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November 2016

# FEDERAL STUDENT LOANS

## Education Needs to Improve Its Income- Driven Repayment Plan Budget Estimates

Accessible Version

# GAO Highlights

Highlights of [GAO-17-22](#), a report to the Chairman, Committee on the Budget, U.S. Senate

## Why GAO Did This Study

As of June 2016, 24 percent of Direct Loan borrowers repaying their loans (or 5.3 million borrowers) were doing so in IDR plans, compared to 10 percent in June 2013. Education expects these plans to have costs to the government. GAO was asked to review Education's IDR plan budget estimates and estimation methodology.

This report examines: (1) current IDR plan budget estimates and how those estimates have changed over time, and (2) the extent to which Education's approach to estimating costs and quality control practices help ensure reliable estimates. GAO analyzed published and unpublished budget data covering Direct Loans made from fiscal years 1995 through 2015 and estimated to be made in 2016 and 2017; analyzed and tested Education's computer code used to estimate IDR plan costs; reviewed documentation related to Education's estimation approach; and interviewed officials at Education and other federal agencies.

## What GAO Recommends

GAO is making six recommendations to Education to improve the quality of its IDR plan budget estimates. These include adjusting borrower income forecasts for inflation, completing planned model revisions and ensuring that they generate reasonable predictions of participation trends, and testing key assumptions. Education generally agreed with GAO's recommendations and noted actions it would take to address them.

View [GAO-17-22](#). For more information, contact Melissa Emrey-Arras at (617) 788-0534 or [emreyarrasm@gao.gov](mailto:emreyarrasm@gao.gov).

November 2016

## FEDERAL STUDENT LOANS

### Education Needs to Improve Its Income-Driven Repayment Plan Budget Estimates

## What GAO Found

For the fiscal year 2017 budget, the U.S. Department of Education (Education) estimates that all federally issued Direct Loans in Income-Driven Repayment (IDR) plans will have government costs of \$74 billion, higher than previous budget estimates. IDR plans are designed to help ease student debt burden by setting loan payments as a percentage of borrower income, extending repayment periods from the standard 10 years to up to 25 years, and forgiving remaining balances at the end of that period. While actual costs cannot be known until borrowers repay their loans, GAO found that current IDR plan budget estimates are more than double what was originally expected for loans made in fiscal years 2009 through 2016 (the only years for which original estimates are available). This growth is largely due to the rising volume of loans in IDR plans.

#### Estimated Costs of Direct Loans in Income-Driven Repayment Plans

Direct loans made in fiscal years 1995-2017

All dollar amounts estimated



Source: GAO analysis of the U.S. Department of Education's fiscal year 2017 budget estimates. | GAO-17-22

Note: Due to the timing of the fiscal year 2017 budget, the amount of loans made to borrowers in fiscal years 2016 and 2017 are estimated.

Education's approach to estimating IDR plan costs and quality control practices do not ensure reliable budget estimates. Weaknesses in this approach may cause costs to be over- or understated by billions of dollars. For instance:

- Education assumes that borrowers' incomes will not grow with inflation even though federal guidelines for estimating loan costs state that estimates should account for relevant economic factors. GAO tested this assumption by incorporating inflation into income forecasts, and found that estimated costs fell by over \$17 billion.
- Education also assumes no borrowers will switch into or out of IDR plans in the future despite participation growth that has led budget estimates to more than double from \$25 to \$53 billion for loans made in recent fiscal years. Predicting plan switching would be advisable per federal guidance on estimating loan costs. Education has begun developing a revised model with this capability, but this model is not complete and it is not yet clear when or how well it will reflect IDR plan participation trends.

Insufficient quality controls contributed to issues GAO identified. For instance:

- Education tested only one assumption for reasonableness, and did so at the request of others, although such testing is recommended in federal guidance on estimating loan costs. Without further model testing, Education's estimates may be based on unreasonable assumptions.

Due to growing IDR plan popularity, improving Education's estimation approach is especially important. Until that happens, IDR plan budget estimates will remain in question, and Congress's ability to make informed decisions may be affected.

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### Abbreviations

Direct Loan	William D. Ford Federal Direct Loan Program
Education	U.S. Department of Education
IDR	Income-Driven Repayment
OMB	Office of Management and Budget
PSLF	Public Service Loan Forgiveness
Treasury	U.S. Department of the Treasury

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November 15, 2016

The Honorable Michael B. Enzi  
Chairman  
Committee on the Budget  
United States Senate

Dear Mr. Chairman:

Currently, over 30 million student loan borrowers hold more than \$900 billion in William D. Ford Federal Direct Loans (Direct Loans), and there are indications that some face difficulties repaying their loans. For instance, almost 20 percent of Direct Loan borrowers were delinquent on their loan payments at the end of 2015, and more than a million borrowers defaulted on their loans over the 2015 fiscal year. Since 2009, the U.S. Department of Education (Education) has created several new Income-Driven Repayment (IDR) plans that borrowers can select to reduce challenges they face in repaying their loans. These plans primarily base payment amounts on a borrower's income and extend repayment periods from the standard 10 years to up to 25 years with any remaining balance forgiven at the end of that period.

Participation in IDR plans is growing, as is their estimated cost to the government. By June 2016, 24 percent of borrowers repaying their loans (or 5.3 million borrowers) were doing so in IDR plans, and it is likely that more will join in the future. We reported in 2015 that there were gaps in awareness about IDR plans.<sup>1</sup> In April 2016, the Administration announced a new goal to add 2 million new borrowers to IDR plans over the next year, through efforts including targeted outreach. Education has also increased its estimates of IDR plan costs. For instance, in its fiscal year 2016 budget justification, Education revised its prior-year estimates of Direct Loan costs upward by \$12.3 billion, and cited growing IDR plan enrollment as the primary cause.

Given questions among policymakers and experts about IDR plan costs to the federal government, you asked us to examine Education's IDR plan

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<sup>1</sup> GAO, *Federal Student Loans: Education Could Do More to Help Ensure Borrowers are Aware of Repayment and Forgiveness Options*, [GAO-15-663](#) (Washington, D.C.: Aug. 25, 2015).

budget estimates and evaluate its approach to estimating costs. In this report, we examine:

1. What are Education's current IDR plan budget estimates and how have they changed over time?
2. To what extent do Education's approach to estimating IDR plan costs and quality control practices help ensure reliable budget estimates?

We used a variety of methods to answer these questions. We reviewed relevant federal laws, regulations, and guidance regarding subsidy cost estimates and IDR plans. We also interviewed officials from the Congressional Budget Office and the U.S. Department of the Treasury (Treasury) and staff from the Office of Management and Budget (OMB), the office that oversees the formulation of the President's budget, as well as higher education policy experts to discuss issues related to federal budgeting practices and estimated IDR plan costs. Additionally, we reviewed documentation and interviewed officials from Education about the agency's approach to estimating costs and its quality control practices.

We analyzed data underlying Education's annual budget estimates for the Direct Loan program. To address our first objective, we analyzed data from two sources: (1) Education's annual submissions to the President's budget for fiscal years 2011 through 2017 and (2) supplemental data provided by Education that rely on the data and assumptions underlying its fiscal year 2016 and 2017 budget estimates.<sup>2</sup> To address our second objective, we reviewed the computer programs and data Education uses to estimate repayment patterns for loans in IDR plans. We then used these programs to generate our own estimates of how changing selected assumptions would affect cost estimates.<sup>3</sup> We also analyzed estimated cash flow data for loans in IDR plans to estimate the proportion of loan dollars Education expects to be forgiven through these plans. To assess

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<sup>2</sup> The President's budget appendix includes disaggregated estimates of IDR plan costs for Direct Loans issued in the current and two most recent fiscal years. The earliest budget containing such break-outs—the fiscal year 2011 budget—includes estimated IDR plan costs for loans issued in fiscal years 2009, 2010, and 2011. The supplemental data queries we requested from Education included break-outs of estimated IDR plan costs for Direct Loans issued from fiscal years 1995 through 2017.

<sup>3</sup> Specifically, we used these programs to generate alternate IDR plan repayment streams. Education then produced updated subsidy cost estimates using our revised repayment streams. We used Education's fiscal year 2017 budget estimates as a baseline against which to measure the impact of our changes to Education's assumptions.

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the reliability of Education's budget estimates, we interviewed agency officials, reviewed related documentation, and conducted extensive electronic testing. We believe the data are reliable to report on the funding Education reports is necessary to operate the Direct Loan program, and to illustrate the sensitivity of Education's budget estimates to different assumptions about future loan repayment activity. We evaluated Education's approach to estimating IDR plan costs and quality control practices using guidance for estimating subsidy costs issued by the Federal Accounting Standards Advisory Board, accepted statistical practices, and Education's information quality guidelines, among other sources. We assessed Education's information sharing practices against Education's strategic plan and standards for internal control in the federal government. See appendix I for more information on our methodology and appendix II for more information on Education's approach.

We conducted this performance audit from March 2015 to November 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

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### Direct Loan Repayment Plans

Education's Direct Loan program provides financing to students and their parents to help students obtain postsecondary education. This program is currently the largest federal direct loan program with \$912 billion in outstanding loans as of June 2016.<sup>4</sup> Under this program, Education issues several types of student loans described in the following sidebar.

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<sup>4</sup> Direct loans are a disbursement of funds by the federal government to a nonfederal borrower under a contract that requires repayment. Guaranteed loans are issued by nonfederal lenders and guaranteed or insured by the federal government. The federal government previously offered student loan guarantees through the Federal Family Education Loan program. While the SAFRA Act terminated the authority to make or insure new loans under this program as of June 30, 2010, there was \$343 billion of outstanding Federal Family Education Loan debt as of June 2016, some of which continues to be held by private lenders. (Some loans were turned over to Education following the 2008 economic downturn, and others have defaulted and are being collected by a guarantee agency or Education.) Pub. L. No. 111-152, tit. II, § 2201, 124 Stat. 1029, 1074 (2010).

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**William D. Ford Federal Direct Loan Types**

**Subsidized Stafford Loans:** Available only to undergraduate students with financial need (generally the difference between their cost of attendance and a measure of their ability to pay, known as expected family contribution). The interest rate as of July 1, 2016 is 3.76 percent. Borrowers are not responsible for paying interest on these loans while in school and during certain periods of deferment.

**Unsubsidized Stafford Loans:** Available both to undergraduate and graduate school students irrespective of financial need. Interest rates as of July 1, 2016 are 3.76 percent for undergraduates and 5.31 percent for graduate school borrowers. Borrowers must pay all interest on these loans.

**PLUS Loans:** Available to graduate student borrowers and parents of dependent undergraduates. The interest rate as of July 1, 2016, is 6.31 percent. Borrowers must pay all interest on these loans.

**Consolidation Loans:** Available to student and parent borrowers wanting to combine multiple federal student loans (including those listed above) into one loan. Repayment periods are extended up to 30 years, thereby lowering monthly payments. Interest rates are equal to the weighted average of the underlying loans.

Source: GAO (Summary of U.S. Department of Education William D. Ford Federal Direct Loan features) | GAO-17-22

Education offers a variety of repayment plans for Direct Loan borrowers: Standard, Graduated, Extended, and Income-Driven. Income-Driven Repayment (IDR) is an umbrella term that describes a number of repayment plans available to Direct Loan borrowers who meet specific eligibility requirements, as seen in figure 1. Unlike the Standard, Graduated, and Extended repayment plans, IDR plans offer loan forgiveness at the end of the repayment term. Additionally, their repayment terms are longer than under the Standard and Graduated plans, which are set at 10 years for non-consolidated loans.

**Figure 1: Direct Loan Repayment Plans**

	Income-Driven Repayment plans							
	Standard plan	Graduated plan	Extended plan	Income-Contingent	Income-Based	New Income-Based	Pay As You Earn	Revised Pay As You Earn
<b>Eligibility<sup>a</sup></b>	All Direct Loan borrowers	All Direct Loan borrowers	Borrowers with \$30,000 or more in student loans	All Direct Loan borrowers	Income-eligible borrowers <sup>e</sup> (Loans issued before July 1, 2014)	Income-eligible borrowers <sup>e</sup> (Loans issued July 1, 2014 or later)	Income-eligible borrowers <sup>e</sup> (Loans issued Oct. 1, 2011 or later <sup>g</sup> )	All Direct Loan borrowers
<b>Monthly payment<sup>b</sup></b>	Remains fixed	Increases over time	Fixed or increases over time	20% of borrower's discretionary income <sup>d</sup>	15% of borrower's discretionary income <sup>f</sup>	10% of borrower's discretionary income <sup>f</sup>	10% of borrower's discretionary income <sup>f</sup>	10% of borrower's discretionary income
<b>Repayment term (in years)</b>	10 <sup>c</sup>	10 <sup>c</sup>	up to 25	25	25	20	20	20 or 25 <sup>h</sup>
	Loan fully repaid at end of term			Forgiveness of any remaining balance at end of term				

Source: GAO analysis of federal student loan repayment plan information. | GAO-17-22

Note: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

<sup>a</sup>Defaulted loans and PLUS loans made to parents of dependent undergraduates (Parent PLUS loans) are ineligible for Income-Driven Repayment plans. In general, default occurs when a borrower reaches 270 days of delinquency.

<sup>b</sup>Monthly payments for Income-Driven Repayment plans are generally set as a proportion of the borrower's discretionary income, which is defined as adjusted gross income exceeding 100 percent of the federal poverty guideline for the Income-Contingent Repayment plan, and 150 percent of the guideline for all other plans. (Borrowers without discretionary income pay \$0.)

<sup>c</sup>Repayment term may be extended to up to 30 years for Consolidation loans (which are available to borrowers wishing to combine multiple federal student loans into one loan) depending on the amount.

<sup>d</sup>Borrowers pay what would be owed under on a fixed 12-year repayment term if less than what would be owed based on discretionary income. The fixed 12-year repayment amount is adjusted according to income.

<sup>e</sup>Borrowers are eligible if their annual Standard 10-year repayment amount exceeds their repayment amount under the plan.

<sup>f</sup>Payments cannot rise above the Standard 10-year repayment amount.

<sup>g</sup>Borrower must not have an outstanding balance on certain other federal student loans issued prior to October 1, 2007.

<sup>h</sup>Maximum repayment term is 20 years for borrowers with undergraduate loans and 25 years for borrowers with loans for graduate education.

Borrowers in IDR plans generally have lower monthly payments compared to the Standard 10-year repayment plan.<sup>5</sup> They may also pay less in the long term than they would under the Standard 10-year repayment plan due to the opportunity for eventual loan forgiveness. However, some borrowers may pay more. Borrowers in IDR plans can ultimately pay more in interest on their loans than they would under the Standard 10-year repayment plan due to longer repayment periods. Some borrowers will also fully repay their loans before their IDR plan repayment term ends and, therefore, not receive forgiveness. Additionally, under current tax law any amount forgiven under these plans is subject to federal income tax.

In addition to making monthly payments more manageable (and eventually reducing the total amount owed for some borrowers receiving forgiveness), IDR plans may also reduce the risk of default. Borrowers who default on student loans face serious consequences, including damaged credit ratings and difficulty obtaining affordable credit in the future.<sup>6</sup> In 2015, we reported that borrowers in two IDR plans had much lower default rates than borrowers in the Standard repayment plan.<sup>7</sup> Specifically, among borrowers who entered repayment from fiscal year 2010 through fiscal year 2014, less than 1 percent of borrowers in the Income-Based Repayment and Pay As You Earn had defaulted on their loan, compared to 14 percent in the Standard repayment plan.

To participate in an IDR plan, borrowers must provide documentation of their adjusted gross income (which we generally refer to as income in this report) to their loan servicer and certify their family size for an eligibility determination.<sup>8</sup> Borrowers must recertify this information annually, which is used to update the borrower's monthly payment amount. A borrower

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<sup>5</sup> There are five IDR plans that Education has made available borrowers: Income-Contingent, Pay As You Earn, Revised Pay As You Earn, and two Income-Based plans. To differentiate between the two Income-based plans which provide different benefits to borrowers, in this report we refer to the newer plan, implemented in 2014, as the New Income-Based Repayment plan.

<sup>6</sup> The federal government also incurs costs to collect on defaulted loans, although it has strong collection powers.

<sup>7</sup> [GAO-15-663](#).

<sup>8</sup> For most IDR plans, spousal income is only considered in payment calculations if the borrower files taxes jointly with his or her spouse; however, spousal income is considered when calculating payments under the Revised Pay As You Earn plan regardless of whether the borrower filed jointly or separately.

who fails to provide updated income information can remain in an IDR plan in order to qualify for future loan forgiveness, but their monthly payments will no longer be based on their income. Rather, payments will generally revert to the amount that would be owed under the Standard 10-year repayment plan until the borrower submits the required information.

Borrowers who work in public service may lower their long-term loan costs by participating in the Public Service Loan Forgiveness (PSLF) program while repaying their loans through an IDR plan.<sup>9</sup> Beginning in October 2017, borrowers eligible for PSLF can have their remaining Direct Loan balances forgiven after at least 10 years of payments in eligible repayment plans, generally an IDR plan or the Standard 10-year repayment plan.<sup>10</sup> As we recently reported, PSLF may provide substantial savings over the life of the loan for qualifying borrowers in IDR plans compared to what they would pay without the PSLF benefit.<sup>11</sup> In contrast, borrowers in the Standard 10-year repayment plan would pay their loans in full by the time they were eligible for forgiveness under PSLF. (See figure 2.)

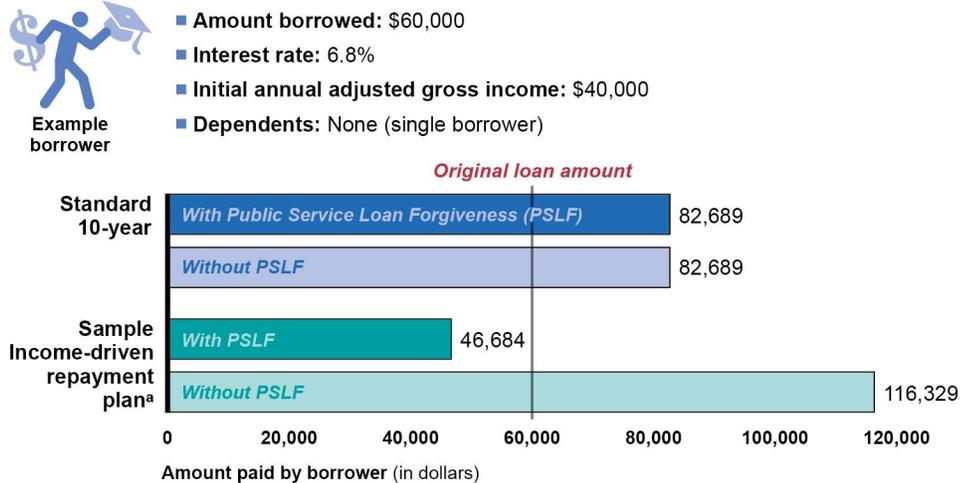
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<sup>9</sup> See 34 C.F.R. § 685.219. Qualified public service organizations include those in federal, state, local government; 501(c)(3) nonprofits; and other nonprofit organizations providing a variety of public services.

<sup>10</sup> Eligible borrowers may receive forgiveness after making 120 on-time payments in an IDR plan or the Standard plan (which generally takes at least 10 years) while employed full-time by a public service organization. Borrowers in another payment plan may also participate if the borrower's payment amounts equal or exceed the 10-year Standard payment amount. Borrowers must still be working for a qualifying organization when they apply for and receive forgiveness.

<sup>11</sup> [GAO-15-663](#).

**Figure 2: Amount Paid by Hypothetical Borrower with Public Service Loan Forgiveness, under a Sample Income-Driven Repayment Plan and the Standard 10-Year Repayment Plan**



Source: Adapted from GAO-15-663. | GAO-17-22

Notes: The Public Service Loan Forgiveness program allows borrowers employed full-time by a public service organization to apply for forgiveness after making 120 on-time payments in an Income-Driven Repayment plan or the Standard 10-year repayment plan.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

This example assumes about \$60,000 borrowed (rounded from \$59,978) to reflect the approximate median loan amount of borrowers with employment and loans certified for Public Service Loan Forgiveness in 2015. This analysis illustrates the amount paid by the borrower. It does not reflect the total cost to the government of making the loan, which is calculated on a net present value basis and includes other factors that could increase or decrease the government's total cost, such as fees paid by borrowers.

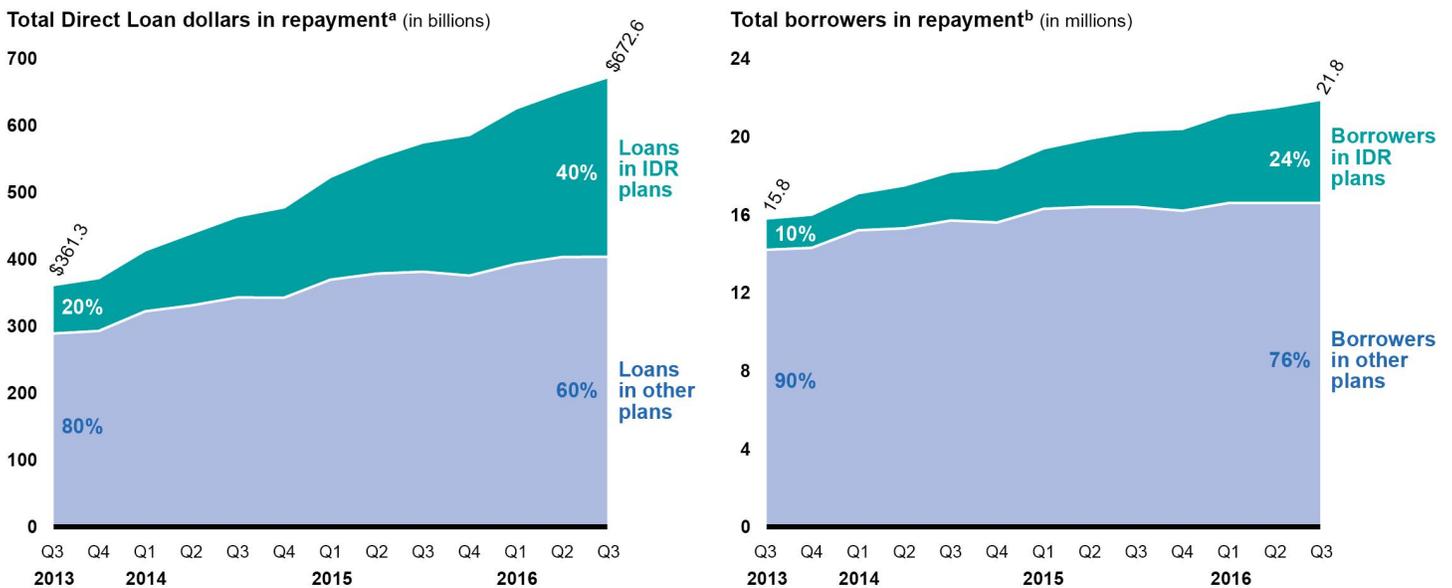
<sup>a</sup>The Income-Driven Repayment plan used for this example is the Income-Based Repayment plan, which bases repayment amounts on 15 percent of the borrower's discretionary income and has a repayment period of up to 25 years.

Participation in IDR plans has grown over time, as seen in figure 3. According to currently available quarterly data released by Education, the percent of outstanding Direct Loan dollars being repaid through IDR plans doubled from June 2013 to June 2016 to 40 percent.<sup>12</sup> The percent of borrowers participating in IDR plans more than doubled over the same

<sup>12</sup> Amounts include loan dollars in deferment and forbearance. Borrowers may defer repaying their loans for certain reasons, such as enrollment in college or an economic hardship. Borrowers who do not qualify for deferment may be granted a forbearance for up to 12 months for reasons including illness and National Guard activation.

time period to 24 percent.<sup>13</sup> However, as we previously reported, some borrowers who could benefit from IDR plans may still not be aware of them.<sup>14</sup>

**Figure 3: Direct Loan Dollars and Borrowers in Income-Driven Repayment Plans, Third Quarter Fiscal Year 2013 through Third Quarter Fiscal Year 2016**



Source: GAO analysis of Income-Driven Repayment (IDR) data from the National Student Loan Data System (NSLDS). | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>Includes loan dollars in deferment and forbearance, periods in which borrowers may temporarily cease repaying their loans for approved reasons, such as enrollment in college or economic hardship.

<sup>b</sup>Includes borrowers in deferment and forbearance.

<sup>13</sup> The proportion of outstanding loan dollars being repaid through IDR plans is higher than the proportion of borrowers in IDR plans because borrowers in IDR plans have higher loan balances on average than borrowers in other repayment plans. In our 2015 report, we found that 64 percent of borrowers in the Income-Based Repayment plan and 45 percent of borrowers in the Pay As You Earn repayment plan had borrowed more than \$30,000, compared to 23 percent of borrowers in the Standard repayment plan. [GAO-15-663](#).

<sup>14</sup> As a result, we recommended that Education take steps to ensure that it consistently informs borrowers of these options. [GAO-15-663](#).

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## Proposals to Modify IDR Plans

As the variety of IDR options available to borrowers has expanded in recent years, there have been numerous reform proposals with a variety of goals ranging from simplifying IDR plans and better targeting their benefits to changing the tax treatment of IDR plan loan forgiveness. For instance, recent President's budgets have proposed limiting the available IDR plan options for new borrowers to one revised IDR plan designed to better target benefits to the highest-need borrowers.<sup>15</sup> A proposal has been introduced in the current Congress that would similarly make only one IDR plan available to new borrowers and target more generous benefits to those with lower incomes.<sup>16</sup> Additional legislative proposals would automatically enroll all borrowers in a version of income-driven repayment and withhold payments from borrowers' paychecks.<sup>17</sup> Other proposed legislation would allow for automatic annual recertification of borrowers' incomes and automatically place certain delinquent borrowers in an IDR plan.<sup>18</sup> Another proposal would expand IDR plan eligibility to parents with Parent PLUS loans for dependent students.<sup>19</sup> Legislation has

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<sup>15</sup> Similar to the new Revised Pay As You Earn plan, borrowers' payment amounts under this plan could rise above the Standard 10-year payment amount. Loan forgiveness under PSLF would also be capped to discourage overborrowing, and payments made under non-IDR plans could not be applied toward PSLF to ensure that forgiveness is targeted to borrowers with the greatest need. This proposal has not been enacted.

<sup>16</sup> Senate Bill 85 would establish a simplified IDR plan for all new borrowers that would set borrower payment amounts as equal to 10 percent of discretionary income up to \$25,000 and 15 percent above that threshold for borrowers with higher incomes. Repay Act of 2015, S. 85, 114th Cong. § 2. House Bill 4652 would also make only one IDR plan available to new borrowers, but payment amounts would not escalate above 10 percent of discretionary income for borrowers with higher incomes. Clarity in Lending for Education and Repayment Act, H.R. 4652, 114th Cong. § 2 (2016).

<sup>17</sup> Senate Bill 2456 and House Bill 3752, in addition to establishing a new income dependent education assistance loan program, would establish a new income-driven repayment plan and automatic withholding of 10 and 15 percent, respectively, of the borrower's wages above the borrower's exemption amounts. Dynamic Repayment Act of 2016, S. 2456, 114th Cong. §§ 2-3; Earnings Contingent Education Loans Act of 2015, H.R. 3752, 114th Cong. §§ 2-3.

<sup>18</sup> SIMPLE Act, H.R. 5962, 114th Cong. §§ 2-3 (2016).

<sup>19</sup> Parent Plus Improvement Act of 2016, H.R. 4661, 114th Cong. § 5.

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also been introduced that would exempt student loan forgiveness under certain IDR plans from being taxed as income.<sup>20</sup>

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## Subsidy Cost Estimates

As required by the Federal Credit Reform Act of 1990, Education estimates the long-term costs, known as subsidy costs, of the Direct Loan program annually for inclusion in the President's budget.<sup>21</sup> For Direct Loans, subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.<sup>22</sup> (In this report, we generally refer to subsidy costs as "costs.") Subsidy cost estimates are calculated based on the net present value of lifetime estimated cash flows to and from the government associated with these loans.<sup>23</sup> For Direct Loans, cash flows from the government include loan disbursements to borrowers, while cash flows to the government include repayments of loan principal, interest and fee payments, and recoveries on defaulted loans. A positive subsidy cost estimate indicates that the government anticipates a net cost, while a negative subsidy cost estimate indicates that the government anticipates generating net subsidy income, not counting administrative costs.

Education also annually reestimates the cost of loans made in each fiscal year, known as a loan cohort. Reestimates take into account actual loan performance as well as changes in assumptions about future performance, such as how many borrowers will default or how many will participate in different repayment plans. Reestimates may result in increases or decreases in subsidy cost estimates. No loan cohorts have been fully repaid, and estimates for all cohorts continue to be updated annually in the President's budget.

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<sup>20</sup> The Student Loan Tax Relief Act and the Student Loan Tax Debt Relief Act would both exempt student loans discharged through participation in the Income-Based Repayment and Income-Contingent Repayment plans from being taxed as income. Student Loan Tax Relief Act, S. 3266, 114th Cong. § 2 (2016). Student Loan Tax Debt Relief Act, H.R. 2429, 114th Cong. §2 (2015).

<sup>21</sup> Pub. L. No. 101-508, § 13201(a), 104 Stat. 1388, 1388-609 (Nov. 5, 1990), *classified, as amended*, at 2 U.S.C. §§ 661-661f.

<sup>22</sup> Administrative costs are loan program expenses excluded from subsidy cost calculations, such as costs related to processing loan applications or servicing existing loans.

<sup>23</sup> The net present value of expected future cash flows over the life of each loan cohort is calculated using a discount rate, which is also generally the rate Education pays Treasury to finance its lending.

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To estimate subsidy costs, Education has developed a student loan cash flow model (the student loan model) that incorporates a variety of assumptions about the future. These assumptions concern various aspects of loan performance, such as how many borrowers will prepay their loans, how many borrowers will default, and how successful default collection activities will be. Education uses a supplementary model to assist with the task of estimating repayment patterns for loans in IDR plans. (See appendix II for a description of how this supplementary model for estimating IDR plan repayment patterns works.) In the spring of 2015, Education initiated a redesign of its overall student loan model with technical support from Treasury and guidance from OMB in what is anticipated to be a multi-year project.

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## Education's Budget Estimates of IDR Plan Costs Are Growing, but Actual Costs Will Not Be Known for Many Years

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### Education Estimates That Loans in IDR Plans Will Have Substantial Costs to the Government

Through our analysis of data underlying the President's fiscal year 2017 budget, we found that Education estimates that Direct Loans in IDR plans will cost the government about \$74 billion over their repayment term.<sup>24</sup> More specifically, Education estimates that about \$355 billion in loans will enter an IDR plan, and \$281 billion will ultimately be paid by borrowers.<sup>25</sup>

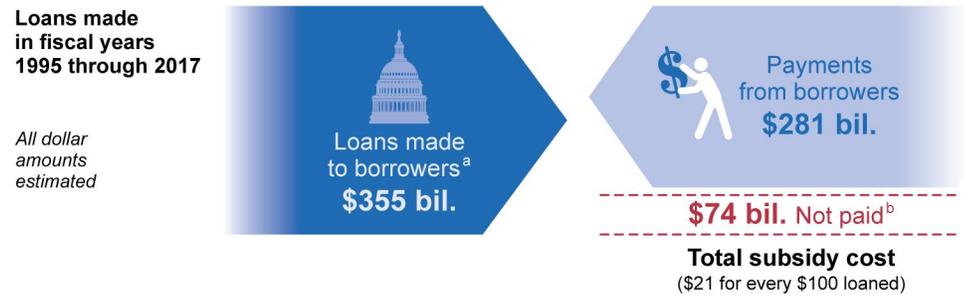
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<sup>24</sup> This estimate of IDR plan costs includes the total volume of Direct Loans issued in past cohorts and loans estimated to be issued in the 2016 and 2017 cohorts that Education expects to be repaid in an IDR plan. While the first cohort of Direct Loans was issued in 1994, Education begins estimating IDR subsidy costs with the 1995 loan cohort.

<sup>25</sup> The estimated \$355 billion that Education expects to be repaid in an IDR plan includes the original loan volume estimate published in the President's fiscal year 2017 budget for the 2017 cohort only. Loan volume estimates for all other cohorts were provided by Education and are updated to remove loans that are originated, but may not be disbursed to borrowers (e.g., when a borrower decides not to attend school.) The \$355 billion in IDR plan loan volume accounts for 26 percent of the \$1.4 trillion total in Direct Loans Education estimates will have been issued from fiscal year 1994 through the end of fiscal year 2017.

As a result, Education expects a 21 percent subsidy rate, or an average cost to the government of \$21 per every \$100 in loans disbursed.<sup>26</sup> See figure 4.

**Figure 4: Current Estimated Subsidy Costs of All Direct Loans in Income-Driven Repayment Plans (Fiscal Year 2017 Budget)**



Source: GAO analysis of the U.S. Department of Education's fiscal year 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>Due to the timing of the fiscal year 2017 budget, the amount of loans made to borrowers in fiscal years 2016 and 2017 are estimated.

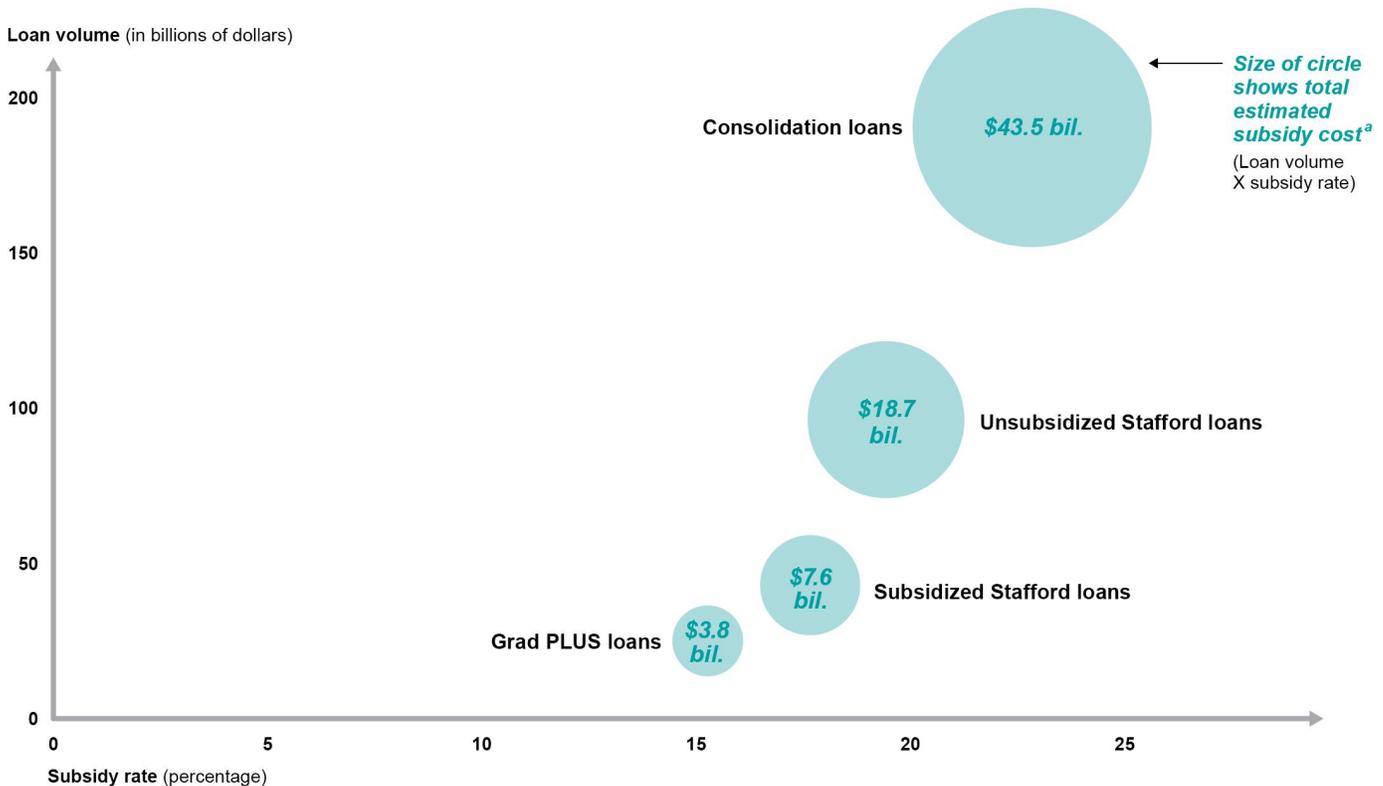
<sup>b</sup>The amount not paid is the estimated subsidy cost.

All of the Direct Loan types eligible to participate in IDR plans contribute to the \$74 billion Education estimates the government will incur in subsidy costs. Of these loan types, Consolidation loans are estimated to be the most costly, as seen in figure 5. Consolidation loans, which combine multiple existing federal student loans into one loan, are larger on average than other types of Direct Loans, and may have higher balances forgiven at the end of their repayment term. Further, Education officials said that some borrowers in IDR plans with Consolidation loans have higher default risks than other borrowers, which leads to higher expected

<sup>26</sup> This 21 percent subsidy rate is calculated by dividing the estimated subsidy cost of \$74 billion by the estimated \$355 billion in loan volume. Presented another way, the total estimated subsidy cost of \$74 billion equals the 21 percent subsidy rate multiplied by the \$355 billion loan volume estimate.

subsidy rates for these loans.<sup>27</sup> Education estimates lower subsidy costs for Subsidized and Unsubsidized Stafford and PLUS loans for graduate student borrowers (known as Grad PLUS loans) than Consolidation loans.<sup>28</sup>

**Figure 5: Current Estimated Subsidy Costs of All Direct Loans in Income-Driven Repayment Plans, by Loan Type (Fiscal Year 2017 Budget)**



Source: GAO analysis of the U.S. Department of Education’s fiscal year 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

<sup>27</sup> Specifically, borrowers who have defaulted on their federal student loans may consolidate their defaulted loans in order to exit default status. Education officials stated that such borrowers almost always enter IDR plans, and are more likely to default on their new Consolidation loans in the future than other borrowers, resulting in higher expected subsidy rates.

<sup>28</sup> PLUS loans available to parents of dependent undergraduates (known as Parent PLUS loans) are not eligible for IDR plans.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

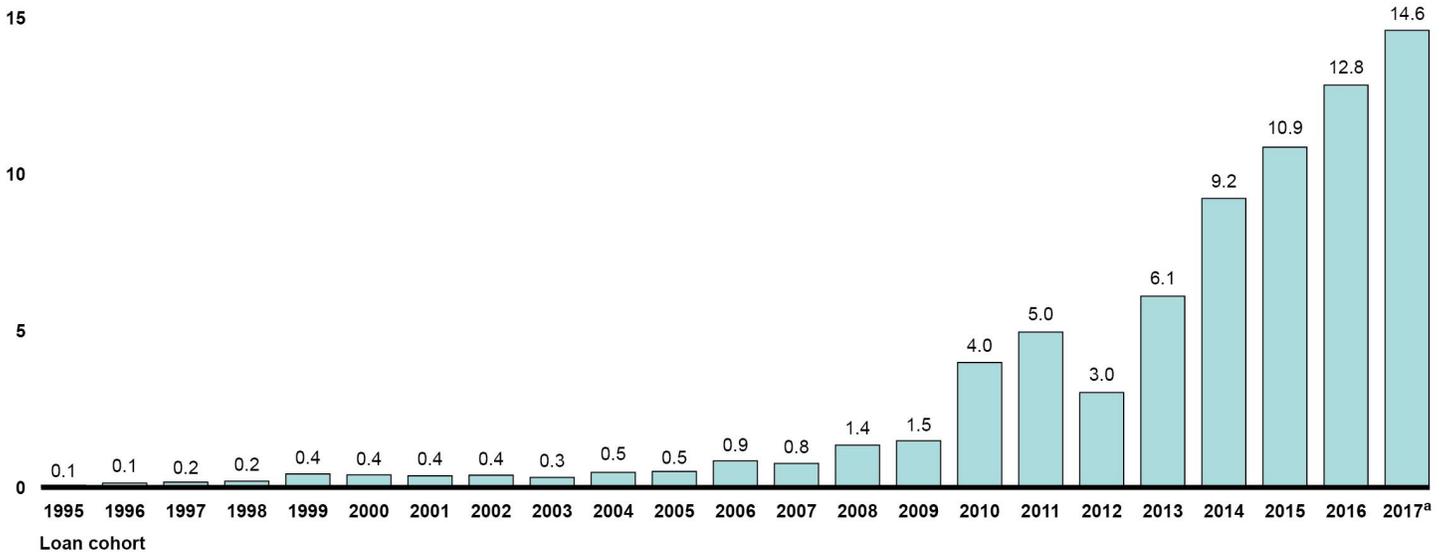
Education issues four types of Direct Loans: (1) Subsidized Stafford loans are available to undergraduate borrowers with financial need. (2) Unsubsidized Stafford loans are available to undergraduate and graduate student borrowers, regardless of financial need. (3) PLUS loans are available to graduate student borrowers as Grad PLUS loans and parents of dependent undergraduates as Parent PLUS loans. (Grad PLUS loans are eligible for Income Driven Repayment plans, while Parent PLUS loans are not.) (4) Consolidation loans are available to borrowers wishing to combine multiple existing federal student loans into one loan.

<sup>a</sup>Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. They can be calculated by multiplying the rate of the expected subsidy by the volume of loans estimated to be made in a given year.

As figure 6 shows, Education estimates higher subsidy costs for loans participating in IDR plans from more recent loan cohorts compared to loans from older cohorts.

**Figure 6: Current Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, by Loan Cohort (Fiscal Year 2017 Budget)**

Dollars (in billions)



Source: GAO analysis of the U.S. Department of Education's fiscal year 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. Subsidy costs are calculated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

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<sup>a</sup>The subsidy cost estimate for the 2017 loan cohort uses that cohort's original loan volume estimate contained in the President's fiscal year 2017 budget. Estimates for all other cohorts use updated loan volume estimates provided by Education that exclude loans that are originated but may not be disbursed to borrowers (e.g., when borrowers decide not to attend school).

Figure 7 shows that these higher estimated costs track closely with the higher loan volume (or total loan dollars) estimated to enter IDR plans for more recent loan cohorts. Education officials confirmed that this higher estimated loan volume is likely related to three key factors:

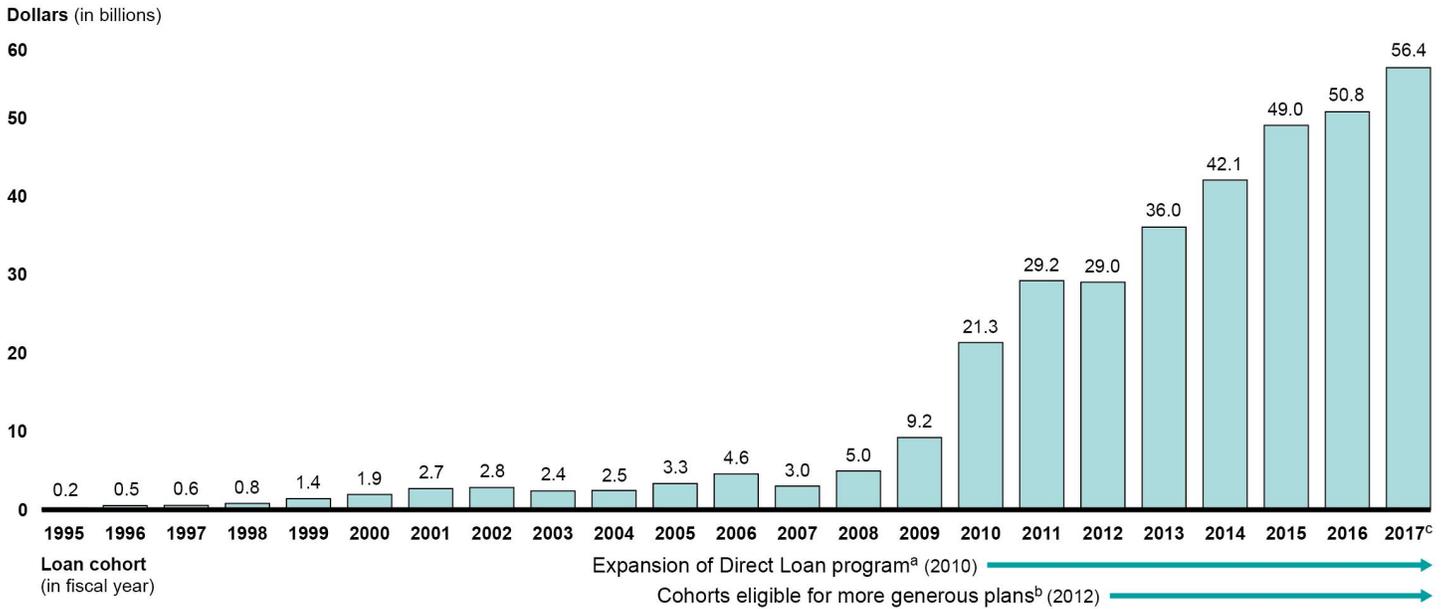
- more generous IDR plans available for loans issued since fiscal year 2012,<sup>29</sup>
- increased efforts to make borrowers aware of IDR plans, and
- increased overall volume of Direct Loans issued as a result of increased college attendance following the 2008 economic downturn and the end of the Federal Family Education Loan program (which guaranteed federal student loans issued by private lenders) in 2010.<sup>30</sup>

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<sup>29</sup> These plans—New Income-Based Repayment and Pay As You Earn—limit monthly payments to 10 percent of discretionary income and offer loan forgiveness after 20 years. While the new Revised Pay As You Earn plan is available to all cohorts and shares some characteristics with these plans, it has other provisions that make it less generous. Education officials stated that they do not expect borrowers with loans issued in older cohorts to take advantage of Revised Pay As You Earn.

<sup>30</sup> Under the Federal Family Education Loan Program, Education guarantees loans that were issued by private lenders by committing to cover costs related to loan defaults and other write-offs. The SAFRA Act terminated the authority to make or insure new Federal Family Education Loans after June 30, 2010. Pub. L. No. 111-152, tit. II, § 2201, 124 Stat. 1029, 1074 (2010).

**Figure 7: Current Estimated Direct Loan Volume in Income-Driven Repayment Plans, by Loan Cohort (Fiscal Year 2017 Budget)**



Source: GAO analysis of the U.S. Department of Education’s fiscal year 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

Loan volume is estimated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

<sup>a</sup>The volume of loans issued under the Direct Loan program expanded dramatically after the SAFRA Act terminated the authority to make or insure new Federal Family Education Loans on June 30, 2010.

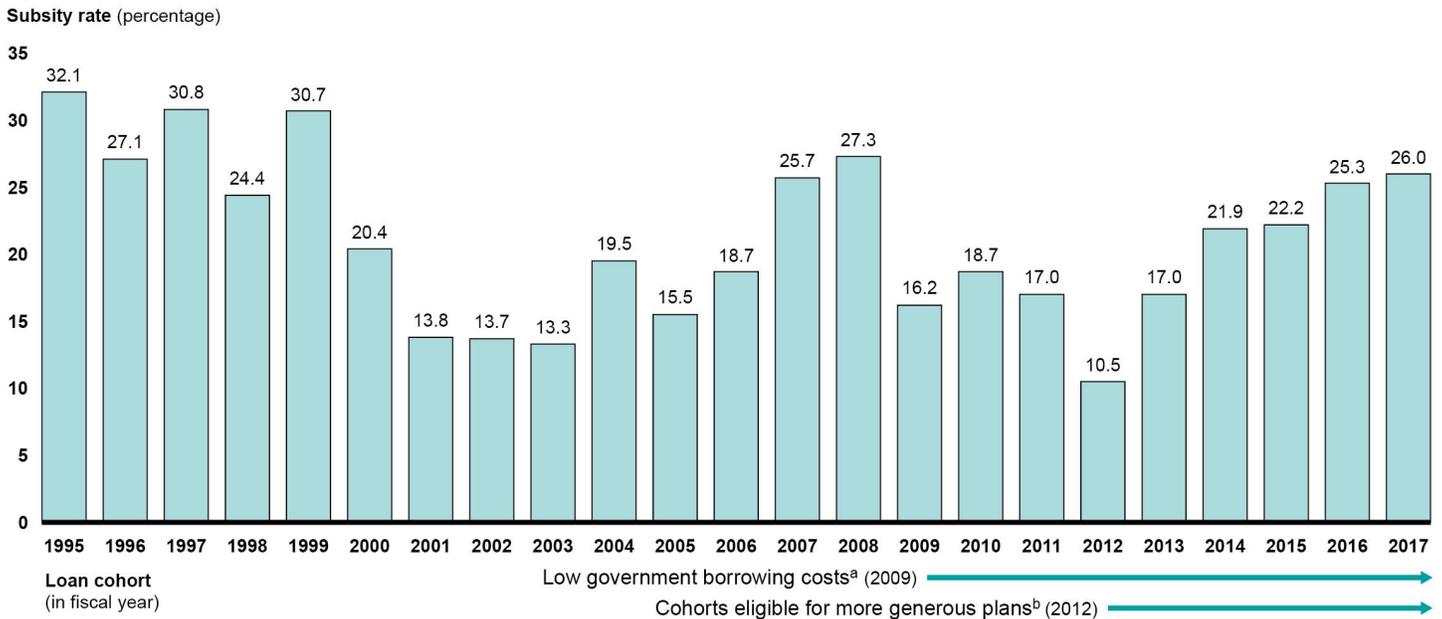
<sup>b</sup>In general, loans from the 2012 cohort forward are eligible for the most generous Income-Driven Repayment plans.

<sup>c</sup>The loan volume estimate for the 2017 loan cohort is the original estimate contained in the President’s fiscal year 2017 budget. Estimates for all other loan cohorts are updated by Education to exclude loans that are originated but may not be disbursed to borrowers (e.g., when borrowers decide not to attend school).

While borrowers in IDR plans in more recent loan cohorts have access to more generous benefits (which could lead to higher government costs), these loan cohorts do not have higher estimated subsidy rates than earlier loan cohorts, as seen in figure 8. Direct Loan subsidy rates fluctuate according to changes in a variety of factors, and are particularly

sensitive to changes in government borrowing costs and borrower interest rates.<sup>31</sup> As we previously reported, government borrowing costs fell sharply in 2009, due to historically low interest rates of Treasury securities.<sup>32</sup> This phenomenon contributed to lower overall estimated subsidy rates for Direct Loans issued following the 2008 loan cohort.

**Figure 8: Current Estimated Subsidy Rates of Direct Loans in Income-Driven Repayment Plans, by Loan Cohort (Fiscal Year 2017 Budget)**



Source: GAO analysis of the U.S. Department of Education’s fiscal year 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy rates represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs, and expressed as a percentage. Subsidy rates are calculated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

<sup>31</sup> As we have previously reported, the difference, or “spread,” between the government’s cost of borrowing and borrower interest rates is a key factor in determining subsidy costs. Education incurs borrowing costs on funds provided by Treasury to finance its lending through the Direct Loan program. These costs are reflected in subsidy cost estimates through the discount rate used to determine the present value of expected future cash flows for each loan cohort. GAO, *Federal Student Loans: Borrower Interest Rates Cannot Be Set in Advance to Precisely and Consistently Balance Federal Revenues and Costs*, [GAO-14-234](#) (Washington, D.C.: Jan. 31, 2014).

<sup>32</sup> Average borrower interest rates also fell during this time period, but less sharply than government borrowing costs. [GAO-14-234](#).

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Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>In 2014, we reported that government borrowing costs fell sharply in 2009 and remained low for the 2009 through 2012 cohorts. Over this period, weighted average interest rates charged to borrowers declined more gradually, leading to an increased "spread" between government borrowing costs and borrower interest rates. We also reported that Direct Loan costs are particularly sensitive to changes in the government's cost of borrowing. [GAO-14-234](#)

<sup>b</sup>In general, loans from the 2012 cohort forward are eligible for the most generous Income-Driven Repayment plans.

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## Education's Current IDR Subsidy Cost Estimates Are Higher than Previously Expected, but Actual Costs Will Not Be Known for Many Years

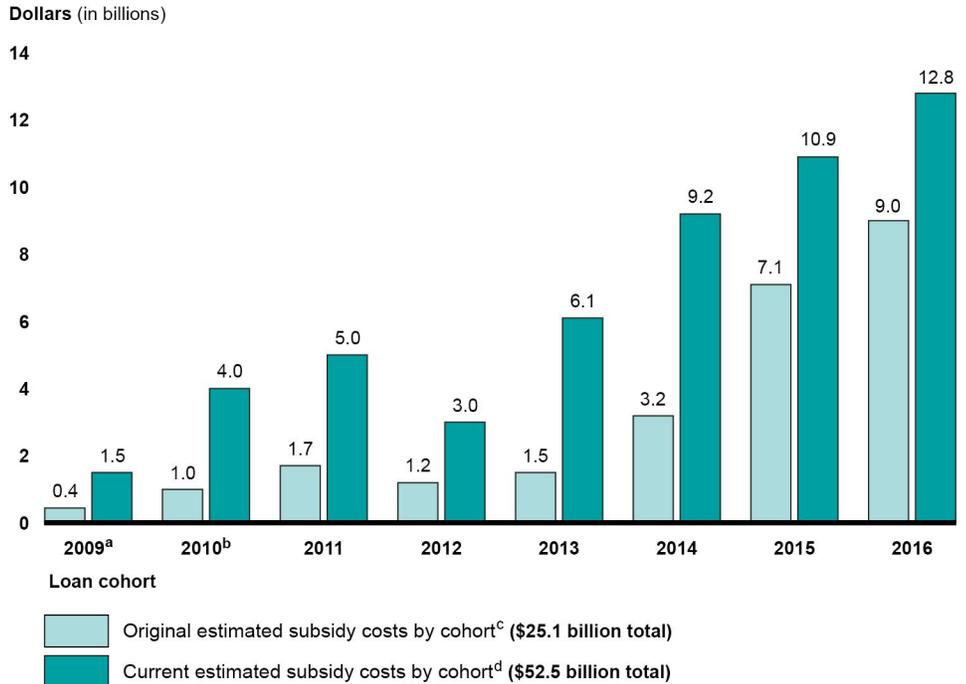
Education has raised its estimates of IDR plan costs in recent years through its annual process of revising past budget estimates to account for actual loan performance and updated assumptions about future loan performance. In figure 9, we compare Education's original IDR plan subsidy cost estimates for loans issued in recent cohorts to its current subsidy cost estimates prepared for the President's fiscal year 2017 budget.<sup>33</sup> Our results show that current estimated IDR plan costs are more than double what was originally expected for these cohorts. For instance, Education originally estimated in the President's fiscal year 2012 budget that IDR plan costs for the 2012 cohort would be \$1.2 billion. As of the fiscal year 2017 budget, Education's estimate had grown to \$3 billion.<sup>34</sup> (We also compared Education's fiscal year 2016 IDR plan budget estimates to its fiscal year 2017 budget estimates to illustrate how Education's cost estimates changed over one budget cycle, and present the results of that analysis in appendix IV.)

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<sup>33</sup> The current subsidy cost estimate refers to total updated subsidy costs reflecting data and assumptions underlying the President's fiscal year 2017 budget.

<sup>34</sup> Original IDR subsidy cost estimates are not available for the 1994-2008 cohorts because they were not published in past budgets, and Education did not maintain the information necessary to easily identify such past estimates.

**Figure 9: Original and Current (Fiscal Year 2017 Budget) Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 2009-2016 Loan Cohorts**



Source: GAO analysis of the U.S. Department of Education’s fiscal year 2011-2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. Subsidy costs are calculated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>The first available subsidy cost estimate for the 2009 cohort is its third-year estimate published in the President’s fiscal year 2011 budget.

<sup>b</sup>The first available subsidy cost estimate for the 2010 cohort is its second-year estimate published in the President’s fiscal year 2011 budget.

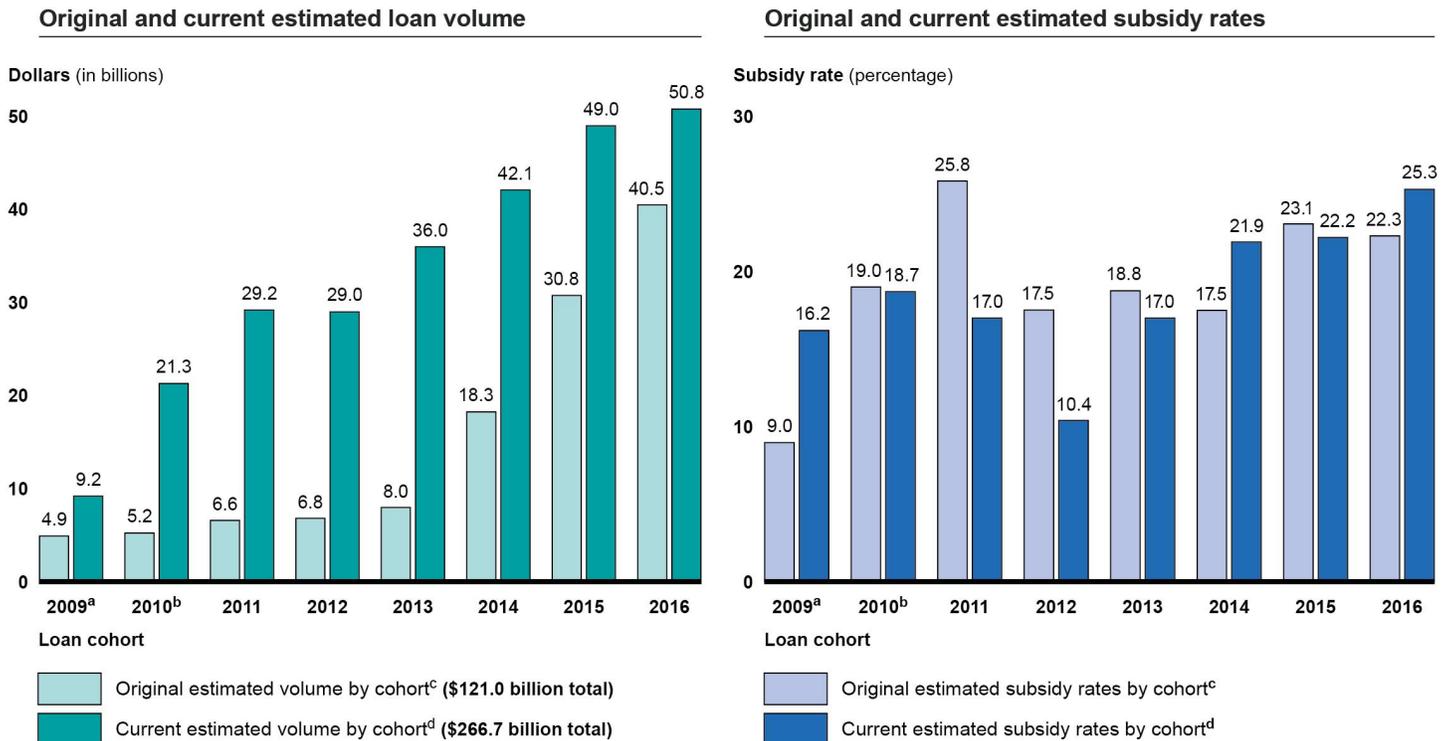
<sup>c</sup>Original subsidy cost estimates use the original loan volume estimates contained in prior President’s budgets.

<sup>d</sup>Current estimates use updated loan volume estimates provided by Education that exclude loans that are originated but may not be disbursed to borrowers (e.g., when borrowers decide not to attend school).

As seen in figure 10, subsidy rates have remained relatively stable from original to current estimates, while the volume of loans expected to be repaid in IDR plans has increased dramatically. Because Education expects loans in IDR plans to have positive subsidy rates (or to have costs

to the government), this growth in estimated loan volume has been accompanied by increasing estimates of IDR plan costs.

**Figure 10: Original and Current (Fiscal Year 2017 Budget) Estimated Loan Volume and Subsidy Rates for Direct Loans in Income-Driven Repayment Plans, 2009-2016 Loan Cohorts**



Source: GAO analysis of the U.S. Department of Education’s fiscal year 2011-2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loans subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. A subsidy rate is the cost per dollar of credit assistance, determined by dividing the subsidy cost by the volume of loans estimated to be made in a given year. Subsidy costs are calculated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>The first available subsidy cost estimate for the 2009 cohort is its third-year estimate published in the President’s fiscal year 2011 budget.

<sup>b</sup>The first available subsidy cost estimate for the 2010 cohort is its second-year estimate published in the President’s fiscal year 2011 budget.

<sup>c</sup>Original subsidy cost estimates use original loan volume estimates contained in prior President’s budgets.

<sup>d</sup>Current estimates use updated loan volume estimates that exclude loans that are originated but may not be disbursed to borrowers (e.g., when borrowers decide not to attend school).

According to our data analysis and interviews with Education officials, Education may have originally underestimated the volume of loans that would enter IDR plans from these cohorts for several reasons:

1. Education did not include Grad PLUS loans in its IDR plan subsidy estimates until the fiscal year 2015 budget, even though Grad PLUS loans have been eligible for IDR plans since they were first issued in 2006. Education officials said that they had to make a model adjustment in order to include Grad PLUS loans in IDR estimates. Prior to this adjustment they assumed all Grad PLUS loans would be repaid in other repayment plans.
2. Policy changes made IDR plans more generous and available to more borrowers after Education originally estimated costs for some cohorts. For example, the Pay As You Earn repayment plan was implemented in fiscal year 2013 and retroactively made more generous benefits available to certain borrowers with loans issued as early as the 2008 cohort.
3. While some eligible borrowers still may not be aware of IDR plans, participation rates are growing, and officials responsible for budget estimates may not have adequately anticipated participation growth.

While we previously reported that there are substantial challenges associated with estimating Direct Loan subsidy costs, these challenges are increased for Direct Loans in IDR plans due to their complex features and other uncertainties.<sup>35</sup> It is difficult for Education to estimate which borrowers have incomes low enough to benefit from or be eligible for IDR plans because Education does not collect income information for all Direct Loan borrowers.<sup>36</sup> Additionally, IDR plan participation rates are difficult to predict. While participation has been growing rapidly in recent years, it is unclear at what rate it will continue to grow. It is also challenging to predict how the incomes of borrowers already participating in IDR plans will change over time and how much loan principal will ultimately be forgiven. Further complicating Education's task is the fact that the large majority of loans expected to be repaid in IDR plans are from recent cohorts, and many borrowers in these cohorts have not yet started repaying their loans. As a result, there is limited actual repayment

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<sup>35</sup> [GAO-14-234](#).

<sup>36</sup> Education does not have access to data necessary to identify borrowers who would qualify for or benefit from an IDR plan. To estimate eligibility rates, Education officials use eligibility data they obtained from a Treasury analysis of Direct Loan borrowers eligible for certain IDR plans as of September 2012.

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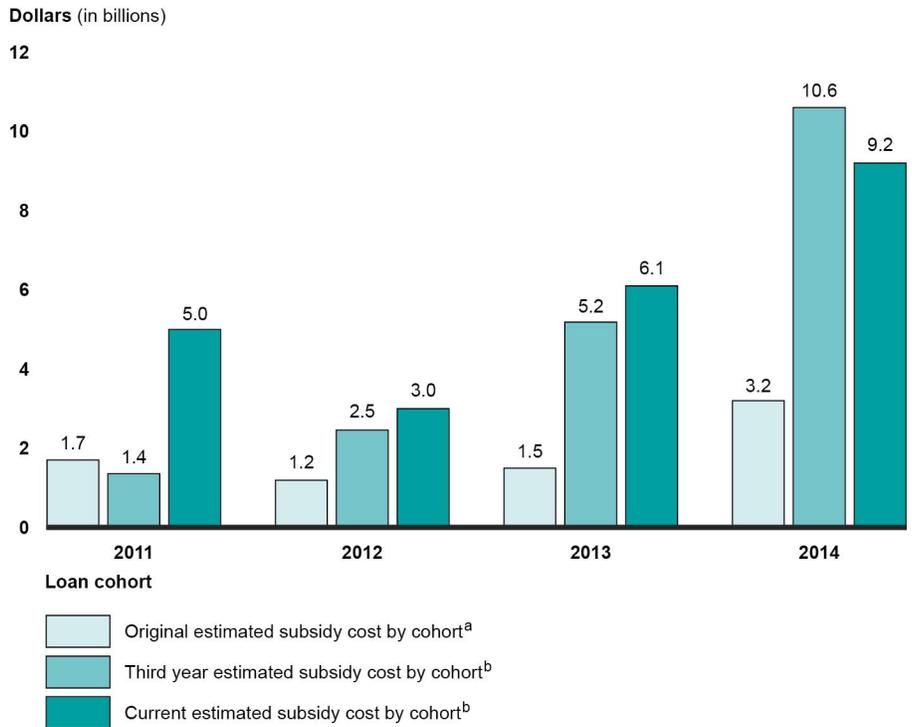
data available to inform Education's estimates. Further, no borrower has received loan forgiveness under IDR plans.

Volatility in subsidy cost estimates is generally expected to be greatest early in the life of a loan cohort, and to decrease over time as more actual repayment data are incorporated into estimates. When we compared original, third-year, and currently estimated IDR plan subsidy cost estimates for several recent cohorts, we found that third-year estimates were generally closer to current estimated costs than the original, as figure 11 illustrates. However, estimates will continue to change over time, and actual subsidy costs of a loan cohort will not be known until all loans in the cohort have been repaid, which may take 40 years.<sup>37</sup>

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<sup>37</sup> Education officials recommended that we use each cohort's third-year estimate as a basis for our comparison to current estimated costs for two reasons: (1) the discount rate (which reflects government borrowing costs and strongly influences subsidy costs) has been finalized, and (2) the volume of loans issued in the cohort is known. While Education's original subsidy cost and loan volume estimates are made before discount rates and loan volumes are known, these numbers reflect Education's best estimates about costs associated with a new cohort of loans when the President's budget is developed and is presented to Congress as a part of the federal budget process.

**Figure 11: Original, Third Year, and Current (Fiscal Year 2017 Budget) Estimated Subsidy Costs for Direct Loans in Income-Driven Repayment Plans, 2011-2014 Loan Cohorts**



Source: GAO analysis of the U.S. Department of Education's fiscal year 2011-2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. Subsidy costs are calculated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>Original subsidy cost estimates use original loan volume estimates contained in prior President's budgets.

<sup>b</sup>Third year and current estimates use updated loan volume estimates that exclude loans that are originated but may not be disbursed to borrowers (e.g., when borrowers decide not to attend school).

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**Current Estimated IDR  
Plan Costs Are Offset by  
Greater Estimated Income  
from Loans in Other  
Repayment Plans**

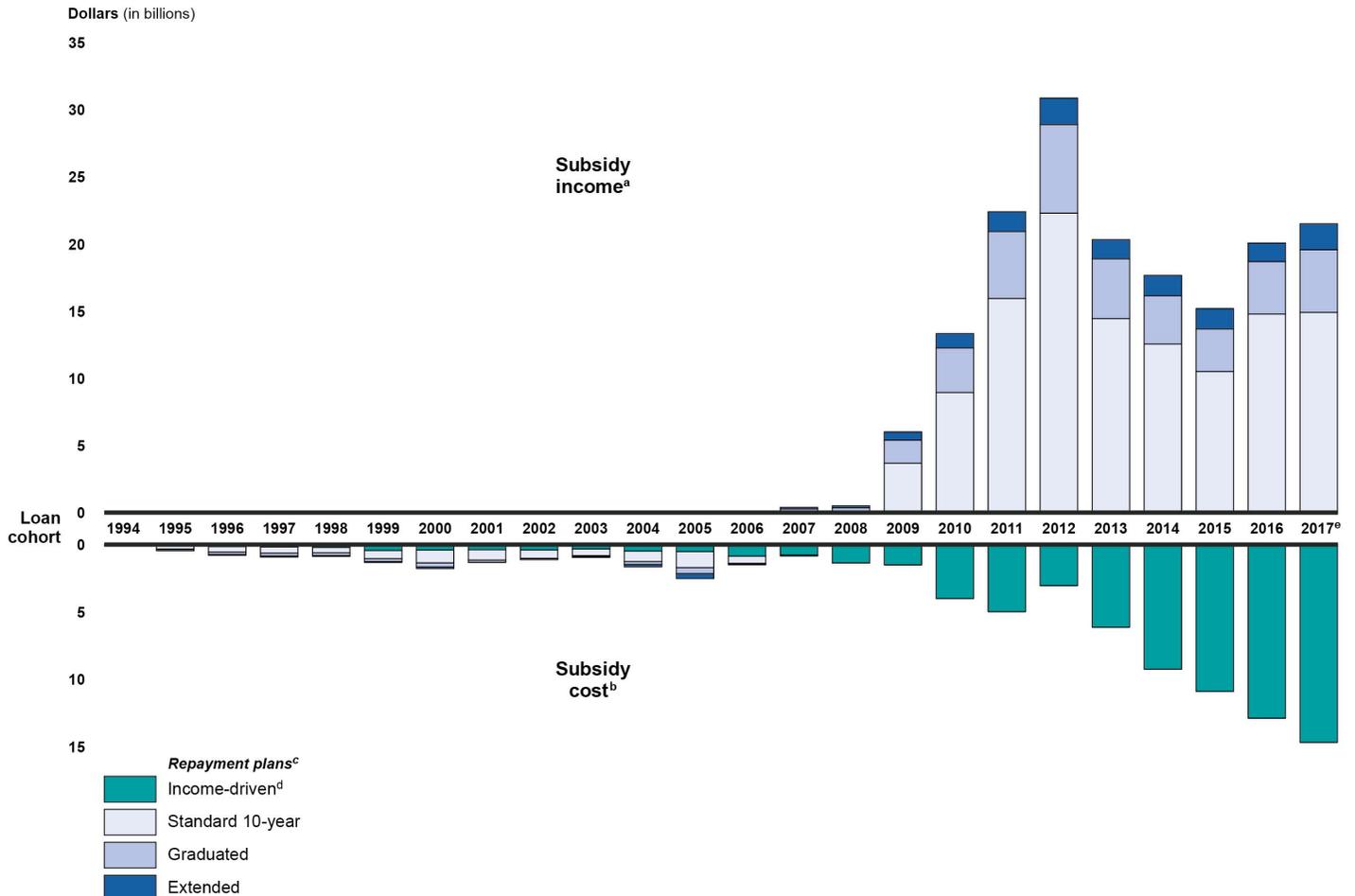
While loans in IDR plans are expected to have long-term costs to the government, loans in other repayment plans (Standard, Graduated, and Extended) are expected to generate greater subsidy income, as seen in figure 12.<sup>38</sup> Figure 12 also illustrates that Education currently expects income to be higher for more recent cohorts than older cohorts.<sup>39</sup> However, as mentioned previously, subsidy cost estimates change over time, and the actual costs or income attributable to any Direct Loan cohort will not be known until all loans in the cohort are repaid.

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<sup>38</sup> Unlike IDR plans, Standard, Extended, and Graduated plans do not offer borrowers loan forgiveness or monthly payments tied to income and family size.

<sup>39</sup> Higher projected income for these cohorts is partly attributable to declines in the government's cost of borrowing following 2008 and the dramatic expansion of the Direct Loan program in the years that followed.

**Figure 12: Current Estimated Subsidy Costs and Income for Direct Loans, by Loan Cohort and Repayment Plan (Fiscal Year 2017 Budget)**



Source: GAO analysis of the U.S. Department of Education's fiscal year 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. Subsidy costs are calculated separately for each group of loans made in a particular fiscal year—referred to as a loan cohort.

<sup>a</sup>A subsidy income results if the present value of estimated payments from borrowers exceeds the present value of disbursements to borrowers.

<sup>b</sup>A subsidy costs results if the present value of disbursements to borrowers exceeds the present value of estimated payments from borrowers.

<sup>c</sup>Education offers a variety of repayment plans for Direct Loan borrowers: (1) Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period. (2) Standard repayment fixes borrowers' monthly payments over a repayment term of 10 years. (3) Graduated repayment offers borrowers payments that gradually increase over a 10 year repayment term. (4) Extended repayment extends borrowers' repayment term up to 25 years.

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<sup>d</sup>Education estimates costs of loans in Income-Driven Repayment plans for loans made in fiscal years 1995 through 2017 only. It estimates costs of loans in all other repayment plans for loans made in fiscal years 1994 through 2017.

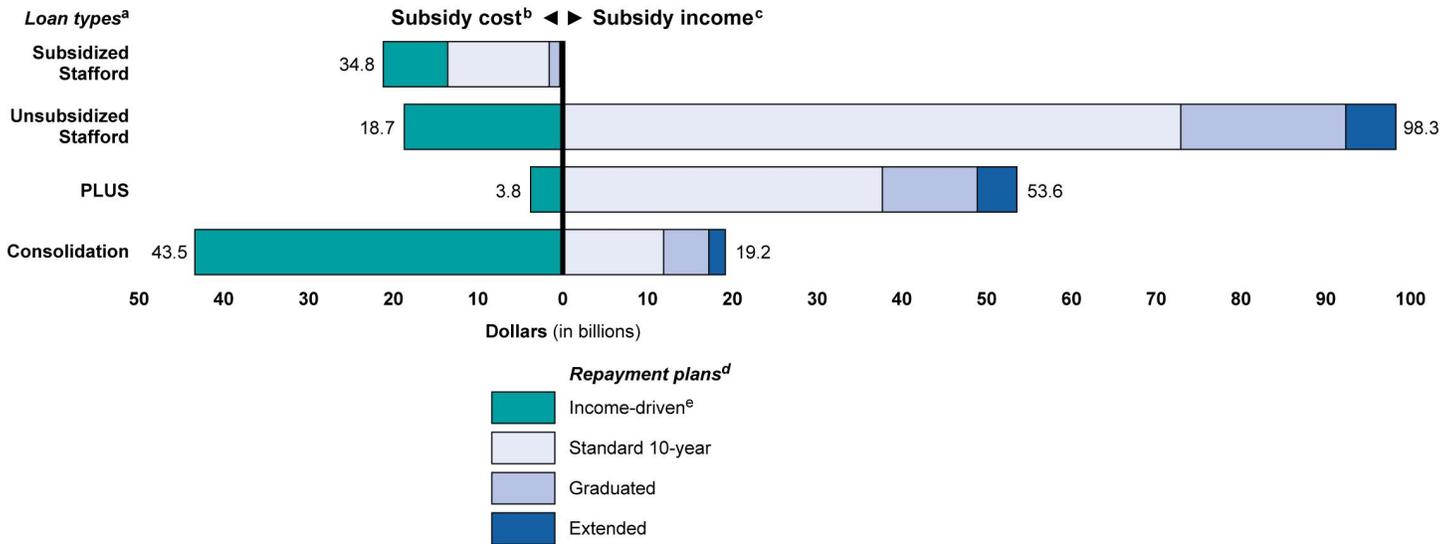
<sup>e</sup>The subsidy cost and income estimates for the 2017 loan cohort use that cohort's original loan volume estimate contained in the President's fiscal year 2017 budget. Estimates for all other cohorts use updated loan volume estimates provided by Education that exclude loans that are originated but may not be disbursed to borrowers (e.g., when borrowers decide not to attend school).

Subsidy income estimates for loans participating in non-IDR plans vary by loan type and repayment plan. Unsubsidized Stafford and PLUS loans participating in the Standard 10-year repayment plan are estimated to result in the greatest subsidy income to the government. This could be due in part to the higher interest rates charged to borrowers with Unsubsidized Stafford and PLUS loans compared to Subsidized Stafford loans, as well as a higher volume of loans participating in Standard repayment compared to other repayment plan options.<sup>40</sup> See figure 13.

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<sup>40</sup> Grad PLUS loans are the only PLUS loans eligible to participate in IDR plans, but Parent PLUS loans and Grad PLUS loans are both eligible to participate in Standard, Extended, and Graduated repayment plans. Like Grad PLUS loans, Parent PLUS loans have a higher interest rate than other loan types. Subsidized Stafford loans and unsubsidized loans to undergraduate school borrowers pay the same interest rate; however, the interest rate on Unsubsidized Stafford loans made to graduate school borrowers is higher.

**Figure 13: Current Estimated Subsidy Costs and Income for All Direct Loans, by Loan Type and Repayment Plan (Fiscal Year 2017 Budget)**



Source: GAO analysis of the U.S. Department of Education’s fiscal year 2017 budget estimates. | GAO-17-22

Note: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.

<sup>a</sup>Education issues four types of Direct Loans: (1) Subsidized Stafford loans are available to undergraduate borrowers with financial need. (2) Unsubsidized Stafford loans are available to undergraduate and graduate student borrowers, regardless of financial need. (3) PLUS loans are available to graduate student borrowers as Grad PLUS loans and parents of dependent undergraduates as Parent PLUS loans. (Grad PLUS loans are eligible for Income Driven Repayment plans, while Parent PLUS loans are not.) (4) Consolidation loans are available to borrowers wishing to combine multiple existing federal student loans into one loan.

<sup>b</sup>A subsidy costs results if the present value of loan disbursements to borrowers exceeds the present value of estimated payments from borrowers.

<sup>c</sup>A subsidy income results if the present value of estimated payments from borrowers exceeds the present value of disbursements to borrowers.

<sup>d</sup>Education offers a variety of repayment plans for Direct Loan borrowers: (1) Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period. (2) Standard repayment fixes borrowers’ monthly payments over a repayment term of 10 years. (3) Graduated repayment offers borrowers payments that gradually increase over a 10 year repayment term. (4) Extended repayment extends borrowers’ repayment term up to 25 years.

<sup>e</sup>Education estimates costs of loans in Income-Driven Repayment plans for loans made in fiscal years 1995 through 2017 only. It estimates costs of loans in all other repayment plans for loans made in fiscal years 1994 through 2017.

Further, as with loans in IDR plans, Education’s estimates of subsidy income from loans in non-IDR plans have changed over time and will continue to fluctuate as they are updated with actual repayment data and revised assumptions about future cash flows. We found that estimated

income associated with loans participating in non-IDR plans increased (about \$19 billion more) for some cohorts and decreased (about \$36 billion less) for other cohorts when we compared Education's original and current estimates for those cohorts (2009-2015).

While Education currently estimates that loans in IDR plans will have costs to the government, these plans are designed to provide relief to struggling borrowers, which could indicate that government subsidies may be expected. By tying monthly payments to borrowers' incomes, IDR plans help make potentially onerous student debt payments more affordable for many individuals. Because these borrowers' repayment amounts may be lower than they otherwise would be, borrowers in IDR plans may have more success in making their loan payments than borrowers in other plans. As we previously reported, substantially lower percentages of participants in the Income-Based Repayment and Pay As You Earn repayment plans had defaulted on their loans compared to those in the Standard 10-year repayment plan, and the great majority of borrowers in these IDR plans were in active repayment status (e.g., not in delinquency, default, or forbearance).<sup>41</sup> Further, because IDR plans attract borrowers experiencing difficulty repaying their loans in other plans, increased IDR participation from these borrowers may lead to lower subsidy rates for non-IDR plans.

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## IDR Plan Budget Estimates May Be Unreliable Due to Limitations in Education's Approach and Inadequate Quality Control Practices

Education's approach to estimating IDR plan costs has numerous weaknesses that may result in unreliable budget estimates. Poor quality control practices, such as inadequate model testing, contributed to issues we identified. Further, because Education publishes only limited information about its estimates, it may be difficult for policymakers to assess expected plan costs and consider the potential for alternative outcomes.

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<sup>41</sup> Specifically, among borrowers who entered repayment from fiscal year 2010 to fiscal year 2014, less than 1 percent of Income-Based Repayment and Pay As You Earn participants had defaulted on their loan, compared to 14 percent in Standard repayment. For this analysis we defined Standard repayment to include borrowers on Extended repayment with fixed payments. [GAO-15-663](#).

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## Education's Approach to Estimating IDR Plan Costs May Produce Unreliable Budget Estimates

Due to several methodological limitations, Education's approach to estimating IDR plan costs may result in unreliable budget estimates. First, Education did not adequately assess the reliability of the data it uses to forecast borrower incomes over time, or assess the level of error these data or its forecasting methods introduced into its IDR plan budget estimates. Second, it did not consider how inflation would affect borrowers' incomes over time. Third, Education unrealistically assumes that no borrower will fail to recertify their income, which is required of borrowers annually to maintain lower income-driven payment amounts. Fourth, Education does not account for future growth in IDR plan participation rates. Fifth, Education does not produce separate cost estimates for each of the five IDR plans currently available to borrowers. Finally, Education's cost estimates for Subsidized Stafford, Unsubsidized Stafford, and Grad PLUS loans in IDR plans do not account for likely differences in how they will perform over time.

## Borrower Income Data and Forecasting Methods

Education's IDR plan cost estimates are vulnerable to unidentified error because Education has not adequately assessed the reliability of the estimated borrower income data and methods it uses to forecast borrower incomes many years into the future—information that is vital to determining how much borrowers will owe and repay on their loans over time.<sup>42</sup> Education conducted only limited, informal testing to assess the data's reliability, in part because the agency had short timeframes in which to develop its approach to estimating IDR plan costs, according to officials we interviewed.<sup>43</sup> Education did not measure the amount of error

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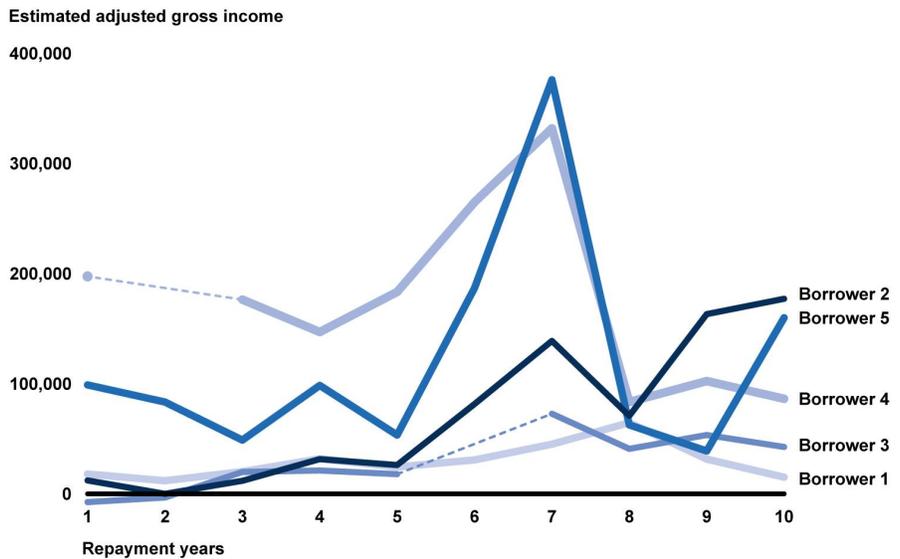
<sup>42</sup> Because Education does not collect income data on all borrowers repaying their loans, officials worked with Treasury to develop a more comprehensive estimated historical income dataset to use in its estimation approach. Education first provided Treasury with a sample of borrowers with information on their loan activity through September 2013. This sample included a limited set of variables including borrowers' loan type and balances, dependency status, family income from the last period the borrower was enrolled in school, ages, education levels, and gender. To protect taxpayer privacy, Treasury provided Education with historical income estimates for these borrowers that were intended to resemble their actual incomes. To do this, Treasury first estimated each borrower's income range (for instance, \$34,000 to \$50,000) for each year a borrower was in repayment from 1996 through 2013. Treasury then randomly selected a dollar value in that range for Education to use for estimation purposes. (See appendix III for more details on Treasury's approach.)

<sup>43</sup> Education assessed the estimated income data by examining aggregate patterns, such as correlations between incomes and key factors like education and borrowing levels. Education officials said they conducted limited data reliability assessment because they were under pressure to develop their approach quickly to inform negotiated rulemaking on the Revised Pay As You Earn IDR plan. The plan's final regulations were issued October 30, 2015.

these data introduced into IDR plan cost estimates to determine whether it was acceptable, or if alternative data were needed.<sup>44</sup>

Through our data reliability testing, we identified patterns in the estimated historical income data suggesting reliability problems that could make them unacceptable for Education’s purposes. An analysis by Treasury (the agency that created the estimated historical income data) indicates that the data fluctuate on average by 44 percent more per year than the actual income data upon which they were based.<sup>45</sup> In figure 14, we illustrate this fluctuation for five randomly selected borrowers from the estimated dataset over the first 10 years of their repayment period. (See appendix III for more information on how these data were estimated and our evaluation of them.)

**Figure 14: Estimated Historical Incomes for Randomly Selected Sample of Direct Loan Borrowers Used in Education’s Approach to Estimating Costs of Loans in Income-Driven Repayment Plans, For Each Borrower’s First 10 Years in Repayment**



Source: Estimated data provided by the U.S. Department of the Treasury for use in the U.S. Department of Education's Income-Driven Repayment Cash Flow Model. | GAO-17-22

<sup>44</sup> Estimated data and statistical estimation methodologies always generate some amount of error, but the amount produced depends on how well suited the data and methods are to the task at hand.

<sup>45</sup> This analysis indicated that estimated historical incomes varied by 75 percent a year, compared to 52 percent a year in the actual tax data used for the estimation.

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Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

Estimated incomes represent borrowers' nominal adjusted gross incomes for the first 10 years of loan repayments, as estimated by the U.S. Department of the Treasury. Repayment could have occurred from tax year 1996 through tax year 2013, depending on when the borrowers entered repayment. Dashes in the income series represent years when borrowers were estimated not to have filed tax returns. Adjusted gross income can be negative if taxpayers have income deductions or exclusions that exceed their gross income. Changes in tax filing status—for instance, from single to married filing jointly—do not fully account for variation in individual borrowers' incomes over time.

Education uses individuals' estimated historical incomes, such as those illustrated in figure 14, to make numerous sequential calculations that determine how much each borrower will owe and pay in each year of the borrower's repayment period. While the estimated historical income data appeared more reasonable in the aggregate, Education officials confirmed that any unusual fluctuations in them at the individual borrower level could affect the quality of IDR plan budget estimates.<sup>46</sup>

In addition to being vulnerable to error associated with the estimated historical income data they use, Education's IDR plan budget estimates may further be affected by error associated with the agency's method for forecasting borrowers' incomes for up to 30 years into the future. The accuracy of any forecast—separately from the reliability of the data used for forecasting—depends on how well the data and forecasting methods can estimate future incomes. However, Education did not assess the amount of error in its forecasts of borrower incomes. Until Education assesses its forecasting methodology, its IDR plan cost estimates may be vulnerable to unidentified error.

Both federal guidance for estimating subsidy costs and Education's own information quality standards emphasize the importance of ensuring that

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<sup>46</sup> Specifically, the distribution of estimated historical incomes aggregated over tax years generally matched the distribution of actual incomes upon which the estimates were based, with some exceptions. However, individual borrower income estimates are at the heart of how Education estimated repayment patterns for loans in IDR plans, and unusual patterns in individual borrowers' income trajectories could affect the quality of its estimates. See appendix III for more information.

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estimates are based on reliable data.<sup>47</sup> Education's information quality standards and generally accepted statistical practices also recommend measuring error to assess its impact on estimates.<sup>48</sup> Education officials agreed with the concerns we raised regarding their borrower income data and said they are open to improving data quality as necessary to help ensure reliable IDR plan budget estimates. Quality data and methods are essential to Education's estimation approach, and both should be assessed to determine whether they produce reasonable results. (See appendix III for more information on error associated with Education's data and methods.)

## Effect of Inflation

In addition to insufficiently assessing the reliability of its income data and forecasting methods, Education has not adjusted its income forecasts for inflation, causing IDR plan budget estimates to appear higher than they otherwise would be.<sup>49</sup> Adjusting for inflation would increase borrowers' future incomes and payment amounts, because loan payments are based

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<sup>47</sup> This Federal Accounting Standards Advisory Board guidance states that when agencies estimate subsidy costs, cash flow projections should be based on sufficient relevant and reliable data and reestimates should be based upon the best available data at the time the estimates are made. Federal Accounting Standards Advisory Board, *Federal Financial Accounting and Auditing Technical Release 6: Preparing Estimates for Direct Loan and Loan Guarantee Subsidies under the Federal Credit Reform Act-Amendments to Technical Release No. 3*, FASAB Handbook, Version 13 (June 2014). Further, Education's information quality guidelines state that when Education uses sample data, it should assess the reliability of the sample, including its representativeness. U.S. Department of Education, *U.S. Department of Education Information Quality Guidelines* (Washington, D.C.: Oct. 3, 2002).

<sup>48</sup> These standards encourage Education to carefully select appropriate techniques when conducting statistical analysis, and acknowledge limitations including error produced by the selected methods. *U.S. Department of Education Information Quality Guidelines*. OMB guidelines also state that federal statistical agencies should apply sound statistical methods and account for error associated with them. Office of Management and Budget, *Statistical Policy Directive No. 1: Fundamental Responsibilities of Federal Statistical Agencies and Recognized Statistical Units*, Fed. Reg. Vol. 79 No.231 (Dec. 2, 2014). While Education is not a federal statistical agency, incorporating this best practice would help the agency identify and determine whether the effects of forecasting error on its cost estimates are acceptable.

<sup>49</sup> Instead, Education estimated borrowers' incomes for the years 2014 through 2043 using historical income estimates from 1996 through 2013 without adjusting them for inflation. Additionally, Education assumed that any borrower entering repayment in 2014 or later would have the same characteristics as those that entered repayment in 2013. As a result, incomes and repayment amounts for borrowers who enter repayment in future years (2014 through 2030) will be very similar to those of borrowers who entered repayment in 2013.

on borrowers' incomes.<sup>50</sup> Increasing payment amounts would, in turn, decrease costs to the government. When asked, Education officials said they did not adjust income forecasts for inflation because they did not identify patterns in the estimated historical income data suggesting that incomes would be affected by inflation. Whether or not these patterns were evident when reviewing the data, there was inflation over the almost 20-year period covered by the historical dataset and there is likely to be inflation in the future.<sup>51</sup> Federal guidance for estimating subsidy costs stresses the importance of taking economic effects into account when estimating loan performance.<sup>52</sup> For IDR plan costs, this would include the extent to which inflation affects borrower incomes and payment amounts.

By choosing not to adjust income forecasts to capture inflation's future effects, Education over-estimated IDR plan costs. When we used Education's data and computer programs to adjust borrowers' future incomes for inflation, as well as the federal poverty guidelines used to calculate their discretionary incomes, we found that IDR plan budget estimates declined by over \$17 billion, when compared to Education's current IDR plan budget estimates.<sup>53</sup> (See figure 15.<sup>54</sup>) In light of the

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<sup>50</sup> Borrower payment amounts under IDR plans are generally set as a set as a proportion of a borrowers' income exceeding federal poverty guidelines. These guidelines are updated annually by the U.S. Department of Health and Human Services. However, Education used 2013 federal poverty guidelines throughout its forecasts and it did not consider the likelihood that poverty guidelines would also grow with inflation.

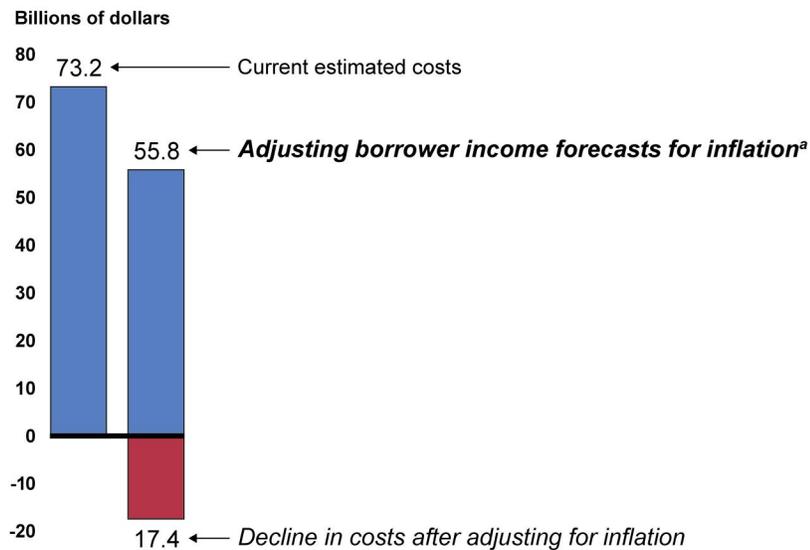
<sup>51</sup> Education officials also said they did not incorporate inflation into their income forecasts because they believed that inflation would affect federal poverty guidelines and incomes similarly, mitigating inflation's effect on cost estimates. However, officials did not test this assumption. When we tested the impact of inflation on both borrower incomes and federal poverty guidelines, expected costs changed substantially. See figure 15.

<sup>52</sup> Federal Accounting Standards Advisory Board, Credit Reform Task Force, Issue Paper: *Model Credit Program Methods and Documentation for Estimating Subsidy Rates and the Model Information Store*, 96-CR-7 (Washington, D.C.: May 1, 1996)

<sup>53</sup> As previously noted, Education assumes that the profiles of borrowers who begin repaying their loans after fiscal year 2013 will be the same as those of borrowers who began repaying their loans in 2013. (Borrower profiles include income and loan amounts.) This limitation restricts the impact of inflation on the incomes of borrowers who began repaying their loans after 2013, as their annual inflation-adjusted incomes and the applicable poverty guidelines are identical to those of borrowers entering repayment in 2013.

substantial effects of inflation on borrower incomes and loan repayment amounts, inflation adjustment is essential to developing reliable IDR plan budget estimates. Until Education adjusts for inflation, its budget estimates will continue to inaccurately represent potential IDR plan costs.

**Figure 15: Impact of Adjusting Borrower Income Forecasts for Inflation on Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 1995-2017 Loan Cohorts**



Source: GAO sensitivity analysis conducted using the U.S. Department of Education’s model and fiscal year 2017 budget assumptions. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.

Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>This adjustment includes incorporating inflation into both borrowers’ future incomes and the federal poverty guidelines used to help determine their payment amounts. In general, payment amounts under Income-Driven Repayment plans are set as a percentage of borrowers’ adjusted gross incomes over 150 percent of the federal poverty guideline. (For the Income-Contingent Repayment plan, it is generally set as a percentage of borrowers’ adjusted gross income over 100 percent of the federal poverty guideline.)

<sup>54</sup> This figure includes \$73.2 billion in current estimated costs, which is slightly lower than the \$73.6 billion presented in our first research objective (rounded to \$74 billion) and appendix IV. Those analyses included a slightly higher estimate of IDR plan loan volume for the 2017 cohort contained in the President’s fiscal year 2017 budget appendix. This analysis uses an updated loan volume estimate from Education that excludes loans that may not be disbursed to borrowers (e.g., when a borrower decides not to attend school).

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**Income Recertification**

Additionally, Education assumes that all borrowers in IDR plans will recertify their incomes every year as required, which is likely to be inaccurate and could lead Education to overstate IDR plan costs. In fact, we recently reported that over half of borrowers in an Education sample failed to do so.<sup>55</sup> When borrowers fail to recertify their income, Education generally increases their payments to what they would owe under the Standard 10-year repayment plan until they submit their required recertification.<sup>56</sup> For some borrowers who fail to recertify their income, payments could increase by hundreds of dollars a month. While some borrowers may subsequently recertify within a few months, others may never recertify. Because Education does not take these occurrences into account, it underestimates what borrowers will pay when their certification lapses.

Education officials told us they did not include certification lapses in their approach to estimating IDR plan costs because they lacked recertification data linked to individuals. They also believed that certification lapses would not have a large impact on their estimates. Initially, officials said the agency is taking steps to reduce the number of borrowers failing to recertify. However, officials later acknowledged that these efforts are in the early stages of implementation, and there have been some setbacks.<sup>57</sup> Until efforts to improve recertification rates are put in place,

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<sup>55</sup> [GAO-15-663](#).

<sup>56</sup> A borrower in the Income-Based, Income-Contingent, and Pay As You Earn plans who fails to provide updated income information can remain in an IDR plan and may be eligible for loan forgiveness, but their monthly payments will no longer be based on the borrower's income. Instead, the monthly payment amount is adjusted to what would be owed under the Standard 10-year repayment plan based on the loan balance when the borrower began repaying under an IDR plan. For the Revised Pay As You Earn plan, the borrower's payment amount is set to ensure that the loan is paid in full over 10 years or the remainder of the borrower's maximum Revised Pay As You Earn repayment period, whichever is less.

<sup>57</sup> In August of 2015, we reported that Education was exploring ways to help borrowers enroll and recertify their eligibility for IDR plans after learning that a majority of borrowers did not re-certify on time. This included working with the Internal Revenue Service and Treasury to allow borrowers in income-driven repayment plans to authorize the release of tax return information for multiple years and working with loan servicers to identify the most effective ways to communicate with IDR plan participants. [GAO-15-663](#). Officials recently told us the initiative with the Internal Revenue Service has not progressed as hoped. However, they did engage in a pilot project with the cross-agency Social and Behavioral Sciences Team to explore the impact of different communications to borrowers about recertification, the results of which were still being verified. As previously noted, a bill was recently introduced in the House that would allow for automatic annual income recertification. However, this legislation has not been passed. SIMPLE Act, H.R. 5962, 114th Cong. §§ 2-3 (2016).

certification lapses will likely continue. Further, without data indicating that certification lapses do not have a large impact on borrower payment amounts, Education may overstate IDR plan costs.<sup>58</sup> Federal guidance for estimating subsidy costs states that the information used in the estimation process should reflect actual repayment patterns for loans whose costs are being estimated, which would include instances when a borrower's payment amount changes due to program rules.<sup>59</sup> Obtaining data on borrowers' actual repayment patterns after they fail to recertify their income could help Education determine whether its current approach appropriately accounts for the impact of recertification failure on IDR plan costs, and determine whether changes are needed.

#### Future IDR Plan Participation

Education likely underestimates IDR plan participation because it assumes all borrowers will remain in their currently selected repayment plan for their entire repayment period. This assumption conflicts with the fact that borrowers can switch into or out of IDR plans at any time, and IDR plan participation has grown in recent years.<sup>60</sup> Participation is also likely to continue growing. Education agreed with our recent recommendation that the agency increase its efforts to make all borrowers aware of IDR plans.<sup>61</sup> Further, as previously mentioned, the Administration recently announced a goal to enroll 2 million additional borrowers in IDR plans.<sup>62</sup>

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<sup>58</sup> Education officials also said some borrowers who fail to recertify will cease repaying their loans (for instance through deferment or default), and that their estimation approach includes assumptions about such occurrences. Officials further theorized that borrowers who could afford to make higher payments based on their Standard payment amount would also repay their loans fully under their income-driven payment amount. For these reasons, officials believed that adjusting estimates for recertification failures may not be necessary. However, officials acknowledged that they lacked data to support their view.

<sup>59</sup> Federal Accounting Standards Advisory Board, Credit Reform Task Force, *Model Credit Program Methods and Documentation for Estimating Subsidy Rates and the Model Information Store*.

<sup>60</sup> The proportion of Direct Loan borrowers in IDR plans grew from 10 percent to 24 percent between June 2013 and June 2016. This growth could be attributable to higher proportions of new borrowers joining IDR plans immediately upon entering repayment and other borrowers switching into IDR plans from other repayment plans.

<sup>61</sup> [GAO-15-663](#).

<sup>62</sup> This goal is to enroll 2 million borrowers in IDR plans by Spring 2017 through efforts including targeted outreach.

As a result of Education's likely underestimation of IDR plan participation, its IDR plan budget estimates may be biased downward, or appear lower than they otherwise should be. We found that Education's IDR plan budget estimates for loans issued in recent cohorts have more than doubled over what was originally expected (\$53 billion vs. \$25 billion), primarily because of higher than expected participation in IDR plans.<sup>63</sup> Federal guidance for estimating subsidy costs of federal loan programs states that it is preferable to use methods to estimate costs that are more sophisticated than relying solely on historical data, such as borrowers' past plan selection.<sup>64</sup>

While Education's current student loan model was not designed to project future changes in plan participation, officials told us that despite the challenge of predicting future borrower behavior they are working with Treasury to develop a more sophisticated model, and have begun incorporating this enhancement into a test version of this new model. Additional work remains to ensure that the new model reasonably reflects trends in IDR plan participation—particularly borrowers switching into IDR plans from other repayment plans. For instance, IDR plans have not yet been added to the new model, which currently includes only the Standard and Extended repayment plans. Education's model redesign is anticipated to be a multi-year project, and until the model has been completed and tested to ensure reasonable results, Education's IDR plan budget estimates are vulnerable to underestimated IDR plan participation and costs.

#### Cost Estimates for Different IDR Plans

Additionally, Education does not produce separate cost estimates for each of the five IDR plans currently available, even though these plans provide different benefits to borrowers and will likely have different costs to the government. For instance, the Income-Contingent Repayment plan has less generous provisions for borrowers than the Pay As You Earn

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<sup>63</sup> As noted earlier, Education's fiscal year 2016 budget justification included a \$12.3 billion net upward reestimate that was due primarily to greater enrollment in IDR plans. Increased participation in IDR plans could include borrowers who are enrolling in IDR plans for the first time and borrowers who have switched from other repayment plans into IDR plans.

<sup>64</sup> In general, this guidance states that econometric models, which are estimated quantitative methods of analysis that can define key relationships between loan performance and economic and other indicators are preferable to relying solely on historical information. Federal Accounting Standards Advisory Board, Credit Reform Task Force, *Model Credit Program Methods and Documentation for Estimating Subsidy Rates and the Model Information Store*.

plan, and as a result will likely have lower costs to the government.<sup>65</sup> However, Education does not estimate these plans' costs separately. According to Education officials, the student loan model, which it uses to generate official estimates of total Direct Loan costs, was created when only one IDR plan was available and cannot produce separate estimates for each IDR plan. While the supplementary model Education uses to estimate IDR plan repayment patterns could track repayment streams separately for each plan, its outputs must conform to the structure of the larger student loan model.

Federal guidance for estimating subsidy costs for federal loan programs specifies that agencies should assess the impact of changes in laws or regulations (such as the introduction of new repayment plans) on the reliability of estimates and should ensure that an agency's methodology reflects these changes.<sup>66</sup> While Education officials expressed concern about the complexity of estimating separate costs for each IDR plan, OMB staff told us that Education should add this capability as part of Education's efforts to develop a more sophisticated model. Incorporating the ability to track costs of each IDR plan separately would help ensure that estimates more accurately reflect the current loan environment and provide valuable information to policymakers interested in streamlining student loan repayment options moving forward.

## Repayment Patterns for Different Loan Types

Lastly, Education combines repayment patterns for several types of loans eligible for IDR plans, obscuring likely differences in their performance over time. As a result, its budget estimates for Subsidized Stafford, Unsubsidized Stafford, and Grad PLUS loans in IDR plans are based on identical repayment patterns, although these types of loans have

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<sup>65</sup> Specifically, borrowers in the Income-Contingent Repayment plan are generally required to pay 20 percent of any adjusted gross income exceeding federal poverty guidelines for 25 years, or until their loan is fully repaid. Borrowers in the Pay As You Earn plan are required to pay 10 percent of their adjusted gross income exceeding 150 percent of the federal poverty guideline for 20 years, or until their loan is fully repaid. Borrowers in the Income-Contingent Repayment plan may have signed up for that plan before other more generous IDR plans became available.

<sup>66</sup> Federal Accounting Standards Advisory Board, *Federal Financial Accounting and Auditing Technical Release 6: Preparing Estimates for Direct Loan and Loan Guarantee Subsidies under the Federal Credit Reform Act-Amendments to Technical Release No. 3*.

numerous distinct features.<sup>67</sup> For instance, the current interest rate on a Grad PLUS loan is almost double that of a Subsidized Stafford loan, leading borrowers with Grad PLUS loans to owe much more in interest on those loans over time.<sup>68</sup> Conversely, borrowers with Subsidized Stafford loans will pay down principal on their loans more quickly over time because less of their payment goes toward interest. However, Education's cost estimates do not reflect higher expected interest payments on Grad PLUS loans in IDR plans or faster principal repayment on Subsidized Stafford loans in IDR plans, because they are based on aggregate repayment patterns that include both types of loans. Education officials told us that, as a result of this practice, all differences in published subsidy rates for these loan types are wholly attributable to fees charged to borrowers at the time the loans are issued and how much interest accrues during the relatively short period that borrowers are still in school.<sup>69</sup>

Because Education's estimates do not reflect differences in performance over the decades that loans in IDR plans may be in repayment, users of the budget are missing key information that could help them assess how IDR plan costs vary by loan type. As an example, some experts have raised concerns that Grad PLUS loans could have relatively high forgiveness amounts because they are larger on average than Stafford loans and may have a large amount of outstanding loan principal at the

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<sup>67</sup> Education officials noted that their supplementary model estimates IDR plan repayment patterns at the borrower level, similar to how a borrower's loans would be serviced in the real world. Each borrower's repayment will depend on their mix of underlying loans and will differ depending upon the relative mix of loans they have. However, outputs from this supplementary model (which are currently used to generate official subsidy cost estimates) are not separated by loan type. As a result, subsidy cost estimates for Grad PLUS, Subsidized Stafford, and Unsubsidized Stafford loans are based on identical repayment rates.

<sup>68</sup> Grad PLUS loans issued on or after July 1, 2016, and before July 1, 2017, have an interest rate of 6.31 percent while Subsidized Stafford loans issued at that time have an interest rate of 3.76 percent.

<sup>69</sup> For loans issued on or after October 1, 2016, and before October 1, 2017, Stafford loan borrowers (subsidized and unsubsidized) will pay a loan fee of 1.069 percent and Grad PLUS borrowers will pay a loan fee of 4.276 percent.

end of their repayment term.<sup>70</sup> Due to limitations in Education's current approach, users of the budget cannot determine the extent to which this concern affects subsidy rates for Grad PLUS loans in IDR plans.

According to Education officials, they could have separately estimated repayment patterns for each loan type, but did not believe that it was important to do so for several reasons. First, officials stated that they focused their efforts on estimating separate repayment patterns for Consolidation loans because they make up the majority of loans in IDR plans.<sup>71</sup> However, nearly half of IDR plan loan volume—or \$164 billion—is made up of Subsidized Stafford, Unsubsidized Stafford, and Grad PLUS loans, and it is important to estimate their repayment patterns accurately as well. Second, officials stated that they did not believe it was necessary to maintain separate repayment patterns for each type of loan because borrowers often have a mix of loans and repay them simultaneously. While this is true, policymakers have an interest in budget information that accurately reflects expected costs for each type of loan eligible for IDR plans.<sup>72</sup> Further, federal guidance for estimating subsidy costs of federal loan programs states that loan characteristics—such as loan types—are critical for identifying factors that predict subsidy costs and should be preserved.<sup>73</sup> Until Education separately tracks repayment patterns for each type of loan in IDR plans, its cost estimates will continue not to take into account important differences in loan characteristics, calling into question the reliability of the cost estimates, and policymakers will be unable to assess the relative costs of different types of loans.

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<sup>70</sup> Specifically, Grad PLUS loans do not have a set dollar amount borrowing limit. Through these loans, graduate students can borrow up to the full cost of attendance such as tuition and fees and living expenses. Subsidized and Unsubsidized Stafford loans, however, have annual limits—from \$3,500 to \$5,500 for Subsidized loans, depending on the grade level, and from \$5,500 to \$20,500, depending on grade level and dependency status. Grad PLUS loans also have higher interest rates, and borrowers may repay more in interest over their repayment period.

<sup>71</sup> Consolidation loans are available to borrowers wanting to combine multiple federal loans (including Subsidized and Unsubsidized Stafford and PLUS loans) into one loan. Repayment periods are extended up to 30 years, thereby lowering monthly payments. Interest rates are equal to the weighted average of the underlying loans.

<sup>72</sup> Current estimates do not capture how differences in interest rates affect expected principal and interest payments, or the amount of loan principal expected to be forgiven.

<sup>73</sup> Federal Accounting Standards Advisory Board, Credit Reform Task Force, *Model Credit Program Methods and Documentation for Estimating Subsidy Rates and the Model Information Store*.

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Education’s Quality Control Practices Are Inadequate to Help Ensure That Its IDR Plan Budget Estimates Are Reliable

Inadequate quality control practices contribute to concerns we identified regarding Education’s approach to estimating IDR plan costs. First, management has not ensured that the agency’s supplementary model for estimating IDR plan repayment patterns is properly documented. Second, management has not reviewed or approved that model. Third, management has not ensured that the model has been sufficiently tested for reliability.

Documentation

Education has not ensured that its supplementary model for estimating IDR plan repayment patterns is properly documented. While a broad narrative summary of the model is available, agency officials confirmed that other technical documentation recommended in federal guidance for estimating subsidy costs does not exist.<sup>74</sup> For instance, Education does not have a flow chart or other similar documentation specifying how elements of the estimation process—which is implemented by nearly 50 computer programs—are sequenced and interact with each other. Additionally, the numerous mathematical formulas embedded in these programs are not separately documented, and there is no data dictionary to decode the variable names and values. Standards for internal control in the federal government state that documentation is a necessary part of an effective internal control system.<sup>75</sup> Federal guidance for estimating subsidy costs states that model documentation should be thorough enough that a knowledgeable independent person could follow the estimation process and replicate its results with little to no assistance.<sup>76</sup> Such documentation is not available for Education’s supplementary model for estimating IDR plan repayment patterns.<sup>77</sup>

We recently recommended that Education improve documentation of its overall process for estimating costs of Direct Loans.<sup>78</sup> Education agreed

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<sup>74</sup> Federal Accounting Standards Advisory Board, *Preparing Estimates under the Federal Credit Reform Act*, Technical Release 6.

<sup>75</sup> GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

<sup>76</sup> Federal Accounting Standards Advisory Board, *Preparing Estimates under the Federal Credit Reform Act*, Technical Release 6.

<sup>77</sup> Our assessment of Education’s process necessitated reviewing numerous complex computer programs and following up with agency staff multiple times to clarify important details that were not documented. These details ranged from the order in which computer programs should be run to definitions of variables used in the model.

<sup>78</sup> [GAO-16-269](#).

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with this recommendation, and officials stated that they were in the process of improving their documentation practices.

## Review and Approval

Further, we found that Education's managers did not review and approve the supplementary model for estimating IDR plan repayment patterns, as recommended in federal guidance for estimating subsidy costs, after it was developed by staff.<sup>79</sup> Additionally, as a good practice, we have found that agencies often hire an independent firm to ensure that model calculations are accurate and consistent with documentation. However, Education officials confirmed that their supplementary model for estimating IDR plan repayment patterns has not been reviewed by an independent firm.

Some of the concerns we identified in the previous section of our report regarding Education's estimation approach could have been identified and resolved through an internal management review or independent external review. For instance, we found that the decision not to adjust borrower income forecasts for inflation causes IDR plan budget estimates to be \$17 billion higher than they otherwise would be. We also found that PSLF loan forgiveness was programmed to begin a year after the benefit will actually become available to eligible borrowers. When we revised these programs to allow loans to be forgiven a year earlier, estimated IDR plan costs rose by \$70 million. Agency staff told us this decision was made because borrowers were not likely to make the 120 consecutive on-time payments necessary to qualify for immediate forgiveness.<sup>80</sup> However, Education already makes assumptions about when borrowers

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<sup>79</sup> According to this guidance, the cash flow estimation process, including all underlying assumptions, should be reviewed and approved at the appropriate level including revisions and updates to the original model. Education officials said that while the model was not reviewed and approved, they do review outputs of revisions to the model. Federal Accounting Standards Advisory Board, *Preparing Estimates under the Federal Credit Reform Act*, Technical Release 6. Education managers did not review and approve the approach for estimating IDR cash flows (or repayment streams), which was created for the 2017 budget cycle.

<sup>80</sup> Only payments made after October 1, 2007 count toward forgiveness, and borrowers cannot accelerate their repayment schedule. Therefore, the earliest a borrower could accrue the 120 scheduled on-time payments required to receive forgiveness is October 1, 2017. (Qualifying payments must be made under a qualifying repayment plan for the full amount due while a borrower is employed full-time by a qualifying employer. Payments must be received no more than 15 days after their due date.)

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will not make scheduled loan payments.<sup>81</sup> An internal management review or independent external review may have pointed toward another solution—such as adjusting how often borrowers are assumed to have periods of non-payment—rather than simply delaying the PSLF start date.<sup>82</sup>

We recently recommended that Education create a documented process for management review and approval of its student loan model.<sup>83</sup> Education agreed with this recommendation, and officials told us they also hoped to have their revised student loan model reviewed by an outside party in the future.

## Model Testing

Although Education currently expects loans in IDR plans to be the most costly component of the Direct Loan portfolio, management has not ensured that its supplementary model for estimating IDR plan repayment patterns has been thoroughly tested. Such testing can help identify weaknesses so that they can be addressed, and help ensure that estimates are reasonable. As we previously mentioned, Education had not conducted the necessary testing to thoroughly assess the reliability of its borrower income data or measured error associated with its income forecasting methodology. Without such testing, Education officials do not know whether their data and methods produce reasonable results, or if alternatives are needed.

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<sup>81</sup> Reasons for non-payment include deferment and forbearance, which are approved periods of non-payment (for instance, when a borrower returns to school or is unemployed) as well as default. Borrowers in default are not eligible for PSLF.

<sup>82</sup> In follow-up information, officials also cited information they said they received from Education's Office of Federal Student Aid indicating that borrowers had only precertified about \$6.5 million in loans as eligible for PSLF in the program's first year. While precertification is not required, such information may be cause for Education to examine and adjust its current PSLF participation assumption, as discussed in the "model testing" section of our report that follows.

<sup>83</sup> [GAO-16-269](#).

Further, Education conducted sensitivity analysis on only one key assumption—borrower incomes—at the request of OMB.<sup>84</sup> Federal guidance for estimating subsidy costs states that agencies should conduct sensitivity analysis—which involves adjusting an assumption up or down by a fixed proportion—or other testing to identify which assumptions have the largest influence on cost estimates.<sup>85</sup> This information helps management anticipate the cost implications of alternative scenarios and focus oversight resources on key assumptions to help ensure that they are reliable and reasonable. However, Education officials told us they only conducted sensitivity analysis when asked by others, preferring instead to focus their resources on developing a single set of assumptions they believed were best. Developing a sound set of assumptions is, of course, important. Sensitivity analysis supports, rather than detracts from, this effort.

For instance, little is known about how many borrowers are eligible for or will participate in PSLF when it becomes available in October 2017.<sup>86</sup> Despite this uncertainty and concerns among some experts and

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<sup>84</sup> When Education adjusted incomes up by 10 percent, cost estimates fell by almost \$8.7 billion for the 1995 through 2016 cohorts. When Education adjusted incomes down by 10 percent, cost estimates rose by an equivalent amount. Education used its fiscal year 2016 budget assumptions and revised model for estimating repayment patterns of loans in IDR plans for this analysis, which was not in use as of the fiscal year 2016 budget. It did not calculate a baseline estimate of what costs would be prior to adjusting incomes, so it is not possible for us to calculate the percent by which subsidy cost estimates changed. These results indicate that if borrowers' future incomes deviate from Education's current assumption, actual IDR plan costs could differ substantially from current estimates.

<sup>85</sup> Federal Accounting Standards Advisory Board, *Preparing Estimates under the Federal Credit Reform Act*, Technical Release 6.

<sup>86</sup> Only borrowers who complete Education's voluntary PSLF pre-certification process provide their employment information to Education. According to Education, almost 950,000 pre-certification forms had been submitted as of June 30, 2016, about two-thirds of which had been approved.

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policymakers that PSLF could be costly to the government, Education has not conducted sensitivity analysis on its PSLF participation assumption.<sup>87</sup>

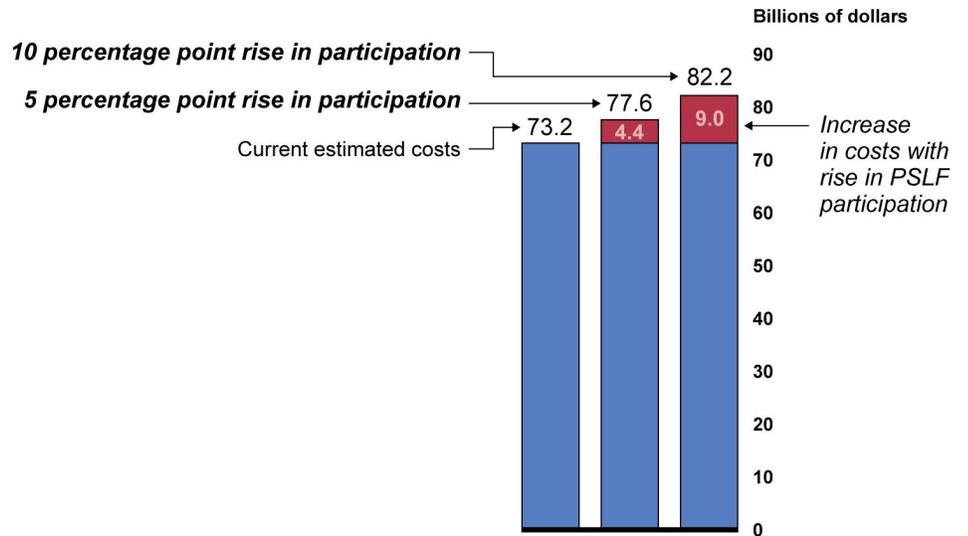
In order to illustrate the importance of conducting sensitivity analysis on major assumptions, we first revised Education's computer programs to increase the percentage of borrowers expected to participate in PSLF by 5 and 10 percentage points. As illustrated in figure 16, costs rose by \$4.4 and \$9 billion, respectively.<sup>88</sup>

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<sup>87</sup> Education's PSLF assumption contains two elements, both of which are subject to uncertainty. First, Education estimates the percent of borrowers eligible for PSLF based on borrower employment patterns from past Education surveys. However, IDR plans allow PSLF-eligible borrowers to maximize forgiveness and may attract eligible borrowers at a higher rate than Education assumes. Second, Education assumes 100 percent of eligible borrowers will participate in PSLF, which is unlikely to occur. Specifically, as we have reported in the past, some borrowers may not be aware of the program. [GAO-15-663](#) and *Federal Student Loans: Education Could Improve Direct Loan Program Customer Service and Oversight*, [GAO-16-523](#) (Washington, D.C.: May 16, 2016). (See appendix I for more information on Education's assumption and how we assessed it.)

<sup>88</sup> This figure (as well as figure 17) includes \$73.2 billion in current estimated costs, which is slightly lower than the \$73.6 billion presented in our first research objective (rounded to \$74 billion) and appendix IV. Those analyses included a slightly higher estimate of IDR plan loan volume for the 2017 cohort contained in the President's fiscal year 2017 budget appendix. This analysis uses an updated loan volume estimate from Education that excludes loans that may not be disbursed to borrowers (e.g., when a borrower decides not to attend school).

**Figure 16: Impact of Increasing Public Service Loan Forgiveness Participation on Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 1995-2017 Loan Cohorts**



Source: GAO sensitivity analysis conducted using the U.S. Department of Education's model and fiscal year 2017 budget assumptions. | GAO-17-22

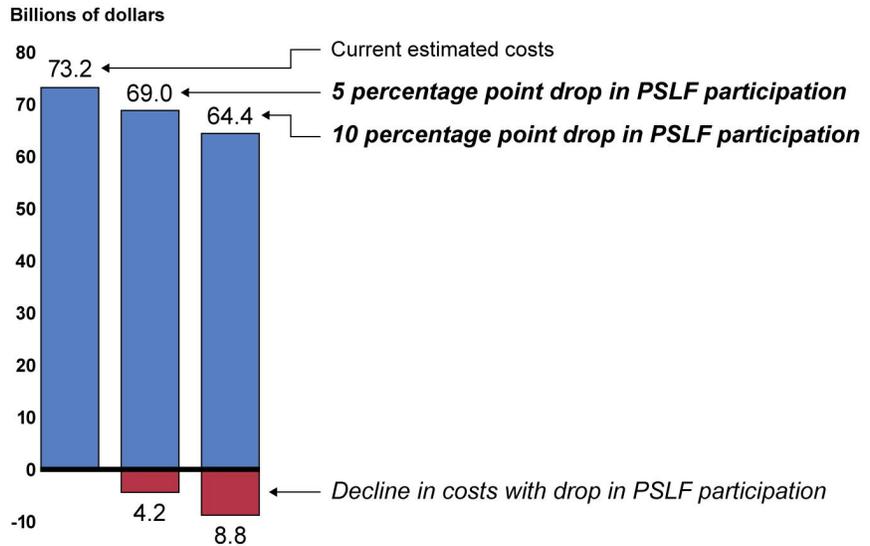
Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

The Public Service Loan Forgiveness program allows borrowers employed full-time by a public service organization to apply for forgiveness after making 120 on-time payments in an Income-Driven Repayment plan or the Standard 10-year repayment plan.

We then decreased the percentage of borrowers participating in PSLF by 5 and 10 percentage points. As seen in figure 17, costs fell by similar amounts.

**Figure 17: Impact of Reducing Public Service Loan Forgiveness Participation on Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 1995-2017 Loan Cohorts**



Source: GAO sensitivity analysis conducted using the U.S. Department of Education’s model and fiscal year 2017 budget assumptions. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.

Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

The Public Service Loan Forgiveness program allows borrowers employed full-time by a public service organization to apply for forgiveness after making 120 on-time payments in an Income-Driven Repayment plan or the Standard 10-year repayment plan.

Our results illustrate the potential for PSLF costs to be different than what Education currently expects, and why it is important for Education to monitor this assumption and adjust it as necessary to ensure that it is reasonable. Without conducting similar sensitivity analysis on other major assumptions, monitoring those assumptions carefully, and adjusting them as necessary to ensure that they are reliable, Education’s budget estimates are vulnerable to bias that could result in costs being over- or understated by billions of dollars.

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**Published Information May Not Be Sufficient for Policymakers to Accurately Assess Expected IDR Plan Costs**

In addition to identifying limitations in Education’s approach to estimating IDR plan costs and its quality control practices, we also found that Education has not published sufficient information about its estimates for policymakers to readily assess expected IDR plan costs. The kinds of information that Education has not published—and that could be useful to policymakers—include (1) total expected costs, (2) trend in estimates, (3) sensitivity analysis results, (4) limitations in estimates, and (5) estimated forgiveness amounts. Education officials noted that the department takes its responsiveness to policymakers and the general public seriously, and that the agency has responded to information requests about IDR plan cost estimates by congressional staff. However, congressional interest in IDR plans is high, and currently available information may be insufficient for policymakers to accurately assess likely plan costs, and consider the potential for alternative outcomes.

For instance, as a part of the President’s budget, Education publishes IDR plan loan volume and subsidy rate estimates for loans issued in the current and two most recent cohorts. This information can be used to calculate expected IDR plan costs for this limited group of loans. However, it is not possible to use this information to determine total expected costs for all loans in IDR plans. Additionally, Education has disclosed in reports accompanying the President’s budget that IDR plans are major contributors to upward revisions in estimated Direct Loan costs as a whole—it has not reported the amount by which IDR plan costs have risen or clearly described the reasons why.

Using unpublished data from Education, we found that total current expected IDR plan costs are about \$74 billion, or \$21 for every \$100 issued. We also found that expected IDR plan costs have doubled from \$25 to \$53 billion for loans issued from fiscal years 2009 through 2016—primarily due to the growing volume of loans expected to be repaid in IDR plans. Publishing more comprehensive information like this could help policymakers better understand currently expected costs and monitor trends in the Direct Loan portfolio.

Additionally, by publishing sensitivity analysis results and limitations in estimates, Education could help policymakers understand what is known about possible IDR plan costs, and what is still unknown. Our own sensitivity analysis illustrates that IDR plan costs could be billions of dollars more or less than currently estimated if PSLF participation is higher or lower than expected. Given growth in IDR plan cost estimates over time due to the rising volume of loans expected to be repaid in these plans, it would also be useful to disclose that current estimates assume

that no borrowers will switch from other repayment plans into IDR plans in the future.

Lastly, sharing the amount of principal Education expects to forgive on loans in IDR plans could help policymakers better understand a key plan feature that contributes to their expected costs. Education officials raised concerns that publishing forgiveness amounts could be misleading, because it is possible for the government still to generate income on loans with principal forgiven, particularly if borrower interest payments exceed forgiveness amounts. While this is true, loan amounts forgiven do represent foregone cash flows to the government. Further, legislation has been introduced in Congress to make forgiveness under certain IDR plans tax-free. Sharing information about expected forgiveness amounts could help policymakers better understand the scope of currently expected loan forgiveness and the potential tax implications of excluding forgiveness from taxable income.<sup>89</sup>

We calculated currently expected IDR plan forgiveness amounts using cash flow estimates provided by Education.<sup>90</sup> For our analysis, we calculated the amount of loan principal Education expects borrowers in IDR plans to repay, and the amount it expects borrowers not to repay due to forgiveness and other reasons.<sup>91</sup> Our results are in figure 18.<sup>92</sup>

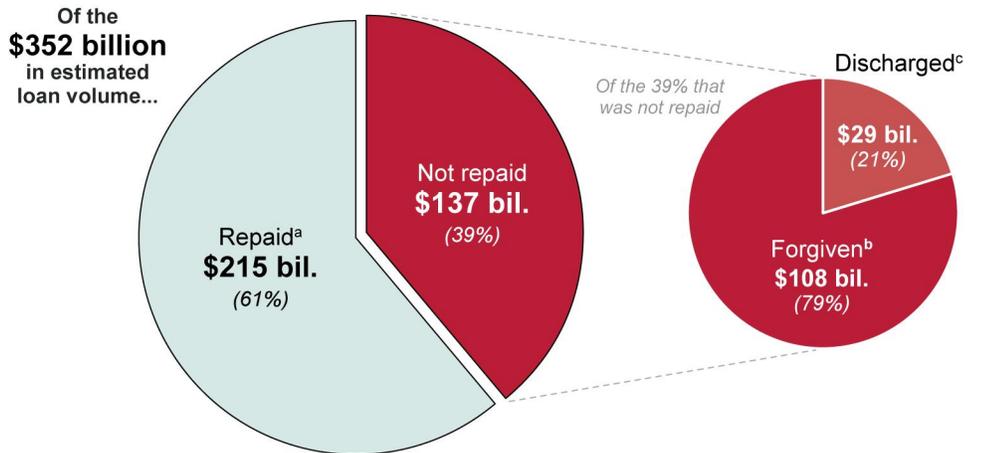
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<sup>89</sup> Loan principal forgiven under PSLF is not taxed. Legislation has been introduced in Congress to make forgiveness under certain IDR plans tax-free. See Student Loan Tax Relief Act, S. 3266, 114th Cong. § 2 (2016) and Student Loan Tax Debt Relief Act, H.R. 2429, 114th Cong. § 2 (2015). While the Congressional Budget Office estimates costs of legislative proposals, such as those to change the tax treatment of loan forgiveness, members of Congress need sufficient information about currently expected costs to determine whether to propose such reforms.

<sup>90</sup> For Direct Loans, cash flows from the government include loan disbursements to borrowers, while cash flows to the government include repayments of loan principal, interest and fee payments, and recoveries on defaulted loans.

<sup>91</sup> Loan forgiveness amounts are distinct from estimated subsidy costs. Subsidy costs represent the net present value of expected cash flows from the government minus expected cash flows to the government over the life of the loan, excluding administrative costs. The forgiveness amounts we report are on a cash basis and are not discounted to present value. They also do not take into account the impact of interest and fee revenues from borrowers on expected subsidy costs.

**Figure 18: Direct Loan Principal in Income-Driven Repayment Plans Estimated to Be Repaid, Discharged, and Forgiven, 1995-2017 Loan Cohorts**



Source: GAO analysis of estimated Income-Driven Repayment plan cash flow data provided by the U.S. Department of Education. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

<sup>a</sup>Includes recoveries on defaults. The federal government has strong collection powers, and Education expects to recover all defaulted loan principal in Income-Driven Repayment plans.

<sup>b</sup>Includes loan principal that Education estimates will be forgiven under Income-Driven Repayment plan terms and the Public Service Loan Forgiveness program, which makes forgiveness available to borrowers employed full-time by a public service organization after making 120 on-time payments in an Income-Driven Repayment plan or the Standard 10-year repayment plan.

<sup>c</sup>Includes loan principal that Education estimates will be discharged due to death or disability.

When discussing expanded information sharing, Education officials and OMB staff agreed that there could be value in reporting additional information about IDR plan cost estimates. An Education official raised concerns about the agency's ability to publish additional cost information, because OMB determines what is presented in the President's budget. OMB staff agreed that such information would be too detailed for the

<sup>92</sup> This analysis includes \$3 billion less in loan volume than the \$355 billion loan volume estimate presented in analyses for our first research objective and appendix IV, due to differences in how loan volume for the 2017 cohort was estimated. Specifically, those analyses used the loan volume estimate contained in the President's fiscal year 2017 budget appendix. This analysis uses an updated loan volume estimate provided by Education that excludes originated loans that may not be disbursed to borrowers (e.g., when a borrower decides not to attend school).

President's budget, but suggested that Education could provide more detailed IDR plan cost information through separate reports.<sup>93</sup> Education's strategic plan emphasizes the importance of information transparency as a tool to encourage data-driven decision-making and improve the U.S. educational system.<sup>94</sup> Standards for internal control in the federal government also note that management should share quality information externally.<sup>95</sup> By more thoroughly disclosing IDR plan cost information—such as total estimated costs, sensitivity analysis results, key limitations in estimates, and expected forgiveness amounts—Education could help policymakers better assess the cost implications of current IDR plan provisions and consider whether reforms are needed.

## Conclusions

Policymakers need reliable budget estimates to help align federal expenditures with policy priorities. In an environment of scarce resources, quality budget information becomes all the more important, as policymakers face difficult funding decisions. While IDR plans are a promising tool to help alleviate the burden of student loan debt and reduce borrowers' risk of default, they may be costly for the federal government. Some uncertainty is unavoidable when anticipating long-term loan costs, but we found numerous shortcomings in Education's estimation approach and quality control practices that call into question the reliability of its budget estimates and affect the quality of information Congress has to make informed budget decisions.

Because Education administers the federal government's largest direct loan program, it is especially important that the agency corrects its methodological weaknesses associated with estimating IDR plan costs. More specifically, until Education assesses and improves the quality of data and methods it uses to forecast borrowers' future incomes and accounts for inflation in its estimates, its IDR plan budget estimates may be unreliable. Further, until Education obtains data needed to estimate

<sup>93</sup> OMB staff stated that because the President's budget typically includes high-level information, a separate publication with more detailed information on estimated costs could be an appropriate place for such additional reporting.

<sup>94</sup> Specifically, Education states in this plan that it will communicate findings from its own analysis, research, and evaluation in a clear and engaging way that is appropriate for the intended audience to further efforts to encourage data-driven decision-making by others. U.S. Department of Education, *U.S. Department of Education Strategic Plan for Fiscal Years 2014-2018* (Washington, D.C.: Mar. 10, 2014).

<sup>95</sup> [GAO-14-704G](#).

the impact of income recertification lapses on borrower payment amounts, it will not know whether borrower payments are currently underestimated and whether adjustments are needed to avoid overstating IDR plan costs. In addition, until Education's planned revisions to its student loan model have been completed and tested to ensure reasonableness, the agency's IDR plan budget estimates will not reasonably reflect participation trends in IDR plans, particularly the extent to which borrowers in other repayment plans may switch into them. In the interim, Education may continue to understate IDR plan costs by billions of dollars, as past trends in estimates indicate. Without separately tracking how available IDR plans and the types of loans eligible for them perform relative to each other over time, Education's estimates will lack the detail needed to inform policymakers' ongoing efforts to streamline plans and better target costs.

In addition to correcting its methodological weaknesses, Education could enhance the reliability of its budget estimates by implementing more robust quality control practices. Implementing our previous recommendation to more thoroughly document and review its approach could help Education's management identify and resolve weaknesses.<sup>96</sup> More robust model testing, including more extensive sensitivity analysis, could also help Education's management identify and mitigate problems that may reduce the reliability of its budget estimates.

Moreover, as Education works to improve the quality of its IDR plan budget estimates, it could also help policymakers better understand the scope of currently expected costs and the potential for alternative outcomes by publishing more detailed information about its estimates, such as total estimated costs, the results of sensitivity analysis, key limitations, and expected forgiveness amounts. This information could help better support efforts to assess the cost-effectiveness of IDR plans and design any needed reforms.

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## Recommendations for Executive Action

We recommend that the Secretary of Education take the following six actions:

1. Assess and improve, as necessary, the quality of data and methods used to forecast borrower incomes, and revise the forecasting method to account for inflation in estimates.

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<sup>96</sup> GAO, *Credit Programs: Key Agencies Should Better Document Procedures for Estimating Subsidy Costs*, [GAO-16-269](#) (Washington, D.C.: July 13, 2016).

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2. Obtain data needed to assess the impact of income recertification lapses on borrower payment amounts, and adjust estimated borrower repayment patterns as necessary.
  3. Complete efforts to incorporate repayment plan switching into the agency's redesigned student loan model, and conduct testing to help ensure that the model produces estimates that reasonably reflect trends in Income-Driven Repayment plan participation.
  4. As a part of the agency's ongoing student loan model redesign efforts, add the capability to produce separate cost estimates for each Income-Driven Repayment plan and more accurately reflect likely repayment patterns for each type of loan eligible for these plans.
  5. More thoroughly test the agency's approach to estimating Income-Driven Repayment plan costs, including by conducting more comprehensive sensitivity analysis on key assumptions and adjusting those assumptions (such as the agency's Public Service Loan Forgiveness participation assumption) to ensure reasonableness.
  6. Publish more detailed Income Driven Repayment plan cost information— beyond what is regularly provided through the President's budget—including items such as total estimated costs, sensitivity analysis results, key limitations, and expected forgiveness amounts.

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## Agency Comments and Our Evaluation

We provided a draft of our report to the U.S. Department of Education (Education) for its review and comment. We provided relevant excerpts from our report to the U.S. Department of the Treasury and incorporated its technical comments as appropriate. We provided a draft of our report to the Office of Management and Budget for technical review, and did not receive technical comments in response.

Education generally agreed with our recommendations, stating that in light of growing IDR plan participation, the agency has focused efforts on improving IDR plan budget estimates. Additionally, Education said that estimating the federal student loan costs is a task it takes very seriously, and that the agency is constantly seeking to enhance and refine its models.

First, Education agreed to assess and improve its borrower income forecasts, and listed additional factors it wished to consider when determining how to incorporate inflation into its forecasts.

Second, Education agreed to attempt to obtain data to assess the impact of income recertification lapses on borrower payment amounts. Education reiterated its belief that such lapses may only have a small impact on plan costs, but did not provide data to support that view. We clarified the language in our recommendation to indicate that model adjustments should only be undertaken as needed, based on the outcome of Education's review of relevant data.

Third, Education also agreed to incorporate repayment plan switching into its redesigned student loan model, and reiterated that efforts to incorporate this capability had begun despite challenges inherent in predicting borrower behavior.

Fourth, Education agreed to add the capability to produce separate cost estimates for each IDR plan and each eligible loan type into its redesigned student loan model. Given the concern Education raised in its letter that revising its current approach to improve loan-type estimates may not be a good use of resources, we revised our recommendation to clarify that this improvement could be undertaken as a part of the agency's longer-term efforts to redesign its student loan model.

Fifth, Education agreed to test its approach to estimating IDR plan costs more thoroughly, including through more comprehensive sensitivity analysis. Education further explained its rationale for delaying the Public Service Loan Forgiveness (PSLF) start date in its cost model, citing preliminary evidence suggesting that few borrowers will make the 120 consecutive on-time payments necessary to receive forgiveness in the program's first year. Education also raised concerns that using the correct start date (which we found caused estimated costs to rise by \$70 million) would overstate costs. We noted Education's rationale and concerns in our report, and responded that another solution—such as adjusting how often borrowers are assumed not to make scheduled loan payments—may be more appropriate than simply delaying the PSLF start date.

Education agreed with our sixth recommendation to publish more detailed IDR plan cost information and stated that it plans to present sensitivity analysis results and key limitations in upcoming financial reports.

Education's comments are reproduced in appendix V.

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As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 15 days from the report date.

At that time, we will send copies to interested congressional committees and to the U.S. Departments of Education and the Treasury and the Office of Management and Budget. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (617) 788-0534 or [emreyarrasm@gao.gov](mailto:emreyarrasm@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix VI.

Sincerely yours,

*Melissa Emrey-Arras*

Melissa Emrey-Arras, Director  
Education, Workforce, and Income Security Issues

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# Appendix I: Objectives, Scope, and Methodology

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This appendix discusses in detail our methodology for addressing (1) the U.S. Department of Education's (Education's) current Income-Driven (IDR) Repayment plan budget estimates and how they have changed over time and (2) the extent to which Education's approach to estimating IDR plan costs and its quality control practices help ensure reliable budget estimates.

To address these objectives, we reviewed relevant federal laws, regulations, and guidance on the William D. Ford Federal Direct Loan (Direct Loan) Program and IDR plans. We reviewed documentation and interviewed officials from Education about the agency's approach to estimating costs and its quality control practices. We also interviewed officials from the Congressional Budget Office and the U.S. Department of the Treasury (Treasury) and staff at the Office of Management and Budget (OMB), as well as higher education policy experts, to discuss issues related to federal budgeting practices and estimated IDR plan costs. To answer our first objective, we analyzed and reported on data underlying Education's annual budget estimates for the Direct Loan program. To answer our second objective, we evaluated Education's estimation approach and conducted sensitivity analysis to determine the impact of alternative assumptions on Education's cost estimates. We also calculated the proportion of loan dollars Education expects to forgive under IDR plans using estimated cash flow data provided by Education. These analyses are described in more detail below. To assess the reliability of Education's budget estimates, we interviewed agency officials, reviewed related documentation, and conducted extensive electronic testing. We believe the data are reliable to report in objective one as a representation of the funding Education reports is necessary to operate the Direct Loan program, and in objective two, to illustrate the sensitivity of Education's budget estimates to different assumptions about future loan repayment activity and to illustrate currently expected forgiveness amounts.

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## Objective One: Review of Current and Past IDR Plan Budget Estimates

To analyze Education's current IDR plan budget estimates and how they have changed over time, we reviewed Education's annual submissions to the President's budget for fiscal years 2011 through 2017, which include estimated IDR plan loan volume and subsidy rates for Direct Loans to be issued in the year the of the budget and the two preceding fiscal years. For example, the budget submission for fiscal year 2011 included estimated IDR plan costs for loans in fiscal years 2009, 2010, and 2011.<sup>1</sup> We used these budgets to identify the original IDR plan cost estimates for the 2009 through 2016 cohorts.<sup>2</sup> Education did not publish subsidy cost estimates by repayment plan prior to the 2011 budget and could not easily provide the information necessary to determine original IDR plan cost estimates for previous cohorts.

We also reviewed supplemental unpublished data from Education to illustrate current IDR plan subsidy cost estimates for loans issued in fiscal years 1995 through 2017 using assumptions underlying their estimates for the President's fiscal year 2016 and 2017 budget. We used these supplemental data, along with published data for the 2017 cohort, to calculate current total reestimated subsidy costs and subsidy income for each repayment plan, loan cohort, and loan type. We also compare original published IDR plan subsidy estimates for the 2009-2016 cohorts to the current reestimated IDR plan subsidy costs for those cohorts. We limited our comparison to these cohorts because Education did not publish subsidy cost estimates by repayment plan in earlier budgets and does not maintain information that would be needed to identify past estimates. (In appendix IV, we also compare Education's IDR plan subsidy cost estimates for the fiscal year 2017 budget with those prepared for the fiscal year 2016 budget to illustrate how estimates changed from one budget to the next.) We compared the supplemental unpublished data to published data from the fiscal year 2016 and 2017

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<sup>1</sup> The President's fiscal year 2011 budget contained estimates for loans issued in fiscal years 2011 and 2010, which were based on estimated discount rates and loan volumes. That fiscal year's budget also contained estimates loans issued in fiscal year 2009, based on actual executed rates for 2009.

<sup>2</sup> Because original estimates by repayment plan were not available for the 2009 and 2010 cohorts, we used the first and second reestimate for those cohorts that were published in the 2011 budget.

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credit supplements to the President's budget and interviewed Education to clarify reasons for minor discrepancies.<sup>3</sup>

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## Objective 2: Review of Education's Approach to Estimating IDR Plan Costs and Sensitivity Analysis of Education's IDR Repayment Model

### Evaluation of Education's Estimation Approach

To understand and evaluate Education's approach to estimating the cost of loans in IDR plans, we first reviewed available documentation from Education on the supplementary model Education created to estimate repayment patterns of loans in IDR plans (referred to as the IDR plan repayment model in this appendix). We also reviewed documentation on Education's student loan model, which uses information from the IDR repayment model and other assumptions to calculate total subsidy costs. (See appendix II for detailed information on how Education estimates IDR costs using these models.) This documentation provided limited details regarding the steps of Education's IDR repayment model or how assumptions were operationalized and programmed in the model.

Given the limited documentation available regarding Education's IDR plan repayment model, we reviewed the computer programs and datasets used in the model. Education provided us with SAS program files and data input files used in the model.<sup>4</sup> The data input files contained the

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<sup>3</sup> For the 2017 budget data, we found differences in loan volume totals between the published budget and the supplemental data provided by Education for three loan cohorts. Specifically, the published loan volume for the 2012 and 2013 cohorts was slightly higher than in the supplemental data provided by Education. Education officials explained that for the 2012 and 2013 cohorts, total volume in the budget included a special loan consolidation program, Special Direct Consolidation, which was not included in the supplemental data provided to GAO because Education's model could not estimate loan volume by repayment plan for that program. For the 2014 cohort, the published loan volume was somewhat lower than in the supplemental data because the published budget only included loans issued through the end of the fiscal year (September 2015) while the supplemental data included loans issued through the end of the 2015 award year (December 2015).

<sup>4</sup> The data analysis for this report was generated using SAS Enterprise Guide 7.12 Copyright 2016 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

sample of Direct Loan borrowers Education used in its analysis as well as estimated historical incomes of those borrowers provided by Treasury. (See appendix III for more information on these historical income estimates.) The SAS program files implementing the model forecasted those borrowers' future incomes and scheduled IDR plan payment amounts, as well as forecasted events that would lead to non-payment, such as default, death or disability, prepayment of loans through consolidation, or forgiveness of loans through the Public Service Loan Forgiveness (PSLF) program. To get further clarification on the documentation, data, and computer programs provided, we interviewed Education officials who created and manage the IDR plan repayment model and the overall student loan model, which is used to calculate subsidy costs for all Direct Loans.<sup>5</sup>

We assessed the IDR plan repayment model's major assumptions for reasonableness and evaluated them against federal guidance for estimating subsidy costs developed by the Federal Accounting Standards Advisory Board. We evaluated methods used in the model, particularly Education's approach to forecasting borrower incomes, against this guidance and accepted practices in statistics and the social sciences. We also assessed whether the model appropriately replicated IDR plan program rules. Finally, we conducted an in-depth review of the Treasury-created estimated historical income data used in Education's approach. We assessed the reasonableness of the data by conducting electronic testing and producing summary statistics, which we asked Treasury to compare to the actual taxpayer data upon which its estimates were based. We reviewed related documentation from Treasury about the estimation process, and interviewed Treasury officials to clarify factual details and obtain their views on the process. (See appendix III for more information on our review of these data and Education's subsequent forecasting approach.)

## IDR Plan Repayment Model Sensitivity Analysis

Based on our detailed review of the assumptions, methods, and data used in the IDR plan repayment model, we identified two separate areas for testing the sensitivity of Education's IDR plan cost estimates to changes in assumptions. First, we tested the effects of inflation on income

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<sup>5</sup> We used the model documentation, data, computer programs, and interviews to produce more detailed summaries of the modeling process, including step-by-step descriptions of the sequence of SAS program files, to understand and describe how the IDR plan repayment model works. For a detailed description of how Education estimates the costs of loans in IDR plans, see appendix II.

projections and poverty guidelines, both of which are used to estimate borrower payment amounts. We adjusted borrower incomes and poverty guidelines for inflation due to the exclusion of inflation from Education's current model and the results of a prior Education analysis showing that cost estimates were sensitive to changes in borrower incomes. Second, we tested Education's assumption about PSLF participation and the year borrowers would be first eligible for forgiveness under the program. We focused on PSLF participation because actual participation is not yet known for this program and Education assumed that any borrower they estimated to be eligible for PSLF would choose to participate. We carried out each sensitivity analysis by rewriting relevant portions of the existing SAS computer programs that Education developed to implement the IDR plan repayment model.

### **Establishing Baseline Output**

To conduct these analyses, we first produced baseline cash flow estimates using the existing programs we received from Education. We sought to produce baseline estimates that were identical to those from Education's existing model. The baseline replication ensured that the new model assumptions, rather than different versions of programs or input data, were solely responsible for any changes in the estimates. The replication process included selecting random samples of the data files and using the SAS Compare procedure to detect any differences in observations and variables. We interviewed Education officials to confirm the sequence and versions of programs and to establish our final baseline file.<sup>6</sup>

### **General Testing Procedures**

After producing baseline estimates, we wrote two new sets of SAS program files to implement each new assumption and produce new cash flow output for each analysis. The final output data, which we sent to Education to produce subsidy rates, consisted of cash flows summed across all borrowers in repayment within each fiscal year and within loan population type (non-consolidated loans, loans consolidated from default,

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<sup>6</sup> We identified differences between our output and the fiscal year 2017 baseline output provided by Education. Through follow-up with Education officials about these differences, we determined that Education's baseline output relied on older versions of their SAS program files. Education officials then advised us to use the output we created as a baseline for the sensitivity analysis, as this output used the most up-to-date SAS program files.

and loans consolidated not from default). We provided this output to Education officials, who uploaded and ran the new estimates through the larger student loan model. Education officials provided revised subsidy rates for each loan type and origination cohort, reflecting the new IDR plan cash flows under our alternative assumptions. For each sensitivity analysis, we compared the baseline and revised IDR cash flows and subsidy cost estimates and calculated the percent change.

### **Public Service Loan Forgiveness**

We tested Education's assumptions regarding borrower participation and the first year that borrowers are eligible for PSLF. Education estimates borrower eligibility for PSLF using survey data that may not be representative of borrowers in newer IDR plans.<sup>7</sup> In addition, Education assumes that 100 percent of borrowers who are estimated to be eligible for PSLF will choose to participate after making 120 payments in a qualifying repayment plan. Lastly, Education assumes that no borrower will become eligible to benefit from PSLF until a year after the program is scheduled to begin. To assess the impact of altering these three assumptions, we increased and decreased the estimated percentage of borrowers eligible and participating in PSLF by 10 and 5 percentage points, and moved up the PSLF start date by a full year.

### **Adjusting Projected Incomes and Poverty Guidelines for Inflation**

We tested the extent to which cost estimates were sensitive to adjusting incomes and poverty guidelines for inflation for future years after 2013. As described in appendix II, Education forecasts borrowers' incomes by substituting the historical incomes of borrowers with similar characteristics, but does it not adjust these projected incomes for inflation. Education also uses 2013 poverty guideline data for future years, with no inflation adjustment. To implement this adjustment, we obtained inflation factors from OMB for all future repayment years, and inflated Education's forecasted borrower incomes and poverty guidelines

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<sup>7</sup> Specifically, Education bases its estimates of eligible borrowers on employment data from the 1993 Baccalaureate and Beyond Longitudinal Study, which surveyed federal student aid recipients who graduated from college in 1993, and the 2004 Beginning Postsecondary Students Longitudinal Study, which surveyed non-college graduates and others who began school in 2004. It assumes that 21 percent of non-college graduates, 29 percent of college graduates, and 31 percent of borrowers with graduate education are eligible for PSLF.

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into the appropriate year's dollar units.<sup>8</sup> Specifically, we applied adjustment factors to the 2013 dollar amounts to inflate them to each future year's dollar units. We then applied the existing repayment model using the inflated incomes and poverty guidelines as input, without altering any additional model assumptions or calculations.

### Calculating IDR Plan Forgiveness Amounts

To calculate expected forgiveness amounts for loans entering repayment in fiscal years 1995 through 2017, we analyzed cash flow data from Education, which provided detailed information on the amount of loan principal expected to be paid and not repaid. First, we determined the overall amount of loan principal in IDR plans estimated not to be repaid for any reason, as Education recommended. We did this by subtracting the amount of principal expected to be repaid from the total volume of loans disbursed to borrowers. The remaining amount represented loan principal estimated not to be repaid. We then subtracted the amount of loan principal estimated to be discharged due to a borrower's death or disability. We attributed the remaining balance of unpaid principal to loan forgiveness under IDR plans and PSLF. Because Education expects to recover all defaulted loan principal through the collections process, loan defaults did not contribute to total non-payment of loan principal.

### Evaluation of Education's Quality Control and Information Sharing Practices

We assessed Education's quality control practices by reviewing relevant documentation and interviewing officials in the office responsible for developing and managing the estimates. We evaluated Education's practices against federal guidance related to estimating subsidy costs and standards for internal control in the federal government. We also assessed Education's information sharing against standards for internal control in the federal government, and Education's strategic plan.

We conducted this performance audit from March 2015 to November 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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<sup>8</sup> OMB works with agencies to execute the federal budget and issues economic assumptions, including inflation assumptions, for agencies' use.

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# Appendix II: Description of Education's Approach to Estimating Costs of Income-Driven Repayment Plans

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## Education's Approach to Estimating Costs of Loans in Income-Driven Repayment Plans

Based on our review of Education's computer programs, model documentation, and interviews with agency officials, we confirmed that Education estimates subsidy costs for loans in Income-Driven Repayment (IDR) plans in the following way. First, Education estimates how many loan dollars will enter IDR plans from each loan cohort. Second, Education estimates repayment patterns for those loans over time. It performs this first task within its larger student loan model that calculates cash flows for cohorts of loans and incorporates various assumptions about the future.<sup>1</sup> Education addresses the second task inside a supplementary microsimulation model for estimating IDR plan repayment patterns—referred to as the IDR plan repayment model in this appendix—that was designed to predict the repayment behavior of individual borrowers from a sample of borrowers with loans in IDR plans.<sup>2</sup> Through interviews, Education officials stated that they combine the resulting pieces of information in their larger student loan model to generate subsidy cost estimates.

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## Estimating How Many Loan Dollars Will Enter IDR Plans

Education estimates the percentage of loans in each cohort that will enter each repayment plan—Standard, Extended, Graduated, and IDR—inside its student loan model. According to Education's model documentation and follow-up information from agency officials, Education based its cost estimates reported in the President's fiscal year 2017 budget on a random sample of loans drawn from its National Student Loan Data System in January 2015.<sup>3</sup> For loans issued after September 2014, Education applied repayment plan participation rates from a past cohort. For Consolidation loans, Education used 2014 cohort data because borrowers generally begin repaying those loans immediately. For non-consolidated loans, which generally do not enter repayment for several years while borrowers are in school, Education used participation rates

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<sup>1</sup> Overall, the student loan model contains 19 major sets of assumptions. These assumptions concern various aspects of loan performance, such as how many borrowers will prepay their loans, how many borrowers will default, and how successful default collection activities will be.

<sup>2</sup> A dynamic microsimulation model, such as the one Education developed, starts with individual-level data from a representative sample of the population and applies rules and behaviors to project outcomes for that sample over time.

<sup>3</sup> The National Student Loan Data System is Education's central database for student aid and contains information about individual borrowers' loan activity including the amount they borrowed, their repayment plan, and whether they are in default, among other things.

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## Estimating Repayment Patterns for Loans in IDR Plans

from the 2011 cohort.<sup>4</sup> IDR plan participation rates for the 2015 through 2017 cohorts were adjusted upward in comparison to the 2014 cohort to account for expanded eligibility for two newer IDR plans (Pay As You Earn and Revised Pay As You Earn). For the fiscal year 2017 budget, this upward adjustment ranged from 1.4 to 6.2 percent, depending on the cohort and type of loan. Education officials stated that they then apply the percentage of loans assumed to enter IDR plans to the total dollar value of loans originated (or loan volume) in each loan cohort.

Education uses a separate IDR plan repayment model to forecast cash flows, which we refer to as repayment patterns, of loans in IDR plans based on a sample of borrowers with loans in repayment as of September 2013. This random sample of borrowers was also drawn from the National Student Loan Database and reflected all loan activity through the end of fiscal year 2013, including but not limited to, the amount borrowed, loan type, and repayment plan. From this sample, Education selected all borrowers who had already begun repaying their loans under an IDR plan by September 2013. For the purpose of modeling future loan cohorts, Education assumes all borrowers entering repayment after September 2013 will have the same characteristics as borrowers who entered repayment in 2013.

Education then estimates how much each of these borrowers will owe on their loans over a 31-year span, based on the borrower's estimated adjusted gross income (income) and family size for each year in the repayment period and the rules of the IDR plan selected.<sup>5</sup> Education used a two-step process to forecast borrower income and family size:

1. To forecast borrowers' future incomes, Education first worked with Treasury to estimate past incomes, filing status, and family sizes of the sample of borrowers who had entered repayment by the end of fiscal year 2013. Treasury developed these estimates because Education does not collect tax data on all borrowers. Treasury collects

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<sup>4</sup> The 2011 cohort was selected for non-consolidated loans because about 80 percent of the non-consolidated loan volume for that cohort had entered repayment by the end of 2014.

<sup>5</sup> Borrower's monthly payment amounts are calculated as a percentage of their discretionary income. Discretionary income is the difference between the borrower's adjusted gross income and the federal poverty guideline for the borrower's state of residence and family size (100 percent for Income-Contingent Repayment and 150 percent for the other IDR plans). Borrowers without discretionary income pay \$0.

this information for all U.S. tax filers, but did not share actual data from these borrowers' tax filings due to privacy restrictions. Instead, it created a tax file that contained substituted, or "imputed," information based on borrower characteristics including age, gender, loan balance, dependency status and family income. Treasury first estimated if a borrower would file taxes in a given year. For each borrower estimated to file taxes, it then imputed estimated nominal incomes and number of tax exemptions (approximating family size) for each of the borrower's repayment years that occurred in tax years 1996 through 2013. For example, borrowers who entered repayment in 1996 would have 18 years of imputed incomes while borrowers entering repayment in 2000 would have 14 years. (See Evaluating Income Data Used in Education's Approach in appendix III for more information on Treasury's methodology to estimate borrower incomes and our assessment of error associated with its approach).

2. To forecast future incomes of each borrower in its sample from 2014 through the end of the borrower's repayment period (up to 31 years in the future), Education first converted the estimated historical income data from Treasury from calendar years into "repayment years."<sup>6</sup> A borrower who began repaying his loan in calendar year 2000 would have estimated historical income data covering repayment years 1 through 14 (formerly calendar years 2000 through 2013).<sup>7</sup> To forecast that borrower's future income in repayment year 15, Education first matched the borrower with a set of borrowers with similar characteristics. Education then randomly selected a borrower from this matched set of borrowers and substituted the nominal historical income observation from the same repayment year.<sup>8</sup> It repeated this

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<sup>6</sup> Education begins estimating IDR plan repayment patterns after borrowers enter repayment status. While it may take up to 40 years for a borrower to fully repay a loan in an IDR plan from the time the loan is issued, that period includes the time that borrowers are still in school and in a 6-month period after finishing school when they are not required to repay their loans. Education estimates repayment patterns for borrowers in IDR plans for a period of up to 31 years based on the borrower's maximum repayment period of 20 or 25 years, (depending on the plan) plus 6 years to account for potential loan deferment or forbearance. According to Education officials, less than 3 percent of borrowers are in deferment or forbearance for more than 6 years.

<sup>7</sup> For each forecast year, Education forecasted adjusted gross income, filing status, tax exemptions (proxy for family size), among other variables.

<sup>8</sup> Education identified similar borrowers based on information from their previous repayment year including adjusted gross income group, filing status, gender, initial loan balance group, highest degree earned, age group, and family status, among other variables.

step for each subsequent year of the borrower's maximum repayment period, choosing a different borrower's nominal historical income observation in each year. Because Education matched the borrowers in their file with Treasury's based on their repayment year (as opposed to calendar year), the nominal historical income values used in the forecasts could come from various non-sequential calendar years. (See Evaluating Income Data Used in Education's Approach in appendix III for more information on Education's methodology and the error associated with its approach).

Once Education forecasted incomes and family size for each borrower in the sample's entire repayment period, Education then applied the rules of the borrower's selected IDR plan to calculate the amount the borrower would owe over time.<sup>9</sup> For instance, a borrower in the New Income-Based Repayment plan would pay 10 percent of her discretionary income for 20 years, whereas a borrower in the Income-Contingent Repayment plan would pay 20 percent of her discretionary income for 25 years. For borrowers in the file who had not yet selected an IDR plan as September 2013 (i.e., those estimated to enter repayment in 2014 or later), Education selects a plan for them based on assumptions about borrower behavior.<sup>10</sup> For borrowers in the Income-Contingent Repayment plan, the IDR plan repayment model annually reevaluates whether they will switch into the Income-Based Repayment plan, and does so if the borrower's monthly payment amount would be lowered by at least \$50 by switching into the Income-Based Repayment plan. The IDR plan repayment model switches a borrower into the Revised Pay As You Earn Plan if that borrower is not eligible for the Pay As You Earn or New Income-Based Repayment plans and if the borrower saw his or her payment fall by \$50 compared to what would be owed under the Income-Based Repayment plan. Borrowers were assumed to choose Revised Pay As You Earn if the

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<sup>9</sup> Because the plans have identical benefits to borrowers, Education does not differentiate between the New Income-Based repayment plan and the Pay As You Earn plan in its approach. While older loan cohorts are eligible for Pay As You Earn and newer cohorts are eligible for New Income-Based repayment, those two plans offer borrowers the same benefits: borrowers pay 10 percent of their discretionary income and receive forgiveness after 20 years.

<sup>10</sup> For example, Education assumes that borrowers who have not entered repayment and go into deferment or forbearance in 2010 or later will always choose the Income-Based Repayment plan. To reflect Pay As You Earn and New Income-Based Repayment plan rules, Education decreases the maximum repayment period by 5 years for Income-Based Repayment plan borrowers who are not in deferment or forbearance and who first borrowed in 2008 or later. Education assumed all borrowers who are eligible for Pay As You Earn or New Income-Based Repayment will select that plan.

present value of the payments with Revised Pay As You Earn were lower than the present value of payments without Revised Pay As You Earn using a 30 percent discount rate. Education used a high discount rate because borrowers would likely place much less weight on the higher payments that would be likely to occur toward the end of the repayment period. Borrowers already in IDR repayment were assumed to choose Revised Pay As You Earn in the first year their payments fell by \$50 a month or more. Borrowers who had not yet chosen an IDR plan were assumed to choose Revised Pay As You Earn if their payments would be lower in the first year. Borrowers stay in an IDR plan for their entire repayment period, even if their income rises beyond the point at which they would qualify if they were applying in that year, in order to calculate possible loan forgiveness amounts.

The IDR plan repayment model also includes predictions about when borrowers will delay repaying their loans (through deferment and forbearance); when they will fail to repay their loans (due to default, death, and disability); when they will prepay their loans through consolidation; and when their loan balances will be forgiven due to participation in the Public Service Loan Forgiveness program or at the end of their IDR plan's full repayment term.<sup>11</sup>

The IDR plan repayment model's final output consists of cash flows received (broken out by principal and interest) and foregone (such as through default, death, and disability) for each of the 31 years of repayment. These cash flows are summed across all borrowers who enter repayment in the same year for three different groups: (1) borrowers with Subsidized Stafford, Unsubsidized Stafford, and Graduate PLUS loans, (2) borrowers who defaulted and then consolidated their loans, and (3) borrowers who consolidated their loans without defaulting.<sup>12</sup>

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<sup>11</sup> For defaulted loans, the government has strong collection powers and tools such as tax refund offsets and wage garnishments. Loans are only discharged under limited conditions, such as if a borrower dies, becomes totally and permanently disabled. Loans can also be discharged under bankruptcy, but because this type of loan discharge is rare, Education does not account for these occurrences in the IDR repayment model.

<sup>12</sup> Education estimates repayment patterns for Subsidized Stafford, Unsubsidized Stafford, and Graduate PLUS loans collectively and factors in the relative mix of the underlying loan types, but then combines the loan types to run through the student loan model. Education officials told us that, as a result of this practice, all differences in published subsidy rates for these loan types are wholly attributable to fees charged to borrowers at the time the loans are issued and how much interest accrues to the borrower during the relatively short period that borrowers are still in school.

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## Exporting Cash Flows to Student Loan Model

Cash flows from the IDR plan repayment model are then exported to the larger student loan model. According to Education officials, the student loan model allocates these cash flows, which are organized by the year in which loans enter repayment, back to the appropriate loan origination cohorts using an assumption about the rate at which loans originated in a given year will enter repayment. Education assumes that all loans being repaid in IDR plans in a particular loan origination cohort will have the same cash flow patterns as loans in the sample used in the IDR plan repayment model.

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## Calculating Subsidy Costs

The student loan model discounts estimated cash flows to present value using the Office of Management and Budget's credit subsidy calculator tool to determine the subsidy cost. The subsidy rate is determined by taking the ratio of the subsidy cost to the volume of loan obligations estimated to be made in that year.

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# Appendix III: Evaluation of Income Data Used in Education’s Approach

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## Income Data Used in Education’s Approach

The U.S. Department of Education’s (Education’s) supplementary model for estimating Income-Driven Repayment (IDR) plan repayment patterns—referred to as the IDR plan repayment model—blends statistical analysis and assumptions about the future behavior of borrowers.

## General Use of Historical Income Estimates

Education uses data on borrowers’ historical incomes to estimate their incomes in future repayment years. According to Education staff, the previous version of the agency’s IDR plan repayment model used data from the Current Population Survey, a general population sample survey administered by the U.S. Census Bureau, which the agency matched to a sample of borrower data. Education staff told us they searched for a different source of income data beginning in 2013, due to the relatively short 2-year Current Population Survey panel length. The short panel required Education to combine incomes from different individuals and Current Population Survey samples to project over enough repayment years.

For Education’s current IDR plan repayment model, developed in 2015, agency staff sought income and other data from federal income tax returns, as collected by the U.S. Department of the Treasury (Treasury). Taxpayer data offered the potential for more accurate data than matched Current Population Survey data, which only covered a sample of borrowers for relatively short 2-year period. (According to Education officials, the Current Population Survey does not contain data on student borrowing so the prior model had to assume that borrowers and non-borrowers had the same income patterns.) Despite the expected benefits of using actual taxpayer data, Treasury staff indicated that rules concerning taxpayer privacy prevented them from providing data on actual borrower incomes directly.

Education staff said they initially hoped to receive data from Treasury that matched borrowers’ actual incomes as closely as possible, perhaps with a random distortion to protect taxpayer privacy. Staff mentioned Education’s National Postsecondary Student Aid Study restricted-use file as an example of a similar dataset.<sup>1</sup> However, Treasury’s chosen

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<sup>1</sup> The National Postsecondary Student Aid Study restricted-use data file contains data on a sample of undergraduate and graduate students attending postsecondary institutions in the 50 states and the District of Columbia that were eligible to participate in the federal financial aid programs in Title IV of the Higher Education Act. The survey focuses on how students and their families pay for postsecondary education, and contains a wide range of demographic information about the nation’s postsecondary students.

Methodology for Assembling  
Historical Income Estimates

approach involved imputing borrower income categories. Education staff then requested that Treasury convert these categorical values into dollar-scaled incomes for use in Education's IDR plan repayment model.

Based on our review of documentation from Treasury and Education, to assemble the data prior to imputation, Treasury matched a sample of borrower data that Education drew from the National Student Loan Data System containing loan information from September 2013 to their tax return data for filing years 1996 through 2013. Treasury assumed that borrowers did not file returns if they did not have matching tax return data for a given year. Key tax variables matched to the file for loan modeling purposes included adjusted gross income, number of exemptions, and filing status, among others. The final matched dataset included observations for approximately 1.3 million borrowers in each of 18 tax years.

After matching the files, Treasury used a data mining algorithm, known as "graphical models," to create an imputed version of the matched data. According to Education staff, they asked Treasury to provide an imputed dataset that resembled the actual data as closely as possible, for all of the tax variables joined to their borrower records. Education staff said they expected incomes to be accurate within categories but having random distortion to preserve taxpayer privacy. Treasury staff told us that they lacked the time and prior experience with Education's data to have a pre-existing model to meet these specifications. Instead, Treasury used graphical methods to automatically identify a model that best fit the joint distribution of the data across several variables and allowed for the simulation of new imputed data. Treasury staff said that this approach was simpler than what they might have done given more time, but it is unclear whether greater complexity in the model would have yielded better results.

Based on our review of documentation and interviews with Treasury staff, Treasury's exact method of imputation had several steps. First, Treasury rescaled all variables from their natural scales into discrete categories, which primarily affected borrower incomes, which are naturally measured in continuous nominal dollars.<sup>2</sup> Using categories of incomes rather than

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<sup>2</sup> In addition to a category for non-tax filers, Treasury created income categories for tax filers with adjusted gross incomes in the following ranges: up to \$10,900, \$10,900 to \$22,000, \$22,000 to \$34,000, \$34,000 to \$50,000, \$50,000 to \$71,000, \$71,000 to \$104,000, and over \$104,000.

the continuous dollar scale allowed Treasury to develop a model using graphical methods that required less computing power. Second, Treasury used graphical methods to identify the relationships (or dependencies) among the borrower and tax variables in the matched data, in the form of multivariate crosstabulations. The model first estimated the probability that a borrower would file a tax return in a given year, and then modeled the joint distribution of the data, given that the first-stage model estimated that a borrower would file a return. After estimating these crosstabulations, Treasury created a single imputed dataset by drawing random variates from the fitted joint distribution of the data, in order to replace records in the actual dataset.

When imputing incomes, Treasury staff told us they took an additional step to transform the imputed income variables from a categorical to continuous scale by drawing random dollar values from probability distributions. For borrowers with incomes imputed in the lowest and highest categories, Treasury simulated continuous incomes by drawing from normal or log-normal distributions with moments set to their sample values. For borrowers in all other categories, Treasury drew independent random variates from uniform distributions with support on the range of each imputed category.

According to Treasury staff, they constrained the imputation model to replicate some of the longitudinal structure in the tax data over time within borrowers. The model imputed a borrower's income in the current year based on the borrower's one-year lagged income, which generally ensures that the imputed data recreates the correlation between incomes in adjacent years (i.e., the first-order autocorrelation). In addition, Treasury staff said that the imputation variables were stratified by year, in order to allow the conditional distributions to vary over time.

#### Error in Historical Income Estimates

Any imputed data will have imputation error, the amount of which depends on the predictive power of the model or method used to create them. According to statistical theory, imputation models can produce imputed datasets that are systematically biased, in the sense that the imputed distribution of the data does not resemble the actual distribution across many imputations. Imputation can also produce imputed datasets that are unbiased but have a high degree of imputation error. (More specifically, the variance of a model's posterior predictive distribution can be large.) In these cases, the imputed distribution of the data will resemble the actual distribution across many imputations, but the imputed

distribution in any one sample of imputed data, often one random simulation, may be quite different.<sup>3</sup> Measuring error can involve calculating confidence intervals. A larger confidence interval relative to the estimate would suggest imputed data that are more prone to error. A user of imputed data typically would consider the size of a confidence interval as one criterion when assessing whether imputed data are sufficiently precise for a specific application, along with the imputation model's potential bias and the user's tolerance for error.

These two types of imputation error can affect the analysis of imputed data. Ordinary methods of statistical analysis generally assume that variables (like borrower incomes) are measured without error—an assumption that is clearly not valid when analyzing imputed data. Analyses that do not account for imputation error can produce estimates that are biased or more or less precise than ordinary statistical theory would imply, depending on the nature of the analysis.

To address these features of imputed data, generally accepted statistical practices suggest a number of methods for the analysis of imputed data. One common method uses “multiple imputation” to impute the data several times, producing “implicate datasets.” Implicates are randomly generated copies of the imputed data, produced by the same imputation model.<sup>4</sup> The imputed data will vary randomly across implicates, depending on the nature and precision of the imputation method, because most imputation models have a partially random or probabilistic structure. By assessing the degree to which analytical results vary across implicates, analysts can incorporate the error of imputation when estimating the error of their estimates more generally. Imputation error “propagates” into other measures of precision, such as sampling error.

As an alternative or complement to assessing imputation error directly, the statistical literature recommends that analysts use imputed data as preliminary information, prior to replicating their analyses using actual

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<sup>3</sup> Roderick J.A. Little, “Statistical Analysis of Masked Data,” *Journal of Official Statistics*, Statistics Sweden vol. 9 no. 2 (1993): 407-426. Jerome P. Reiter, “Releasing Multiply Imputed, Synthetic Public Use Microdata: An Illustration and Empirical Study,” *Journal of the Royal Statistical Society, Series A* vol. 168 no. 1 (2005): 185-205. Jerome P. Reiter and Trivellore E. Raghunathan, “The Multiple Adaptations of Multiple Imputation,” *Journal of the American Statistical Association* vol. 102 no. 480 (2007): 1462-1471.

<sup>4</sup> Ibid.

data.<sup>5</sup> This approach applies to situations in which an analyst may not access the underlying data, but can provide computer code or algorithms to another analyst who may access the actual data and replicate the work.

Education staff told us they did not request information that would have allowed them to assess how imputation error would have affected its cost estimates, nor did they provide their computer code to a Treasury analyst who had access to the data to replicate their work. Education staff conducted an informal assessment of the quality of the borrower income data by reviewing correlations between incomes and key factors like education and borrowing levels. They did not use more formal methods to assess and address imputation error in their estimates, such as those discussed above. In addition, Education staff did not thoroughly document and evaluate the imputation methods that Treasury used, nor did they request evidence of an adequate model fit. Instead, according to Education staff, Treasury provided Education with limited documentation which included a broad overview of the imputation approach. Treasury developed detailed documentation of the imputation model and error at our request, several months after Education had accepted the final imputed data. Treasury staff reported having computing and other resource constraints that affected their choice of models and methods. These constraints would have affected Treasury's capacity to run their model multiple times and produce multiple impute datasets.

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## Comparison of Estimated and Actual Income Data

Through our review of summary documentation and limited descriptive and graphical analysis from Treasury, we found indications of imputation error that Education may not find acceptable for its purposes. This error relates to the imputation of incomes in the lowest and highest categories as well as the longitudinal structure of borrower incomes over time. This error warrants further evaluation by Education, given that the agency sought income data that would resemble borrowers' actual, historical incomes as closely as possible, including accurate longitudinal profiles of incomes. Accurate longitudinal profiles of income are important, because Education's IDR plan repayment model includes a number of calculations at the borrower level, such as specific payment amounts and borrowers' eligibility for specific IDR plans, which use the sequence of data within

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<sup>5</sup> Gary Benedetto, Martha H. Stinson, and John M. Abowd, "The Creation and Use of the SIPP Synthetic Beta" (unpublished manuscript, U.S. Census Bureau, April 2013), 16.

borrowers over time as inputs and are re-calculated each year over the repayment period.

Treasury staff told us they did not seek to impute incomes on the dollar scale. Rather, staff imputed income categories, and then evaluated model fit using the categorical distributions of the imputed and actual income data. After developing and validating the categorical imputation model, Treasury provided a simple transformation of the income categories into dollar values, using the secondary imputation methods we describe above. Treasury staff described this aspect of the imputation as a practical solution to meet needs that Education clarified after Treasury had developed the imputation method and its goals. Because dollar-scaled incomes were not originally specified, Treasury staff told us they did not assess the fit of the imputed dollar-scaled incomes to the joint distribution of the data.

#### Error in Dollar-Scaled Incomes in Highest and Lowest Categories

Treasury's comparison of the imputed and actual income data indicates the imputed categorical data generally resembled the actual data, but its secondary step to produce dollar scaled data introduced additional error, particularly for observations in the highest and lowest income categories. Treasury provided us with tabulations and plots of the imputed and actual data, along with predictive *p*-values.<sup>6</sup> The frequency statistics showed that the marginal and joint distributions of key variables were generally similar in the imputed and actual data for the categorical data, but that the secondary imputation of dollar scale incomes produced additional error for borrowers in the lowest and highest income categories. As the Treasury-provided summary statistics in table 1 show, the mean imputed income was about 2.1 times smaller than the mean actual income among borrowers who earned \$12,000 or less. The imputed mean was about 1.9 times larger than the actual mean for borrowers in the highest income category. Treasury officials agreed that imputation error may be greater in the lowest and highest categories, but speculated that the error may not be practically consequential for the calculation of income-based loan payments. However, because these data form the foundation of numerous individual-level sequential calculations that determine what borrowers are estimated to repay to the government, error associated

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<sup>6</sup> A predictive *p*-value is a measure of the degree to which the predictions of a statistical model will fall in the same range as the observed data used to develop the model. See Andrew Gelman, John B. Carlin, Hal S. Stern, and Donald B. Rubin, *Bayesian Data Analysis*, 2nd ed. (Boca Raton: Chapman and Hall/CRC, 2004), 159-165.

with the data should be measured and its effect on budget estimates should be assessed.

**Table 1: Descriptive Statistics on Imputed and Actual Income Data (Tax Years 1996 through 2013)**

Value	Mean Adjusted Gross Income (in thousands of dollars)									
	12 or less		over 12 to 18		Over 18 to 100		Over 100 to 200		Over 200	
Data Type	Actual data	Imputed data	Actual data	Imputed data	Actual data	Imputed data	Actual data	Imputed data	Actual data	Imputed data
Percent	9.8	8.7	6.6	6.5	63.8	62.8	15.5	16.8	5.2	5.1
Mean	-2.3	-4.8	15.0	15.0	51.3	52.3	134.1	135.4	481.1	922.0

Source: U.S. Department of the Treasury, Office of Tax Analysis. | GAO-17-22

### Error in Longitudinal Structure of Incomes over Time

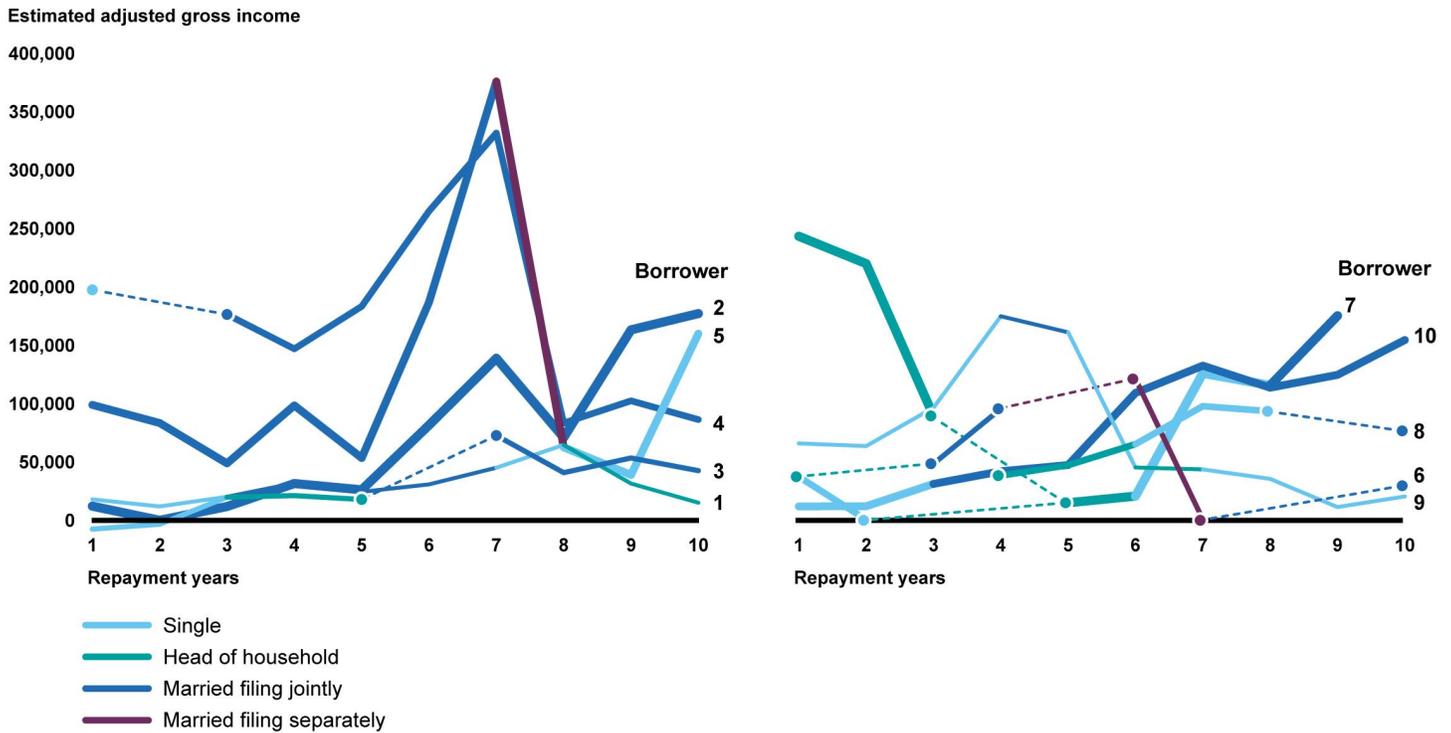
By design, Treasury's imputation model ensured that the correlation between incomes in adjacent years was similar in the imputed and actual data. Despite this important constraint, the model did not seek to accurately impute complete, realistic profiles of dollar-scaled incomes over time within the same borrower for all observed years. Consequently, the imputed profiles of incomes over time within borrowers were not designed to ensure that they resemble those observed in the actual data at the individual level. Treasury staff confirmed this feature of the imputed data.

Our limited exploratory analysis of the imputed dollar-scaled income data revealed patterns consistent with these features of the imputation. Incomes were less strongly correlated between adjacent years in the imputed data than in the actual data, based on statistics that Treasury staff provided. Specifically, let  $\text{Var}(\text{AGIt} \mid \text{ADIt-1}, \text{AGIt-2}, \dots, \text{AGIt-k})$  denote the marginal variance of incomes at time  $t$ , conditional on  $k$  previous values. In the imputed data, the limited evidence available to us suggests that the estimated conditional variance in the imputed data may exceed the actual variance in the population of student loan borrowers. The Pearson correlation between incomes in the current and previous year, truncated to the interval of positive incomes less than \$1 million, was 0.84 in the actual data and 0.58 in the imputed data.<sup>7</sup> In other words, one measure of the year-to-year instability of incomes was about 44 percent larger than in the actual data. In addition, the absolute value of incomes changed between adjacent years by 52 percent in the actual

<sup>7</sup> The Pearson correlation is a measure of the linear correlation between two variables, ranging from -1 (total negative correlation) to 1 (total positive correlation).

data but 75 percent in the imputed data. Consistent with these aggregate statistics, figure 19 shows how imputed incomes vary by large amounts from year to year within the same 10 randomly selected borrowers presented previously in the report, this time with their tax filing status indicated. Figure 20 illustrates how imputed incomes vary by large amounts from year to year within the same 60 randomly selected borrowers.

**Figure 19: Treasury's Estimated Historical Incomes for Randomly Selected Sample of Direct Loan Borrowers**



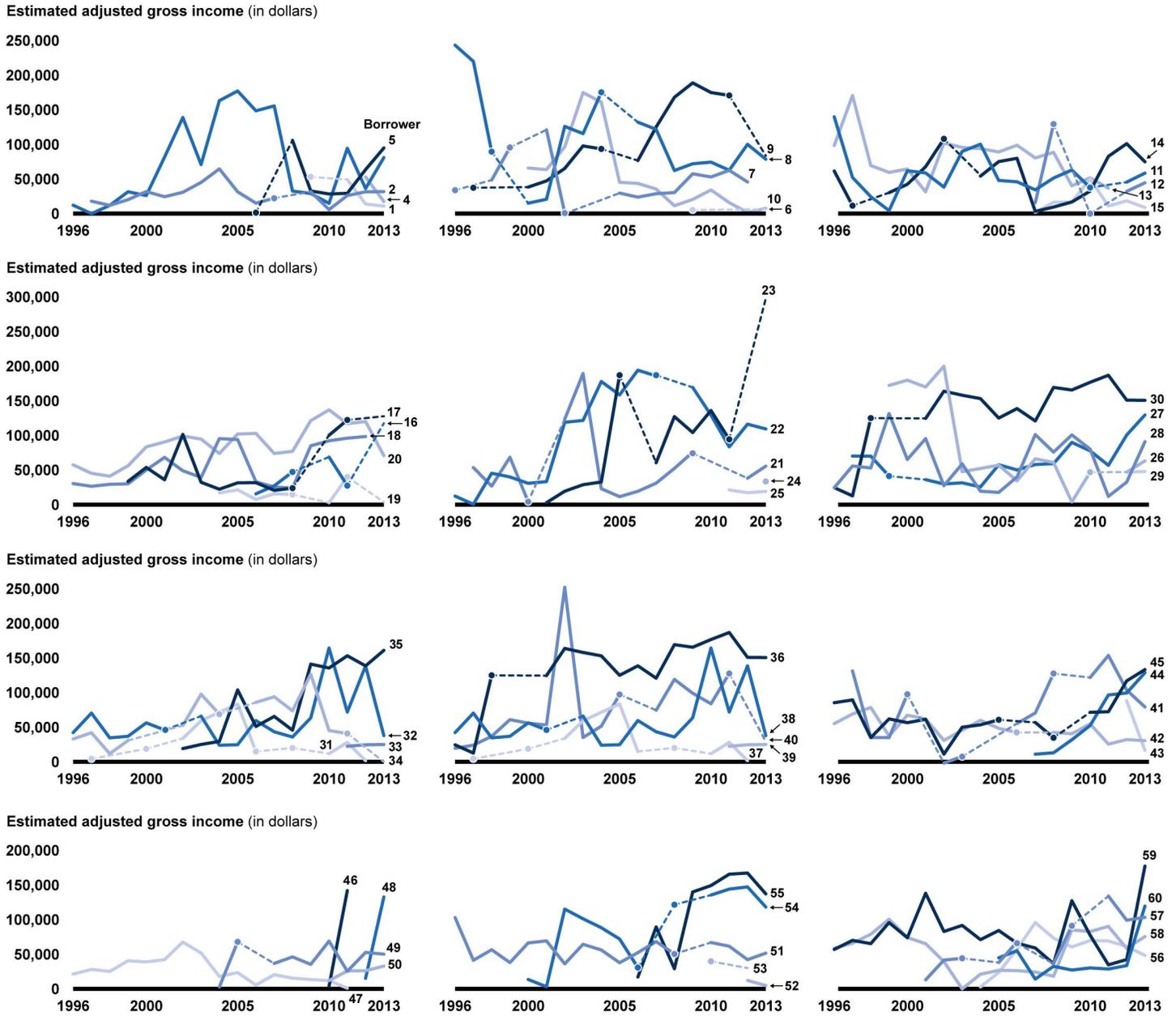
Source: Estimated data provided by the U.S. Department of the Treasury for use in the U.S. Department of Education's Income-Driven Repayment Cash Flow Model. | GAO-17-22

Notes: Estimated incomes represent borrowers' nominal adjusted gross incomes for the first 10 years of loan repayments, as estimated by the U.S. Department of the Treasury (Treasury). Repayment could have occurred from tax year 1996 through tax year 2013, depending on when the borrowers entered repayment. Dashes in the income series represent years when borrowers were estimated not to have filed tax returns. Adjusted gross income can be negative if taxpayers have income deductions or exclusions that exceed their gross income.

Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

Appendix III: Evaluation of Income Data Used in Education's Approach

Figure 20: Treasury's Estimated Historical Incomes for Randomly Selected Direct Loan Borrowers (Tax Years 1996 through 2013)



Source: Estimated data provided by the U.S. Department of the Treasury for use in the U.S. Department of Education's Income-Driven Repayment Cash Flow Model. | GAO-17-22

Notes: Limited to borrowers with estimated adjusted gross incomes between \$5,000 and \$300,000. Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

The secondary imputation of incomes in dollars may explain the patterns above. Simulating dollar-scaled incomes from a set of uniform, normal, or log-normal distributions would have added some amount of approximation error, potentially inflating the conditional variance above in the imputed data. The degree of error would depend on how strongly the actual income distribution within each category diverged from the assumed distribution (e.g., its nonlinearity when simulated as uniform). Consistent with this explanation, Treasury staff reported nearly identical Pearson correlations between current and 1-year lagged categorical incomes in the imputed and actual data, at 0.69 and 0.67, respectively. The approximation error for continuous incomes may have compounded across years when Treasury staff independently simulated incomes for the same borrowers in adjacent years, without constraining the imputed distribution to preserve the potential dependency of incomes across second-order lags and higher.

Treasury staff emphasized that adjusted gross income can be more volatile over time than other measures of income. Adjusted gross income includes gross wages, business income, and asset income, among other sources, as well as certain deductions and credits. According to Treasury staff, adjusted gross income can vary more substantially over time than other sources of income, such as wages, and that such variation is common among upper-income filers. However, we found that the absolute value of imputed adjusted gross incomes varied between adjacent years by 15 to 77 percent for the middle 50 percent of the sample of borrowers with adjusted gross incomes above 0 and less than \$400,000. The widespread nature of the volatility conflicts with an explanation that emphasizes volatile sources of income, deductions, and credits among borrowers with high incomes.

We did not receive sufficient information to fully evaluate the nature and extent of imputation error in the Treasury data, and how it would affect Education's IDR plan cost estimates. For instance, we did not receive Treasury's computer code or the actual tax data. Instead, Treasury staff described the analysis in interviews and written briefing slides, as well as a 7-page summary of the analysis that they previously provided to Education. The correlations and proportional change statistics above are limited in their ability to fully describe complete profiles of incomes at the individual borrower level and their dependence over time, because they describe linear associations only between data from adjacent years. Additional analysis, with full access to the imputation model code and tax data and a thorough assessment of the longitudinal structure of incomes

within borrowers over time, is necessary to confirm the imputation error suggested by the limited evidence we obtained from Treasury.

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### Forecasting Future Borrower Incomes and Characteristics

The IDR plan repayment model uses the imputed data on borrower incomes and other characteristics to forecast these data for future repayment years that have not yet occurred. The model uses a different method of imputation, known as the "hot-deck," to make these forecasts. Below, we describe this method in detail and evaluate it against generally accepted statistical practices.

### Education's Process of Forecasting Borrower Incomes and Other Characteristics

According to our review of the imputed data that Education received from Treasury, the data could span a variable portion of each borrower's repayment history. Education received imputed data for tax years 1996 through 2013. For a borrower who entered repayment in 1996, this period would span the entire historical repayment period through 2013, but it would not cover future years when the borrower may still be in repayment. Conversely, for a borrower who entered repayment in 1986 and repaid all debt in 2000, the data would span the last four historical years but not the first 10. Many other types of overlap are possible.

The repayment model uses these historical data and hot-deck methods to impute or forecast data for repayment years that have not yet occurred. The hot-deck is a general purpose method of imputation, which statistical organizations commonly use to impute missing survey data. For a set of records needing imputation, hot-deck methods use a set of covariates to identify one or more records in the data with observed values on all variables, which is similar to the record needing imputation. The method then substitutes the observed values for the values needing imputation, often using random selection among the donor records when multiple donor records are available.

Once the repayment model forecasts data for unobserved repayment years, it treats them as known, observed data. The repayment model uses the forecasted data as input for the second stage of modeling, which applies various assumptions about how borrowers will repay their loans over time. The second stage modeling incorporates neither the error associated with Treasury's imputation of the matched tax and loan data nor the error associated with Education's hot-deck forecasting.

### Education's Forecasting Process and Prediction Error

As mentioned previously, any method of imputing or forecasting unknown observations will have error associated with its predictions. Although the nature of this error depends on the method and data, generally accepted

statistical practices typically recommend quantifying the error and incorporating it into subsequent analysis of the predictions. Education's method of forecasting borrower incomes does not quantify the error associated with the method or incorporate it into subsequent analyses.

Education's analysis seeks to forecast the values of several variables, most notably income, for a set of borrowers over up to 31 future repayment years. One could view this as either a longitudinal econometric modeling problem or a general purpose imputation of missing data. Using either approach, accepted statistical practice involves quantifying and propagating the error that is inherently associated with prediction.

An econometric approach would use an explicit statistical model for how the forecasted variable depends on several other variables (or covariates).<sup>8</sup> Additional assumptions would describe how the imputed variable varies over time, either through covariates (such as time indicators) or assumptions about the variable's random fluctuation around its long-term mean (such as an error term with an autoregressive order 1 structure). These model assumptions provide explicit formulas to predict future values of the variable and to quantify the likely error of prediction. The latter formulas for prediction error (or the posterior predictive distribution) can allow analysts to propagate the error of prediction into subsequent analyses of those predictions.

An alternative approach would use more advanced methods of imputing missing data, such as multiple, maximum likelihood, or expectation-maximization imputation.<sup>9</sup> These methods assume an explicit probability model for the joint distribution of the data, with parameters that can be estimated from the data. Analysts can use various methods for drawing from the fitted data distribution, in order to generate multiple imputed datasets, as discussed above. This allows for analysts to quantify and propagate error across subsequent analyses of the imputed data.

Education's application of the hot-deck method does not follow these general statistical principles. The method imputes the future values of all

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<sup>8</sup> Often the analysis would develop a generalized linear regression model for the conditional mean and a distributional model for an error term. For example, see Edward W. Frees, *Longitudinal and Panel Data: Analysis and Applications in the Social Sciences* (New York: Cambridge University Press, 2004), 125-147.

<sup>9</sup> Roderick J.A. Little and Donald B. Rubin, *Statistical Analysis with Missing Data*, 2nd ed. (Hoboken: John Wiley and Sons), 75-90, 133-143, 190-198.

unknown data, using donor cases that are similar on a set of covariates, such as gender and highest educational program level. After making predictions, the method does not quantify the prediction error of the estimates, using in-sample statistics such as mean-squared error, misclassification rates, deviance statistics, predictive p-values, or the estimated variance of the posterior predictive distribution.

Once the repayment model forecasts the income data for future years, it assumes that the estimates have zero prediction error associated with them, or equivalently, that the error does not affect the repayment model's loan cost estimates. Since any applied method of forecasting or imputation produces error, and Education's IDR plan cost estimates are highly sensitive to changes in borrower income forecasts, it is important for Education to measure this error and determine its ultimate impact on IDR plan cost estimates.

Moreover, the IDR repayment model uses source data that have their own unquantified imputation error from Treasury's imputation. These two sources of error—Treasury's imputation and Education's forecast—may interact and combine in ways that further increase the bias and imprecision of Education's loan cost estimates. The presence of multiple forms of error, at different stages of analysis, emphasizes the importance of propagating all sources of error through the entire analysis, or else eliminating imputation error from the imputed data by using actual observations. At a minimum, Education should acknowledge the presence of imputation error and identify how it might affect estimates from the repayment model. Such acknowledgements would provide more transparent information to users of its estimates, compared to point estimates that do not disclose the limitations of the source data.

Statistical organizations accept the need for users of imputed data, such as Education, to quantify and assess the effects of imputation error, despite their release of public data that have been imputed. The U.S. Census Bureau warns users that methods of estimating sampling error will underestimate total error when data have been imputed.<sup>10</sup> In recent years, the Census has generated imputed data for several surveys, the Survey of Income and Program Participation and Longitudinal Business Database, but has warned that analyzing imputed data without necessary

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<sup>10</sup> For example, see U.S. Census Bureau, *Survey of Income and Program Participation Users' Guide: Supplement to the Technical Documentation*, 3rd ed. (Washington, D.C.: 2001), 7-6.

corrections may understate the variance of estimates.<sup>11</sup> This guidance to data users is consistent with the criteria discussed above, which recommend quantifying and propagating imputation error, despite statistical agencies' widespread use of imputed data in public data products.

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<sup>11</sup> Ron S. Jarmin, Thomas A. Louis, and Javier Miranda, "Synthetic Data: Public-Use Micro Data for a Big Data World," accessed Sept. 1, 2016, <http://researchmatters.blogs.census.gov/2014/10/14/synthetic-data-public-use-micro-data-for-a-big-data-world/>.

# Appendix IV: Supplemental Direct Loan Subsidy Cost Data

The following tables include a summary of available loan cohort data underlying the U.S. Department of Education’s (Education’s) submissions to the President’s fiscal year 2016 and fiscal year 2017 budgets. These tables are provided to illustrate how Education’s estimates of IDR plan costs shifted over the past two President’s budgets. Some of the differences are attributable to the change in Education’s methodology for estimating IDR plan costs, which was implemented for the President’s fiscal year 2017 budget and is described in this report. Other differences are due to the policy assumptions in place when the budgets were developed. Specifically, for the fiscal year 2016 budget, Education used provisional policies for its newest IDR plan that were under negotiation. Estimates prepared for both the President’s fiscal year 2016 and fiscal year 2017 budgets included legislative proposals affecting new borrowers.<sup>1</sup> Finally, the fiscal year 2017 budget estimates include increased costs associated with the addition of the 2017 loan cohort, as well as the updated current reestimated costs of older cohorts.

**Table 2: President’s Fiscal Year 2016 and 2017 Budget Estimated Subsidy Rates, Loan Volumes, and Subsidy Costs for All Direct Loans in Income-Driven Repayment Plans, by Loan Type**

Loan type <sup>a</sup>	Subsidy rate (percent)		Total volume <sup>b</sup> (Dollars in millions)		Total subsidy cost (Dollars in millions)	
	2016	2017	2016	2017	2016	2017
Subsidized Stafford	15.61	17.66	37,267	42,991	\$5,817	\$7,593
Unsubsidized Stafford	15.44	19.43	76,468	96,305	11,803	\$18,709
PLUS	7.63	15.27	20,310	25,054	1,550	\$3,826
Consolidation	28.67	22.84	134,459	190,429	38,550	\$43,489
<b>Total</b>	<b>21.50</b>	<b>20.75</b>	<b>268,504</b>	<b>354,778</b>	<b>57,720</b>	<b>\$73,617</b>

Source: GAO analysis of the U.S. Department of Education’s fiscal year 2016 and 2017 budget estimates. | GAO-17-22

Notes: Income-Driven Repayment (IDR) plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs. A subsidy rate

<sup>1</sup> Education created Revised Pay As You Earn through administrative action, and it was under negotiation when Education officials prepared estimates for the President’s fiscal year 2016 budget proposal. Education officials told us they used Revised Pay As You Earn draft provisions to calculate subsidy cost estimates for all past loan cohorts. Additionally, both the fiscal year 2016 and fiscal year 2017 budgets modeled legislative proposals to limit available IDR plans to the Revised Pay As You Earn plan for new borrowers; however, neither was subsequently implemented.

**Appendix IV: Supplemental Direct Loan Subsidy Cost Data**

is the cost per dollar of credit assistance, determined by dividing the subsidy cost by the volume of loans estimated to be made in a given year.

Estimates included in this table do not include the 1994 loan cohort. (A loan cohort is the group of loans made in a particular fiscal year.) Education does not begin estimating IDR subsidy costs until the 1995 loan cohort. Fiscal year 2016 budget estimates include loan cohorts 1995-2016. Fiscal year 2017 budget estimates include loan cohorts 1995-2017.

<sup>a</sup>Education issues four types of Direct Loans: (1) Subsidized Stafford loans are available to undergraduate borrowers with financial need. (2) Unsubsidized Stafford loans are available to undergraduate and graduate student borrowers, regardless of financial need. (3) PLUS loans are available to graduate student borrowers as Grad PLUS loans and parents of dependent undergraduates as Parent PLUS loans. (Grad PLUS loans are eligible for Income-Driven Repayment plans, while Parent PLUS loans are not.) (4) Consolidation loans are available to borrowers wishing to combine multiple existing federal student loans into one loan.

<sup>b</sup>Estimates in the 2016 column include the original loan volume estimate for the 2016 cohort contained in the President's fiscal year 2016 budget. Estimates in the 2017 column include the original loan volume estimate for the 2017 cohort contained in the President's fiscal year 2017 budget. Estimates for all other loan cohorts are based on updated loan volume estimates provided by Education that exclude loans that are originated but may not be disbursed (e.g., when borrowers decide not to attend school).

**Table 3: President's Fiscal Years 2016 and 2017 Budget Estimated Subsidy Costs for All Direct Loans, by Loan Type and Repayment Plan**

Dollars in millions

Loan type <sup>a</sup>	Standard		Graduated		Extended		Income-Driven <sup>b</sup>	
	2016	2017	2016	2017	2016	2017	2016	2017
Subsidized Stafford	\$11,003	\$11,963	\$1,873	\$1,272	\$357	\$348	\$5,817	\$7,593
Unsubsidized Stafford	-77,242	-72,914	-18,435	-19,476	-4,778	-5,892	\$11,803	\$18,709
PLUS	-33,336	-37,706	-9,914	-11,221	-4,278	-4,651	\$1,550	\$3,826
Consolidation	-7,888	-11,920	-2,981	-5,328	-431	-1,956	\$38,550	\$43,489
<b>Total</b>	<b>-107,463</b>	<b>-110,578</b>	<b>-29,458</b>	<b>-34,752</b>	<b>-9,130</b>	<b>-12,151</b>	<b>\$57,720</b>	<b>\$73,617</b>

Source: GAO analysis of the U.S. Department of Education's fiscal year 2016 and 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy costs represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs.

Education offers a variety of repayment plans for Direct Loan borrowers. Standard repayment fixes borrowers' monthly payments over a repayment term of 10 years. Graduated repayment offers borrowers payments that gradually increase over a 10 year repayment term. Extended repayment extends borrowers' repayment term up to 25 years, and features fixed or graduated repayment amounts. Income-Driven Repayment plans tie borrowers' monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

Estimates in the 2016 columns use the original loan volume estimate for the 2016 cohort contained in the President's fiscal year 2016 budget. (A loan cohort is the group of loans made in a particular fiscal year.) Estimates in the 2017 columns use the original loan volume estimate for the 2017 cohort contained in the President's fiscal year 2017 budget. Estimates for all other loan cohorts use updated loan volume estimates provided by Education that exclude loans that are originated but may not be disbursed (e.g., when borrowers decide not to attend school).

<sup>a</sup>Education issues four types of Direct Loans: (1) Subsidized Stafford loans are available to undergraduate borrowers with financial need. (2) Unsubsidized Stafford loans are available to undergraduate and graduate student borrowers, regardless of financial need. (3) PLUS loans are

**Appendix IV: Supplemental Direct Loan  
Subsidy Cost Data**

available to graduate student borrowers as Grad PLUS loans and parents of dependent undergraduates as Parent PLUS loans. (Grad PLUS loans are eligible for Income-Driven Repayment plans, while Parent PLUS loans are not.) (4) Consolidation loans are available to borrowers wishing to combine multiple existing federal student loans into one loan.

<sup>b</sup>Income-Driven Repayment plan estimates do not include the 1994 loan cohort; Education does not begin estimating Income-Driven Repayment plan subsidy costs until the 1995 loan cohort.

**Table 4: President’s Fiscal Years 2016 and 2017 Budget Estimated Subsidy Rates for All Direct Loans, by Loan Type and Repayment Plan**

Subsidy rates in percent

Loan type <sup>a</sup>	Standard		Graduated		Extended		Income-Driven <sup>b</sup>	
	2016	2017	2016	2017	2016	2017	2016	2017
Subsidized Stafford	4.92	5.18	5.34	3.38	4.54	4.15	15.61	17.66
Unsubsidized Stafford	-25.57	-23.15	-35.40	-34.37	-31.72	-32.75	15.44	19.43
PLUS	-30.94	-31.02	-48.14	-46.86	-47.23	-46.58	7.63	15.27
Consolidation	-8.24	-10.62	-8.43	-11.96	-2.03	-6.86	28.67	22.84

Source: GAO analysis of the U.S. Department of Education’s fiscal year 2016 and 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program. Direct Loan subsidy rates represent the estimated cost to the government of extending credit over the life of the loan, excluding administrative costs, and expressed as a percentage.

Education offers a variety of repayment plans for Direct Loan borrowers. Standard repayment fixes borrowers’ monthly payments over a repayment term of 10 years. Graduated repayment offers borrowers payments that gradually increase over a 10 year repayment term. Extended repayment extends borrowers’ repayment term up to 25 years, and features fixed or graduated repayment amounts. Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

Fiscal year 2016 budget estimates include loan cohorts 1994-2016. (A loan cohort is the group of loans made in a particular fiscal year.) Fiscal year 2017 budget estimates include loan cohorts 1994-2017.

<sup>a</sup>Education issues four types of Direct Loans: (1) Subsidized Stafford loans are available to undergraduate borrowers with financial need. (2) Unsubsidized Stafford loans are available to undergraduate and graduate student borrowers, regardless of financial need. (3) PLUS loans are available to graduate student borrowers as Grad PLUS loans and parents of dependent undergraduates as Parent PLUS loans. (Grad PLUS loans are eligible for Income-Driven Repayment plans, while Parent PLUS loans are not.) (4) Consolidation loans are available to borrowers wishing to combine multiple existing federal student loans into one loan.

<sup>b</sup>Income-Driven Repayment plan estimates do not include the 1994 loan cohort; Education does not begin estimating Income-Driven Repayment plan subsidy costs until the 1995 loan cohort.

**Appendix IV: Supplemental Direct Loan  
Subsidy Cost Data**

**Table 5: President’s Fiscal Years 2016 and 2017 Budget Estimated Loan Volume for All Direct Loans, by Loan Type and Repayment Plan**

Dollars in millions

Loan Type <sup>a</sup>	Standard		Graduated		Extended		Income-Driven <sup>b</sup>	
	2016	2017	2016	2017	2016	2017	2016	2017
Subsidized Stafford	223,709	230,978	35,087	37,589	7,872	8,388	37,267	42,991
Unsubsidized Stafford	302,114	314,953	52,077	56,674	15,066	17,991	76,468	96,305
PLUS	107,749	121,551	20,595	23,946	9,059	9,984	20,310	25,054
Consolidation	95,723	112,231	35,365	44,548	21,257	28,520	134,459	190,429

Source: GAO analysis of the U.S. Department of Education’s fiscal year 2016 and 2017 budget estimates. | GAO-17-22

Notes: Education disburses student loans directly to borrowers through the William D. Ford Federal Direct Loan (Direct Loan) Program.

Education offers a variety of repayment plans for Direct Loan borrowers. Standard repayment fixes borrowers’ monthly payments over a repayment term of 10 years. Graduated repayment offers borrowers payments that gradually increase over a 10 year repayment term. Extended repayment extends borrowers’ repayment term up to 25 years. Income-Driven Repayment plans tie borrowers’ monthly payments to their incomes, lengthen repayment periods beyond the standard 10 years, and offer forgiveness at the end of the repayment period.

Fiscal year 2016 budget estimates include loan cohorts 1994-2016. (A loan cohort is the group of loans made in a particular fiscal year.) Fiscal year 2017 budget estimates include loan cohorts 1994-2017.

Estimates in the 2016 columns include the original loan volume estimate for the 2016 cohort contained in the President’s fiscal year 2016 budget. Estimates in the 2017 columns include the original loan volume estimate for the 2017 cohort contained in the President’s fiscal year 2017 budget. Estimates for all other loan cohorts are based on updated loan volume estimates provided by Education that exclude loans that are originated but may not be disbursed (e.g., when borrowers decide not to attend school).

<sup>a</sup>Education issues four types of Direct Loans: (1) Subsidized Stafford loans are available to undergraduate borrowers with financial need. (2) Unsubsidized Stafford loans are available to undergraduate and graduate student borrowers, regardless of financial need. (3) PLUS loans are available to graduate student borrowers as Grad PLUS loans and parents of dependent undergraduates as Parent PLUS loans. (Grad PLUS loans are eligible for Income-Driven Repayment plans, while Parent PLUS loans are not.) (4) Consolidation loans are available to borrowers wishing to combine multiple existing federal student loans into one loan.

<sup>b</sup>Income-Driven Repayment plan estimates do not include the 1994 loan cohort; Education does not begin estimating Income-Driven Repayment plan subsidy costs until the 1995 loan cohort.

# Appendix V: Comments from the U.S. Department of Education



UNITED STATES DEPARTMENT OF EDUCATION  
OFFICE OF PLANNING, EVALUATION AND POLICY DEVELOPMENT

October 25, 2016

ASSISTANT SECRETARY

Ms. Melissa Emrey-Arras  
Director, Education, Workforce, and  
Income Security Issues  
Government Accountability Office  
Washington, DC 20548

Dear Ms. Emrey-Arras:

Thank you for providing the U.S. Department of Education (Department) with the opportunity to review and respond to the draft of the Government Accountability Office (GAO) report, **FEDERAL STUDENT LOANS: Education Needs to Improve its Income-Driven Repayment Plan Budget Estimates (GAO-17-22)**.

As increasing numbers of borrowers have selected income-driven repayment (IDR) plans, IDR-specific budget estimates have played an increasing role in the overall cost of the student loan programs. In response to this trend, the Department focused on improving its IDR budget estimates. In 2014, the Department, with support from the Office of Management and Budget and the Department of Treasury (Treasury), undertook a significant effort to update and improve the submodel used to estimate the cost of IDR plans.

Previous income data used to estimate IDR subsidy costs were highly synthetic and difficult to match to the Department's student loan data. The Department reviewed a number of alternative sources to determine the best source of data on IDR borrowers. Ultimately, based on this review, the Department worked with Treasury to merge data on student loan borrowers with income tax data from the Internal Revenue Service (IRS). The resulting data has a number of advantages including:

- Representing the characteristics of borrowers currently in IDR repayment plans accurately.
- Providing income data on non-IDR borrowers.
- Allowing estimates of future data streams to be based on the characteristics of student loan borrowers.

While privacy restrictions prevented the Department from receiving administrative tax information, the data we received provided significant advantages over previous data. These advantages were primarily because the income imputations we did receive were based on and representative of the underlying student loan borrower characteristics.

Even though the collaboration with Treasury has greatly improved Education's estimates, the Department agrees with GAO that there is still room for improvement. The Department plans to

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build off of this effort and apply lessons learned to the next iteration of the IDR plan model. The Department also plans to discuss potential improvements with Treasury. In addition, the Department has reached out to other agencies such as the Social Security Administration and the Congressional Budget Office to explore other potential data sources and methodologies.

Although the Department generally concurs with GAO's recommendations, it is important to note that the decisions made (and critiqued in this report) were based on existing staff and systems resources available, assessed impact, and consideration for conservatism. The lifecycle of a student loan is exceedingly complex, with a multitude of projection paths and outcomes. Estimating the Federal cost of student loans is a task we take very seriously, and we are constantly seeking to enhance and refine our cost estimation models. As with our other student loan cost models, the next version of the IDR model will represent continued improvement and incorporate many significant and meaningful enhancements.

The Department's response to each of the recommendations follows:

**Recommendation 1:** Assess and improve, as necessary, the quality of data and methods used to forecast borrower incomes, and revise the forecasting method to account for inflation in estimates.

**Response:** The Department agrees that continuous improvement of the IDR model is critical, and we are already in the process of assessing potential improvements to forecast borrower incomes. The need to ensure that taxpayer privacy is protected creates challenges in obtaining the best data available, but the Department is hopeful that this challenge can be addressed appropriately. The Department also hopes to establish a timeframe for improvements to the IDR model that allows for adequate and thorough analysis and quality control. As the GAO report mentions, the current IDR model was developed in a highly condensed timeframe that did not allow for extensive analysis of the data received.

As part of assessing all potential improvements, the Department will consider including an adjustment for inflation in our income estimates and will document the results of our analysis for the next version of the IDR model. Before making such an adjustment, however, the Department will need to explore more fully the historical relationship between overall wage inflation and adjusted gross income for IDR borrowers. In addition, any adjustment for inflation should probably be accompanied with an adjustment for expected wage growth. These adjustments will require careful analysis, since the relationship between the adjusted gross incomes of IDR borrowers and these statistics may not align smoothly. In the meantime, GAO's analysis on the cost impact of including inflation is useful as sensitivity analysis but should not yet be construed as a conclusive statement on the impact on IDR subsidy estimates of inflation adjustments (although the Department does agree that the likely outcome of these adjustments alone will be lower IDR subsidy estimates).

**Recommendation 2:** Obtain data needed to account for instances in which borrowers fail to recertify their income, and adjust estimated borrower repayment patterns accordingly.

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**Response:** The Department will attempt to obtain data needed to assess the impact of borrowers failing to recertify their income. These data will need to assess not only the rate of recertification, but also the borrower's activity following the failure to recertify. In addition, the Department will need to consider whether to include behavioral effects to account for efforts to inform borrowers of the need to recertify (which may increase recertification rates in the future).

The Department communicated to GAO that many of the possible outcomes of failing to recertify are already likely to be included in the subsidy estimate, or will have only a small effect. If a borrower does not recertify, one of three outcomes tends to occur:

- The borrower is placed in deferment or forbearance and then eventually recertifies and continues in IDR. The Department's cash flow model captures deferments and forbearances in the yearly income flows and makes the necessary adjustment for accrued interest during these periods.
- The borrower is converted to the standard repayment plan and then defaults. The Department's cash flow model captures this through the adjustment of the payment flows for expected defaults.
- The borrower is converted to the standard repayment plan and makes his or her required payments. The cash flow model assumes they would have stayed in IDR making payments based on their income. It is difficult to say what effect this might have on the overall cash flows since it depends on the relative value of payments made under IDR versus the standard repayment plan for these borrowers. Assuming these borrowers tend to have low debt burdens since they could make their standard payments, one might assume they would repay their loans under IDR as well so that the relative cash flows would tend to be similar.

**Recommendation 3:** Complete efforts to incorporate repayment plan switching into the agency's redesigned student loan model, and conduct testing to help ensure that the model produces estimates that reasonably reflect trends in Income-Driven Repayment plan participation.

**Response:** As stated in the report, we have already begun efforts to incorporate repayment plan-switching into our redesigned student loan model and this model will be tested to validate its results. Regardless of the approach taken to estimating repayment plan participation, however, there are a number of factors that make forecasting future IDR participation inherently difficult. GAO correctly states that the Administration announced a goal to enroll 2 million additional borrowers in IDR plans. While this may very well result in continued growth in IDR enrollment, it also entails behavioral effects that are extremely difficult to incorporate and project into the future. It is unclear how much of this behavioral effect is the result of the Administration's efforts to enroll additional borrowers into IDR plans.

**Recommendation 4:** As a part of the agency's ongoing student loan model redesign efforts, add the capability to produce separate cost estimates for each Income-Driven Repayment plan, and also update the supplementary model for estimating Income-Driven Repayment plan repayment patterns to more accurately reflect likely repayment patterns for each type of loan eligible for these plans.

Page 4 - Ms. Emrey-Arras

**Response:** As the Department redesigns its current cost estimation models, it will add the capability to produce separate cost estimates for each IDR plan and allow for separate, more accurate estimates by loan type. Given that the existing supplementary model is estimated at the borrower level, updating it to provide separate estimates by loan type would require a significant effort. Until the development of the redesigned models is complete, the focus of any update to the existing supplementary model will likely concentrate on broad improvements to projecting borrower incomes. With this in mind, the Department will evaluate whether it is cost-effective to undertake these efforts in the near term.

**Recommendation 5:** More thoroughly test the agency's approach to estimating Income-Driven Repayment plan costs, including by conducting more sensitivity analysis on key assumptions and adjusting those assumptions (such as the agency's Public Service Loan Forgiveness participation assumption) to ensure reasonableness.

**Response:** The Department is committed to continuous improvement in the IDR model and in how it is documented and reviewed. Sensitivity analyses have been conducted in the past for IDR plans and will continue to be used as a tool to isolate specific vulnerabilities in the model. In particular, we plan to conduct more sensitivity analyses for future annual financial reports.

In response to GAO's specific points regarding the decision to push the initial year of Public Sector Loan Forgiveness (PLSF) estimates of forgiveness out one year for purposes of the model, in the Department's response to GAO's statement of facts, we stated that "given the unlikelihood of someone never missing a payment, we simply moved the start year of PSLF for purposes of the model to FY 2019. This does not mean we would miss the rare borrower that got forgiveness in 2018, we simply moved the forgiveness up to 2019. This should have a minimal effect on the cash flows." Based on data collected earlier this year, we expect approximately \$6.5 million in loans to be eligible for PSLF forgiveness in 2018. Of course, the actual cost impact would be lower, since we made clear the impact in this case would be to move \$6.5 million in forgiveness out one year. Moving our PLSF assumption up one year as GAO suggests, given their estimated cost impact of \$70 million, would produce greater mis-estimation.

**Recommendation 6:** Publish more detailed Income Driven Repayment plan cost information—beyond what is regularly provided through the President's Budget—including items such as total estimated costs, sensitivity analysis results, key limitations, and expected forgiveness amounts.

**Response:** The Department is fully committed to advancing transparency and thus takes its responsiveness to GAO, the Office of Inspector General (OIG), external policymakers, and the general public seriously. The Department works collaboratively with all interested parties to ensure that useful student cost information is disseminated widely. For example, in early 2016, after a Congressional briefing, the Department provided detailed breakouts of the costs of its IDR policy proposal to Congressional staff in response to their request. This information was shared with GAO. In addition, the Department has provided cost information on request to student aid interest groups and consistently responded to requests for information from GAO and OIG. We do plan on including more information on sensitivity analysis results and key

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**Appendix V: Comments from the U.S.  
Department of Education**

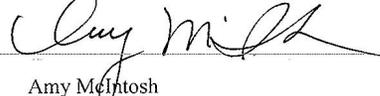
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Page 5 - Ms. Emrey-Arras

limitations in upcoming annual financial reports. We will consider the value of publishing additional information regarding IDR plan costs.

Thank you again for the opportunity to review and comment on the draft GAO report.

Sincerely,



Amy McIntosh  
Deputy Assistant Secretary Delegated Duties  
of the Assistant Secretary  
Office of Planning, Evaluation and Policy Development

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# Appendix VI: GAO Contact and Staff Acknowledgments

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## GAO Contact

Melissa Emrey-Arras, (617) 788-0534 or [emreyarrasm@gao.gov](mailto:emreyarrasm@gao.gov)

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## Staff Acknowledgments

In addition to the contact named above, Kris Nguyen (Assistant Director), Ellen Phelps Ranen (Analyst-in-Charge), Rachel Beers, James Bennett, John Karikari, Karissa Robie, Amber Sinclair, and Jeff Tessin made key contributions to this report. Additional assistance was provided by Deborah Bland, Jessica Botsford, Russ Burnett, Marcia Carlsen, David Chrisinger, Cole Haase, Carol Henn, Susan J. Irving, Marissa Jones, Sheila McCoy, Erin McLaughlin, Jeffrey G. Miller, Andrew Nelson, Jason Palmer, Jessica Rider, Amrita Sen, Brian Schwartz, Michelle St. Pierre, Adam Wendel, Charlie Willson, and Rebecca Woiwode.

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# Appendix VII: Accessible Data

**Data Table for Figure 2: Amount Paid by Hypothetical Borrower with Public Service Loan Forgiveness, under a Sample Income-Driven Repayment Plan and the Standard 10-Year Repayment Plan**

Example borrower  
 Amount borrowed: \$60,000  
 Interest rate: 6.8%  
 Initial annual adjusted gross income: \$40,000  
 Dependents: None (single borrower)

Example borrower				
Plan	Standard 10-year		Sample Income-driven repayment plan <sup>a</sup>	
With/Without Loan Forgiveness	With Public Service Loan Forgiveness (PSLF)	Without PSLF	With PSLF	Without PSLF
Amount paid by borrower (in dollars)	82,689	82,689	46,684	116,329

**Data Tables for Figure 3: Direct Loan Dollars and Borrowers in Income-Driven Repayment Plans, Third Quarter Fiscal Year 2013 through Third Quarter Fiscal Year 2016**

Total Direct Loan dollars in repayment <sup>a</sup> (in billions)			
Year	Quarter	Loans in other plans	Loans in IDR plans
2013	Q3	289	72.3
2013	Q4	292.8	79.1
2014	Q1	322.2	91.2
2014	Q2	331	108
2014	Q3	343	121.3
2014	Q4	342.6	135.1
2015	Q1	369.5	153.8
2015	Q2	378.6	173.8
2015	Q3	381.4	193.4
2015	Q4	375.6	210.3
2016	Q1	393	232.5
2016	Q2	403.4	247.2
2016	Q3	403.6	269

**Data Tables for Figure 3: Total borrowers in repayment (in millions)**

Year	Quarter	Loans in other plans	Loans in IDR plans
2013	Q3	14.2	1.6
2013	Q4	14.3	1.7
2014	Q1	15.2	1.9
2014	Q2	15.3	2.2
2014	Q3	15.7	2.5
2014	Q4	15.6	2.8
2015	Q1	16.3	3.1
2015	Q2	16.4	3.5
2015	Q3	16.4	3.9
2015	Q4	16.2	4.2
2016	Q1	16.6	4.6
2016	Q2	16.6	4.9
2016	Q3	16.6	5.3

**Data Table for Figure 5: Current Estimated Subsidy Costs of All Direct Loans in Income-Driven Repayment Plans, by Loan Type (Fiscal Year 2017 Budget)**

Subsidy rate (percentage)	Loan volume (in billions of dollars)			
	Consolidation loans	Unsubsidized Stafford loans	Subsidized Stafford loans	Grad PLUS loans
15-25%	\$43.5 billions	\$18.7 billions	\$7.6 billions	\$3.8 billions

**Data Table for Figure 6: Current Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, by Loan Cohort (Fiscal Year 2017 Budget)**

Loan cohort	Dollars (in billions)
1995	0.07
1996	0.14
1997	0.17
1998	0.2
1999	0.43
2000	0.4
2001	0.37
2002	0.39

2003	0.32
2004	0.48
2005	0.51
2006	0.85
2007	0.77
2008	1.35
2009	1.49
2010	3.99
2011	4.96
2012	3.03
2013	6.11
2014	9.23
2015	10.87
2016	12.85
2017 <sup>a</sup>	14.6

**Data Table for Figure 7: Current Estimated Direct Loan Volume in Income-Driven Repayment Plans, by Loan Cohort (Fiscal Year 2017 Budget)**

Loan cohort (in fiscal year)	Dollars (in billions)	Expansion of Direct Loan program <sup>a</sup> (2010)	Cohorts eligible for more generous plans (2012)
1995	0.213	n/a	n/a
1996	0.52	n/a	n/a
1997	0.553	n/a	n/a
1998	0.811	n/a	n/a
1999	1.414	n/a	n/a
2000	1.944	n/a	n/a
2001	2.685	n/a	n/a
2002	2.844	n/a	n/a
2003	2.393	n/a	n/a
2004	2.463	n/a	n/a
2005	3.329	n/a	n/a
2006	4.555	n/a	n/a
2007	3.007	n/a	n/a
2008	4.952	n/a	n/a
2009	9.215	n/a	n/a

2010	21.33	2010-2017	n/a
2011	29.227	2010-2017	n/a
2012	29.017	2010-2017	2012-2017
2013	36.047	2010-2017	2012-2017
2014	42.071	2010-2017	2012-2017
2015	49.035	2010-2017	2012-2017
2016	50.767	2010-2017	2012-2017
2017 <sup>c</sup>	56.4	2010-2017	2012-2017

**Data Table for Figure 8: Current Estimated Subsidy Rates of Direct Loans in Income-Driven Repayment Plans, by Loan Cohort (Fiscal Year 2017 Budget)**

Loan cohort (in fiscal year)	Subsidy rate (percentage)	Low government borrowing costs <sup>a</sup> (2009)	Cohorts eligible for more generous plans <sup>b</sup> (2012)
1995	32.1	n/a	n/a
1996	27.1	n/a	n/a
1997	30.8	n/a	n/a
1998	24.4	n/a	n/a
1999	30.7	n/a	n/a
2000	20.4	n/a	n/a
2001	13.8	n/a	n/a
2002	13.7	n/a	n/a
2003	13.3	n/a	n/a
2004	19.5	n/a	n/a
2005	15.5	n/a	n/a
2006	18.7	n/a	n/a
2007	25.7	n/a	n/a
2008	27.3	n/a	n/a
2009	16.2	2009-2017	n/a
2010	18.7	2009-2017	n/a
2011	17	2009-2017	n/a
2012	10.5	2009-2017	2012-2017
2013	17	2009-2017	2012-2017
2014	21.9	2009-2017	2012-2017
2015	22.2	2009-2017	2012-2017
2016	25.3	2009-2017	2012-2017
2017 <sup>c</sup>	26	2009-2017	2012-2017

Source: GAO analysis of the U.S. Department of Education's fiscal year 2017 budget estimates. | GAO-17-22

**Data Table for Figure 9: Original and Current (Fiscal Year 2017 Budget) Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 2009-2016 Loan Cohorts**

Loan cohort	Original estimated subsidy costs by cohort <sup>c</sup> (\$25.1 billion total)	Current estimated subsidy costs by cohort <sup>d</sup> (\$52.5 billion total)
2009 <sup>a</sup>	0.44	1.5
2010	0.995	4
2011	1.703	5
2012	1.193	3
2013	1.497	6.1
2014	3.186	9.2
2015	7.098	10.9
2016	9	12.8

Source: GAO analysis of the U.S. Department of Education's fiscal year 2011-2017 budget estimates. | GAO-17-22

**Data Table for Figure 10: Original and Current (Fiscal Year 2017 Budget) Estimated Loan Volume and Subsidy Rates for Direct Loans in Income-Driven Repayment Plans, 2009-2016 Loan Cohorts**

Loan cohort	Original and current estimated loan volume Dollars (in billions)		Original and current estimated subsidy rates Subsidy rate (percentage)	
	Original estimated volume by cohort <sup>c</sup> (\$121.0 billion total)	Current estimated volume by cohort <sup>d</sup> (\$266.7 billion total)	Original estimated subsidy rates by cohort <sup>c</sup>	Current estimated subsidy rates by cohort <sup>d</sup>
2009 <sup>a</sup>	4.909	9.2	8.97	16.2
2010 <sup>b</sup>	5.233	21.3	19.01	18.7
2011	6.588	29.2	25.84	17
2012	6.807	29	17.52	10.4
2013	7.983	36	18.76	17
2014	18.252	42.1	17.5	21.9
2015	30.769	49	23.07	22.2
2016	40.5	50.8	22.3	25.3

Source: GAO analysis of the U.S. Department of Education's fiscal year 2011-2017 budget estimates. | GAO-17-22

**Data Table for Figure 11: Original, Third Year, and Current (Fiscal Year 2017 Budget) Estimated Subsidy Costs for Direct Loans in Income-Driven Repayment Plans, 2011-2014 Loan Cohorts** **24**

Loan cohort	Dollars (in billions)		
	Original estimated subsidy cost by cohort <sup>a</sup>	Third year estimated subsidy cost by cohort <sup>b</sup>	Current estimated subsidy cost by cohort <sup>b</sup>
2011	1.703	1.356	5
2012	1.193	2.458	3
2013	1.497	5.184	6.1
2014	3.2	10.6	9.2

Source: GAO analysis of the U.S. Department of Education's fiscal year 2011-2017 budget estimates. | GAO-17-22

**Data Table #1 for Figure 12: Current Estimated Subsidy Costs and Income for Direct Loans, by Loan Cohort and Repayment Plan (Fiscal Year 2017 Budget)**

Loan cohort	Subsidy income <sup>a</sup> Repayment Plans <sup>c</sup>			
	Income Driven <sup>d</sup>	Standard 10-year	Graduated	Extended
1994	0	0	0	0
1995	0	0	0	0
1996	0	0	0	0
1997	0	0	0	0
1998	0	0	0	0
1999	0	0	0	0
2000	0	0	0	0
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	0	264	127
2008	0	13	343	147
2009	0	3678	1720	620
2010	0	8942	3324	1077
2011	0	15957	4983	1477
2012	0	22315	6598	1979
2013	0	14454	4449	1430
2014	0	12562	3589	1525

2015	0	10508	3167	1526
2016	0	14792	3910	1384
2017 <sup>e</sup>	0	14918	4667	1934

**Data Table #2 for Figure 12: Current Estimated Subsidy Costs and Income for Direct Loans, by Loan Cohort and Repayment Plan (Fiscal Year 2017 Budget)**

Subsidy cost<sup>b</sup> Repayment Plans<sup>c</sup>

Loan cohort	Income Driven <sup>d</sup>	Standard 10-year	Graduated	Extended
1994	0	-43	-13	-4
1995	-68	-261	-92	-30
1996	-141	-415	-171	-53
1997	-170	-465	-209	-70
1998	-198	-402	-198	-74
1999	-434	-603	-217	-62
2000	-397	-954	-297	-119
2001	-371	-763	-165	-18
2002	-391	-618	-99	-3
2003	-319	-492	-85	-50
2004	-481	-768	-220	-174
2005	-514	-1188	-435	-375
2006	-854	-532	-60	-43
2007	-773	-57	0	0
2008	-1352	0	0	0
2009	-1489	0	0	0
2010	-3990	0	0	0
2011	-4958	0	0	0
2012	-3032	0	0	0
2013	-6112	0	0	0
2014	-9227	0	0	0
2015	-10868	0	0	0
2016	-12847	0	0	0
2017 <sup>e</sup>	-14631	0	0	0

**Data Table for Figure 13: Current Estimated Subsidy Costs and Income for All Direct Loans, by Loan Type and Repayment Plan (Fiscal Year 2017 Budget)**

Repayment plans	Income driven <sup>d</sup>	Standard 10-year	Graduated	Extended
Subsidized Stafford loans	7.6 (cost)	11.96 (cost)	1.27 (cost)	0.348 (cost)
Unsubsidized Stafford loans	18.7 (cost)	72.9	19.47	5.892
PLUS <sup>c</sup> loans	3.8 (cost)	37.7	11.2	4.651
Consolidation loans	43.4 (cost)	11.9	5.328	1.956

**Data Table for Figure 14: Estimated Historical Incomes for Randomly Selected Sample of Direct Loan Borrowers Used in Education’s Approach to Estimating Costs of Loans in Income-Driven Repayment Plans, For Each Borrower’s First 10 Years in Repayment**

Repayment years	Estimated adjusted gross income				
	Borrower 1	Borrower 2	Borrower 3	Borrower 4	Borrower 5
1	17959.5	12122	-7518.88	197363	98849.1
2	11878.4	0	-3332.17	100000	83320
3	20157	11812	19827.1	176310	48762.3
4	31841.7	31497.3	21165.6	146869	98395.1
5	24376	26129	17853.2	183242	53372
6	30780.8	81514	0	264798	186834
7	45033.5	138804	72662.7	331756	375862
8	64578.2	70821.7	40821.4	83298.1	62539.8
9	31487	163122	53401.5	102357	38861.1
10	15083.8	177054	42539.7	86281.8	159820

Source: Estimated data provided by the U.S. Department of the Treasury for use in the U.S. Department of Education’s Income-Driven Repayment—Cash Flow Model. | GAO-17-22

**Data Table Figure 15: Impact of Adjusting Borrower Income Forecasts for Inflation on Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 1995-2017 Loan Cohorts**

Billions of dollars		
Current estimated costs	Adjusting borrower income forecasts for inflation <sup>a</sup>	Decline in costs after adjusting for inflation
73.2	55.8	17.4

Source: GAO sensitivity analysis conducted using the U.S. Department of Education’s model and fiscal year 2017 budget assumptions. GAO-17-22

**Data Table for Figure 16: Impact of Increasing Public Service Loan Forgiveness Participation on Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 1995-2017 Loan Cohorts**

Billions of dollars		
Current estimated costs	5 percentage point rise in participation	10 percentage point rise in participation
73.2	77.6	82.2
N/A	Increase in costs with rise in PSLF participation	
N/A	4.4	9.0

Source: GAO sensitivity analysis conducted using the U.S. Department of Education's model and fiscal year 2017 budget assumptions. | GAO-17-22

**Data Table for Figure 17: Impact of Reducing Public Service Loan Forgiveness Participation on Estimated Subsidy Costs of Direct Loans in Income-Driven Repayment Plans, 1995-2017 Loan Cohorts**

Billions of dollars		
Current estimated costs	5 percentage point drop in PSLF participation	10 percentage point drop in PSLF participation
73.2	69.0	64.4
N/A	Decline in costs with drop in PSLF participation	Decline in costs with drop in PSLF participation
N/A	4.2	8.8

Source: GAO sensitivity analysis conducted using the U.S. Department of Education's model and fiscal year 2017 budget assumptions. | GAO-17-22

**Data Table for Figure 18: Direct Loan Principal in Income-Driven Repayment Plans Estimated to Be Repaid, Discharged, and Forgiven, 1995-2017 Loan Cohorts**

Of the \$352 billion in estimated loan volume	Repaid <sup>a</sup> \$215 bil. (61%)	Not repaid \$137 bil. (39%)
Of the 39% that was not repaid	Forgiven <sup>b</sup> \$108 bil. (79%)	\$29 bil. (21%) Discharged <sup>c</sup>

Source: GAO analysis of estimated Income-Driven Repayment plan cash flow data provided by the U.S. Department of Education. | GAO-17-22

**Data Table for Figure 19: Treasury's Estimated Historical Incomes for Randomly Selected Sample of Direct Loan Borrowers**

Repayment years	Estimated adjusted gross income									
	Borrower 1	Borrower 2	Borrower 3	Borrower 4	Borrower 5	Borrower 6	Borrower 7	Borrower 8	Borrower 9	Borrower 10
1	17960	12122	-7519	197363	98849	33822	243264	37345	65851	11902
2	11878	0	-3332	500	83320	500	219864	500	63584	12032
3	20157	11812	19827	176310	48762	48449	89403	500	96462	31193
4	31842	31497	21166	146869	98395	95532	500	38286	174765	41983
5	24376	26129	17853	183242	53372	500	15021	47224	161011	47325
6	30781	81514	500	264798	186834	121054	20734	65243	45253	109096

7	45033	138804	72663	331756	375862	760	125941	97749	43596	132457
8	64578	70822	40821	83298	62540	500	115512	93405	35496	113594
9	31487	163122	53402	102357	38861	500	175199	500	11354	124567
10	15084	177054	42540	86282	159820	29621	500	76605	20446	154407

Source: Estimated data provided by the U.S. Department of the Treasury for use in the U.S. Department of Education's Income-Driven Repayment Cash Flow Model. | GAO-17-22

**Data Tables for Figure 20: Treasury's Estimated Historical Incomes for Randomly Selected Direct Loan Borrowers (Tax Years 1996 through 2013)**

Estimated adjusted gross income (in dollars)

Year	Borrower 1	Borrower 2	Borrower 3	Borrower 4	Borrower 5
1996	n/a	n/a	12122	n/a	n/a
1997	n/a	17960	0	n/a	n/a
1998	n/a	11878	11812	n/a	n/a
1999	n/a	20157	31497	n/a	n/a
2000	n/a	31842	26129	n/a	n/a
2001	n/a	24376	81514	n/a	n/a
2002	n/a	30781	138804	n/a	n/a
2003	n/a	45033	70822	n/a	n/a
2004	n/a	64578	163122	n/a	n/a
2005	n/a	31487	177054	n/a	n/a
2006	n/a	15084	148483	n/a	1376
2007	n/a	22259	155512	n/a	500
2008	n/a	500	32519	n/a	105765
2009	52121	31610	29064	n/a	32666
2010	500	5755	14817	n/a	28364
2011	49107	26096	94328	n/a	29254
2012	13846	31497	36264	52904	63570
2013	10846	31801	80971	17466	94815

Year	Borrower 6	Borrower 7	Borrower 8	Borrower 9	Borrower 10
1996	n/a	33822	243264	n/a	n/a
1997	n/a	500	219864	37345	n/a
1998	n/a	48449	89403	500	n/a
1999	n/a	95532	500	500	n/a
2000	n/a	500	15021	38286	65851
2001	n/a	121054	20734	47224	63584
2002	n/a	760	125941	65243	96462

2003	n/a	500	115512	97749	174765
2004	n/a	500	175199	93405	161011
2005	n/a	29621	500	500	45253
2006	n/a	23809	132029	76605	43596
2007	n/a	28731	121679	125059	35496
2008	n/a	30351	62244	167983	11354
2009	5308	57521	71962	188810	20446
2010	500	52915	74341	174879	34207
2011	500	62470	62653	170677	15842
2012	500	45731	100033	500	1516
2013	6344	n/a	78585	83580	7534

Year	Borrower 11	Borrower 12	Borrower 13	Borrower 14	Borrower 15
1996	139728	n/a	98420	61483	n/a
1997	52209	n/a	170580	11469	n/a
1998	24442	n/a	69430	500	n/a
1999	4333	n/a	59507	30222	n/a
2000	61872	n/a	64377	42300	n/a
2001	58746	n/a	31463	67747	n/a
2002	38261	n/a	101862	107973	n/a
2003	89848	n/a	95607	500	n/a
2004	100217	n/a	93797	54149	n/a
2005	47911	n/a	89083	75104	n/a
2006	45936	n/a	98729	79894	n/a
2007	34295	15723	80408	3185	1679
2008	51369	129322	88518	9443	16405
2009	62917	500	40156	16780	16767
2010	37598	0	51719	32491	50128
2011	500	500	36703	82697	10990
2012	45483	32102	n/a	101010	18439
2013	58463	44572	n/a	74781	8818

Year	Borrower 16	Borrower 17	Borrower 18	Borrower 19	Borrower 20
1996	n/a	n/a	30341	n/a	57456
1997	n/a	n/a	26441	n/a	45239
1998	n/a	n/a	29304	n/a	41021

1999	n/a	33489	30024	n/a	56018
2000	n/a	53707	49970	n/a	83354
2001	n/a	35912	68158	n/a	90463
2002	n/a	101382	48937	n/a	99013
2003	n/a	32256	39217	n/a	94671
2004	n/a	22218	95319	16924	73853
2005	n/a	31443	93981	21364	101934
2006	15583	31656	32983	7445	102851
2007	27163	20545	25421	15670	73869
2008	47184	23768	23852	14639	76963
2009	500	500	84945	500	121253
2010	68728	100151	92201	2759	136848
2011	27407	122207	95957	39924	116919
2012	500	500	98330	500	119916
2013	117549	127608	n/a	3667	70751

Year	Borrower 21	Borrower 22	Borrower 23	Borrower 24	Borrower 25
1996	n/a	12269	n/a	n/a	n/a
1997	53483	500	n/a	n/a	n/a
1998	26710	45306	n/a	n/a	n/a
1999	68386	39954	n/a	n/a	n/a
2000	4167	30712	n/a	n/a	n/a
2001	1560	33222	2734	n/a	n/a
2002	123383	118872	19307	n/a	n/a
2003	189254	121565	28733	n/a	n/a
2004	22966	177792	32652	n/a	n/a
2005	11452	158435	186933	n/a	n/a
2006	19195	194096	500	n/a	n/a
2007	30938	185863	60456	n/a	n/a
2008	52326	500	127122	n/a	n/a
2009	75673	169260	104040	n/a	n/a
2010	500	129357	135893	n/a	n/a
2011	500	83399	94277	n/a	21213
2012	38053	116161	500	500	17184
2013	55532	109269	297777	33449	19045

Year	Borrower 26	Borrower 27	Borrower 28	Borrower 29	Borrower 30
1996	n/a	n/a	24407	n/a	24528
1997	n/a	70082	55771	n/a	12612
1998	n/a	69947	52912	n/a	124948
1999	172145	41231	131423	n/a	500
2000	179686	500	65215	n/a	500
2001	169898	36074	95309	n/a	124460
2002	199848	29776	27270	n/a	163796
2003	47468	31483	58817	n/a	157982
2004	52188	25505	19268	n/a	153089
2005	56961	57589	17654	n/a	124968
2006	34366	50070	39954	n/a	138676
2007	66142	57864	101140	n/a	120784
2008	60856	59222	75829	n/a	169254
2009	3910	89887	100617	n/a	165516
2010	46757	77689	80141	n/a	176648
2011	500	56747	11857	n/a	186806
2012	46939	100447	32491	46924	150894
2013	63123	129505	90846	47742	150612

Year	Borrower 31	Borrower 32	Borrower 33	Borrower 34	Borrower 35
1996	n/a	42207	n/a	32984	n/a
1997	4323	70375	n/a	42003	n/a
1998	500	34651	n/a	11750	n/a
1999	500	36878	n/a	30825	n/a
2000	18811	56322	n/a	500	n/a
2001	500	46068	n/a	500	n/a
2002	33856	500	n/a	52507	19110
2003	59303	66090	n/a	97685	25066
2004	71682	23961	n/a	68791	29496
2005	83389	24709	n/a	500	103810
2006	15020	59635	n/a	85893	51070
2007	500	43401	n/a	93986	65603
2008	20014	35861	n/a	73688	45667
2009	500	63503	n/a	126575	141137
2010	11719	164376	n/a	45248	135510
2011	28070	71928	22446	40907	153197

2012	1709	138526	24619	500	138582
2013	n/a	37908	25021	0	161026

Year	Borrower 36	Borrower 37	Borrower 38	Borrower 39	Borrower 40
1996	24528	n/a	42207	n/a	19571
1997	12612	4323	70375	n/a	24065
1998	124948	500	34651	n/a	36876
1999	500	500	36878	n/a	60936
2000	500	18811	56322	n/a	55846
2001	124460	500	46068	n/a	53175
2002	163796	33856	500	n/a	252177
2003	157982	59303	66090	n/a	35170
2004	153089	71682	23961	n/a	51497
2005	124968	83389	24709	n/a	97227
2006	138676	15020	59635	n/a	500
2007	120784	500	43401	n/a	74506
2008	169254	20014	35861	n/a	119045
2009	165516	500	63503	n/a	99055
2010	176648	11719	164376	n/a	83876
2011	186806	28070	71928	22446	127488
2012	150894	1709	138526	24619	500
2013	150612	n/a	37908	25021	29345

Year	Borrower 41	Borrower 42	Borrower 43	Borrower 44	Borrower 45
1996	n/a	55221	n/a	n/a	85402
1997	131387	69111	n/a	n/a	89380
1998	35135	78480	n/a	n/a	35002
1999	35010	37288	n/a	n/a	62006
2000	97559	67389	n/a	n/a	56528
2001	500	62000	n/a	n/a	61407
2002	-1856	30918	n/a	n/a	11083
2003	7857	45728	n/a	n/a	50000
2004	500	59952	n/a	n/a	53473
2005	500	48375	n/a	n/a	60735
2006	55286	42379	n/a	n/a	500
2007	70554	500	n/a	11014	56906

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2008	127549	42469	n/a	13090	34741
2009	500	40530	n/a	31853	500
2010	121752	54854	n/a	52451	71534
2011	153639	25578	n/a	96557	72384
2012	103654	32130	88111	99416	116881
2013	79157	30563	16509	128781	133231

Source: Estimated data provided by the U.S. Department of the Treasury for use in the U.S. Department of Education's Income-Driven Repayment Cash Flow Model. | GAO-17-22