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Child Benefit, Child Tax Credit and Working Tax Credit

Take-up rates

2016 to 2017

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For general enquiries relating to tax credits, including information on eligibility and advice on making a claim, please see the gov.uk website: <https://www.gov.uk/browse/benefits/tax-credits>, or contact the Tax Credits Helpline: 0345 300 3900

Similarly for general enquiries relating to Child Benefit, including advice on making a claim, please refer to the gov.uk website: <https://www.gov.uk/browse/benefits/child>, or contact the Child Benefit Helpline: 0300 200 3100

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Excel versions of the tables are available at request.

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Child Benefit, Child Tax Credit and Working Tax Credit Take-Up Rates 2016-17

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Introduction

Child Benefit, Child Tax Credit and Working Tax Credit

Child Benefit is a payment that families can claim for their children (including qualifying 16-19 year old young people in full-time non-advanced education or approved training). It is usually paid every four weeks but in some cases can be paid weekly. Separate rates are payable for the only/eldest child and any subsequent children.

An important change was made to Child Benefit from January 2013 – the High Income Child Benefit Charge. This is a tax charge paid by families containing an adult individual whose income exceeds £50,000 a year and who choose to continue to receive Child Benefit payments. As an individual's income increases from between £50,000 and £60,000, the charge is gradually increased until it is equivalent to 100% of the amount of Child Benefit. As an alternative to paying the charge, families can opt out of receiving Child Benefit payments, whilst remaining registered for Child Benefit. More information can be found on the gov.uk website at:

<https://www.gov.uk/child-benefit-tax-charge>

Tax credits are based on household circumstances and can be claimed jointly by members of a couple, or by singles. Entitlement is based on the following factors:

- age
- income
- hours worked
- number and age of children
- childcare costs
- disabilities

Child Tax Credit (CTC) is a form of income-related support for children and for qualifying young people aged 16-19 who are in full time non-advanced education or approved training, payable to the main carer. Claims can be made regardless of the adults in the family being in or out of work.

Working Tax Credit (WTC) provides in-work support for people on low incomes, with or without children. WTC is available to those working 30 hours or more a week, or in the case of those with children or a disability, those working 16 hours or more a week (24 hours or more for couples with children). This requirement for couples with children to work 24 hours or more came into effect in April 2012.

This publication

Child Benefit take-up rates measure the proportion of eligible children and young people who have Child Benefit claimed on their behalf. Tax credit take-up rates measure the proportion of eligible families who claim (the caseload take-up rate), as well as the proportion of available financial support which is claimed (the expenditure take-up rate)¹.

¹ The Child Benefit take-up rate is measured on a per child basis because separate Child Benefit claims are usually made for each child. In contrast, in tax credits, claims are made by

This publication presents estimates of annual take-up rates for Child Benefit, CTC and WTC covering the 2016-17 financial year. In the case of tax credits, it also presents estimates for the number of entitled non-recipient families, and the amount of available expenditure which is unclaimed. The results from this publication, and those of selected previous years, can be found on the gov.uk website at:

<https://www.gov.uk/government/collections/personal-tax-credits-statistics>

The publication is structured as follows:

- Key results and comparisons with previous publications are given in the next section
- This is followed by a general description of the methodology (more details are contained in a Technical Annex at the end of the publication)
- In part A, a single table shows the Child Benefit caseload take-up rate, with associated upper and lower bounds; to assist in comparing changes over time, this table contains figures for each year from 2006-07 up to and including 2016-17
- In part B, tax credit take-up rates are presented. The majority of tables in part B have a similar format:
 - The first column presents caseload or expenditure estimates derived from administrative data
 - The following three columns contain estimates of the number of entitled non-recipients, or the amount of tax credits unclaimed, and are given as central estimates with upper and lower bounds.
 - The final three columns show take-up rates by caseload and expenditure, each with a central estimate and upper and lower bounds

The exceptions are tables 1b and 2, where take-up rates alone are shown. Both these tables show how take-up rates have changed over time.

Caseload figures are shown in thousands and are rounded to the nearest 10,000; expenditure figures are in millions and are rounded to the nearest £10 million. Some figures in the tables may not sum due to rounding.

- The final section is a Technical Annex which gives a more detailed discussion of the methodology

families (single or couple adults) and additional children are simply treated as a change in circumstances; as a result the take-up rate for tax credits is measured on a per family basis.

Key Results and comparisons with previous publications

Child Benefit

- **The central estimate of the Child Benefit take-up rate in 2016-17 is 93%**

The estimated Child Benefit take-up rate fell from 94 per cent to 93 per cent between 2015-16 and 2016-17. This change is statistically significant at the 5 per cent significance level. This is now the fourth year that the results include the impact of the High Income Child Benefit Charge (HICBC) – more details of this are given in the Methodology section.

Tax credits

- **The central estimate of the Child Tax Credit caseload take-up rate in 2016-17 is 83%**

The estimated Child Tax Credit (CTC) caseload take-up rate in 2016-17 is unchanged from 2015-16. The change in the CTC caseload is not statistically significant at the 5 per cent significance level.

- **The central estimate of the Working Tax Credit caseload take-up rate in 2016-17 is 65%**

For Working Tax Credit (WTC), the central estimate of the caseload take-up rate increased by two percentage points between 2015-16 and 2016-17. This change is not statistically significant. The WTC take-up rates for families with children and WTC only households without children were both unchanged at 88% and 31% respectively. There was not a statistically significant change in either of the two aforementioned rates: the change in the overall rate was a result of a compositional shift in the population towards families with children.

Changes in the rates and thresholds of the tax credit system affect the number of families entitled to tax credits, and the size of their entitlements. For the 2016-17 tax year the income disregard decreased from £5,000 to £2,500. This change reduces the number of entitled families and is thought to have pushed caseload take-up rates upwards by a small degree (around 2 percentage points for WTC with little impact on CTC).

Universal Credit is due to replace Child and Working Tax Credit over the next few years. However, during 2016-17 the impact on take-up rates is considered to be small.

More details regarding the comparability of specific tables with previous publications are contained in the Methodology section.

Methodology

Child Benefit

The approach used to estimate Child Benefit take-up rates is set out briefly below. A more detailed description of the method used is available in the Technical Annex.

The data used

Three separate data sources are used to produce Child Benefit take-up rate estimates. These are:

- **Administrative data:** this is based on quarterly extracts of 100% data from the Child Benefit Computer System, appropriately interpolated to cover the full financial year
- **The Family Resources Survey (FRS):** this is a household survey carried out by the Department for Work and Pensions, which collects a wide range of information relating to (amongst other things) family circumstances and income, which can be used to model families' entitlement to Child Benefit
- **The Labour Force Survey (LFS):** this is a quarterly household survey covering, amongst other things, the education and training activities of young people aged 16 and over

Definition of the take-up rate

The Child Benefit take-up rate represents the proportion of children eligible for Child Benefit who are registered by their parents. Administrative data is used to calculate the caseload, and includes children of parents who have opted out of Child Benefit payments as a result of the High Income Child Benefit Charge – these children remain registered for Child Benefit. Family Resources Survey data is used to estimate the number of children who are eligible for Child Benefit but who are not registered, although these figures are adjusted to account for backdated awards and an undercount of eligible 16-19 year olds in the FRS data.

As a result of these adjustments the take-up rate is defined as follows:

$$\frac{C_A}{C_A + (ENR_{FRS} - BD_A) + (ENR_{FRS\ 16-19} \times AF_{LFS})}$$

Where:

- C_A is the administrative caseload (the estimated number of children and young people who are registered for Child Benefit, irrespective of whether their parents have opted out of Child Benefit payments as part of the High Income Child Benefit Charge);
- ENR_{FRS} is the estimated number of children and young people aged 16-19 in full-time education or approved training who are eligible to be registered for Child Benefit, but who are not registered, based on the FRS;
- BD_A is a deduction made for backdating, since some of those who appear to have an eligible child for whom they have not claimed will have made a claim which is backdated to cover the FRS interview date;

$ENR_{FRS\ 16-19}$ is the estimated number of ENR children and young people present within families containing a 16-19 year old, also based on the FRS;
 AF_{LFS} is an adjustment factor to the number of young people aged 16-19 in full-time education, based on the LFS.

The take-up rate is presented as a central estimate around which there are upper and lower bounds. These bounds represent a combination of uncertainty arising from sampling error, and uncertainty around the size of the age 16-19 eligible population. More details about these issues are given in the Technical Annex.

Tax Credits

Entitlement to tax credits in 2016-17 depended on family circumstances in that year (such as number of children, use of eligible childcare, or disability) and incomes in 2015-16 and 2016-17. The first £2,500 of any increase in income between 2015-16 and 2016-17, and the first £2,500 of any decrease in income over the same period, was disregarded for tax credit purposes.

There are a number of methodological challenges involved in estimating take-up rates for CTC and WTC, many of which have been dealt with fully or partially in the analysis undertaken to produce this publication, and others which remain unaddressed due to challenges with the data sources used. The Technical Annex of the publication gives a fuller treatment of these issues.

Out-of-work families with children receive their child support either via Child Tax Credit, or through child allowances in out-of-work benefits (Income Support or income-based Jobseeker's Allowance). For publications prior to 2006-07, sufficiently detailed information on the annual incomes or level of child allowances received was not available, so tables 4 to 9 in the 2003-04, 2004-05 and 2005-06 publications were restricted to in-work families only.

From 2006-07 onwards there has been enough information to accurately estimate the caseload and expenditure of out-of-work families who receive their child support through the child allowances in out-of-work benefits. Therefore tables 4 to 9 now include both out-of-work and in-work families. This means that these tables are not directly comparable with those in publications prior to 2006-07.

From 2014-15 onwards, some former tax credit claimants moved onto Universal Credit (UC) and some claimants who would have made a claim for tax credits have claimed UC instead. Whilst the impact is thought to have been small during 2016-17, some modest adjustments have been made to the methodology to address this which are set out in the Technical Annex.

The data used

Three separate data sources have been used to produce the take-up rate estimates. A brief description of these sources is given below; more details are provided in the Technical Annex.

- **Administrative data:** various scans of the tax credits computer system were used to produce the caseload figures in this publication, using a similar method to that used to produce the HMRC statistical publication *Child and Working Tax Credits Statistics: Finalised Annual Awards 2016-17*

- **The Family Resources Survey (FRS):** this is a household survey carried out by the Department for Work and Pensions, which collects a wide range of information relating to (amongst other things) family circumstances and income, which can be used to model families' entitlement to tax credits
- **The United Kingdom Household Longitudinal Study (UKHLS)²:** also known as "Understanding Society", this is a longitudinal survey of British households, carried out since 2009. As a panel study, it allows for comparisons of incomes in individual families across different years. This survey replaces the British Household Panel Study which was used prior to the 2010-11 publication

Definition of take-up rates

The **caseload take-up rate** represents the proportion of families who are entitled to a positive tax credit award who take up (i.e. claim) their entitlement. Administrative data is used to calculate the caseload (the number of families who have made a claim and are entitled to a positive award). Survey data from the FRS is required to estimate the number of entitled non-recipients. FRS data is used to estimate respondents' entitlement based on their reported income and can measure whether they receive tax credits, but the raw estimate will not be accurate. This is for two reasons. First, respondents reporting that they do not receive tax credits will include those who are waiting for a decision on their award and who will subsequently receive an award which covers the date of interview. They will also include families whose awards have been reduced to zero because of previous over-payments or other adjustments. Neither of these groups should be treated as non-recipients. Second, a correction is needed as entitlement to tax credits is not based on current income, but on both current and previous year's income.

Using these corrections we estimate the take-up rate as:

$$\frac{C_A}{C_A + ((ENR_{FRS} - BA_{FRS}) \times DAF_{UKHLS}) - PRZ_A}$$

Where:

- | | |
|---------------|--|
| C_A | is the administrative caseload (the number of families who have made a claim and are entitled to a positive award) |
| ENR_{FRS} | is the estimated number of entitled non-recipients (ENRs). These are people whose circumstances entitled them to tax credits according to the FRS, but who did not report receipt at the time of interview |
| DAF_{UKHLS} | is an adjustment factor which scales the number of FRS ENRs so that they reflect the impact of the £2,500 income change disregards. The disregard adjustment factor is calculated using UKHLS data |

² University of Essex. Institute for Social and Economic Research, NatCen Social Research, Kantar Public. (2018). *Understanding Society: Waves 1-7, 2009-2016*. [data collection]. 10th Edition. UK Data Service. SN: 6614, <http://doi.org/10.5255/UKDA-SN-6614-11>

BA _A	is an adjustment for backdating using FRS data, since some ENRs who applied after the FRS interview date, or were waiting for an award for which they had already applied, would subsequently receive tax credits which covered that date
PRZ _A	is an adjustment for cases whose payments were reduced to zero, based on administrative data - these cases are in the tax credit system and entitled to a positive award, but receive no payments due to repayment of amounts which had previously been overpaid or other adjustments to their award, and who therefore appear to be non-recipients on the FRS

The **expenditure take-up rate** represents the proportion of total 2016-17 tax credit entitlements which have been claimed. It is calculated in precisely the same way as the caseload take-up rate, except that in each part of the calculation, total entitlement (defined as caseload multiplied by mean entitlement) replaces the relevant caseload terms.

Note that the expenditure figures presented in this publication should not be regarded as definitive estimates of spending on tax credits and are primarily used to construct expenditure take-up rates. They are based on modelled levels of entitlement, which may differ in some respects from actual expenditure. In particular, the existence of underpayments and overpayments may result in expenditure being incurred in a different financial year to the one implied by simple modelling of current entitlements.

Central estimates of the number of entitled non-recipients, amounts of tax credits unclaimed, and caseload and expenditure take-up rates are presented with lower and upper bounds; these approximately represent 95 per cent confidence intervals. The upper and lower bounds for the number of entitled non-recipients and the amounts unclaimed are symmetric around the central estimate, but the rates are not, since the impact on take-up rates of adding or subtracting given levels of ENRs or amounts unclaimed depends on the level of those rates.

Comparisons of Child and Working Tax Credit take-up rates over time

Table 1b of section B of the publication presents the central estimates and upper and lower bounds of the take-up rates for Child and Working Tax Credit since 2003-04. This is to aid time series comparisons of the main figures. Please note that these figures are likely to be affected by policy changes over time, most notably the increase in the income disregard to £25,000 in 2006-07 and the reductions in tax credit support, particularly for higher income families, made from 2011-12 onwards.

Comparisons with previous systems of in-work support for families

Table 2 of section B shows longer-term comparisons over time between four systems of in-work support for low income families with children:

- Family Income Supplement (in operation between 1971 and 1988)
- Family Credit (FC, which existed between 1988 to 1999)
- Working Families' Tax Credit (WFTC, which existed between 1999 to 2003)
- Child and Working Tax Credit (in operation from 2003 onwards)

Comparing take-up rates between these different systems is not straightforward, due to changes in the systems themselves, as well as changes in the methodologies and

data sources used. It is therefore recommended that the figures in table 2 are used only as broad indicators of levels and trends in take-up.

To mitigate some of the problems of comparability, take-up rates are estimated for that group of CTC and WTC claimants who are most similar to those analysed for the WFTC and FC publications. The out of work population are excluded, along with those without children and those entitled to the family element or less in CTC, as these three groups would not have been entitled under WFTC and FC. The self-employed and those in Northern Ireland are also excluded, as these cases were excluded in estimating historical WFTC and FC take-up rates. Even with these exclusions, it should be noted that variations in the amounts of support paid via the tax credit system (due to changes in the uprating of elements, taper rates and thresholds) will be likely to have had an effect on measured take-up rates.

Glossary of terms used in tables

CTC – Child Tax Credit

WTC – Working Tax Credit

Caseload – the number of tax credit recipients entitled to a positive award

Expenditure – the total value of entitlements of tax credit recipients

Entitled non-recipients – families entitled to a positive tax credit award who have not claimed

Amount unclaimed – the total value of tax credit entitlements which have not been claimed by entitled non-recipients

Income used to calculate entitlement – the income figure used to calculate how much families are entitled to, after taking into account the £2,500 disregards for income rises and falls

Modelled entitlement – the annual amount of tax credits families are entitled to, based on their reported circumstances

In-work families – families where at least one adult works above the relevant WTC hours threshold

Out-of-work families – families which do not work above the relevant WTC hours threshold and are only eligible for CTC

Tables

Part A: Child Benefit

A.1 Take up of Child Benefit

	Caseload take-up rate (%)		
	Lower bound	Central estimate	Upper bound
2006-07	96	97	98
2007-08	96	97	97
2008-09	95	96	97
2009-10	95	96	97
2010-11	95	96	97
2011-12	95	96	96
2012-13*	96	96	97
2013-14**	95	95	96
2014-15**	95	96	96
2015-16**	94	94	95
2016-17**	92	93	93

Notes

* First nine months of 2012-13, prior to the introduction of the High Income Child Benefit Charge.

** Includes children who are eligible for Child Benefit, but who do not receive payment due to the High Income Child Benefit Charge

Part B: Tax Credits

Section B1: Summary Figures and Comparisons over Time

B.1A Take up of CTC and WTC in 2016-17

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC	3,650	610	730	850	81	83	86
WTC	2,050	970	1,110	1,240	62	65	68

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC	26,090	2,230	2,900	3,570	88	90	92
WTC	16,150	2,420	3,150	3,880	81	84	87

Notes

1. The CTC and WTC figures in this table cannot be added together to give a total for both CTC and WTC, since some families with children receive both CTC and WTC.
2. The expenditure and amounts unclaimed relate to **total** tax credit expenditure for those entitled to CTC and WTC (i.e. the CTC figure includes WTC expenditure for those receiving both CTC and WTC, and similarly the WTC figure includes CTC expenditure for those receiving both CTC and WTC).

B.1B Take up rates of CTC and WTC, 2003-04 onwards

	Caseload take-up rate (%)			Expenditure take-up rate (%)		
	Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Child Tax Credit						
2003-04	78	79	81	85	87	89
2004-05	80	82	84	89	91	93
2005-06	80	82	84	89	91	93
2006-07	79	81	83	85	88	90
2007-08	79	81	84	86	89	92
2008-09	78	80	83	87	90	93
2009-10	79	81	83	87	90	92
2010-11	81	83	85	91	92	94
2011-12	83	85	87	92	93	95
2012-13	86	88	90	92	93	95
2013-14	85	87	89	91	93	94
2014-15	84	86	88	90	92	94
2015-16	81	83	85	88	90	92
2016-17	81	83	86	88	90	92
Working Tax Credit						
2003-04	54	56	58	75	78	81
2004-05	59	61	64	80	82	85
2005-06	59	61	63	79	82	85
2006-07	55	57	59	74	77	80
2007-08	55	57	59	72	76	81
2008-09	56	58	60	76	80	84
2009-10	59	61	63	79	82	86
2010-11	62	64	66	82	84	86
2011-12	63	65	68	82	84	87
2012-13	64	66	69	82	84	87
2013-14	66	68	71	84	86	87
2014-15	63	65	68	83	85	88
2015-16	60	63	65	80	83	86
2016-17	62	65	68	81	84	87

Notes

1. See discussion in Key Results section regarding the impact of recent policy changes.

B.2 Time series comparisons: take-up rates for low income working families with children

	Caseload take-up rate (%)			Expenditure take-up rate (%)		
	Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Family Income Supplement						
1974-75		50			*	
1978-79		51			58	
1981-82		48			53	
1983-84		54			65	
1985-86		48			54	
1986-87		51			60	
Family Credit						
1988-89**		57			67	
1990-91***		62			68	
1991-92+		66			73	
1993-94		71			81	
1994-95		69			82	
1995-96		70			83	
1996-97	71		75	82		88
1997-98++	67		70	75		81
1998-99	66		70	73		79
Working Families' Tax Credit						
2000-01	62		65	73		78
2001-02	71		74	80		85
2002-03+++	72		76	82		88
Child Tax Credit and Working Tax Credit – low income working families with children[§]						
2003-04	87	89	91	91	93	95
2004-05	87	90	93	93	95	98
2005-06	87	90	93	91	94	97
2006-07	81	85	88	85	88	92
2007-08	78	84	91	84	89	95
2008-09	82	87	92	86	91	96
2009-10	81	85	90	86	90	96
2010-11	88	90	92	91	93	95
2011-12	85	87	91	90	92	95
2012-13	82	84	87	90	93	95
2013-14	81	84	87	90	92	95
2014-15	80	82	85	89	91	94
2015-16	76	79	82	86	89	91
2016-17	78	81	84	87	89	92

Notes

Figures should be used as a broad guide only due to methodological, data and policy changes over the various years; for more details see the Methodology and Key Results sections. Ranges were not published prior to 1996-97 and central estimates were not published between 1996-97 and 2002-03.

* Expenditure take-up rate not available

** April 1988 to December 1989

*** 1990 and 1991 calendar years

+ 1991 and 1992 calendar years

++ April 2002 to November 2002

§ Defined as families with children in work who receive more than the family element of the Child Tax Credit, excluding the self-employed and those living in Northern Ireland

Sources for previous years:

Family Income Supplement:	Family Income Supplement Estimates of Take-up 1986-87 Technical Note, Department of Social Security Analytical Services Division, 1991
Family Credit:	Income-Related Benefits Estimates of Take-up, Department of Social Security, various years
Working Families' Tax Credit:	Working Families' Tax Credit Estimates of Take-up, Inland Revenue, various years

Section B2: Families with Children

B.3 Take-up by position on tax credits profile

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC out of work	1,190	50	90	130	90	93	96
CTC and WTC	1,650	160	230	310	84	88	91
CTC in work	800	320	410	510	61	66	72

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC out of work	7,740	160	330	500	94	96	98
CTC and WTC	15,220	1,070	1,630	2,190	87	90	93
CTC in work	3,140	650	930	1,220	72	77	83

Notes

CTC out of work cases includes those benefiting via Income Support/Jobseeker's Allowance. See Methodology section for more details.

B.4 Take-up by income used to calculate entitlement

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
£0-10,000	1,940	100	150	210	90	93	95
£10,000-£20,000	960	150	210	270	78	82	87
£20,000-£30,000	550	150	230	300	65	71	78
£30,000+	190	90	140	180	52	58	67

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
£0-10,000	16,070	630	1,010	1,390	92	94	96
£10,000-£20,000	7,120	720	1,110	1,500	83	86	91
£20,000-£30,000	2,350	300	480	660	78	83	89
£30,000+	560	120	260	400	59	68	82

B.5 Take-up by income used to calculate entitlement

	Caseload (‘000)	Entitled non-recipients (‘000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Under £1,000	110	90	130	180	39	46	56
£1,000-£2,000	130	60	100	130	50	58	69
£2,000-£4,000	770	180	240	300	72	76	81
£4,000 and over	2,620	190	270	350	88	91	93

	Entitlement (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Under £1,000	60	30	60	90	38	48	66
£1,000-£2,000	200	100	150	200	50	57	67
£2,000-£4,000	2,470	550	730	910	73	77	82
£4,000 and over	23,370	1,400	1,960	2,510	90	92	94

B.6 Take-up by family type

	Caseload (‘000)	Entitled non-recipients (‘000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Lone parents	1,990	40	80	120	94	96	98
Couples with children	1,660	520	650	780	68	72	76

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Lone parents	14,440	50	220	380	97	99	100
Couples with children	11,660	1,970	2,670	3,370	78	81	86

B.7 Take-up by family size

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
One child	1,490	280	360	450	77	80	84
Two children	1,290	200	270	340	79	83	87
Three or more children	860	50	100	140	86	90	94

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
One child	7,250	880	1,200	1,530	83	86	89
Two children	9,180	750	1,120	1,480	86	89	92
Three or more children	9,660	240	580	920	91	94	98

B.8 Take-up by age of youngest child

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
0-4	1,490	200	290	390	79	83	88
5-9	1,020	110	160	210	83	86	90
10-15	840	110	170	220	79	83	88
16 or over	300	60	100	130	69	75	83

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
0-4	11,400	680	1,180	1,680	87	91	94
5-9	7,840	430	740	1,060	88	91	95
10-15	5,350	390	620	860	86	90	93
16 or over	1,500	210	350	490	75	81	88

B.9 Take-up by country and region

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
North East	160	0	30	60	74	84	99
North West	440	30	70	110	80	86	93
Yorks & the Humber	340	20	50	90	79	87	95
East Midlands	270	10	50	80	76	85	95
West Midlands	370	30	60	90	80	86	93
East	300	40	80	110	73	80	88
London	510	70	130	180	74	80	88
South East	390	60	100	140	73	79	87
South West	270	30	70	110	71	79	90
Wales	190	10	30	50	78	86	96
Scotland	270	20	50	80	77	85	95
Northern Ireland	130	0	30	60	69	84	100

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
North East	1,150	0	90	200	85	93	100
North West	3,230	130	340	550	86	90	96
Yorks & the Humber	2,480	10	220	420	86	92	99
East Midlands	1,900	50	230	410	82	89	97
West Midlands	2,720	70	220	380	88	92	97
East	2,070	110	270	430	83	88	95
London	3,880	230	490	740	84	89	94
South East	2,700	200	400	600	82	87	93
South West	1,820	50	280	520	78	86	97
Wales	1,300	0	80	160	89	94	100
Scotland	1,790	20	210	400	82	89	99
Northern Ireland	960	0	120	290	77	89	100

Notes

Some claimants with missing regional information have been excluded.

Estimates of regional totals are based on small samples (as shown by the wide confidence intervals), so comparisons with previous years should be treated with caution.

Section B3: Families without Children

B.10 Take-up by country and region

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
WTC only	400	790	870	960	29	31	34

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
WTC only	930	1,290	1,530	1,770	34	38	42

B.11 Take-up by income used to calculate entitlement

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
£0-£10,000	200	260	310	350	36	39	43
£10,000 and over	200	500	570	650	24	26	28

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
£0-£10,000	650	770	910	1,050	38	42	46
£10,000 and over	280	520	670	820	26	30	35

B.12 Take-up by level of modelled entitlement

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Under £1,000	100	290	330	380	21	23	25
£1,000-£2,000	90	160	200	230	28	31	36
£2,000 and over	210	270	340	400	35	39	44

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Under £1,000	50	130	170	210	19	23	28
£1,000-£2,000	130	220	280	330	28	32	37
£2,000 and over	750	860	1,060	1,250	37	41	47

B.13 Take-up by family type

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Singles without children	280	470	520	580	33	35	38
Couples without children	120	310	400	480	20	23	27

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Singles without children	590	670	810	950	38	42	47
Couples without children	340	400	650	900	27	34	46

Technical Annex

Child Benefit

As set out in the methodology section, the Child Benefit take-up rate is defined as follows:

$$\frac{C_A}{C_A + (ENR_{FRS} - BD_A) + (ENR_{FRS\ 16-19} \times AF_{LFS})}$$

Where:

C_A	is the administrative caseload (the estimated number of children and young people who are registered for Child Benefit, irrespective of whether their parents have opted out of Child Benefit payments as part of the High Income Child Benefit Charge)
ENR_{FRS}	is the estimated number of children and young people aged 16-19 in full-time education or approved training who are eligible to be registered for Child Benefit, but who are not registered, based on the FRS
BD_A	is a deduction made for backdating, since some of those who appear to have an eligible child for whom they have not claimed will have made a claim which is backdated to cover the FRS interview date
$ENR_{FRS\ 16-19}$	is the estimated number of ENR children and young people present within families containing a 16-19 year old, also based on the FRS;
AF_{LFS}	is an adjustment factor to the number of young people aged 16-19 in full-time education, based on the LFS

This section describes how each of these elements of the calculation are constructed and used in creating the take-up rate estimates.

C_A : The administrative caseload

The administrative caseload is the estimated number of children who were registered for Child Benefit during 2016-17. It includes both those children eligible for a Child Benefit payment, and those children registered for Child Benefit but who were not eligible for a payment as their parents had opted out as part of the High Income Child Benefit Charge arrangements. From June 2009 onwards, HMRC has received quarterly 100% data extracts from the Child Benefit Computer System. The estimates exclude foreign and unknown addresses so as far as possible reflect the number of children resident in the UK for whom Child Benefit is being claimed. The estimates on each date also include Child Benefit awards which have been backdated to cover the extract date. These quarterly figures are interpolated in order to produce an estimate of the average number of children across the twelve month period.

ENR_{FRS} : Estimated number of eligible children and young people who are not registered for Child Benefit

The number of eligible children and young people who are not registered for Child Benefit is estimated using the Family Resources Survey. Although it is not possible to directly analyse which children in a family are or are not being claimed for using the FRS, it is possible to calculate the total number of children in a family for whom Child

Benefit is claimed based on the amount of Child Benefit reported³. By calculating for each family the difference between the total number of children and young people in that family and the estimated number of children and young people for whom Child Benefit is claimed, it is possible to derive an estimate of the number of eligible children and young people for whom Child Benefit is not received.

In cases where FRS respondents report that they have chosen to stop receiving Child Benefit payments due to having a high income (as a consequence of the High Income Child Benefit Charge), all children in such families are treated as registered for Child Benefit and are therefore not counted as part of the estimate of ENRs.

BD_A: the backdating adjustment

The estimated average number of ENRs calculated using the method above will be too high because Child Benefit claims can be backdated by up to three months. Some eligible children who may appear to have not been claimed for based on the FRS will have subsequently had a claim made for them which is backdated to cover the FRS interview date. These children should therefore not be counted as ENRs and doing so would incorrectly under-estimate the take-up rate.

The size of the backdating adjustment is estimated using Child Benefit administrative data, in a similar manner to the method described earlier for the total caseload. This estimate is then deducted from the estimated number of ENRs.

ENR_{FRS 16-19}: Estimated number of eligible children and young people who are not registered for Child Benefit in families containing a 16-19 year old

A further problem with the FRS estimate described above is that the grossing regime used in the FRS grosses up the number of 16-19 year olds in full-time education to, amongst other things, the number of 16-19 year olds for whom Child Benefit is being claimed. As such, it does not include the (unknown) number of eligible 16-19 year olds for whom Child Benefit is not claimed⁴. This will tend to result in the unadjusted FRS estimate being too low, and the take-up rate correspondingly will be over-estimated. The number of ENRs is therefore scaled up to account for this problem.

Whilst it is unknown how many FRS ENRs are affected by this issue, it is possible to produce an upper bound estimate by scaling up the total number of ENRs within a family containing a 16-19 year old. This implicitly assumes that those for whom Child Benefit is not being claimed in a family containing 16-19 year olds are all aged 16-19; this will therefore tend to over-estimate the number of ENRs, and under-estimate the take-up rate.

³ The values of Child Benefit reported in the FRS are not imputed and are, in the overwhelming majority of cases, multiples of the first and subsequent child rates payable in Child Benefit, so appear to be a reliable way of counting the number of children for whom Child Benefit is claimed. The FRS team in the Department of Work and Pensions have stated that whilst Child Benefit values may be edited eg. to reflect uprated benefit rates where out of date financial documentation has been consulted by the respondent, they are not edited to account for children for whom Child Benefit is apparently not being received.

⁴ It is not possible to directly estimate the ages of eligible children or young people who are not claimed for because, as noted earlier, the FRS methodology we have outlined does not permit the identification of which children are not being claimed for; only the total number within each family.

AF_{LFS}: the adjustment factor for 16-19 year olds⁵

The adjustment factor used to scale up the number of potential 16-19 year old ENRs is based on the Labour Force Survey. The Labour Force Survey is considered to give the best measure of participation in non-advanced education by 16-19 year olds; as it is not grossed up to Child Benefit families, it gives a higher estimate than the numbers participating based on the FRS.

The main drawback of the LFS (and this is a problem shared by all other household surveys, as well as administrative data on participants in education/training courses) is that it is not known when the course began. If a 19 year old began their course prior to their 19th birthday, then they are still eligible for Child Benefit; whereas if they began after their 19th birthday, they are not eligible.

As such, scaling up by the LFS will tend to over-estimate the total numbers of 16-19 year olds who are eligible for Child Benefit.

Derivation of upper and lower bounds and central estimate

The upper and lower bounds of the estimate of ENRs (and hence, the lower and upper bounds of the take-up rate) are based on a combination of:

- **Sampling error:** the number of ENRs (adjusted and unadjusted) are based on the FRS and LFS, and so there is sampling error associated with these estimates. Upper and lower bounds based on 95% confidence intervals are therefore derived around a central estimate
- **Uncertainty about the size of the adjustment:** on the one hand, the unadjusted FRS estimate of ENRs (less backdating) is likely to be too low; on the other hand, the number of ENRs (less backdating) scaled up by the LFS adjustment factor is likely to be too high. This range, together with the range implied by the confidence intervals, is therefore included in the estimate of the upper and lower bounds

Tax Credits

As described in the Methodology section, the caseload take-up rate is defined as:

$$\frac{C_A}{C_A + \left((ENR_{FRS} - BA_{FRS}) \times DAF_{UKHLS} \right) - PRZ_A}$$

Where:

C_A is the administrative caseload (the number of families who have made a claim and are entitled to a positive award);

ENR_{FRS} is the estimated number of those entitled to, but not receiving, tax credits based on the FRS;

⁵ Note that the 16-19 adjustment factor applied in this section is used after the deduction of the backdating adjustment. This is because backdated cases are almost always claims made for children under 1; whereas the adjustment factor concerns 16-19 year old young people. The backdating adjustment should therefore be made to the unadjusted FRS estimate, since the estimate of eligible children under 1 implied in the FRS requires no further adjustment.

- DAF_{UKHLS} is an adjustment factor which scales the number of FRS ENRs so that they reflect the impact of the £2,500 disregards for income changes. The disregard adjustment factor is calculated using UKHLS data;
- BA_{FRS} is an adjustment for backdating using FRS data, since some ENRs who applied after the FRS interview date, or were waiting for an award for which they had already applied, would subsequently receive tax credits which covered that date;
- PRZ_A is an adjustment for cases whose payments were reduced to zero, based on administrative data - these cases are in the tax credit system and entitled to a positive award, but receive no payments due to repayment of amounts which had previously been overpaid, and are regarded as non-recipients on the FRS.

This section describes how each of these elements of the calculation are constructed and used in creating the take-up rate estimates.

C_A: The administrative caseload

The majority of the administrative data used in this publication are consistent with those used in the HMRC publication “Child and Working Tax Credits Statistics: Finalised Annual Awards, 2016-17”⁶. These figures are based on all 2016-17 tax credit records, with each sub-period of tax credit entitlement weighted by the duration of these periods. More details about the data used are available in the Technical Note of that publication.

ENR_{FRS}: Estimates of entitled non-recipients (ENRs) from the Family Resources Survey

The FRS is considered to be the best survey data source available covering current income and other circumstances. It therefore forms the basis of the estimates of “entitled non-recipients”; families who were entitled to a tax credit payment in 2016-17, but did not receive one.

One of the main shortcomings with the FRS in modelling the system of tax credits is that tax credit entitlements are based on annual income, whereas FRS estimates are largely “snapshots” of circumstances at a particular point in time. A particular family in the FRS may therefore appear to be entitled to tax credits if their weekly income is annualised, but that week’s income may not be typical of the year as a whole. Earlier research⁷ has suggested that a number of families may have weekly incomes which vary considerably from an annual average.

In some ways, the FRS may be less prone to these problems of income variability than it first appears. Many sources of income in the FRS are not “weekly” as such, for various reasons: many individuals in families are paid monthly; some of the FRS questions ask about “usual” income, rather than income in a particular week or month; and some non-employee income sources are often recorded on an annual basis (for example self-employment income, and interest and investment income). In addition, the FRS is a survey which is carried out continuously through the whole year, and so long as income variations are not correlated (eg. there is no marked

⁶ Available at <https://www.gov.uk/government/collections/personal-tax-credits-statistics>

⁷ Hills, J., Smithies, R. and McKnight, A., “Tracking Income: How Working Families’ Incomes Vary Through the Year” (2006)

seasonality), random fluctuations in measured income at the individual level may be smoothed out when looking at figures derived for the year as a whole. As a result of these considerations, and because a truly “annual” large scale survey of incomes is not available, the results of the FRS are accepted to give the best available picture of 2016-17 incomes.

Aside from the question of annualisation, the FRS does have several well known, and some less well known, issues which are addressed in the modelling of entitlement. Income from self-employment is generally considered to be somewhat less reliable than other FRS income data. However, improvements have been made in recent years and self-employment income is now considered to be sufficiently reliable to be used in the Department for Work and Pensions Households Below Average Income publication. In addition, although families with income from self-employment were generally excluded from take-up estimates for Working Families’ Tax Credit, such an exclusion makes less sense in a tax credit system which is paid to those in and out of work. The self-employed are therefore included in all tables, apart from in table 2 where they are explicitly excluded in order to improve the comparability of time series figures.

Of the less well known issues, two in particular are highlighted. The first is that income brought to account in tax credits includes benefits in kind (for example, company cars), in line with the rules relating to income tax. FRS information on benefits in kind is limited, and so estimated values for income from benefits in kind has been imputed using administrative data.

The second issue is not related to income, but disability. Entitlement to the disability element is extremely difficult to model reliably on the FRS. Entitlement is therefore modelled on a partial basis, based on current receipt of qualifying disability benefits, but no attempt is made to model past receipt (eg. of Employment and Support Allowance). Exclusion of entitlement based on past benefit receipt will tend to result in the population of entitled non-recipients being underestimated, and the caseload take-up rate being overestimated.

DAF_{UKHLS}: The disregard adjustment (DA) – UK Household Longitudinal Study data

Entitlement to tax credits does not rely, straightforwardly, on 2016-17 income, which is a necessary assumption for the FRS modelling. Following the tax credit finalisation process, 2016-17 tax credit awards were based on 2015-16 incomes, but could be adjusted in-year to reflect applicants’ own estimates of 2016-17 incomes if they felt these were more accurate. Once the 2015-16 tax year had ended, recipients were able to report their final 2016-17 income at finalisation. However, a £2,500 disregard for income rises, and a £2,500 disregard for income falls meant that the first £2,500 of any increase in income or the first £2,500 of any decrease in income between 2015-16 and 2016-17 was not taken into account in tax credit calculations.

This means that there are three different definitions of income used to determine tax credit entitlement, depending on the direction and size of the income change between 2015-16 and 2016-17:

- 2016-17 income, plus £2,500, is used if income has fallen by more than £2,500 between 2015-16 and 2016-17
- 2015-16 income is used if income has not changed, or has fallen by up to £2,500 or has risen by up to £2,500, between 2015-16 and 2016-17

- 2015-16 income, less £2,500, is used if income has risen by more than £2,500 between 2015-16 and 2016-17

Clearly, this definition of entitlement requires 2015-16 income data to be linked with 2016-17 data on income and other circumstances relevant for tax credit entitlement. To do this, longitudinal data from a panel study is required and data from the first two waves of the UK Household Longitudinal Study (UKHLS, also known as “Understanding Society”) has been used to derive the following ratio:

$$\frac{\text{Entitled non-recipients based on actual income rules}}{\text{Entitled non-recipients based on current year income rules}}$$

In most cases, this ratio is greater than 1, since the effect of the income rises disregard tends to outweigh the effect of the income falls disregard.

Previous versions of this publication used data from the British Household Panel Study (BHPS). The UKHLS replaces the BHPS and was launched in 2009. The UKHLS has a larger sample size than its predecessor.

The treatment of imputed incomes on the UKHLS remains the same as in last year’s publication. Analysis has suggested that imputed incomes on the UKHLS, particularly in two-year periods where both year’s incomes are imputed, show marked volatility relative to periods where just one year’s income is imputed, and crucially relative to tax credits administrative data. We therefore replace missing or imputed values with actual values from the next or previous years where applicable (which the UKHLS already does in some cases) and excluding the remaining observations.

In addition, in order to boost sample sizes which had been reduced by falls in the population entitled to tax credits as well as the exclusions described above, we have modelled the 2016-17 tax credit system on both 2015-16 and 2016-17 observations, with previous year income data being linked to these observations based on 2014-15 and 2015-16 respectively. Whilst this means that the disregard adjustments are no longer exactly centred on the policy year in question, the resulting boost in sample sizes more than offsets this disadvantage. Our tests suggest that ratios derived from the combined two years’ worth of data compare well against single year estimates, and against those estimated using administrative data.

BA_{FRS}: The backdating adjustment

The backdating adjustment is intended to account for the fact that tax credit awards can be backdated by up to one month (reduced from three months in years prior to 2012-13). Any survey-based estimate of entitled non-recipients is likely to overstate the number of ENRs in a system with backdating, since some ENRs who applied after the FRS interview date, or were waiting for an award for which they had already applied, would subsequently receive tax credits which covered that date.

The number of backdated awards is estimated using the number of entitled non-recipients identified in the FRS as “waiting for the outcome of an application [for tax credits]”. Whilst it is possible that respondents waiting for the outcome of an application may not be entitled to tax credits on the interview date due to the shorter backdating period, HMRC data on application processing times suggests that this will be true in the majority of cases.

PRZ_A: The adjustment for payments reduced to zero

The payments reduced to zero adjustment is intended to capture cases who have claimed tax credits but whose payments are currently reduced to zero. Such cases are unlikely to consider themselves to be tax credit recipients on the FRS, as the relevant FRS question is based on current receipt of tax credit payments. These cases may arise as a result of repaying either an in-year overpayment (ie. they were overpaid earlier in 2016-17) or a cross-year overpayment (ie. they were overpaid in 2015-16 and/or earlier years). Only cases entitled to the family element may have their payments reduced to zero in order to repay an overpayment.

There are also a smaller number of cases entitled to more than the family element but whose payments are also recorded as zero. These may include cases where payments have been suspended. Again, such cases will be unlikely to be recorded as receiving tax credits payments on the FRS.

To account for these discrepancies an estimate of the number of tax credit families with zero payments is made, based on administrative data on payments and entitlements, and this number is deducted from the estimate of entitled non-recipients.

Impact of Universal Credit

In 2016-17, the rollout of Universal Credit to replace the existing system of income-related benefits and tax credits will have had an impact on the numbers of those entitled to, or claiming, tax credits. The impact of UC was particularly concentrated in those areas of the country where the Universal Credit Full Service had been introduced, and new claims to tax credits had been stopped. As the Family Resources Survey is not capable of distinguishing between areas where UC has been fully rolled out and those where it has not, it is not possible to produce a measure of tax credits take-up which is wholly unaffected by UC.

During 2016-17 the impact of UC on tax credit claimants was relatively small. However, ignoring UC claimants entirely from tax credits take-up analysis will cause a downward bias in measured take-up rates, as UC claimants who replaced their tax credit equivalents would be treated as non-claimants. To mitigate this impact, we have treated UC claimants who were modelled as eligible for tax credits in the Family Resources Survey as if they were tax credit claimants in the calculation of entitled non-recipients. This has reduced entitled non-recipient estimates, and pushed up take-up rates, slightly. Entitled non-recipient and caseload take-up rate estimates with and without FRS UC recipients are shown in tables C1 and C2 below.

C.1 Take up of CTC and WTC in 2016-17

With FRS UC recipients identified as entitled non-recipients

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC	3,650	640	770	890	80	83	85
WTC	2,050	990	1,130	1,270	62	65	68

C.2 Take up of CTC and WTC in 2016-17

With FRS UC recipients **not** identified as entitled non-recipients

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC	3,650	610	730	850	81	83	86
WTC	2,050	970	1,110	1,240	62	65	68

Derivation of upper and lower bounds

Much of the data in this publication are based on samples, and as estimates derived from different samples are combined, this adds to the total level of uncertainty present in the estimates. In presenting the ranges, the two biggest sources of uncertainty are considered; the estimate of the number of ENRs derived from the FRS, and the estimate of the disregard adjustment factor derived from the UKHLS. As the administrative data estimates (including the adjustments for backdating and for payments reduced to zero) are derived either from 100% administrative data or from extremely large samples, any sampling uncertainty arising from this source is ignored.

The estimate of the number of entitled non-recipients derived from the FRS is subject to sampling uncertainty. Its variance is estimated by calculating the standard error of the estimated proportion of entitled families who were not in receipt of a tax credit, as derived wholly from the FRS, and this is multiplied by the estimated number of entitled families; the result is then squared. The standard errors assume a simple random sample design which approximates the true standard errors, as they do not take the complex design of the FRS into account.

The variance of the disregard adjustment factor derived from the UKHLS is not estimated directly, but instead the variance of the numerator and denominator of the adjustment factor are estimated separately; in other words, the variance of those entitled to and not receiving tax credits based on the current year's income, and the variance of those entitled to and not receiving tax credits based on actual income rules. The variance of the ratio of these two figures is then estimated using the formula⁸:

$$V(R) = \frac{S_y^2 + R^2 S_x^2}{nX^2}$$

Where X is the estimated denominator of the ratio, Y is the estimated numerator of the ratio, R is the ratio, n is the sample size and S_x^2 and S_y^2 are the sample variance of X and the sample variance of Y respectively.

When X and Y are positively correlated, as they are here, this approximation will provide a conservative estimate of the variance.

⁸ See, for example, Cochran, W. G. "Sampling Techniques", 3rd edition, p.155.

To combine the sample variance of the estimate of ENRs from the FRS, and the estimated sample variance of the disregard adjustment factor, the following formula is used⁹:

$$V(P) = S_Z^2 S_R^2 + Z^2 S_R^2 + R^2 S_Z^2$$

Where Z is the estimated number of ENRs, R is the disregard adjustment factor ratio, P is the product of Z and R , and S_Z^2 and S_R^2 are the respective sample variances.

$V(P)$ is the final estimate of the variance of the number of entitled non-recipients, adjusted using the disregard adjustment factor. The square root of this figure is taken and multiplied by 1.96 to estimate approximate 95% confidence intervals for the estimate of ENRs, and the upper and lower bounds are used to derive a range for the take-up rates. Similar calculations are carried out on the expenditure figures, although the variance associated with mean entitlements generally leads to ranges which are somewhat wider than those for caseloads.

⁹ See for example Barnett H.A.R., "The Variance of the Product of Two Independent Variables and its Application to an Investigation Based on Sample Data", *Journal of the Institute of Actuaries* Vol 81 (1955), p. 190.