

HM REVENUE & CUSTOMS
Analysis Team

**Child Tax Credit and Working
Tax Credit**

Take-up rates

2003-04

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Introduction

The tax credit system

Child Tax Credit (CTC) and Working Tax Credit (WTC) were introduced in April 2003 and replaced Working Families' Tax Credit, Disabled Person's Tax Credit and Children's Tax Credit, as well as some other forms of financial support for families with children. For the first time, WTC also extended in-work financial support to families without children or a disability. The aims of the tax credits were set out in Budget 2002, and are as follows¹:

- supporting families with children, recognising the responsibilities that come with parenthood;
- tackling child poverty, by offering the greatest help to those most in need, such as low-income families;
- helping to make sure that work pays more than welfare and that people have incentives to move up the earnings ladder.

In order to meet these objectives, the financial support available through the tax credit system must be taken up by those eligible for support. This publication presents estimates of annual take-up rates for CTC and WTC, covering the 2003-04 financial year.

Entitlement to tax credits in 2003-04 depended on family circumstances in that year (for example, number of children, use of eligible childcare, disability) and incomes in 2001-02 and 2003-04. The first £2,500 of any increase in income between 2001-02 and 2003-04 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. The methodological section of the publication gives a fuller treatment of these issues.

The data used

Three separate data sources have been used to produce the take-up rate estimates. These are;

- Administrative data: a 10 per cent sample of single claimants and 20 per cent sample of couples, taken from tax credit administrative records at various points in time. As tax credit awards can be backdated, some of these "snapshots" relate to 2003-04 but others are drawn from points after the end of the 2003-04 financial year. The dataset is identical to that used to produce the HMRC statistical publication "Child and Working Tax Credits Statistics: Finalised Annual Awards 2003-04".
- The Family Resources Survey (FRS): 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 British Household Panel Survey (BHPS): a longitudinal survey of British households carried out since 1991. As a panel study, it allows for comparisons of

¹ "The Child and Working Tax Credits, the Modernisation of Britain's Tax and Benefit System Number Ten", April 2002

incomes in individual families across different years, which we use to derive information on 2001-02 and 2003-04 incomes.

In addition to the above datasets, we also make use of The Families and Children Study (FACS), which is a longitudinal survey of families with children carried out since 1999, funded by DWP, HMRC and other Government departments. Although it does not cover those without children, it provides a useful check against BHPS figures for those with children.

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, or claim, their entitlement. It is estimated as:

$$\frac{C_A}{C_A + ((ENR_{FRS} \times DAF_{BHPS}) - BA_A)}$$

Where:

C_A is the administrative caseload (the number of families receiving a positive tax credit award)

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

DAF_{BHPS} is an adjustment factor which scales the number of FRS ENRs so that they reflect the impact of the £2,500 disregard; the disregard adjustment factor is calculated using the BHPS

BA_A is an adjustment for 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 **expenditure take-up rate** represents the proportion of total potential tax credit expenditure which has 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.

Format of the tables

Each of the tables in this publication 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 exception is table 2, where take-up rates alone are shown.

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 £10m. Some figures in the tables may not sum due to rounding.

Previous estimates

HMRC originally produced a provisional estimate of the take-up rate for Child Tax Credit of 80 per cent by caseload. Due to the use of new data and a revised methodology, the final central estimate (as shown in table 1) is slightly lower, at 79 per cent. However, as 80 per cent lies within the upper and lower bounds of 78 and 81 per cent, the revised figure is statistically insignificantly different from the provisional estimate.

Time series comparisons with previous systems

Table 2 shows 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) and Child and Working Tax Credits (in operation from 2003 onwards). Comparing take-up rates between these different systems are not straightforward, due to changes in the systems themselves, as well as changes in the methodologies and data sources used. We therefore recommend 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, we estimate take-up for that group of CTC and WTC claimants who are most similar to those analysed for the WFTC and FC publications. We exclude the out of work population, 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. We also exclude the self-employed and those in Northern Ireland, as these cases were also excluded in estimating WFTC and FC take-up rates. Even with these exclusions, it should be noted that each of the systems which has been introduced have, in general, been more generous at given income levels than their predecessors, and so it should be borne in mind that the size of the entitled population underlying the figures in table 2 has increased over time.

Glossary of terms used in tables

CTC – Child Tax Credit

WTC – Working Tax Credit

Caseload – the number of tax credit recipients receiving a positive award

Expenditure – the amount of spending on 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 awards 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 annual income disregard

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 16 hours or more per week

Section 1: Summary figures

Table 1: Take-up of CTC and WTC

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC	5,570	1,330	1,470	1,610	78	79	81
WTC	1,600	1,170	1,280	1,380	54	56	58

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
CTC	15,620	1,870	2,280	2,680	85	87	89
WTC	8,630	2,000	2,410	2,830	75	78	81

Notes:

The CTC and WTC figures in this table are not additive, since some families with children receive both CTC and WTC. Note also that the expenditure and amounts unclaimed relate to total tax credit expenditure for those entitled to CTC and WTC (ie. the CTC figures 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).

Section 2: Families with children

Table 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

Notes:

Figures should be used as a broad guide only due to methodological, data and policy changes over the various years. 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

++ Revised estimates. Original estimates 71 to 76 per cent by caseload; 80 to 87 per cent by expenditure

+++ 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

Table 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	1,400	150	200	260	84	87	90
CTC and WTC	1,440	130	190	240	86	88	91
CTC, more than family element	640	90	140	190	77	82	87
CTC, family element or less	2,090	830	940	1,050	67	69	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	4,600	420	590	760	86	89	92
CTC and WTC	8,330	690	950	1,210	87	90	92
CTC, more than family element	1,480	140	250	360	80	86	91
CTC, family element or less	1,210	430	490	550	69	71	74

Notes:

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

Table 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	940	40	70	100	90	93	96
£10,000-£20,000	900	160	220	290	76	80	84
£20,000-£30,000	1,080	230	300	380	74	78	83
£30,000-£40,000	780	190	240	300	72	76	80
£40,000-£50,000	360	180	240	300	55	60	66
£50,000+	110	150	200	250	31	36	43

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
£0-10,000	6,050	260	430	590	91	93	96
£10,000-£20,000	3,180	460	670	880	78	83	87
£20,000-£30,000	1,040	180	250	310	77	81	85
£30,000-£40,000	490	120	160	190	72	76	80
£40,000-£50,000	220	120	150	190	54	59	66
£50,000 and over	40	40	50	70	37	44	53

Notes:

In-work families only.

Table 5: 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 £500	90	140	190	240	27	32	39
£500 to £1,000	1,950	630	730	830	70	73	76
£1,000-£2,000	390	70	120	160	71	77	85
£2,000-£4,000	490	70	120	170	74	80	88
£4,000 and over	1,250	80	120	160	89	91	94

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Under £500	30	30	50	70	28	34	44
£500 to £1,000	1,090	350	400	450	71	73	75
£1,000-£2,000	530	110	180	240	68	75	82
£2,000-£4,000	1,460	220	360	500	74	80	87
£4,000 and over	7,910	490	710	930	90	92	94

Notes:

In-work families only.

Table 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	990	50	100	160	86	91	95
Couples with children	3,180	1,040	1,160	1,290	71	73	75

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Lone parents	4,810	0	160	340	93	97	100
Couples with children	6,210	1,220	1,530	1,830	77	80	84

Notes:

In-work families only.

Table 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	1,730	510	610	700	71	74	77
Two children	1,760	400	480	560	76	78	81
Three or more children	680	130	180	230	75	79	84

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
One child	3,680	490	680	880	81	84	88
Two children	4,330	380	560	730	86	89	92
Three or more children	3,010	250	470	680	82	87	92

Notes:

In-work families only.

Table 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	1,540	320	390	460	77	80	83
5-9	1,150	220	290	360	76	80	84
10-15	1,210	300	370	430	74	77	80
16 or over	250	170	220	280	48	53	61

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
0-4	4,510	380	590	810	85	88	92
5-9	3,210	210	400	590	85	89	94
10-15	2,770	320	460	610	82	86	90
16 or over	510	140	250	360	59	67	79

Notes:

In-work families only.

Table 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	200	20	50	80	71	80	91
North West	520	70	100	140	79	84	88
Yorks & the Humber	390	50	80	120	77	83	89
East Midlands	330	50	80	110	74	80	87
West Midlands	400	70	110	150	73	78	85
East	370	90	140	190	67	73	81
London	350	130	190	250	58	65	73
South East	510	150	210	270	65	71	77
South West	360	70	110	150	71	77	83
Wales	220	20	50	80	73	81	93
Scotland	370	50	90	130	75	80	87
Northern Ireland	130	20	50	80	62	73	89

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
North East	560	0	30	70	88	95	100
North West	1,480	50	130	210	87	92	97
Yorks & the Humber	1,110	20	90	170	87	92	98
East Midlands	860	80	160	240	78	84	91
West Midlands	1,100	70	190	310	78	85	94
East	860	90	250	410	68	78	91
London	980	100	270	430	70	79	91
South East	1,160	100	220	340	77	84	92
South West	910	50	140	230	80	86	94
Wales	620	0	60	130	83	92	100
Scotland	960	30	110	190	83	89	97
Northern Ireland	400	0	60	130	75	87	100

Notes:

In-work families only. Regions are defined according to Government Office region boundaries.

Section 3: Families without children

Table 10: Overall take-up amongst families without children

	Caseload ('000)	Entitled non-recipients ('000)			Caseload take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
WTC only	160	1,050	1,090	1,140	13	13	14

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
WTC only	300	1,260	1,460	1,660	15	17	19

Table 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	120	700	740	780	13	14	15
£10,000+	40	330	360	380	10	11	11

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
£0-£10,000	250	1,030	1,190	1,340	16	18	20
£10,000 and over	40	200	260	330	12	14	18

Table 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 £500	20	210	230	250	9	10	10
£500 to £1,000	30	260	300	330	8	9	10
£1,000-£2,000	40	290	330	370	10	11	13
£2,000 and over	70	280	300	310	18	19	20

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Under £500	10	50	60	60	9	10	12
£500 to £1,000	20	190	220	240	8	9	10
£1,000-£2,000	60	420	490	560	10	11	12
£2,000 and over	210	720	780	850	20	21	23

Table 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	110	630	670	720	14	14	15
Couples without children	50	400	420	450	10	11	11

	Expenditure (£m)	Amount unclaimed (£m)			Expenditure take-up rate (%)		
		Lower bound	Central estimate	Upper bound	Lower bound	Central estimate	Upper bound
Singles without children	180	590	710	830	18	21	24
Couples without children	110	610	760	900	11	13	15

Methodology

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

$$\frac{C_A}{C_A + ((ENR_{FRS} \times DAF_{BHPS}) - BA_A)}$$

Where:

C_A is the administrative caseload

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

DAF_{BHPS} is an adjustment factor which scales the number of FRS ENRs so that they reflect the impact of the £2,500 disregard; the disregard adjustment factor is calculated using the BHPS

BA_A is an adjustment for 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.

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

1/ The administrative caseload

All administrative data used in this publication are consistent with those used in the previously published “Child and Working Tax Credits Statistics: Finalised Annual Awards, 2003-04”². These figures are based on a 10% sample of single adults, and a 20% sample of couples, weighted across various “snapshot” dates in 2003-04, to produce annual averages.

One particular point to note is the treatment of out of work families with children. Out of work families with children in 2003-04 received their child support either via Child Tax Credit, or through child allowances in out-of-work benefits (Income Support, income-based Jobseeker’s Allowance or the pensioner’s Minimum Income Guarantee). Although we have caseload estimates of the latter group, we do not have detailed information on their annual incomes or the level of child allowances they are receiving. Because of this, we restrict the analyses from table 4 onwards to families in work only. Expenditure-based take-up rates in tables 1 and 3 are calculated using administrative caseload data and mean entitlement figures which are derived from the FRS.

2/ Estimates of entitled non-recipients (ENRs) from the Family Resources Survey

The FRS is considered to be the best survey data source we have available covering current income and other circumstances. It therefore forms the basis of our estimates of “entitled non-recipients”; families who were entitled to a tax credit in 2003-04, but did not receive one.

One of the main shortcomings with the FRS in modelling the system of new 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

² Available at: <http://www.hmrc.gov.uk/stats/personal-tax-credits/cwtc-annual-0304.pdf>

particular family in the FRS may therefore appear to be entitled to tax credits if we annualise their weekly income, but that week's income may not be typical of the year as a whole. Recent research³ 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 at 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 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 we lack a truly "annual" large scale survey of incomes, we accept the results of the FRS as giving the best available picture of 2003-04 incomes.

Aside from the question of annualisation, the FRS does have several well known, and some less well known, issues which we have attempted to address in our modelling. 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 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. We therefore include the self-employed in all tables, apart from in table 2 where we explicitly exclude them in order to improve the comparability of time series figures.

Of the less well known issues, we highlight two in particular. The first is that income brought to account in tax credits now 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 we have attempted to impute income from benefits in kind using administrative data.

The second issue is not related to income but disability. Entitlement to the disabled worker element (and the 50 plus return to work element) is extremely difficult to model reliably on the FRS. We have therefore modelled entitlement to disabled worker element on a partial basis, based on current receipt of qualifying benefits, but make no attempt to model past receipt (eg. of Incapacity Benefit), and we do not attempt to model the 50 plus return to work element at all. Exclusion of these elements will tend to result in the population of entitled non-recipients being underestimated, and the caseload take-up rate being overstated.

3/ The disregard adjustment (DA) – British Household Panel Survey (BHPS) data

Entitlement to tax credits does not rely, straightforwardly, on 2003-04 income, which is what we have to assume in our FRS modelling. Applications for 2003-04 tax credit awards were initially based on 2001-02 incomes, but could be adjusted in-year to

³ Hills, J., Smithies, R. and McKnight, A., "Tracking Income: How Working Families' Incomes Vary Through the Year" (2006)

reflect applicants' own estimates of 2003-04 incomes if they felt these were more accurate than the initial 2001-02 figure. At finalisation, once the 2003-04 tax year had ended, recipients were able to report their final 2003-04 income. However, a £2,500 disregard was in operation which meant that the first £2,500 of any increase in income between 2001-02 and 2003-04 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 2001-02 and 2003-04:

- 2003-04 income is used if income has fallen between 2001-02 and 2003-04;
- 2001-02 income is used if income has not changed, or has risen by up to £2,500, between 2001-02 and 2003-04;
- 2003-04 income, less £2,500, is used if income has risen by more than £2,500 between 2001-02 and 2003-04.

Clearly, this definition of entitlement requires 2001-02 income data to be linked with 2003-04 data on income and other circumstances relevant for tax credit entitlement. To do this, we require longitudinal data from a panel study, such as the BHPS or DWP's Families and Children Study (FACS). Because we require information on families without children, we have used BHPS data in this publication, but have also modelled entitlement using FACS as a quality check against some of the BHPS figures. The figures from the two surveys are broadly consistent.

The BHPS data is used to produce a caseload adjustment factor to scale the number of entitled non-recipients that we derive from the FRS. The adjustment factor is defined as the following ratio:

Entitled non-recipients based on actual (2001-02 and 2003-04) income rules

Entitled non-recipients based on 2003-04 income rules

In most cases, this ratio is greater than 1, since the effect of the disregard is to increase the entitled population. As an example, a family whose 2003-04 income is such that they are just above the income necessary to receive a tax credit award, would be entitled if their 2001-02 income was within the range necessary to receive an award, and their income had risen by £2,500 or less between 2001-02 and 2003-04.

To demonstrate the impact of these factors, the table below shows the caseload adjustment factors derived for table 3.

Position on taper	Adjustment factor
CTC out of work	1.00
CTC and WTC	1.17
CTC, more than family element	0.98
CTC, family element or less	1.02
WTC only	1.31

Clearly, the effect of the disregard on entitlement will be closely related to the extent to which families experience income rises within, or around, the disregard level. For CTC out of work cases the adjustment factor is unity, because levels of income do not affect their out of work status. In contrast, the adjustment factor for WTC only cases implies that the number of entitled non-recipients rises by 31% after taking the

disregard into account. This is likely to be due to the large number of singles and couples clustered around the end of the tax credits taper who saw modest income rises which would, in the absence of the disregard, have taken them out of tax credit entitlement.

4/ The backdating adjustment

The backdating adjustment is intended to account for the fact that tax credit awards can be backdated by up to three months. 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. This is likely to be a particular issue in 2003-04, since delays in receiving awards were experienced by a number of claimants in the early part of the financial year.

The number of backdated awards is calculated using a combination of two methods. We use the administrative data to calculate the average numbers of backdated awards for most of 2003-04. The exception is the period from 6 April to 11 July 2003, where we have no reliable data on backdated awards. We therefore add onto the number of backdated awards the number of those in the FRS who were interviewed between 6 April and 11 July, who we have modelled as entitled to a tax credit, and who reported that they were waiting for the outcome of a tax credit claim. As the number of backdated awards is likely to exceed the number waiting for a claim (since some people will apply after the interview date) this may underestimate backdated awards.

Derivation of upper and lower bounds

All the data we make use of in this publication are based on samples, and as we are combining estimates derived from different samples, this adds to the total level of uncertainty present in our estimates. In presenting our ranges, we focus on the two biggest sources of uncertainty; the estimate of the number of ENRs derived from the FRS, and the estimate of the disregard adjustment factor derived from BHPS. As the administrative data estimates (including the biggest part of the backdating adjustment) are derived from extremely large samples, we ignore any sampling uncertainty arising from this source.

The estimate of the number of entitled non-recipients derived from the FRS is subject to sampling uncertainty. We estimate its variance 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 FRS, multiplying this by the estimated number of entitled families, and squaring the result.

We do not estimate the variance of the disregard adjustment factor derived from the BHPS directly, but instead separately estimate the variance of the numerator and denominator of the adjustment factor; in other words, the variance of those entitled to and not receiving tax credits based on 2003-04 income rules, and the variance of those entitled to and not receiving tax credits based on actual 2003-04 income rules. We then estimate the variance of the ratio of these two figures using the formula⁴:

$$V(R) = \frac{(s_y^2 + R^2 s_x^2 - 2Rs_{xy})}{nX^2}$$

⁴ See, for example, Cochran, W. G. "Sampling Techniques", 3rd edition, p.155.

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 , s_Y^2 and s_{xy} are the sample variance of X, the sample variance of Y, and the sample covariance of X and Y respectively.

To combine the sample variance of the estimate of ENRs from the FRS, and the estimated sample variance of the disregard adjustment factor, we use the following formula⁵:

$$V(P) = s_Z^2 s_R^2 + Z s_R^2 + R s_Z^2$$

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. Note that as Z and R are derived from different sources, they have no covariance.

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

⁵ 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.