; 2.9 percent for FY 2015; and 3.0 percent each year from FY 2016 through FY 2018, respectively.
- The modest BRDPI growth rate of 1.4 percent for FY 2012 reflects the effect of the reduction of the NIH extramural investigator salary limitation (“cap”) from \$199,700 to \$179,700 for that year and the continued freeze on salaries of Federal civilian employees. The BRDPI growth rate was also adjusted for the growth of stipends and related expenses on fellowships and training awards. In addition, the FY 2012 BRDPI growth is lower than the growth for FY 2011 because the rate of growth of prices for several input categories slowed down in FY 2012 compared with the growth during FY 2011. For inside NIH activities, the categories with slower growth in prices include travel, transportation, printing and reproduction, ADP and other IT services, instruments and apparatus, laboratory supplies, office supplies, utilities, repairs and alterations of facilities, compensation rates for consultants and support contracts. For extramural activities, fringe benefits, travel, equipment, supplies, patient care alterations and indirect costs each showed slower price growth during FY 2012 compared with FY 2011.
- The projected 2.5 percent growth for FY 2013 assumes the limits on extramural investigator salaries, the growth rate of reimbursement for fellowships and training awards, and the freeze on Federal salaries will remain in place at the FY 2012 levels. Notice that the fixed cap does not have as severe an effect on the growth of investigator salaries as the reduction in the cap for FY 2012. Growth for 14.4 percent of requested salaries is frozen rather than decreased by about 10 percent. The less severe limit leads to a higher projected growth for extramural salaries and for the BRDPI. The projected growth for FY 2013 of 2.5 percent also includes an adjustment for the expected slight increase in the general rate of inflation.
- Primarily because of the 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 2011 through FY 2013 has been relatively low compared with its historical relationship with general inflation as represented by the growth of the GDP Price Index. The projections for each of the following five years, FY 2014 through FY 2018, assume the growth of the BRDPI will gradually revert to the historical pattern observed from FY 2003 through FY 2012 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

The Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce developed the BRDPI, in the early 1980s. 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 2012, for example, BEA transmitted information for FY 2012. 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 2011 was revised in December 2012.

The Office of the Director, 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. Please 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

Last year (December 2011 for the FY 2011 estimate) was an unusual year for developing estimates of the BRDPI for the most recently completed fiscal year and projections of growth for future years. Every year since 1990, Congress has legislatively mandated a provision limiting the direct salary that an individual may receive under an NIH grant.¹ 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

¹ http://grants.nih.gov/grants/policy/salcap_summary.htm ; and <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-11-073.html>

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 was 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.

NIH estimated the share of academic salaries subject to each of the two salary caps using information from the detailed budget requests submitted as part of the successful applications for new competitive NIH awards or for competitive renewals. Our best estimate is that over the past year, 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.²

Revision of FY 2011 BRDPI Growth and the FY 2012 Update

This year, the posted estimates for growth of the BRDPI are 2.8 percent for FY 2011 and 1.4 percent for FY 2012. The final estimate for FY 2011 was unchanged from the preliminary estimate posted last year.³

² 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.

³ As a reminder, the estimate for the most recent fiscal year (e.g., FY 2012 in December 2012) 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 2011 was revised in December 2012).

The 1.4 percent rate of growth for FY 2012 is the lowest annual rate of growth in the history of the BRDPI and the first time that the BRDPI increased at a slower rate than the price index for the GDP (1.8 percent). The low rate of growth begs an explanation.

First, focusing on the estimates of the BRDPI based on the conventional methodology before adjustment for the extramural salary cap, the preliminary estimate for FY 2012 was 2.6 percent, somewhat less than the 3.0 percent growth estimated for FY 2011.

One contribution to the slowdown in BRDPI growth is the continued freeze on the salaries of Federal civilian workers.⁴ Also the rate of growth of prices for several input categories slowed down in FY 2012 compared to the growth during FY 2011. For inside NIH activities, the categories with slower growth in prices include travel, transportation, printing and reproduction, ADP and other IT services, instruments and apparatus, laboratory supplies, office supplies, utilities, repairs and alterations of facilities, compensation rates for consultants and support contracts. For extramural activities, fringe benefits, travel, equipment, supplies, patient care alterations and indirect costs each showed slower price growth during FY 2012 compared with FY 2011.

The 3.0 percent growth in the BRDPI for FY 2011 estimated by BEA this year was adjusted down to 2.8 percent to account for the freeze in the salary cap for extramural salaries and the limits on growth of stipend rates and related expenses on fellowships and training awards. But the growth in the BRDPI for FY 2012 was adjusted downward even more, from 2.6 percent estimated by BEA to 1.4 percent. This adjustment reflects the effect of the “reduction” of the NIH investigator salary limitation (“cap”) from \$199,700 to \$179,700 for FY 2012 as well as for the growth of stipends and related expenses on fellowships and training awards⁵

Last January, as is standard practice (see next section) NIH “projected” a growth rate for the (then) out year FY 2012. Given its historically low level, it is not surprising that the currently estimated 1.4 percent growth for FY 2012 is less than the 2.2 percent growth “projected” last year by NIH. The difference is due primarily to the unanticipated slowdown in price growth for several input categories as listed above. Also, last year we did not have sufficient information to fully adjust for the impact of the reduction of the salary cap on the effective growth of academic salaries and on the overall growth of the BRDPI.

⁴ The freeze on Federal salaries was initiated in January 1, 2011 for calendar year 2011. Consequently, the growth in Federal salaries for FY 2011 was only 0.65 percent (one-quarter of the growth rate for CY 2010 plus three-quarters of the zero growth rate for CY 2011). With the continued freeze on Federal salaries for CY 2012, the FY 2012 growth fell to zero (one-quarter of the zero growth rate for CY 2011 plus three-quarters of the zero growth rate for CY 2012)

⁵ As summarized in the previous section, as a result of the reduction of the salary cap, 14.4 percent of requested academic salaries effectively experienced a reduction of 10.7 percent, compared with the zero growth resulting from the mere freeze on salaries during FY 2011 or with the 3.24 percent growth for the 85.6 percent of salaries unaffected by the cap during FY 2012.

Projections for FY 2012-2017

The BRDPI provides the best historical estimate of inflation for the NIH budget for any completed fiscal year. However, development of future NIH budgets benefits 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 2012 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 1.8 percent for FY 2012. OMB projects an increase of 2.1 percent for FY 2013 and an increase of 1.9 percent per year for FY 2014 through FY 2018.

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 2003 through FY 2012) the estimated equation is:

$$\begin{aligned} & \text{(Projected annual percent change in the BRDPI)} \\ & = 2.11 + 0.64 \times \text{(annual percent change in GDP Price Index)}. \end{aligned}$$

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 2012 the estimated growth of 1.4 percent for the BRDPI, is 1.9 percentage points lower than the 3.3 percent growth predicted with the equation above based on the 1.8 percent growth in the GDP Price Index for FY 2012. Because of all the limits on investigator and trainee compensation on extramural awards and the freeze on 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 2.5 percent growth in the BRDPI for FY 2013. This projection assumes no growth in Federal salaries, the cap on investigator salaries remains fixed at \$179,700 and there is no change in the growth rates on compensation on fellowship and training awards. Notice that the fixed cap does not have as severe an effect on the growth of investigator salaries as the reduction in the cap for FY 2012. Growth for about 14.4 percent of requested salaries is

frozen rather than decreased by about 10 percent. The less severe limit leads to a higher projected growth for academic salaries and for the BRDPI.

The projected growth for FY 2013 of 2.5 percent also includes an adjustment for the expected slight increase in the general rate of inflation. The GDP Price Index increased by 1.8 percent during FY 2012. OMB projects an increase of 2.1 percent for FY 2013.

At this time (January 2013) it is still not clear whether Federal salaries will be increased for any part of FY 2013. At most, they will be increased by 0.5% beginning with the third quarter of the fiscal year as recommended by the President. An effective growth of 0.25 percent in Federal salaries has no effect on the estimated growth of the BRDPI when rounded to the first decimal place.

Nor is there any indication that the cap on investigator salaries or the growth of compensation for fellowship and training awards will increase during FY 2013.

Primarily because of the 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 2011 through FY 2013 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 2013 the growth of the BRDPI will gradually revert to the historical pattern observed from FY 2003 through FY 2012 of faster growth relative to the growth of the GDP Price Index.

To summarize, the following pattern of growth in the BRDPI is projected: 2.5 percent for FY 2013; 2.7 percent for FY 2014; 2.9 percent for FY 2015; and 3.0 percent each year from FY 2016 through FY 2018, respectively.

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 1980 through FY 2012. Table B includes projected values of the BRDPI and the GDP Price Index for FY 2013 through FY 2018.

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 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)
1980	8.8%	9.8%
1981	9.9%	10.4%
1982	6.8%	8.6%
1983	4.4%	6.2%
1984	3.7%	5.9%
1985	3.2%	5.6%
1986	2.3%	4.2%
1987	2.7%	5.3%
1988	3.2%	5.0%
1989	3.9%	5.2%
1990	3.7%	5.4%
1991	3.8%	4.8%
1992	2.6%	4.4%
1993	2.2%	3.4%
1994	2.1%	3.9%
1995	2.1%	3.5%
1996	1.9%	2.6%
1997	1.8%	2.8%
1998	1.3%	3.4%
1999	1.3%	3.2%
2000	2.0%	3.7%
2001	2.4%	3.3%
2002	1.7%	3.3%
2003	2.0%	3.5%
2004	2.5%	3.7%
2005	3.2%	3.9%
2006	3.4%	4.6%
2007	3.0%	3.8%
2008	2.3%	4.7%
2009	1.3%	2.9%
2010	1.0%	3.0%
2011	2.1%	2.8%
2012	1.8%	1.4%

**TABLE B
PROJECTED ANNUAL PERCENT CHANGES**

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
2013	2.1%	2.5%
2014	1.9%	2.7%
2015	1.9%	2.9%
2016	1.9%	3.0%
2017	1.9%	3.0%
2018	1.9%	3.0%

**TABLE C
Conversion of Annual Changes into Annual Levels**

Fiscal Year	Annual Percent Change	[1+(Percent Change/100)]	Previous Year Value	Annual Level BRDPI
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 in the attachment below.)

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

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.