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# Employment incentives for sole parents: Labour market effects of changes to financial incentives and support

## Technical report

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## Disclaimer

The Ministry of Social Development and Inland Revenue have made every effort to ensure the information in this report is reliable, but do not guarantee its accuracy and do not accept liability for any errors.

Access to the Household Labour Force Survey data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the authors, not Statistics New Zealand.

# 1. Introduction

Over the period October 2004 to April 2007 the New Zealand government introduced substantial changes to in-work incentives and financial support for families with dependent children as part of the Working for Families (WFF) package. This report is a technical account of analyses into the impact of these changes on employment and benefit receipt outcomes for sole parents.

A summary of the results from these analyses, titled "Employment incentives for sole parents: Labour market effects of changes to financial incentives and support", was published on the websites of Inland Revenue (IR) and the Ministry of Social Development (MSD) in February 2009.[1] This report provides a detailed discussion of the data and methods used in the analyses and presents the associated results in full.

The evaluation of the impact of the WFF policy changes on sole parents used two analytical approaches:

- Difference-in-differences analysis looking at the impact on employment rates for sole parents, using data from the Household Labour Force Survey.
- Survival analysis looking at the impact on sole parents' movements off benefit, and possibly their movements back onto benefit, using a research dataset of linked MSD and IR administrative information for all Domestic Purposes Benefit–Sole Parent recipients.

The two approaches were well-suited to the available data, which provides the most reliable information on the outcomes of interest, and could control for the effects of the strong economy that prevailed through the period of implementation. They offer complementary perspectives on the impact of WFF on sole parents' labour market behaviour.

[1] http://www.ird.govt.nz/aboutir/reports/research/emp-sole-parents/
http://www.msd.govt.nz/about-msd-and-our-work/publications-resources/evaluation/receipt-working-for-families/

# 2. Background

## 2.1 Employment incentives for sole parents

Sole parents are a diverse group. Some sole parents have the necessary skills and are able to work, while others face multiple barriers to employment.

National and international evidence indicates that effective support for sole parents who are not work-ready includes focusing on confidence, raising skill and employability levels, specialist services that increase levels of social participation, and addressing mental health barriers (OECD, 2008; DoL and MSD, 2002).

Successful interventions for work-ready sole parents focus on providing financial incentives and reducing external barriers, for example improving access to quality childcare and finding jobs with family-friendly hours (OECD, 2008).

New Zealand has promoted the employment of sole parents through introducing:

- the Independent Family Tax Credit in July 1996 (later renamed the Child Tax Credit) payable to families not receiving an income-tested benefit or New Zealand Superannuation
- abatement rates in July 1996 that encourage sole parents receiving Domestic Purposes Benefit (DPB) and Widow's Benefit to work part-time
- work-testing for sole parents with children over the age of 6 years in February 1999 (coinciding with an 8% decline in DPB numbers) and its subsequent replacement with Enhanced Case Management in March 2003 (coinciding with a 4% decline in DPB numbers).

More recently, in April 2006 the government replaced the child tax credit with the in-work tax credit, an employment conditional payment for families, paid through the tax system.

In-work benefits similar to the in-work tax credit have been shown by the OECD to effectively improve work incentives. In-work benefits can be a cost-effective mechanism to 'make work pay' as they also reduce in-work poverty. In-work benefits are most effective when targeted at groups less engaged with the labour market (OECD, 2008).

Increased financial support for working has been shown both nationally and internationally to help encourage sole parents into full-time or part-time work (OECD, 2008; DoL and MSD, 2002). Increased financial support works by providing a financial incentive to work, removing or reducing financial barriers (eg cost of childcare, transportation to work, reduced entitlement abatements) and reducing the risks of moving from benefit into work by providing a stable source of income. Transfers similar to the in-work tax credit in the US and the UK have resulted in an increase in sole parents' employment rates of around five percentage points (OECD, 2008).

## 2.2 The Working for Families package

The in-work tax credit was introduced by the New Zealand government as one of a number of substantial changes to in-work incentives and financial support for families with dependent children. The changes were made as part of the WFF package, which was implemented jointly by the MSD and IR over the period October 2004 to April 2007.

The objectives of these changes as set out by Cabinet (Cabinet Policy Committee, 2004) were to:

- make work pay by supporting families with dependent children, so that they are rewarded for their work effort
- ensure income adequacy, with a focus on low and middle income families with dependent children to address issues of poverty, especially child poverty
- achieve a social assistance system that supports people into work, by making sure that people get the assistance they are entitled to, when they should, and with delivery that supports them into, and to remain in, employment.

Low to middle income families with dependent children were the key target group for the policy changes, which are summarised in Table 1. The components of the WFF package, designed to work together, were (Cabinet Policy Committee, 2004):

- increases in family tax credit rates
- introduction of the in-work tax credit
- changes to the abatement regime of WFF Tax Credits (the name of a group of tax credits targeted at families with dependent children including family tax credit, in-work tax credit, parental tax credit and minimum family tax credit)
- increases in Childcare Assistance for those eligible
- raising of Accommodation Supplement thresholds and rates
- Invalid's Benefit changes to encourage work trials
- replacement of Special Benefit with Temporary Additional Support which is targeted at beneficiaries with higher financial costs
- consequential changes to other social assistance.

Before the policy changes, many low income families were little or no better off in low-paid employment once work-related costs, benefit abatement, other entitlement abatements (eg Accommodation Supplement, Family Assistance and Childcare Assistance) and tax were taken into account. In particular, those with low earnings potential who needed to use paid childcare were generally worse off in paid work than on benefit.

Qualitative interviews with sole parents consistently found that a lack of financial incentives to take up paid work kept some sole parents on benefit (Levine et al, 1993; DoL and MSD, 2002).

The changes to financial incentives and support for work were designed to work together to meet the aim of making work pay for all families. Changes increased the number of families eligible for Accommodation Supplement and Childcare Assistance and increased the levels of payments. These changes removed some of the financial barriers to families moving into work. The introduction of the in-work tax credit provided a specific mechanism to increase the financial benefits of working.

After legislation was passed in November 2005, further changes were made that extended the package to larger numbers of recipients. These changes raised the income threshold and lowered the rate of abatement for income in excess of the threshold. By April 2007 nearly all families with children earning under $70,000, many earning $70,000 to $100,000, and some earning more, qualified for WFF.

Appendix A summarises other policy reforms affecting sole parents that preceded, accompanied or followed WFF.

**Table 1: Timetable of major changes as part of WFF**[1]

| | |
|---|---|
| **October 2004** | **Accommodation Supplement and Childcare Assistance – reduced abatements and increased rates** |
| Purpose | Reducing Accommodation Supplement abatements enabled families moving off benefit to continue to receive support for their housing costs and increased the number of eligible non-beneficiary families. Those earning while in receipt of a benefit no longer had Accommodation Supplement abated.<br><br>Childcare Assistance changes increased the rates by 10%, brought Out-of-School Care rates in line with support for younger children and increased the number of eligible non-beneficiary families. |
| **April 2005** | **Family tax credit increased by $25 per week for the first child and $15 per week for additional children**<br><br>**Child component of main benefits moved into family tax credit**<br><br>**Accommodation Supplement areas increased from three to four, and maximum rates increased**<br><br>**Family tax credit began to be treated as income for Special Benefit** |
| Purpose | Family tax credit changes increased the amount of money families were receiving and increased the number of non-beneficiary families eligible for support.<br><br>Moving the child components of the main benefit aimed to simplify the benefit system. It meant that the net increase in family tax credit for beneficiary families was less than that for working families.<br><br>The new Accommodation Supplement areas acknowledged that there were areas with much higher housing costs than the rest of the country, particularly in Auckland.<br><br>Increased maximum rates of Accommodation Supplement provided more assistance for people with high costs. |
| **October 2005** | **Childcare Assistance rates were increased by another 10%** |
| Purpose | Increased payments for childcare reduced financial barriers to working. |
| **April 2006** | **In-work tax credit replaced the child tax credit, paying a maximum of $60 per week for eligible working families with up to three children and a maximum of $15 per week for each additional child**<br><br>**Thresholds raised and abatements standardised to 20% for WFF Tax Credits**<br><br>**Temporary Additional Support introduced to replace Special Benefit**<br><br>**Minimum family tax credit amount increased** |
| Purpose | The focus of these later changes was on making work pay. The introduction of the in-work tax credit provided an incentive for families to enter into or remain in work.<br><br>More non-beneficiary families became eligible for WFF Tax Credits and received more money due to both in-work tax credit and changes to abatements. |
| **April 2007** | **Family tax credit rates increased by $10 per child per week**<br><br>**Minimum family tax credit increased** |
| Purpose | Family tax credit payments increased for both beneficiary and non-beneficiary families. |
| **October 2008** | **Family tax credit rates and income abatement threshold increased to take account of inflation** |

Notes:
1. Highlighted changes were specifically designed to contribute to the goal of making work pay.

## 2.3 Economic context

The policy changes were introduced during a period of economic buoyancy. Growth in gross domestic product (Statistics NZ, 2008a), low unemployment rates (Statistics NZ, 2008b) and an increased demand for low-skilled workers (NZIER, 2007) all characterised the period over which the policy changes were implemented.

The strong economy and tight labour market are likely to have contributed to changes in sole parents' benefit receipt patterns and employment.

The analysis in this report looks at the extent to which the observed changes in employment rates and benefit receipt patterns were due to the policy changes, over and above the favourable economic and labour market conditions of the time.

# 3. The expected effect of Working for Families on labour supply

This section considers what impact the WFF package was expected to have on labour market outcomes.

As can be seen in the previous section, the WFF changes predominantly affected families with children. Families without dependent children also benefit through the changes to Accommodation Supplement, but these changes were relatively minor in comparison to the main WFF reforms which affected only families with children. Consequently, it was expected that the greatest impacts would be seen among families with dependent children.

Increasing the dollar value of government transfer payments would be expected to alter families' desire to work. In general, assuming leisure is a normal good, the associated income effect would act to reduce the amount of hours worked. However, changes to abatement rates introduce substitution effects meaning that the overall expected impact on employment may be ambiguous.

In the case of WFF, receipt of the in-work tax credit was conditional on exceeding a minimum threshold of hours worked per week (20 hours for sole parents, 30 hours combined for couples). This introduced an unambiguous incentive to work at least at these levels. For sole parents, meeting the threshold for eligibility would have, in many cases, required an increase in employment. Prior to WFF in 2004, only 36% of sole parents worked 20 hours or more per week.

Before the introduction of WFF the Treasury commissioned an estimate of the expected labour market impact of the WFF package. Buddelmeyer et al (2007) used a behavioural micro-simulation model to predict the labour supply response to the changed incentives brought about by the WFF package. Their summary results are reproduced here as Table 2.

The largest effects on labour supply were expected for sole parents, with nearly 2% of sole parents expected to enter the labour force and very few expected to leave it. While it was expected that some sole parents already in employment would reduce their hours (mostly confined to those already working more than 20 hours), average hours worked by sole parents were expected to increase.

**Table 2: Simulated labour supply responses to WFF**[1]

| | **Married** | | **Single** | | |
|---|---|---|---|---|---|
| | Men[2] | Women[2] | Men[3] | Women[3] | Parents |
| All workers (% before reform) | 77.20 | 61.43 | 62.35 | 45.86 | 49.58 |
| Salaried workers[4] (% before reform) | 62.21 | 53.24 | 54.94 | 43.75 | 45.70 |
| Salaried workers[4] (% after reform) | 61.84 | 52.61 | 54.92 | 43.79 | 47.47 |
| **Behavioural response**[5] | | | | | |
| Non-work to work (%-points) | 0.14 | 0.11 | 0.05 | 0.07 | 1.84 |
| Work to non-work (%-points) | 0.50 | 0.74 | 0.07 | 0.03 | 0.07 |
| Workers working more (%-points) | 0.07 | 0.06 | 0.00 | 0.00 | 1.93 |
| Workers working less (%-points) | 0.43 | 0.19 | 0.05 | 0.10 | 2.41 |
| Average hours change (in hours) | -0.22 | -0.23 | -0.03 | -0.02 | 0.63 |

Source: Buddelmeyer et al (2007), Table 12.3

Notes:
1. Percentages in the table apply to the population aged 15 years and over.
2. Married men and women include those with dependent children and those without dependent children.
3. Single men and women are without dependent children.
4. Salaried workers exclude the self-employed.
5. The micro-simulation model assumes that the self-employed, those over 65 years of age, full-time students and disabled individuals do not change their labour supply in response to the policy reforms.

# 4. Data

This section describes the two sources of data that were used to estimate the effect of WFF.

## 4.1 Household Labour Force Survey

The Household Labour Force Survey (HLFS) is an ongoing quarterly survey conducted by Statistics New Zealand (Statistics NZ). Nearly 30,000 individuals from around 15,000 households are surveyed each quarter, and the data collected is used to produce a range of statistics related to the employed, unemployed and those not in the labour force.

The HLFS target population is the civilian, usually-resident, non-institutionalised population of New Zealand aged 15 years and over.

The HLFS sample design uses a rotating panel of households. Households in the sample are surveyed for eight consecutive quarters, with one-eighth of the sample rotating out each quarter. In the first quarter that a household is surveyed, interviews are conducted in person (face-to-face), while interviews in subsequent quarters are generally by telephone.

Other information collected in the survey from each in-scope individual in the household includes: hours worked, whether they are currently studying (at school or for a formal qualification), and basic demographic characteristics such as age, gender, ethnicity[2] and educational qualifications.

In each June quarter (ie interviews conducted in April, May and June), the HLFS includes additional questions relating to income. These additional questions are known as the New Zealand Income Survey (NZIS). The additional questions collect information on income from wages and salaries, self-employment, government transfers (including income-tested benefits) and other sources.

Statistics NZ calculates survey weights that take into account the sample design and survey nonresponse, and that are calibrated to independent population estimates by age group and gender. The calibrated weights are integrated person-household weights, so that all respondents from the same household have the same weight. This weight can then be used as a household weight for analysis where households are the unit of interest.

*Creating a dataset for WFF analysis*

The analysis reported in this study used datasets from June quarters of the HLFS, including responses to the NZIS questions. The datasets have family groups and relationships identified within each household. However, only the datasets from 2001 onwards include records for children aged under 15. For reasons that are discussed later (see Section 5.1.3), we used data for the years 2003 to 2007.

We excluded from our analysis households and families where the family group information from the HLFS is inconsistent or missing for some individuals. This reduced the number of individuals (adults and children) in our data by around 5% from the original datasets.

[2] Ethnicity is self-defined and respondents can identify with more than one ethnic group. However, the ethnicity information on the datasets available to us is 'prioritised' ethnicity. This means that people with multiple responses to the ethnicity question were assigned to only one ethnic group using the following prioritisation: Māori, Pacific peoples, other ethnic groups, New Zealand European. For example, a respondent who reported both Māori and New Zealand European would have been assigned to Māori.

The family groups coded by the HLFS are based on identifying couple relationships and/or parent-child relationships within households, where children can be of any age. In contrast, eligibility for WFF depends on having one or more dependent children.

The WFF definition of a dependent child is a child who is at most 18 years of age and financially dependent (ie not working 30 hours a week or more, and not receiving a student allowance, a benefit or other government assistance). Furthermore, those aged 18 must still be in education.

For our analysis we defined new 'WFF families' in the HLFS datasets based on the WFF definition of a dependent child. This meant that some HLFS children were removed from their HLFS family group to become a separate WFF family if they:

- were aged 19 years or over
- were aged 16 to 18 years and one of the following was true: they usually worked 30 hours a week or more, or they were receiving a student allowance or other government assistance.[3]

Our analysis used data for the WFF families that contained a single adult aged 18 to 64 years, either with or without dependent children. In the analysis, each of these families kept the Statistics NZ survey weight of the household that it belonged to.

Table 3 presents summary statistics on the characteristics of single adult families in 2003, by whether or not they had dependent children.

Sole parents were more likely than singles without children to be female, to be aged 30 to 49 and to be Māori or Pacific peoples. Sole parents were also a little less well qualified in general. For just over a third of sole parents, their youngest child was under the age of five.

[3] A limitation of the datasets available to us is that they do not have full information on the education status of respondents in the years prior to 2007. Consequently, it was not possible to incorporate into our re-definition of families whether the 18 year olds were in education. However, since the required information is available for 2007, it was possible to assess the likely effect of this omission. This indicated that around 90% of 18 year olds were correctly classified.

**Table 3: Characteristics of single-adult families, June quarter 2003**

| Variable | Mean[1] | |
|---|---|---|
| | Sole parents | Single adults without children |
| Female | 0.84 | 0.43 |
| Male | 0.16 | 0.57 |
| Age <20 | 0.01 | 0.11 |
| Age 20–29 | 0.25 | 0.40 |
| Age 30–39 | 0.36 | 0.16 |
| Age 40–49 | 0.30 | 0.13 |
| Age 50–59 | 0.07 | 0.14 |
| Age 60+ | 0.01 | 0.07 |
| New Zealand European | 0.58 | 0.72 |
| Māori | 0.26 | 0.11 |
| Pacific peoples | 0.09 | 0.05 |
| Other ethnicity | 0.07 | 0.12 |
| Number of children | 1.79 | - |
| Youngest child <5 | 0.36 | - |
| Youngest child 5–12 | 0.41 | - |
| Youngest child 13+ | 0.22 | - |
| No qualifications | 0.28 | 0.19 |
| Secondary qualification | 0.24 | 0.33 |
| Other post-secondary qualification | 0.39 | 0.33 |
| Degree | 0.09 | 0.14 |
| Sample size | 1,697 | 5,841 |
| Weighted estimate | 153,000 | 641,900 |

Source: Unpublished Household Labour Force Survey data

Notes:

1. For categorical variables, the means give the proportion of respondents in each category. For example, 84% of sole parents were female and 16% were male.

## 4.2 MSD–IR administrative data

The WFF evaluation has available a series of datasets constructed from the combined administrative records of the MSD and IR, known as the 'WFF Research Datasets'. At the time of this study they contained four years of data from April 2003 to March 2007, and included all families who at some point over this period received a WFF payment.

The data includes monthly amounts of income received from:

- salary and wages from employment
- main benefits[4]
- WFF payments
- some other sources (eg student allowances, New Zealand Superannuation, ACC and Paid Parental Leave).

It also has details of the composition of the family on a monthly basis. Income from self-employment is not included in the monthly data but is available on an annual basis.

[4] MSD defines a beneficiary as a person or family in receipt of a 'main benefit', ie Unemployment, Domestic Purposes, Widow's, Independent Youth, Sickness or Invalid's Benefit or Emergency Maintenance Allowance.

Our analysis focused on estimating the effect of WFF on sole parents in receipt of the Domestic Purposes Benefit–Sole Parent (DPB–Sole Parent).[5]

For computational reasons we selected a 25% random sample, comprising 44,479 individuals, from the population of people who were already receiving DPB–Sole Parent in the first month of data available (April 2003) or who started a spell in receipt of DPB–Sole Parent after April 2003.

For each person in the sample, the analysis data contains information for every month from the first month they were observed on DPB–Sole Parent in the time period covered by the WFF Research Datasets, until March 2007. Preparing the data for analysis involved defining new variables that identify their spells on and off benefit over these months.

The data from the WFF Research Datasets was supplemented with additional data needed for the analysis from the MSD's Benefit Dynamics Dataset, a longitudinal dataset built from benefit administration data. This additional data included benefit start dates for those people in the sample who were already receiving DPB–Sole Parent in April 2003, highest educational qualifications, and the age at which the beneficiaries first became a parent.[6]

Table 4 presents summary statistics from our analysis data on the characteristics of individuals who were receiving DPB–Sole Parent in April 2003.

Sole parents receiving DPB were more likely to be female, to be aged under 30, to be Māori, to have children under the age of five, and to have no or only school level qualifications, compared with all sole parents (Table 3). Just over one-third of the DPB–Sole Parent recipients first became parents when they were teenagers.

[5] The different types of Domestic Purposes Benefit payable are: Sole Parent, Woman Alone, and Care of Sick or Infirm. Most sole parents in receipt of DPB receive DPB–Sole Parent.

[6] Age at entry to parenthood was estimated by comparing the age of the person with the age of the oldest child they had ever had included with them in a benefit they received as a sole parent since 1993. This is not an exact measure since, for example, it is possible they could have had an older child who was never included in an application for benefit or they could have adopted the child(ren).

**Table 4: Characteristics of DPB-Sole Parent recipients, April 2003**

| Variable | Mean[1] |
|---|---|
| Female | 0.91 |
| Male | 0.09 |
| Aged < 20 | 0.03 |
| Aged 20–29 | 0.34 |
| Aged 30–39 | 0.39 |
| Aged 40+ | 0.24 |
| New Zealand European | 0.46 |
| Māori | 0.41 |
| Pacific peoples | 0.09 |
| Other ethnicity | 0.04 |
| Ethnicity missing | 0.01 |
| Number of children | 1.83 |
| Youngest child aged under 5 | 0.47 |
| Youngest child aged 5–12 | 0.42 |
| Youngest child aged 13+ | 0.11 |
| Became parent as teenager | 0.35 |
| Became parent aged 20–25 | 0.40 |
| Became parent aged 26+ | 0.25 |
| No qualifications | 0.48 |
| Highest qualification Level 1[2] | 0.33 |
| Highest qualification Level 2/3[3] | 0.12 |
| Highest qualification Level 4+[4] | 0.06 |
| Highest qualification unknown | 0.01 |
| Sample size | 25,344 |

Source: WFF Research Datasets and MSD's Benefit Dynamics Dataset.

Notes:

1. See explanatory note to Table 3.
2. Highest qualification achieved was one or more School Certificate passes, or attainment at NCEA Level 1.
3. Highest qualification achieved was Sixth Form Certificate, University Entrance, or NCEA Levels 2 or 3.
4. Highest qualification achieved was NCEA Level 4, a post-secondary school qualification, degree or professional qualification.

# 5. Methods

The evaluation used two approaches to estimate the effects of WFF. The first, difference-in-differences (DiD), was based on the HLFS data. The second, survival analysis, used the MSD–IR administrative data. This section describes both of these approaches.

## 5.1 Difference-in-differences

### 5.1.1 The standard DiD estimator

DiD is a standard non-experimental evaluation approach (see, for example, Blundell and Costa Dias, 2000). For a policy targeted to a group of interest (the 'treatment' group), it compares the change in an outcome over time for that group with the corresponding change for a group for which the policy should have no effect (the 'comparison' group).

The intuition behind DiD is that, in the absence of the policy, the outcomes for the treatment and comparison groups would have changed in a similar way over time. A difference in the relationship between the treatment and comparison groups following the introduction of the policy can, under certain assumptions (see Section 5.1.3), be viewed as an estimate of the impact of the policy on the outcome in question.

In this study, the treatment group was all sole parent families and the comparison group was single adults without dependent children.

The primary outcome of interest was the proportion of sole parents who were employed, but we also consider the proportion of sole parents working 20 hours or more and the proportion of sole parents receiving a main benefit.

To illustrate the approach, Table 5 shows the proportion of sole parents and single adults without children who were employed in the June quarters of 2004 and 2006, using our analysis sample derived from the HLFS. The columns labelled 'Difference from 2004' calculate the change in the proportion employed between 2004 and 2006, for sole parents and single adults separately. Then the final column calculates the DiD estimate as the difference between these two differences.

**Table 5: Example calculation of a simple difference-in-differences estimate**

| Year | Sole parents | | Single adults without children | | Difference in differences |
|---|---|---|---|---|---|
| | Percent employed | Difference from 2004 | Percent employed | Difference from 2004 | |
| 2004 | 48.3 | - | 71.5 | - | |
| 2006 | 54.1 | 5.8 | 73.1 | 1.6 | 4.2 |

More formally, suppose $y_i$ is a family-level indicator variable for one of the outcomes of interest. For example:

$$y_i = \begin{cases} 1, & \text{if the adult in family } i \text{ is employed} \\ 0, & \text{if the adult in family } i \text{ is not employed.} \end{cases}$$

And suppose we have data for two periods, $t_0$ and $t_1$, where $t_0 < t_1$ and the policy of interest is introduced at some point between $t_0$ and $t_1$.

Then the simple DiD estimator $\hat{\alpha}_{DiD}$ is:

$$\hat{\alpha}_{DiD} = \left(\bar{y}_{t_1}^{\text{treatment}} - \bar{y}_{t_0}^{\text{treatment}}\right) - \left(\bar{y}_{t_1}^{\text{comparison}} - \bar{y}_{t_0}^{\text{comparison}}\right) \quad (1)$$

where $\bar{y}_t^{\text{treatment}}$ and $\bar{y}_t^{\text{comparison}}$ are the average outcomes for the treatment and comparison groups, respectively, in time period *t*. In our case, for example, $\bar{y}_{t_1}^{\text{treatment}}$ is the proportion of sole parents employed at time $t_1$.

We can re-write equation (1) as:

$$\bar{y}_{t_1}^{\text{treatment}} - \hat{\alpha}_{DiD} = \bar{y}_{t_0}^{\text{treatment}} + \left(\bar{y}_{t_1}^{\text{comparison}} - \bar{y}_{t_0}^{\text{comparison}}\right) \quad (2)$$

and interpret the right hand side of equation (2) as an estimate of the counterfactual, the average outcome that would have been obtained for the treatment group in time period $t_1$ if the policy had not been introduced. Specifically, the counterfactual is estimated as the treatment group's pre-policy level of the outcome, increased by the observed change experienced by the comparison group.

### 5.1.2 DiD as a regression analysis

Simple DiD estimates compare outcomes for the treatment group with outcomes for the comparison group, before and after the policy change. Our focus in this study is on results that come from a commonly-applied extension of the simple DiD approach.

We examined the impact of the policy changes using regression analysis to control for family characteristics that are collected in the HLFS. Including these observable characteristics in the regression can help to account for the variability in outcomes across families, and therefore give more precise estimates of the impact of the policy changes on sole parents.

To see how this works in practice, we first show how the simple DiD approach fits into a regression framework. We write the outcome $Y_{it}$ for a randomly selected single-adult family *i* at time *t* as:

$$Y_{it} = \alpha_0 + \alpha_D D_i + \alpha_T T_i + \alpha_{DiD} D_i T_i + u_i \quad (3)$$

where $D_i$ is a dummy variable indicating whether the family has dependent children, $T_i$ is a dummy variable indicating time period $t_1$, and $u_i$ is the error term.

Equation (3) states that, at time $t_0$, the average level of $Y$ is $\alpha_0$ for those families without children and $\alpha_0 + \alpha_D$ for those with children, ie:

$$E(Y \mid D = 0, T = 0) = \alpha_0$$
$$E(Y \mid D = 1, T = 0) = \alpha_0 + \alpha_D$$

where $E(.)$ indicates expected value.

At time $t_1$, the average level of $Y$ has increased for both groups by an amount $\alpha_T$ and, in addition, those with children have seen their average level increase by a further $\alpha_{DiD}$:

$$E(Y \mid D=0, T=1) = \alpha_0 + \alpha_T$$
$$E(Y \mid D=1, T=1) = \alpha_0 + \alpha_D + \alpha_T + \alpha_{DiD}.$$

It is this last parameter that we interpret as the impact of the policy, which we can re-write as:

$$\begin{aligned}\alpha_{DiD} = &\left[E(Y \mid D=1, T=1) - E(Y \mid D=1, T=0)\right] \\ &- \left[E(Y \mid D=0, T=1) - E(Y \mid D=0, T=0)\right]\end{aligned} \tag{4}$$

The sample version of equation (4) is just the simple DiD estimator we saw above in equation (1).

The regression specification we used in this study is an augmented form of equation (3). We fitted regression models of the form:

$$Y_{it} = \alpha_0 + \alpha_D D_i + \alpha_T T_i + \alpha_{DiD} D_i T_i + \boldsymbol{\beta}' \mathbf{X}_i + u_i \tag{5}$$

where $\mathbf{X}_i$ is a vector of variables to control for other factors influencing the outcome. We included the following characteristics that are observed in the HLFS: age, ethnicity, highest educational qualification and region. We also included the regional unemployment rate to control for variations in local labour market conditions.

Our outcomes of interest were binary in nature (eg employed/not employed), so by using linear regression to fit equation (5) we were assuming a linear probability model (LPM). It is common in the literature to use a LPM rather than a modelling approach that explicitly accounts for the binary nature of the outcome. Blundell and Costa Dias (2009) show that using a probit or logit model requires further restrictions on the basic DiD framework.

The LPM approach retains the appealing simplicity of the DiD approach but has two main limitations:

- First, estimated standard errors from the LPM may be biased because the usual linear model assumption that the error term has constant variance is violated. This can be addressed by calculating robust (heteroskedasticity-consistent) standard errors (Wooldridge, 2002).[7]
- Second, the predicted probabilities resulting from the LPM are not constrained to lie in the [0,1] interval. However, this is most likely to be a worry when considering outlier observations. With DiD analysis, outliers are less of a concern because the focus is on averages for families with/without children before/after WFF.

### 5.1.3 The assumptions behind DiD

For the DiD estimate to have a valid causal interpretation, two conditions must be satisfied.

*Relationship between the treatment and comparison groups*

The first condition is that the outcomes of the comparison group should, in the absence of the policy, track the outcomes of the treatment group.

[7] We used PROC SURVEYREG in SAS.

Clearly it is not possible to observe the extent to which this holds over the period in which the policy is introduced. However, if data further back in time is available, it is possible to explore the extent to which the relationship has held in the past.

A 'pre-programme test' (Heckman and Hotz, 1989) calculates a DiD estimate using data for time periods that pre-date the introduction of the policy. If this shows that outcomes for the treatment and comparison groups changed similarly over that time, then there is some reason to believe that, in the absence of the policy, this relationship would also have held in the period of interest.

Table 6 presents pre-programme tests that looked at changes in our outcomes of interest, for sole parents compared with single adults without children, using HLFS data for the June quarters of 2003 and 2004 (before the first WFF changes in October 2004).

While we also had HLFS datasets for 2001 and 2002 that include sufficient family information, we did not use these in pre-programme tests. This was because other policy changes before the June quarter of 2003 are likely to have differentially affected sole parents – most importantly the removal of work testing for DPB recipients in March 2003.

**Table 6: Pre-programme tests of the relationship between sole parents and single adults without children, 2003–2004**

| Outcome variable | Difference-in-differences estimate[1] (pp) |
|---|---|
| Employed | -4.9 (± 4.2) |
| Working 20 hours or more | -5.9 (± 4.2) |
| Receiving a main benefit | 2.3 (± 4.1) |

Notes:

1. Regression-adjusted difference-in-differences estimates using combined HLFS data from the June quarters of 2003 and 2004, for 18–64 year old sole parents and single adults without children. 95% confidence intervals are in parentheses.

Regression sample size is n=14,311 families.

The pre-programme tests for the first two outcome variables in Table 6 are significantly different from zero. These two estimates are negative because the percentage of sole parents employed and the percentage of sole parents working 20 hours or more decreased between 2003 and 2004, while for single adults without children these outcomes increased.

Although the tests show statistically significant differences, the DiD method is still of use. This is because, during the implementation of WFF, the percentage of sole parents employed and the percentage of sole parents working 20 hours or more increased at a faster rate than those of single adults without children (see Section 6.1 for further discussion). Consequently, the DiD results are likely to be, if anything, underestimates of the impact of WFF.

It is also important to consider whether there are possible causes, other than WFF, for the differences we observe between the treatment and comparison groups over the period between 2004 and 2007 when WFF changes were introduced. It is possible that the effects reported in Section 6.1 may capture some or all of the effects of:

- other reforms implemented over the same period that were aimed at promoting employment among sole parents – principally the Jobs Jolt and Working New Zealand initiatives affecting sole parents receiving benefits, and the enhancements to Paid Parental Leave
- behavioural changes in anticipation of reforms implemented soon after WFF – particularly 20 hours free early childhood education for 3 and 4 year olds from July 2007.

Appendix A has more information on these initiatives. Our expectation is that these other policies will have had a relatively minor impact on sole parents' employment outcomes, so that most of the effects estimated in this study reflect a response to the changes in work incentives resulting from WFF.

*No change in the composition of the treatment and comparison groups*

The second condition required for DiD estimates to be viewed as causal is that the composition of the treatment and comparison groups does not change systematically over time.

By double-differencing, the DiD estimator removes trend effects that are common to the treatment and comparison groups and group-specific effects that remain unchanged over time. However, it does not control for any change in unobserved characteristics that is specific to each group. The assumption required for DiD to yield an estimate that can be viewed as causal is that no such change occurred.

In the context of WFF, this means assuming that unobserved characteristics thought to influence employment outcomes did not change (on average) over the time period considered, to a different extent for sole parents compared with single adults without children.

The main concern about the plausibility of this assumption relates to the question of whether WFF affected fertility. More specifically, if WFF increased the likelihood of a single adult becoming a sole parent (rather than having an additional child), it is conceivable that the changed composition of sole parents might be accompanied by a change in unobserved characteristics likely to influence employment outcomes. If this were the case, the DiD estimates may be biased.

It is also relevant to consider whether WFF affected the probability of being partnered. Again, if there were such an effect, the DiD estimates may be biased.

The question of whether WFF is likely to have influenced fertility is not straightforward to answer. Statistics NZ births data shows a sharp increase in the number of births in 2007 compared to previous years (Statistics NZ, 2007). However, this increase was spread across women of all ages and women do not appear to be becoming mothers earlier. Our exploratory analysis using HLFS data suggested that the increase in births was mostly seen in couple families, and was shared between couples having their first baby and couple families having additional children.

The possibility of investigating whether WFF caused an increase in births is complicated by the fact that there was no temporal, geographic or other variation in the introduction of the package that could be used as a means of identifying any potential effect.

In view of this, it is informative to consider research into the possible fertility effects of comparable programmes in other countries. There is little consensus in the literature regarding the relationship between welfare reform and fertility. Moffitt (1998) surveys the literature on the fertility effects of welfare reform and notes that while there may be an effect, the results do not appear robust. A recent paper by Baughman and Dickert-Conlin (2009) suggests that increased payments of the Earned Income Tax Credit in the US had only very small effects on fertility. Brewer et al (2007) report a significant positive effect in the case of the Working Families Tax Credit in the UK.

Looking at the question of whether financial incentives have an effect on partnering, the evidence in the literature suggests these effects are likely to be small, at least in the US

(Hoynes, 1997; Eissa and Hoynes, 2004). In the case of New Zealand, Fitzgerald et al (2008) find no significant evidence of a WFF effect on partnering.

In view of this evidence, we maintain the assumption that there was no significant compositional change between 2004 and 2007.

## 5.2 Survival analysis

### 5.2.1 Overview

Survival (or duration) analysis is a method of analysing data on the time taken for an event of interest to occur. Survival analysis models can be used to help understand how the variation across individuals in the time taken is related to possible explanatory factors (eg characteristics of the individual).

In this study we considered sole parents in receipt of DBP–Sole Parent and we were interested in the time taken to exit benefit entirely (ie transfers from DPB–Sole Parent to another benefit were not regarded as exits).

We used survival analysis to evaluate the impact of WFF on how quickly sole parents exit benefit after starting a spell of benefit receipt, while controlling for other factors that affect the rate of exit.

For those sole parents who leave benefit, we also examined the time taken until they return to (any) benefit. However, for clarity, in the following subsections we present the details of the approach only for modelling exits.

### 5.2.2 Definition of the hazard function

In the data we have for DPB–Sole Parent recipients from the WFF Research Datasets, periods of time on and off benefit are measured in discrete (monthly) units. That is, for a given individual, we are able to identify in which months they received any income from benefit and which months they did not. Therefore the approach we took to modelling the data is an example of 'discrete-time' survival analysis (Singer and Willett, 1993).

We defined a spell of benefit receipt for an individual as one or more consecutive months in which they received income from benefit. An individual exits benefit in a particular month if they received income from benefit in that month but not in the following month.

For each individual and each month of their spell on benefit we defined an indicator variable for exit:

$$y_{it} = \begin{cases} 1, & \text{if individual } i \text{ exited benefit in month } t \text{ of the spell} \\ 0, & \text{if individual } i \text{ was still on benefit at the end of month } t \text{ of the spell} \end{cases}$$

Table 7 illustrates how spells and exits were coded in the analysis dataset, using a fictitious sole parent with three separate spells on benefit.

This sole parent's first spell was only partially observed in the available data, as they were already receiving DBP–Sole Parent in April 2003. Recall that we used additional information from the MSD's Benefit Dynamics Dataset to find the start date of the current spell in these cases. In this example, the first month this sole parent appeared in the analysis dataset was actually month 12 of their spell on benefit. This spell ended when they exited benefit during June 2003, which was month 14 of the spell. Their second spell on benefit started in August

2004 and lasted for four months before they exited in November 2004. Their third spell on benefit started in January 2007 and did not end before we reach the last month of data available, so for this spell we did not observe an exit from benefit (ie the spell on benefit is 'right-censored').

**Table 7: Spells on, and exits from, benefit for a fictitious sole parent**

| Month | Spell | Month in spell | Exit indicator |
|---|---|---|---|
| Apr 2003 | 1 | 12 | 0 |
| May 2003 | 1 | 13 | 0 |
| Jun 2003 | 1 | 14 | 1 |
| … | | | |
| Aug 2004 | 2 | 1 | 0 |
| Sep 2004 | 2 | 2 | 0 |
| Oct 2004 | 2 | 3 | 0 |
| Nov 2004 | 2 | 4 | 1 |
| … | | | |
| Jan 2007 | 3 | 1 | 0 |
| Feb 2007 | 3 | 2 | 0 |
| Mar 2007 | 3 | 3 | 0 |

The central concept in discrete-time survival analysis is the 'hazard function'. This is defined as the conditional probability of an event occurring at a particular time, given that it has not already occurred.

In our case the hazard function $h_{it}$ for individual $i$ in month $t$ of a spell is:

$$h_{it} = \Pr\left(y_{it} = 1 \mid y_{ik} = 0 \text{ for } k \in \{1,\ldots,t-1\}\right). \quad (6)$$

That is, the probability that individual $i$ exited benefit in month $t$ of the spell, given that they did not exit in months 1, …, $t$ -1.

Related to the hazard function is the 'survivor function' $S_{it}$, which is the probability that individual $i$ was still on benefit at the end of month $t$ of the spell, ie:

$$S_{it} = \Pr\left(y_{ik} = 0 \text{ for all } k \in \{1,\ldots,t\}\right).$$

It is straightforward to show that the survivor function is the product of terms involving the hazard:

$$S_{it} = \prod_{k=1}^{t} \left(1 - h_{ik}\right).$$

### 5.2.3 The hazard model

Our survival analysis model for exits from benefit allowed the hazard function to vary with:

- the length of the individual's current spell of benefit receipt (the 'baseline hazard')
- individual characteristics
- seasonal factors
- the strength of the economy
- the stages of the roll-out of WFF changes.

We assume that the hazard function is related to the explanatory variables through the logit transformation:

$$\log\left(\frac{h_{it}}{1-h_{it}}\right) = \alpha(t) + \boldsymbol{\beta}'\mathbf{X}_{it} \qquad (7)$$

where $\alpha(t)$ is the baseline hazard and $\mathbf{X}_{it}$ is a vector of covariates, the values that individual $i$ had for a set of predictors in month $t$.[8] The explanatory variables that were included in the model are considered in more detail below.

*Baseline hazard*

The baseline hazard characterises how the overall pattern of benefit exits depends on the length of the spell.

The most flexible parameterisation of the baseline hazard would be to allow it to vary month by month. However, we used a more parsimonious piecewise-constant specification, allowing the hazard to:

- vary by month over the first quarter of the spell[9]
- vary by quarter for the remainder of the first year
- be constant over the second year
- be constant at a different rate over years three to five
- be constant at a different rate after five years.

Also, the data shows a higher number of exits around months that are multiples of 12, most likely reflecting the MSD's annual review process for DPB–Sole Parent recipients. To capture this effect we included:

- an additional term in the baseline hazard indicating an 'anniversary' month (ie a variable that takes the value 1 in months 12, 24, … of the spell and 0 otherwise)
- two further terms indicating the month before and the month after this anniversary month (ie months 11, 23, … of the spell and months 13, 25, … of the spell respectively) to account for the possibility of small deviations in the timing of the annual review.

*Individual characteristics*

The individual characteristics in the model included: age, gender, ethnicity, age of becoming a parent and highest qualification.

The model also allowed the hazard rate to alter in response to circumstances that changed in the course of a benefit spell. Variables were included to capture the effect of being partnered, the effect of having dependent children and the age of the youngest child.

This is important as family composition plays an important role in labour supply decisions. For example, those with pre-school aged children may be less able to consider working.

[8] An overview of the estimation approach is given in Section 5.2.4.

[9] Allowing the baseline hazard to vary freely over the first three months means that it could take a different value in each of the first three months of the benefit spell.

Also, eligibility for DPB–Sole Parent requires having dependent children and no partner. Consequently, changes to family composition can change eligibility, leading to benefit exit.

*Seasonal effects*

Monthly time series data on the number of DPB–Sole Parent recipients shows a clear seasonal pattern, with a peak usually coinciding with the end of the school year in December.

This seasonality was captured in the hazard model through the inclusion of dummy variables for each quarter of the year; ie January to March, April to June, etc.

*Controlling for the economy*

Real, production-based, seasonally-adjusted gross domestic product (GDP) was included to control for conditions in the broader economy that might influence benefit receipt. The quarterly GDP series from Statistics NZ was smoothed using a three-month moving-average to produce monthly figures for inclusion in the model.

*Capturing the effects of the policy changes*

The model allowed the hazard to change in each of the time periods following the implementation of a set of WFF changes (as outlined in Table 1).

A dummy variable for the period October 2004 to March 2005 captured the effect of the first stage of roll-out. A dummy variable indicating months between April 2005 and September 2005 captured the combined effect of the October 2004 and April 2005 changes. Similarly, the variable indicating months April 2006 or later captured the combined effects of all the policy changes. It is this last variable that reflects the key impact of interest (ie the effect of all the WFF initiatives combined).

### 5.2.4 Estimation

Allison (1982) shows how the parameters of the discrete-time hazard model in equation (7) can be estimated using standard logistic regression procedures, after re-structuring the data so that there is one record for each time period that each person is at risk of experiencing the event of interest (ie constructing a 'person-period dataset').

This estimation approach can be generalised to reflect the fact that, in our case, multiple spells of benefit receipt were observed for some (around a quarter) of the individuals in the sample.

We estimated the parameters of the model using all benefit spells (from their first receipt of DPB–Sole Parent in the time period of interest) for all the individuals in the sample. Treating multiple spells as independent may result in biased estimates, so we used the Generalised Estimating Equations (GEE) approach of Liang and Zeger (1986) which allows for exits to be correlated across multiple spells for the same individual.[10]

Under GEE, the estimated covariance matrix of the vector $Y_i$ of values of the exit indicator $y_{it}$ for individual $i$, over all the months that they are on benefit, is assumed to depend on a correlation structure that is the same for all individuals. That is, the dependence across multiple spells is assumed to be the same for all individuals and represents an average dependence across individuals.

[10] Estimation was carried out in SAS using PROC GENMOD.

The dependence between multiple spells of benefit receipt for the same individual can be thought of as arising from unobserved heterogeneity in the population – that is, that the lengths of people's spells on benefit differ in ways that are not fully explained by the covariates in the model. This means that multiple spells for the same person are more alike than spells for different people.

An alternative to GEE for dealing with the dependence across multiple spells would have been to use a random effects modelling approach. Introducing an individual-level random effect into the model would account for the unobserved heterogeneity by allowing (some of) the parameters of the model to vary across individuals.

Practically, the greater computational convenience of the GEE approach (or 'marginal' model) became a relevant consideration with the size of the estimation sample, since attempts to implement the random effects approach encountered computational limitations.

Also, the insight provided by the marginal model is in some ways more relevant to the focus of this evaluation. The estimates resulting from a random effects model would show the effect of WFF after controlling for unobserved heterogeneity across individuals. The estimates resulting from the marginal model, on the other hand, show the effect of WFF averaged across the distribution of unobserved heterogeneity. That is, rather than attempting to remove the potential influence of unobserved heterogeneity, the marginal model shows the effect of WFF where unobserved heterogeneity reflects the population average.

### 5.2.5 Modelling re-entry to benefit

We also used survival analysis to evaluate the impact of WFF on how quickly sole parents return to benefit after leaving, while controlling for other factors that affect the rate of re-entry.

The approach detailed above for benefit exits was replicated for modelling the time taken to return to benefit from the start of a spell off benefit. The form of the model and the explanatory variables included were almost identical to the model for exits. The only difference in the model for re-entries was one fewer term in the baseline hazard, as the individuals in the sample couldn't be off benefit for longer than the four years of data we had available.

All spells off benefit (after their first receipt of DPB–Sole Parent in the time period of interest) for each individual in the sample were used to estimate the parameters of the model, using the GEE estimation approach.

### 5.2.6 Modelling the destination of exit from benefit

To better understand the nature of exits from benefit, we carried out an additional analysis that considered the destination of the individual upon exit: exit to employment (meaning that they received income from salary or wages in the month following the end of the spell of benefit receipt) or exit to any other destination. The 'other' category is inevitably broad and captured those who simply stop claiming benefit without entering employment; eg because they acquired a new partner who works or became self-employed.

In the survival analysis literature this is known as a 'competing risks' model.

The hazard function in equation (6) is re-defined to account for the two types of exit, as follows. Let $h_{it}^{(1)}$ be the probability that individual $i$ exited to employment in month $t$ of the

spell, conditional on not exiting before that point, and $h_{it}^{(2)}$ be the probability of any other exit, again conditional on no prior exit.

Then, in an analogous way to the exits model described in Section 5.2.3, we assume that the hazard functions are related to the explanatory variables through a multinomial logit model:

$$\begin{aligned} \log\left(\frac{h_{it}^{(1)}}{h_{it}^{(0)}}\right) &= \alpha_1(t) + \boldsymbol{\beta}_1{}' \mathbf{X}_{it} \\ \log\left(\frac{h_{it}^{(2)}}{h_{it}^{(0)}}\right) &= \alpha_2(t) + \boldsymbol{\beta}_2{}' \mathbf{X}_{it} \end{aligned} \qquad (8)$$

where $h_{it}^{(0)}$ is the conditional probability that neither event occurred to individual *i* in month *t* (ie they remained on benefit). That is, $h_{it}^{(0)} = 1 - \left(h_{it}^{(1)} + h_{it}^{(2)}\right)$.

The form of the baseline hazard function and the explanatory factors included in each part of equation (8) are the same as for the main exits model.

The parameters of the model in equations (8) are again estimated using all benefit spells for each individual in the sample.

Unlike the main survival analysis results, we used a standard multinomial logit procedure that treated individuals' multiple spells as independent.[11] As described in Section 5.2.4, this may introduce a bias and, in view of this, the analysis of exit by destination should be viewed as illustrative rather than robust. However, we note that estimates using only the first spell for each individual (and therefore avoiding the potential multiple spells bias) gave similar results. This provides some reassurance that any potential bias is unlikely to qualitatively alter the results.

[11] PROC LOGISTIC in SAS calls this a generalized logit model.

# 6. Results

## 6.1 Differences-in-differences

This section presents DiD estimates of the effect of WFF on sole parents' employment and benefit receipt outcomes.[12]

The estimates are based on four waves of HLFS data: the June quarters of 2004, 2005, 2006 and 2007. They capture the cumulative effect of the stages of the implementation of WFF by comparing each of 2005, 2006 and 2007 with the pre-WFF state in 2004.

One consequence of using June quarter data, however, is that in the years when WFF changes came into effect at the beginning of April, the impact of those changes is probably not seen in the DiD estimates until the following year. That is, it seems unlikely that we will have seen the full extent of changes in people's behaviour in response to changed incentives when they were interviewed during the first three months following those changes.

In particular, the impact of the key change in April 2006 to introduce the in-work tax credit is unlikely to be seen in the HLFS data for the June quarter of 2006, but should be fully captured in the DiD estimate for 2007.

In the following subsections we present the results for each of the three outcome variables of interest.

### 6.1.1 WFF increased sole parents' employment

Table 8 shows that around two-thirds of the increase in the percentage of sole parents employed between 2004 and 2007 was due to WFF. The percentage of sole parents employed increased from 48.3% in the June quarter of 2004 to 57.7% in the same quarter of 2007 – an increase of 9.4 percentage points (pp). DiD analysis estimates that 6.0pp (± 4.4pp) of this increase was the effect of WFF.

The remaining one-third of the increase in sole parents' employment would have been seen regardless of the introduction of WFF, most likely capturing the strength of the economy over this time.

**Table 8: Impact of WFF on employment for sole parents**

| Year | Sole parents employed[1] (%) | Impact of WFF[2] (pp) | Sole parents employed, without WFF[3] (%) |
|---|---|---|---|
| 2004 | 48.3 | | |
| 2005 | 51.4 | 2.6 (± 4.4) | 48.8 |
| 2006 | 54.1 | 3.9 (± 4.6) | 50.2 |
| 2007 | 57.7 | 6.0 (± 4.4) | 51.7 |

Notes:

1. Unpublished HLFS data for 18–64 year old sole parents with WFF dependent children, June quarters.
2. Regression-adjusted difference-in-differences estimates using combined HLFS data from the June quarters of 2004 and the stated year, for 18–64 year old sole parents and single adults without children. 95% confidence intervals are in parentheses.
3. Counterfactual calculated as the HLFS percentage employed minus the estimated impact of WFF.

Regression sample sizes are n=13,197 families for 2004–2005, n=12,734 for 2004–2006, and n=13,629 for 2004–2007.

[12] The DiD estimates presented here are regression-adjusted estimates that control for covariates observed in the HLFS. See Appendix B for the corresponding 'simple' DiD estimates.

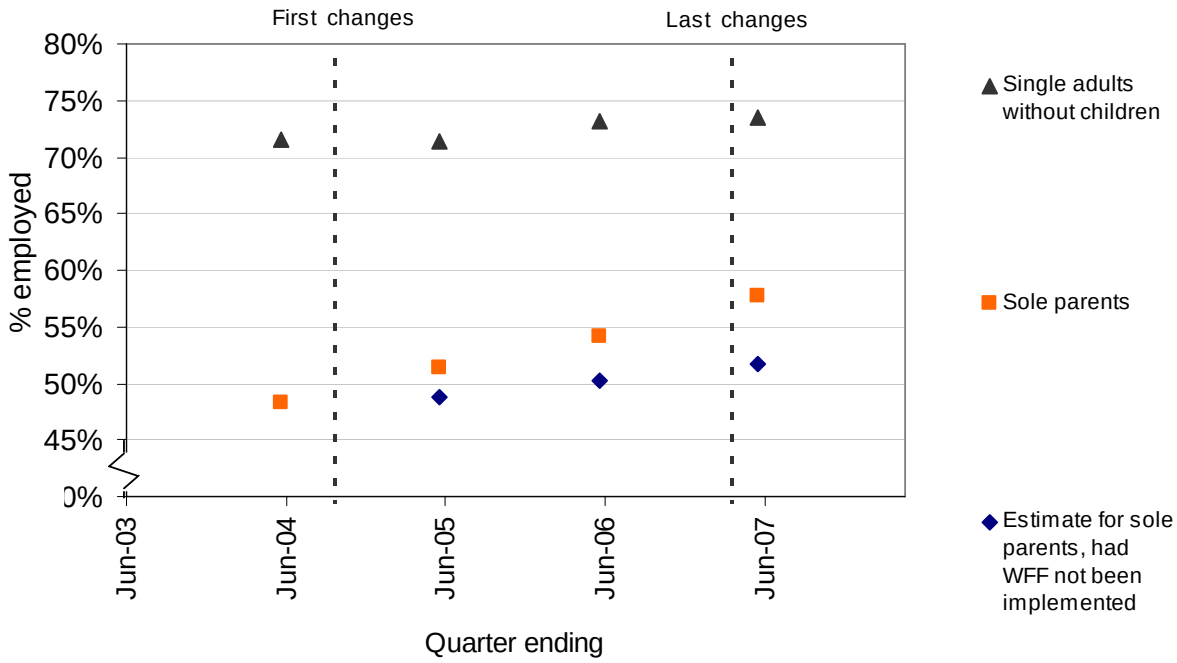
While the effect of the policy changes increased in each successive year of the implementation period, the only effect that was statistically significant was the comparison between the June quarters of 2004 and 2007, after WFF was fully implemented and the in-work tax credit was introduced.

The estimated 6.0pp increase in sole parents' employment equates to around 8,100 additional sole parents engaged in some paid employment in June 2007 due to WFF.[13] This effect was substantially larger than that anticipated by the micro-simulation modelling discussed in Section 3.

Figure 1 shows the contrast between the changes in the percentage of sole parents employed over the time period and the changes seen for single adults without children.

The substantial increase in the percentage of sole parents employed would not have been seen if WFF had not been introduced.

**Figure 1: Changes in the percentage of single adults employed**




Source: Unpublished HLFS data for single 18 to 64 year olds, June quarters.

### 6.1.2 WFF increased hours worked by sole parents

The growth in sole parents' employment was driven by increased numbers of sole parents working 20 or more hours per week. From April 2006, sole parents were eligible for the in-work tax credit if they worked 20 or more hours and were not in receipt of a benefit.

Table 9 shows that the percentage of sole parents meeting the hours threshold for the in-work tax credit increased from 35.9% in the June quarter of 2004 to 47.5% in the same quarter of 2007 – an increase of 11.6pp. DiD analysis estimates that more than three-quarters (9.2pp ± 4.5pp) of this increase was the effect of WFF.

[13] Based on the weighted estimate from our analysis data that there were 134,300 sole parents aged 18–64 in June 2007.

**Table 9: Impact of WFF on sole parents working 20 or more hours**

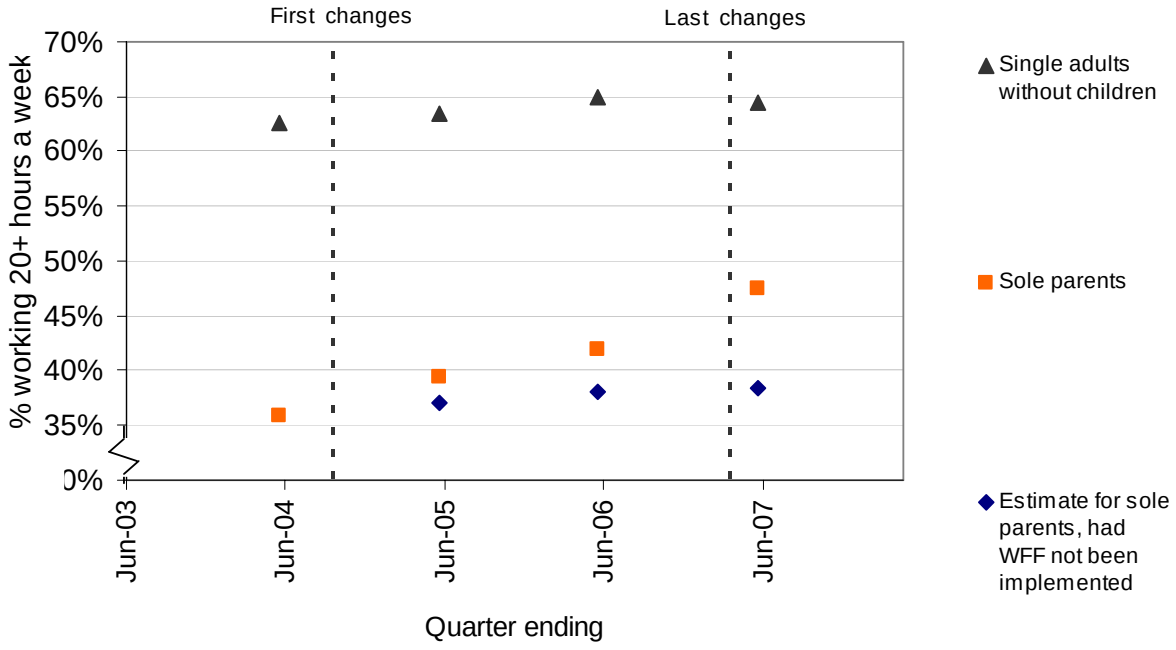
| Year | Sole parents working 20 or more hours[1] (%) | Impact of WFF[2] (pp) | Sole parents working 20 or more hours, without WFF[3] (%) |
|---|---|---|---|
| 2004 | 35.9 | | |
| 2005 | 39.4 | 2.3 (± 4.4) | 37.1 |
| 2006 | 42.0 | 3.9 (± 4.6) | 38.1 |
| 2007 | 47.5 | 9.2 (± 4.5) | 38.3 |

Notes: See explanatory notes 1–3 to Table 8.

Again, it is only in 2007 that the effect of WFF is statistically significant, following smaller increases in 2005 and 2006.

The large increase in the percentage of sole parents working 20 or more hours in 2007 most likely reflects the incentive created by the introduction of the in-work tax credit. This large increase is seen clearly in Figure 2, whereas the percentage of single adults without children working 20 or more hours dropped slightly in 2007.

**Figure 2: Changes in the percentage of single adults working 20 or more hours a week**




Source: Unpublished HLFS data for single 18 to 64 year olds, June quarters.

### 6.1.3 Possible effect of WFF on sole parents' benefit receipt

Care should be taken when using data from the HLFS–NZIS on receipt of benefits. NZIS statistics on the number of beneficiaries are substantially lower than the MSD's official statistics from the benefit administration system. This indicates that there is a problem of under-reporting of benefit receipt in the survey.

It is also apparent from comparisons between the NZIS and the official benefit statistics that the level of under-reporting is not constant over the years of data included in this study, which means that we were unable to adapt the DiD method to allow for this under-reporting.

Bearing this caution in mind, Table 10 suggests that around 10pp of the decrease in the percentage of sole parents receiving a main benefit seen in the HLFS between 2004 and 2007 was due to WFF.

**Table 10: Possible impact of WFF on main benefit receipt for sole parents**

| Year | Sole parents receiving a main benefit[1] (%) | Impact of WFF[2] (pp) | Sole parents receiving a main benefit, without WFF[3] (%) |
|---|---|---|---|
| 2004 | 57.7 | | |
| 2005 | 51.6 | -5.7 (± 4.3) | 57.3 |
| 2006 | 51.0 | -5.4 (± 4.4) | 56.4 |
| 2007 | 45.5 | -9.7 (± 4.3) | 55.2 |

Notes: See explanatory notes 1–3 to Table 8.

However, the survival analysis results in the following section describe the impact of WFF on sole parents' benefit receipt more conclusively.

## 6.2 Survival analysis

This section presents results from survival analysis of the lengths of time that sole parents spent on and off benefit.

The analysis used monthly administrative data from April 2003 to March 2007 for a sample of individuals initially observed in receipt of DPB–Sole Parent.

The following subsections present the results for benefit exits and re-entries. Results from the analysis of the destination of beneficiaries after exit are also presented although, as already discussed, these are somewhat more tentative.

### 6.2.1 Sole parents' periods of benefit receipt were shorter with WFF

Parameter estimates from fitting the hazard model for exits from benefit are presented in Table 11.

*What do the parameter estimates mean?*

Positive coefficients in Table 11 imply that the explanatory variable increased the probability of exit from benefit, while negative coefficients imply a decrease in the probability of exit.

In general, the magnitude of the coefficient reflects the size of the effect of the explanatory variable on the probability of exit, relative to the effect of the other variables in the model. This is because almost all of the explanatory variables were binary variables, taking the values 1 or 0 to indicate the presence or absence of some characteristic. The exceptions were the two numeric variables: number of children (0, 1, 2, etc) and GDP (included in the model in units of billions of dollars).

**Table 11: Hazard model for exits from benefit**

| Explanatory variable | Parameter estimate[1] |
|---|---|
| Intercept | -4.62 (± 0.92) * |
| **Baseline hazard** | |
| Month 1 of spell | 0.50 (± 0.08) * |
| Month 2 of spell | 0.89 (± 0.07) * |
| Month 3 of spell | 0.89 (± 0.07) * |
| Quarter 2 of spell | 0.73 (± 0.05) * |
| Quarter 3 of spell | 0.65 (± 0.05) * |
| Quarter 4 of spell | 0.66 (± 0.06) * |
| Year 2 of spell | 0.43 (± 0.04) * |
| Years 3 to 5 of spell | 0.29 (± 0.04) * |
| Anniversary next month | 0.15 (± 0.04) * |
| Anniversary | 0.34 (± 0.04) * |
| Anniversary previous month | 0.24 (± 0.04) * |
| **Individual characteristics** | |
| Partner | 1.83 (± 0.05) * |
| Female | 0.15 (± 0.05) * |
| Aged Under 20 | -0.56 (± 0.10) * |
| Aged 30–39 | -0.07 (± 0.04) * |
| Aged 40+ | -0.38 (± 0.06) * |
| Māori | -0.11 (± 0.04) * |
| Pacific peoples | -0.07 (± 0.06) * |
| Other ethnicity | -0.21 (± 0.07) * |
| Ethnicity missing | 0.14 (± 0.13) * |
| Number of children | 0.02 (± 0.02) |
| Youngest child aged under 5 | -2.47 (± 0.07) * |
| Youngest child aged 5 to 12 | -2.08 (± 0.07) * |
| Youngest child aged 13+ | -1.67 (± 0.06) * |
| Became parent as teenager | -0.05 (± 0.05) * |
| Became parent aged 20–25 | 0.02 (± 0.04) |
| Level 1 qualification[2] | 0.23 (± 0.04) * |
| Level 2/3 qualification[2] | 0.40 (± 0.04) * |
| Level 4+ qualification[2] | 0.50 (± 0.06) * |
| Unknown qualification | 1.30 (± 0.19) * |
| **Seasonal effects** | |
| Jan–Mar | 0.29 (± 0.03) * |
| Apr–Jun | 0.14 (± 0.04) * |
| Jul–Sep | 0.10 (± 0.04) * |
| **Strength of the economy** | |
| Real production GDP | 0.07 (± 0.03) * |
| **WFF effects** | |
| Oct 2004–Mar 2005 | 0.02 (± 0.05) |
| Apr 2005–Sep 2005 | 0.01 (± 0.06) |
| Oct 2005–Mar 2006 | 0.01 (± 0.06) |
| Apr 2006–Mar 2007 | 0.09 (± 0.07) * |

Notes:

1. 95% confidence intervals are in parentheses. Parameter estimates marked with an asterisk are significantly different from zero, at the 5% level of significance.
2. See explanatory notes to Table 4.

Sample size is n=44,479 individuals.

Interpreting precisely what the numeric values of the parameter estimates in Table 11 mean is not so straightforward, but will be more accessible to readers with some experience of logistic regression models.

Consider a categorical predictor that is included in the hazard model via a set of dummy variables – one dummy variable for each category except a 'reference category'. Then the parameter estimate for the dummy variable representing a particular category is the log (natural logarithm) of the estimated odds ratio for exiting benefit for a person in that category compared to a person in the reference category, controlling for the other explanatory variables in the model.[14]

For example, gender is included in the model by the single dummy variable 'Female' which takes the value 1 for females and 0 for males (ie the reference category is 'Male'). From Table 11 the parameter estimate for 'Female' is 0.15. This means that the odds of exiting benefit in any month of a spell, conditional on not having exited in the previous months, were estimated to be 1.16 ($e^{0.15}$) times greater for women than for men[15], controlling for the other explanatory variables in the model.[16]

We discuss the most important aspects of the modelling results in more detail in what follows.

*What were the important influences on the probability of benefit exit for sole parents?*

The parameters of the baseline hazard show how the probability of exit changed with the length of time on benefit. Exits were more likely towards the start of a spell – the probability was highest in months 2 and 3 – but became progressively less likely the longer a sole parent remained on benefit.

The increase in the probability of exit around the time of the DPB annual review is also clear from the parameters for the anniversary dummy variables.

The individual characteristics that had the biggest influence on the probability of exit were the presence of a partner and the presence and age of children.

Sole parents who gained a partner were then more likely to exit benefit.

The reference category for the age of youngest child variables in the model is 'No children', so, taken as a group, these parameters reflect that sole parents were much more likely to exit benefit when they no longer had dependent children.[17] But also, comparing the parameters for the age of youngest child variables shows that those with children under 5 were less likely to exit benefit than those whose youngest child is aged 5 to 12, who in turn were less likely to exit than those who only had children aged 13 and over.[18]

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[14] Controlling for the other explanatory variables in the model means we are comparing the odds of exiting benefit for a person in the category of interest with the odds of exiting benefit for a person in the reference category having identical values for all the other explanatory variables in the model.

[15] In general, this does not mean that the probability of exit for women is 1.16 times greater than that for men, as probability and odds have different meanings. If the probability of an event is $p$, then the odds of the event are defined to be $p/(1-p)$. The ratio of the probabilities of an event for two groups (or 'relative risk') and the odds ratio are approximately the same when the probabilities are small, but in general the relative risk is closer to 1 than the odds ratio.

[16] For an example using a quantitative predictor, exponentiating the parameter estimate for GDP in Table 11 would give the multiplicative effect on the odds of benefit exit associated with a $1 billion increase in real, seasonally adjusted, quarterly GDP, if the other explanatory variables in the model were held constant.

[17] Recall that the model is characterising the time to exit benefit entirely. An individual with a partner or with no dependent children would no longer have been eligible to receive DPB–Sole Parent, but may have transferred to another main benefit.

[18] Even though the parameter estimate for 'Unknown qualification' is also relatively large, in practice this is not particularly important in the model because there are few individuals in the data falling in this category (see Table 4).

The seasonal dummy variables all have positive parameter estimates, which means that the probability of exit was higher in the first three quarters of each year than in the October to December quarter. The probability of exit being lowest in the October to December quarter of each year fits with the (school holiday) seasonal peak in official DPB statistics.

The coefficient for GDP is positive and statistically significant, indicating that the probability of benefit exit was higher when the economy was stronger.

*What effect did WFF have?*

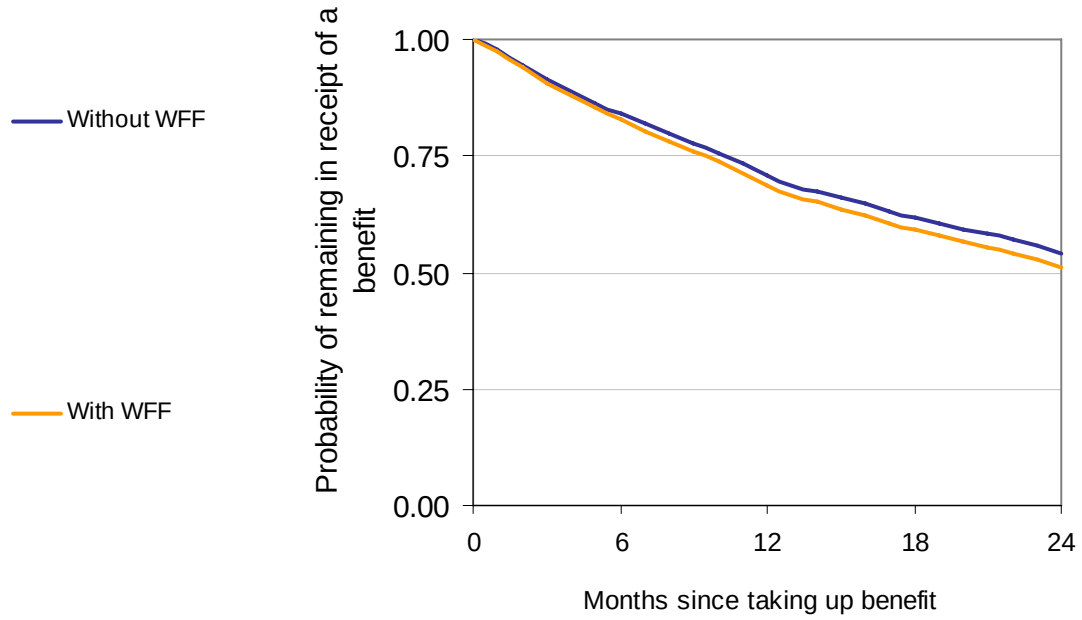
The last four explanatory variables in Table 11 relate to WFF. As with the DiD results in Section 6.1, the parameter estimates here describe the cumulative effect of the stages of roll-out of the WFF changes.

The parameter estimates associated with the WFF changes before April 2006 are not significantly different from zero. However, when the changes introduced in April 2006 are also included, we see that WFF significantly increased the probability of benefit exit.

The size of the parameter estimate for 'April 2006–March 2007' suggests that the odds of a sole parent exiting benefit in any month of a spell, conditional on not having exited in the previous months, were 1.09 times (or 9%) greater with WFF fully implemented compared with the pre-WFF period, controlling for the other explanatory variables in the model.

A useful way to illustrate this result is presented in Figure 3. This plots 'survival curves', which are predictions from the model of the survivor function – the probability of remaining on benefit in each month since the start of a spell.

**Figure 3: Survival curves for the time until benefit exit for an average sole parent**[1]




Notes:
1. These are estimated probabilities from the survival analysis model for benefit exits, for a hypothetical sole parent on benefit having average characteristics.

The line labelled 'With WFF' summarises the pattern of exits in the situation where all the stages of WFF are in place, whereas the line labelled 'Without WFF' corresponds to the

situation if the WFF changes had not been introduced. The predicted probabilities were calculated holding all the other explanatory variables in the model constant at their average values (taken across all spells on benefit and all individuals in the sample), so that we can think of them as predictions for a hypothetical average sole parent on benefit.

The difference between the two lines is a graphical illustration of the effect of WFF estimated by the model.

In Figure 3, the 'With WFF' line lies below the 'Without WFF' line, indicating that after WFF was implemented, sole parents initially observed on DPB–Sole Parent were exiting benefit sooner than they would have had WFF not been introduced.

Table 12 highlights the gap between the lines in Figure 3 at two specific spell lengths, showing the estimated effect of WFF on the probability of remaining on benefit at 12 and 24 months after the start of a spell. The difference was 2pp after one year, growing to 3pp after two years.

**Table 12: Summary of the effect of WFF on an average sole parent's time to exit benefit**[1]

| | Probability of remaining on benefit after | | Median time on benefit (months) |
|---|---|---|---|
| | 12 months | 24 months | |
| Without WFF | 0.71 | 0.54 | 28 |
| With WFF | 0.69 | 0.51 | 25 |
| Difference | -0.02 | -0.03 | -3 |

Notes:
1. These results are estimates from the survival analysis model for benefit exits, for a hypothetical sole parent on benefit having average characteristics.

Table 12 also uses the survival curves in Figure 3 to provide some quantification of how much less time sole parents spent on benefit following the introduction of WFF. The estimated median length of a spell on benefit for an average sole parent was three months shorter with WFF.[19]

### 6.2.2 Sole parents previously on benefit were staying off benefit longer with WFF

Parameter estimates from fitting the hazard model for re-entries to benefit are presented in Table 13.

The interpretation of the parameters is similar to Table 11 – here positive coefficients imply that explanatory variable increased the probability of returning to benefit, while negative coefficients imply a decrease in the probability of a re-entry.

[19] The medians were found from Figure 3 by identifying the points where the survival curves cross a horizontal line through probability 0.5. This means that there is equal probability of a spell being shorter or longer than the median.

**Table 13: Hazard model for re-entries to benefit**

| Explanatory variable | Parameter estimate[1] |
|---|---|
| Intercept | -2.60 (± 1.86) * |
| **Baseline hazard** | |
| Month 1 of spell | 1.63 (± 0.08) * |
| Month 2 of spell | 1.25 (± 0.08) * |
| Month 3 of spell | 1.03 (± 0.09) * |
| Quarter 2 of spell | 0.81 (± 0.08) * |
| Quarter 3 of spell | 0.61 (± 0.08) * |
| Quarter 4 of spell | 0.54 (± 0.09) * |
| Year 2 of spell | 0.18 (± 0.07) * |
| Anniversary next month | -0.20 (± 0.09) * |
| Anniversary | -0.09 (± 0.09) |
| Anniversary previous month | 0.11 (± 0.09) * |
| **Individual characteristics** | |
| Partner | -0.60 (± 0.05) * |
| Female | -0.32 (± 0.06) * |
| Aged Under 20 | 0.41 (± 0.16) * |
| Aged 30–39 | -0.08 (± 0.05) * |
| Aged 40+ | 0.01 (± 0.07) |
| Māori | 0.29 (± 0.04) * |
| Pacific peoples | 0.10 (± 0.07) * |
| Other ethnicity | 0.17 (± 0.10) * |
| Ethnicity missing | -0.57 (± 0.20) * |
| Number of children | -0.02 (± 0.02) * |
| Youngest child aged under 5 | 1.24 (± 0.09) * |
| Youngest child aged 5 to 12 | 0.95 (± 0.08) * |
| Youngest child aged 13+ | 0.83 (± 0.09) * |
| Became parent as teenager | 0.24 (± 0.06) * |
| Became parent aged 20–25 | 0.08 (± 0.06) * |
| Level 1 qualification[2] | -0.27 (± 0.05) * |
| Level 2/3 qualification[2] | -0.48 (± 0.06) * |
| Level 4+ qualification[2] | -0.43 (± 0.08) * |
| Unknown qualification | -1.86 (± 0.34) * |
| **Seasonal effects** | |
| Jan–Mar | -0.10 (± 0.04) * |
| Apr–Jun | -0.21 (± 0.05) * |
| Jul–Sep | -0.18 (± 0.05) * |
| **Strength of the economy** | |
| Real production GDP | -0.05 (± 0.06) |
| **WFF effects** | |
| Oct 2004–Mar 2005 | -0.03 (± 0.07) |
| Apr 2005–Sep 2005 | -0.06 (± 0.10) |
| Oct 2005–Mar 2006 | -0.08 (± 0.11) |
| Apr 2006–Mar 2007 | -0.19 (± 0.12) * |

Notes: See explanatory notes to Table 11.
Sample size is n=23,803 individuals.

*What were the important influences on the probability of benefit re-entry for sole parents?*

The parameters for the baseline hazard show that re-entry to benefit was most likely immediately after leaving benefit, but then became progressively less likely the longer a sole parent remained off benefit.

Some of the key influences on the probability of re-entry to benefit are the same as for benefit exits but with the effects working in the opposite direction, namely:

- the presence of a partner decreased the probability of re-entry to benefit
- having younger children made a return to benefit more likely
- the probability of re-entry was highest in the October to December quarter of each year.

The coefficient for GDP has the expected sign – the probability of returning to benefit was lower when the economy was stronger. However, this effect fails to achieve statistical significance, suggesting that the economy does not play as important a role with re-entries to benefit as it does with benefit exits.

*What effect did WFF have?*

The parameter estimates for the last four explanatory variables in Table 13 describe the cumulative effect of the stages of roll-out of the WFF changes. As with the results for exits, it is only when the changes introduced in April 2006 are included that we see a statistically significant reduction in the probability of benefit re-entry.

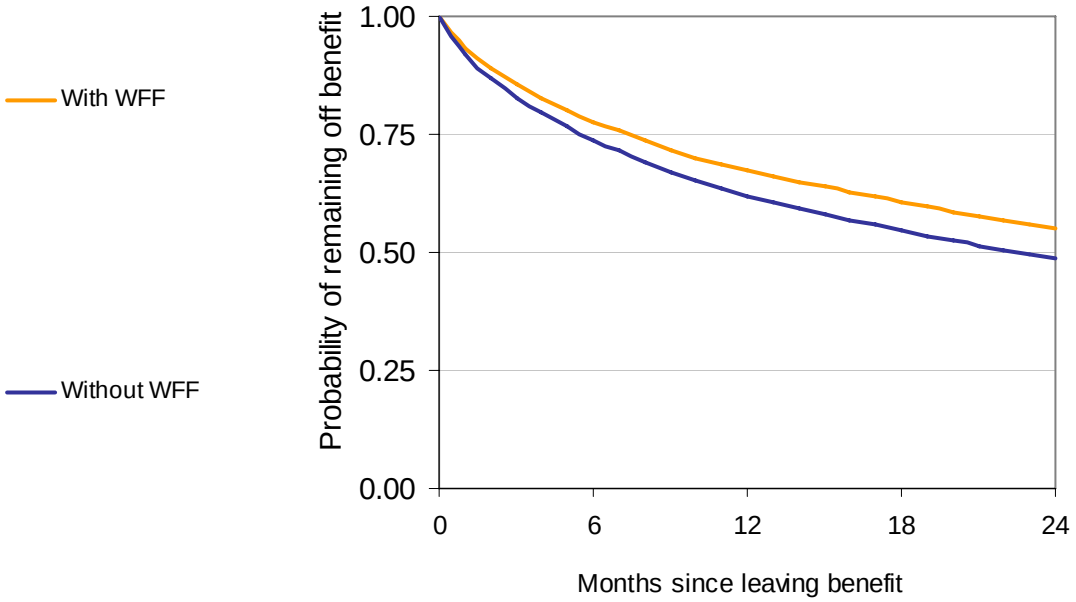
The parameter estimate for 'April 2006–March 2007' suggests that the odds of a sole parent returning to benefit in any month with WFF fully implemented were 0.83 times that (ie 17% less than) in the pre-WFF period, controlling for the other explanatory variables in the model.

Figure 4 again uses survival curves to provide a graphical illustration of this result. Here the predicted probabilities were calculated for a hypothetical average sole parent previously on benefit, where the averages were taken across all spells off benefit for all individuals in the sample.

In contrast to the survival curves for exit from benefit (Figure 3), here the 'With WFF' line lies above the 'Without WFF' line. This indicates that after WFF was implemented, sole parents (initially observed on DPB–Sole Parent) who had exited benefit were returning to benefit later than they would have had WFF not been introduced.

The gap between the 'With WFF' and 'Without WFF' curves is larger in Figure 4 than in Figure 3.

**Figure 4: Survival curves for the time until benefit re-entry for an average sole parent**[1]




Notes:
1. These are estimated probabilities from the survival analysis model for benefit re-entries, for a hypothetical sole parent having average characteristics for sole parents previously on benefit.

Table 14 also shows that the estimated effect of WFF was greater for re-entries to benefit than for benefit exits. The difference WFF makes to the probability of remaining off benefit was 5pp after 12 months and 6pp after 24 months. The estimated median length of a spell off benefit for an average sole parent was eight months longer with WFF.

**Table 14: Summary of the effect of WFF on an average sole parent's time to return to benefit**[1]

| | Probability of remaining off benefit after | | Median time off benefit (months) |
|---|---|---|---|
| | 12 months | 24 months | |
| Without WFF | 0.62 | 0.49 | 23 |
| With WFF | 0.67 | 0.55 | 31 |
| Difference | +0.05 | +0.06 | +8 |

Notes:
1. These results are estimates from the survival analysis model for benefit re-entries, for a hypothetical sole parent having average characteristics for sole parents previously on benefit.

### 6.2.3 The effect of WFF on benefit exits was mostly on exits to employment

Table 15 presents the parameter estimates from fitting the competing risks hazard model that takes into account the destination of sole parents after exit from benefit.

As discussed earlier (see Section 5.2.6) 'exit to employment' includes individuals who received income from salary or wages in the month immediately following the last month that they received a benefit payment, but does not capture employment in any later month or income from self-employment.

The parameter estimates for both types of exit are broadly similar to those for all exits (Table 11). Of interest in Table 15 is that a statistically significant impact for the April 2006 WFF changes is only seen for exits to employment.

**Table 15: Hazard model for destination of exit from benefit**

| Explanatory variable | Parameter estimate[1] | |
|---|---|---|
| | Exit to employment | Other exit |
| Intercept | -4.84 (± 1.18) * | -4.23 (± 1.64) * |
| **Baseline hazard** | | |
| Month 1 of spell | 1.02 (± 0.07) * | 0.46 (± 0.11) * |
| Month 2 of spell | 1.32 (± 0.07) * | 0.93 (± 0.10) * |
| Month 3 of spell | 1.25 (± 0.07) * | 1.03 (± 0.10) * |
| Quarter 2 of spell | 1.09 (± 0.05) * | 0.80 (± 0.08) * |
| Quarter 3 of spell | 0.94 (± 0.06) * | 0.75 (± 0.08) * |
| Quarter 4 of spell | 0.91 (± 0.06) * | 0.74 (± 0.09) * |
| Year 2 of spell | 0.59 (± 0.05) * | 0.49 (± 0.07) * |
| Years 3 to 5 of spell | 0.32 (± 0.04) * | 0.32 (± 0.06) * |
| Anniversary next month | 0.16 (± 0.06) * | 0.15 (± 0.08) * |
| Anniversary | 0.35 (± 0.05) * | 0.34 (± 0.07) * |
| Anniversary previous month | 0.30 (± 0.06) * | 0.23 (± 0.08) * |
| **Individual characteristics** | | |
| Partner | 1.47 (± 0.04) * | 2.21 (± 0.04) * |
| Female | 0.18 (± 0.04) * | 0.12 (± 0.06) * |
| Aged Under 20 | -0.97 (± 0.14) * | -0.24 (± 0.13) * |
| Aged 30–39 | 0.04 (± 0.04) * | -0.25 (± 0.05) * |
| Aged 40+ | -0.14 (± 0.05) * | -0.79 (± 0.07) * |
| Māori | -0.09 (± 0.03) * | -0.09 (± 0.04) * |
| Pacific peoples | -0.17 (± 0.05) * | 0.11 (± 0.06) * |
| Other ethnicity | -0.49 (± 0.08) * | 0.26 (± 0.08) * |
| Ethnicity missing | 0.09 (± 0.11) | 0.12 (± 0.18) |
| Number of children | -0.05 (± 0.02) * | 0.11 (± 0.02) * |
| Youngest child aged under 5 | -2.13 (± 0.06) * | -2.89 (± 0.07) * |
| Youngest child aged 5 to 12 | -1.49 (± 0.05) * | -2.93 (± 0.07) * |
| Youngest child aged 13+ | -1.16 (± 0.06) * | -2.53 (± 0.08) * |
| Became parent as teenager | 0.01 (± 0.05) | -0.13 (± 0.06) * |
| Became parent aged 20–25 | 0.10 (± 0.04) * | -0.11 (± 0.05) * |
| Level 1 qualification[2] | 0.25 (± 0.03) * | 0.14 (± 0.04) * |
| Level 2/3 qualification[2] | 0.42 (± 0.04) * | 0.30 (± 0.06) * |
| Level 4+ qualification[2] | 0.52 (± 0.05) * | 0.36 (± 0.08) * |
| Unknown qualification | 1.16 (± 0.14) * | 1.28 (± 0.17) * |
| **Seasonal effects** | | |
| Jan–Mar | 0.35 (± 0.04) * | 0.22 (± 0.05) * |
| Apr–Jun | 0.18 (± 0.05) * | 0.09 (± 0.06) * |
| Jul–Sep | 0.13 (± 0.05) * | 0.07 (± 0.06) * |
| **Strength of the economy** | | |
| Real production GDP | 0.04 (± 0.04) * | 0.04 (± 0.05) |
| **WFF effects** | | |
| Oct 2004–Mar 2005 | 0.02 (± 0.06) | 0.01 (± 0.08) |
| Apr 2005–Sep 2005 | 0.03 (± 0.08) | -0.01 (± 0.11) |
| Oct 2005–Mar 2006 | 0.01 (± 0.08) | 0.02 (± 0.11) |
| Apr 2006–Mar 2007 | 0.12 (± 0.09) * | 0.05 (± 0.12) |

Notes: See explanatory notes to Table 11.
Sample size is n=44,479 individuals.

As with overall exits from benefit, Table 16 provides some quantification of the impact of the WFF effect in the competing risks model, by calculating the predicted probabilities of the two types of exit from benefit for a sole parent on benefit having average characteristics.

**Table 16: Summary of the effect of WFF on exit from benefit for an average sole parent, by destination of exit**[1]

| | Probability of exit to employment within | | Probability of any other exit within | |
|---|---|---|---|---|
| | 12 months | 24 months | 12 months | 24 months |
| Without WFF | 0.21 | 0.32 | 0.08 | 0.12 |
| With WFF | 0.24 | 0.35 | 0.08 | 0.13 |
| Difference[2] | +0.02 | +0.03 | 0.00 | 0.00 |

Notes:

1. These results are estimates from the survival analysis model for competing risks of benefit exit, for a hypothetical sole parent on benefit having average characteristics.
2. Due to rounding, the 'Difference' figure may not exactly equal the figure derived from subtracting the 'Without WFF' figure from the 'With WFF' figure.

The size of the increases in the probability of exit to employment with WFF – 2pp and 3pp after 12 and 24 months respectively – match up with the decreases in the probability of remaining on benefit seen earlier (Table 12). In contrast, WFF had no substantive effect on the probability of other exits.

Clearly, the effect of WFF to speed up exits from benefit operated mainly through exits to employment rather than to other destinations.

# 7. Discussion

This study used two sources of data and two modelling approaches to estimate the effect of WFF on labour market outcomes for sole parents.

The difference-in-differences results, using HLFS data, indicate that the WFF changes to financial incentives and supports for work caused an increase in the percentage of sole parents employed and an increase in the percentage of sole parents working 20 or more hours a week. The size of the effect on sole parents' employment was greater than had been predicted prior to WFF being introduced.

Survival analysis, using MSD–IR administrative data, offers a different perspective by considering a specific group of sole parents – those receiving DPB–Sole Parent. The survival analysis results provide an insight into the process by which the overall impacts for sole parents arose. WFF appears both to speed sole parents' exits from benefit (exits to employment, in particular) and to reduce the rate at which sole parents return to benefit once they have left.

The survival analysis does not provide a full answer as to what drove the overall impact of WFF, however, because it did not consider sole parents who were not in receipt of DPB over the time period of interest. It is possible that a further effect of WFF may have been to reduce the likelihood of sole parents entering benefit in the first place.

The intention of the analysis in this report was to estimate the impact of the WFF package as a whole. Both the difference-in-differences and survival analysis results indicate that it is only when the April 2006 changes are included that the estimated impacts are statistically significant.

The in-work tax credit was introduced (and the abatement threshold of the family tax credit was increased) in April 2006 after the earlier WFF changes had addressed some of the financial barriers to work. The earlier changes increased childcare assistance to subsidise childcare, increased accommodation supplement thresholds (which allowed families to move into work without losing their accommodation supplement) and increased family tax credit rates. It may be that the in-work tax credit would not have been effective had these other WFF elements not already been in place.

While it is not possible to separate out the impact of the April 2006 changes in isolation, the introduction of the in-work tax credit certainly provided an unambiguous incentive to leave benefit entirely and to work at least 20 hours per week. It seems likely that this was a key driver behind the observed effects on sole parents' labour market behaviour.

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# Appendix A: Other reforms that preceded, accompanied and followed Working for Families

WFF followed more than a decade of reforms aimed at promoting employment among sole parents. It was accompanied and followed by reforms that sought to give parents generally more choice in combining parenting and work (Table A1).

This section summarises some of the wider reforms.

**Table A1: Key reforms affecting sole parents with dependent children 1991–2008**

| | | |
|---|---|---|
| | April 1991 | Reductions in benefit rates. $6 per child universal Family Benefit abolished and Family Support tax credit increased by $6 and made payable through the year |
| | February 1992 | Existing Childcare Subsidies for pre-school children streamlined and refocused. Low income parents in employment, education or training qualify for an increased rate of subsidy for up to 30 hours subsidised care |
| | October 1993 | Family Support rates for second and subsequent children generally increased (some reductions for older children) |
| | October 1994 | Family Support rates for second and subsequent children aged 0–12 increased, abatement threshold increased |
| **Tax Reduction and Social Policy package** | July 1996 | Dual abatement introduced for DPB and Widow's Benefit (WB) |
| | July 1996 | Independent Family Tax Credit introduced and rates of Family Support increased |
| | April 1997 | Part-time work-or-training test (DPB or WB) with youngest child aged 14+) |
| | July 1997 | Independent Family Tax Credit and rates of Family Support increased |
| | August 1997 | COMPASS voluntary welfare to work facilitation programme available nationally |
| | January 1998 | Youth Income Support package: age of eligibility for some benefits increased to 18 years old<br>Rate of Family Support payable for 16 and 17 year old dependent children increased |
| | February 1999 | Full-time work test (DPB or WB with youngest child aged 14+) |
| | | Part-time work test (DPB or WB with youngest child aged 6–13) |
| | | Childcare Assistance made available for school-aged children in approved programmes |
| | October 1999 | Parental Tax Credit introduced for parents with new babies |
| | February 2001 | Maximum hours for Childcare Assistance increased to 37 |
| | July 2002 | 12 weeks Paid Parental Leave introduced |

| | | |
|---|---|---|
| | Mar 2003 | WB and DPB Personal Development and Employment Plans and Enhanced Case Management introduced, work tests removed for DPB and WB recipients, COMPASS discontinued |
| | July 2003 | Maximum hours for Childcare Assistance increased to 50<br>Introduction of Jobs Jolt (some time time-limited components, including the Supporting Sole Parents into Work initiative, apply until 2006) |
| | April 2004 | Abatement thresholds for Family Assistance increased |
| **Working for Families package** (see Table 1 for details) | October 2004 | WFF first changes to Accommodation Supplement and Childcare Assistance |
| | April 2005 | WFF changes – increases in family tax credit rates, Accommodation Supplement changes |
| | October 2005 | WFF changes – Childcare Assistance increases 10% |
| | April 2006 | WFF changes – introduction of in-work tax credit, threshold and abatement changes for WFF Tax Credits |
| | April 2007 | WFF final changes – increases to family tax credit and minimum family tax credit |
| | July 2006 | Paid Parental Leave extended to self employed |
| | September 2006 | Working New Zealand: Job Search Service (JSS) rolled out |
| | July 2007 | 20 hours free Early Childhood Education for three and four year olds in teacher-led services introduced |
| | September 2007 | Working New Zealand: discretion to not require personal development and employment planning introduced for DPB and WB clients alongside new provision to require participation in activities that will increase readiness for work |
| | October 2008 | Increases due to indexation of WFF Tax Credits come into effect |

## A.1 Naming of WFF Tax Credits

The components of WFF Tax Credits have experienced a number of changes over the years they have been in effect. Table A2 presents what these are and what they have been known as.

**Table A2: Naming of WFF Tax Credits**

| Current name | Previously known as |
|---|---|
| Working for Families Tax Credits (WFF Tax Credits / WFFTC) | Family Assistance (FAM)<br>Family Assistance Plus |
| Family tax credit (ftc) | Family Support<br>Family Support Tax Credit |
| Minimum family tax credit (mftc) | Family Tax Credit<br>Guaranteed Minimum Family Income |
| In-work tax credit (iwtc) | In-work payment |
| Child tax credit (ctc) | Independent Family Tax Credit |

## A.2 Incentives and work expectations for sole parents receiving main benefits prior to WFF

When it was introduced in 1973, the DPB aimed to protect sole parents from poverty while allowing them to provide full-time care for their children.

Reforms introduced in the 1990s saw a shift in purpose towards promoting self-reliance through paid work.[20] These reforms included:

- reductions in rates of payment for main benefits
- the introduction of a dual abatement regime in 1996 which provided sole parents receiving DPB or Widow's Benefit (WB) with additional financial incentives to work part-time while receiving benefit
- the introduction and extension of work tests for sole parents receiving DPB or WB with older children.

The Tax Reduction and Social Policy package, which introduced some of these reforms, cut rates of personal income taxes, increased rates of Family Support and, in 1996, introduced the Independent Family Tax Credit (later renamed the Child Tax Credit) payable to families not in receipt of significant state support.[21]

Between the introduction of these changes and WFF, there was no further indexation or adjustment of Family Assistance rates or the thresholds for abatement.[22] This led to a slow erosion of the real value of such benefits for families both on and off benefits.

In March 2003, work tests were removed for sole parents with older children receiving DPB or WB and replaced with a requirement for all recipients of these benefits to participate in Personal Development and Employment Planning after the grant of benefit. This reform retained a focus on paid employment as the key to improving social and economic outcomes but shifted to a more facilitative 'Enhanced Case Management' approach. This approach allowed sole parents to make their own decisions about how to balance work and caring responsibilities.

Additional measures to make work pay for sole parents receiving benefits that were considered at the time the 2003 reform was developed fed into the WFF package.

## A.3 Childcare Assistance

Since the early 1990s, changes both in the direct funding of providers of early childhood education services and in the subsidies available to low-income parents have contributed to an expansion of services.

In 1992, existing Childcare Subsidy programmes were refocused and the rate of subsidy available to parents on low incomes in paid employment, education or training was increased. The Childcare Subsidy subsidised up to 30 hours of care in licensed day-care and childcare centres for pre-school children. The maximum hours of care per child were later increased to 37 per week in February 2001 and to 50 hours per week in July 2003.

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[20] Ministry of Social Development (2007), *The 2002 Domestic Purposes and Widow's Benefit Reform: Evaluation Report*, Wellington: MSD. http://www.msd.govt.nz/about-msd-and-our-work/publications-resources/research/dpb-widows-reform/

[21] The Independent Family Tax Credit provided a payment to low-income families not in receipt of significant state support of $7.50 a week per child from 1 July 1996, rising to $15 a week per child from 1 July 1997.

[22] Aside from an increase in Family Support rates for children aged 16–18 from January 1998.

Subsidising services for school-aged children has been a more recent development. An Out of School Care and Recreation (OSCAR) subsidy was introduced for school-aged children in February 1999. This provided a lower rate of subsidy per hour than that payable for pre-school children and was initially available for up to 20 hours per week in term time and 37 hours per week in school holidays. From July 2003 it was made available for up to 50 hours in school holidays.

One-off development assistance payments for OSCAR providers have been available through the MSD since 1999. In 2002, ongoing Assistance Grants were also introduced in an effort to promote the stability and further expansion of the sector. The pool of funding available for approved providers was increased from July 2007, together with the provision to fund activity-based out-of-school programmes for 5–14 year olds ('Extended Services') at low decile schools from 2008.

Both the Childcare Subsidy and the OSCAR subsidy (referred to jointly as Childcare Assistance) reduce in steep steps with increasing income. Prior to WFF, while the rate of subsidy per hour of care was generally indexed each year in line with the Consumer Price Index, income thresholds were not indexed.[23] This had gradually reduced the real income levels below which families qualified for Childcare Assistance.

### A.4 Early Childhood Education for 3 and 4 year olds

A commitment to guarantee free Early Childhood Education for up to 20 hours per week for all 3 and 4 year olds enrolled in community centres from July 2007 was announced at the same time as the WFF package, and was subsequently extended to a wider range of teacher-led services.[24]

### A.5 Financial support for parents with newborn children

Parental tax credit was introduced in October 1999. This is a payment of up to $150 a week for a newborn baby for the first eight weeks after the baby is born, payable while the family does not receive other payments including an income-tested benefit, a student allowance or accident compensation.

Paid parental leave was introduced in New Zealand on 1 July 2002. It initially provided government funded non-means tested assistance for a maximum of 12 weeks to parents in paid employment with a single employer for 10 or more hours per week in the year before the birth or adoption of a child. From December 2004 the length of payment increased to 13 weeks and increased again to 14 weeks in December 2005. From July 2006, eligibility was extended to self-employed parents working an average of 10 hours a week or more during either a six or 12 month period immediately before the birth or adoption of a child.

Parents can receive either parental tax credit or paid parental leave, but cannot receive both payments at the same time. For most, paid parental leave payments will be higher than parental tax credit payments.

### A.6 Working New Zealand

The Working New Zealand: Work Focused Support reform built on changes introduced through the New Service Approach in 2006. In this reform, Work and Income clients are

[23] The thresholds before the October 2004 WFF changes had applied since 1 February 1992.

[24] New Zealand Government (2006), *Choices for Living, Caring and Working: A ten-year plan to improve the caring and employment choices available to parents and carers*. http://www.dol.govt.nz/PDFs/Choices-for-Living.pdf

streamed into service groups on the basis of their readiness to work, with the aim of increasing opportunities for people to participate in the labour market.

From September 2006 the Job Search Service (JSS) was implemented. The JSS is a new group-facilitated programme that helps clients in the Work Support service group (for work-ready clients) into work through intensive job search activity and support.

The streamlining of eligibility rules for employment programmes gave greater access to groups who had not formerly qualified (including sole parents receiving benefits other than UB).

Working New Zealand also introduced changes to the work and planning expectations and other requirements facing sole parents receiving benefits. From September 2007 sole parents who were the primary recipient of a DPB, WB, or a Sickness or Invalid's Benefit could be required to engage in personal development and employment planning (previously there had been a blanket requirement to participate in this planning, but only for sole parents receiving DPB or WB). They could be required to undertake activities (including rehabilitation, but not including work, unpaid work experience or medical treatment) to improve their readiness for employment.

## A.7 Number of children supported by a main benefit

The number of children supported by the benefit system has declined over the past five years (Table A3).

The number of children of partnered caregivers supported by benefit has almost halved, and the number of children of sole parents supported by benefit decreased by 13%.

**Table A3: Number and estimated percentage of children aged under 18 years dependent on recipients of a main benefit as at end June**

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| Total children aged under 18 years dependent on recipients of main benefits | | | | | | |
| – with sole caregiver | 208,000 | 209,500 | 208,500 | 201,000 | 192,100 | 180,200 |
| – with partnered caregivers | 47,800 | 43,100 | 36,400 | 31,800 | 28,700 | 24,400 |
| Total | 255,800 | 252,600 | 245,000 | 232,800 | 220,800 | 204,700 |
| Estimated % all children aged under 18 years dependent on recipients of main benefits | | | | | | |
| – with sole caregiver | 19.7 | 19.6 | 19.4 | 18.7 | 17.8 | 16.6 |
| – with partnered caregivers | 4.5 | 4.0 | 3.4 | 2.9 | 2.7 | 2.3 |
| Total | 24.2 | 23.7 | 22.8 | 21.6 | 20.4 | 18.9 |

Sources: Statistics New Zealand resident population estimates by age, June quarters; MSD'S Information Analysis Platform.

# Appendix B: Additional results

Table B1 presents simple difference-in-differences results that are not regression-adjusted to control for observed characteristics of families in the HLFS.

The estimates are similar to those in Section 6.1, with slightly wider confidence intervals.

**Table B1: Simple DiD estimates of the impact of WFF on sole parents**

| Years | Impact of WFF[1] (pp) | | | Sample size[2] |
|---|---|---|---|---|
| | Employed | Working 20 hours or more | Receiving a main benefit | |
| 2003–2004 | -4.9 (± 4.5) | -5.8 (± 4.4) | 2.5 (± 4.2) | 14,430 |
| 2004–2005 | 3.1 (± 4.8) | 2.8 (± 4.7) | -5.3 (± 4.5) | 13,242 |
| 2004–2006 | 4.2 (± 4.9) | 3.8 (± 4.9) | -5.4 (± 4.6) | 12,821 |
| 2004–2007 | 7.4 (± 4.7) | 9.9 (± 4.7) | -10.6 (± 4.4) | 13,750 |

Notes:
1. 95% confidence intervals are in parentheses.
2. Combined sample size of 18–64 year old sole parents and single adults without children in the June quarters of the two stated years.