Ministry of Social Development

&

The Treasury

New Zealand

Actuarial valuation of the Benefit System for Working-age Adults as at 30 June 2012

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PART A
EXECUTIVE SUMMARY
& INTRODUCTION

1 EXECUTIVE SUMMARY

1.1 Background

The Welfare Working Group ("WWG") was established by Cabinet in April 2010 to conduct a fundamental review of the welfare system and develop options to reduce long-term dependency.

A key theme from their February 2011 report is the recommendation to take a long term view:

"The welfare system needs to recognise the value of investing early to reduce the long-term social, economic and fiscal costs of welfare dependency. Adopting an actuarial approach to measuring the forward liability will therefore be an important feature of any reform." (from page 2 of the WWG Report)

This valuation report forms part of this new approach. Further details on the development of a long-term approach to improving employment, social and financial outcomes from welfare benefits and services can be found in Section 2.

1.2 Development of the 2012 valuation

The first valuation of the NZ Social Welfare system was carried out as at 30 June 2011. This is the second such report and values the welfare system as at 30 June 2012. It is based on data collected before the most significant elements of the Welfare Reforms were implemented, so represents a baseline to much of the policy change.

This second valuation provides us with:

- A time series to examine, for the first time, movements from year-to-year, and to compare actual experience to forecast.
- Measurement of some of the impact of policy and operational changes related to earlier Future Focus reforms of September 2010[1]. Among other things, these reforms changed the way people apply for and remain on benefits.
- An extension of the actuarial framework for the investment approach, incorporating both Level I and Level II of the framework[2] presented in Section 2.1. The Level II part of the framework includes a break-down of the future cost into client 'segments' and gives a picture of clients' life-time transitions through the benefit system.

[1] http://www.msd.govt.nz/about-msd-and-our-work/newsroom/factsheets/future-focus/
[2] Level I refers to an aggregate valuation of the Welfare System while Level II refers to valuation across different segments of the beneficiary population to allow for improved tailoring of services.

1.3 Definition of liability and scope of the valuation

1.3.1 Definition of the liability

The definition of the liability to be valued, adopted by MSD, the Treasury and Taylor Fry to best capture the policy intent of the long-term investment approach, is:

All future lifetime costs of benefit payments and associated expenses for working-age clients who received a benefit payment in the 12 months up to and including the effective date of the valuation.

This is referred to in this report as the "current client liability": the life-time cost of current clients. We have also carried out valuations of the additional liability under the same definition arising in each of the 5 years following the date of the valuation which we have termed "future client liability". That is:

The future client liability is comprised of all future benefit payments and associated expenses for working-age clients who enter the benefit system in the next five years either:

- **For the first time; or**
- **After being off benefit for more than 1 year at the previous 30 June.**

The valuation is intended to inform MSD's implementation of the investment approach and, in particular, assist with the prevention of long-term benefit receipt through employment outcomes where possible. The valuation excludes New Zealand Superannuation and other benefits paid to people over the age of 65, as well as payments to students (Student Loans, Student Allowances, as well as Unemployment Benefit Student Hardship). It also excludes some benefits that fall outside of Vote Social Development, in particular Working for Families and Income-Related Rent Subsidies. A complete listing of benefits within scope is given in Appendix C.

Further details on the definition of the liability and the scope of the valuation are provided in Sections 2.4 and 2.5.

1.3.2 Inflation and discount basis

Under accounting and actuarial standards for insurance and accident compensation, liabilities must be estimated allowing for future inflation and the impact of investment return (i.e. discounting the estimated future cash flows to allow for the "time value of money"). It is important to estimate liabilities allowing for both future inflation and the time value of money so that investment decisions can be made on a like-for-like basis. E.g. An investment of $100 now to save $150 in 10 years' time would result in a different decision than an investment of $100 now to save $150 next year. Note that such a basis is required whether there is a fund of assets supporting the liability or not.

The valuation uses the Treasury forecasts for Consumer Price Index (CPI) inflation and Government interest rates for inflation and discounting of the benefit system liability. Details of the assumptions used are provided in Section 19.

Changes to inflation and discounting assumptions will have a significant impact on the valuation figures from year to year. However, these are outside the control of MSD. For this reason we separate the change in the valuation attributable to these items from other impacts to the valuation.

1.4 Results: Current client liability

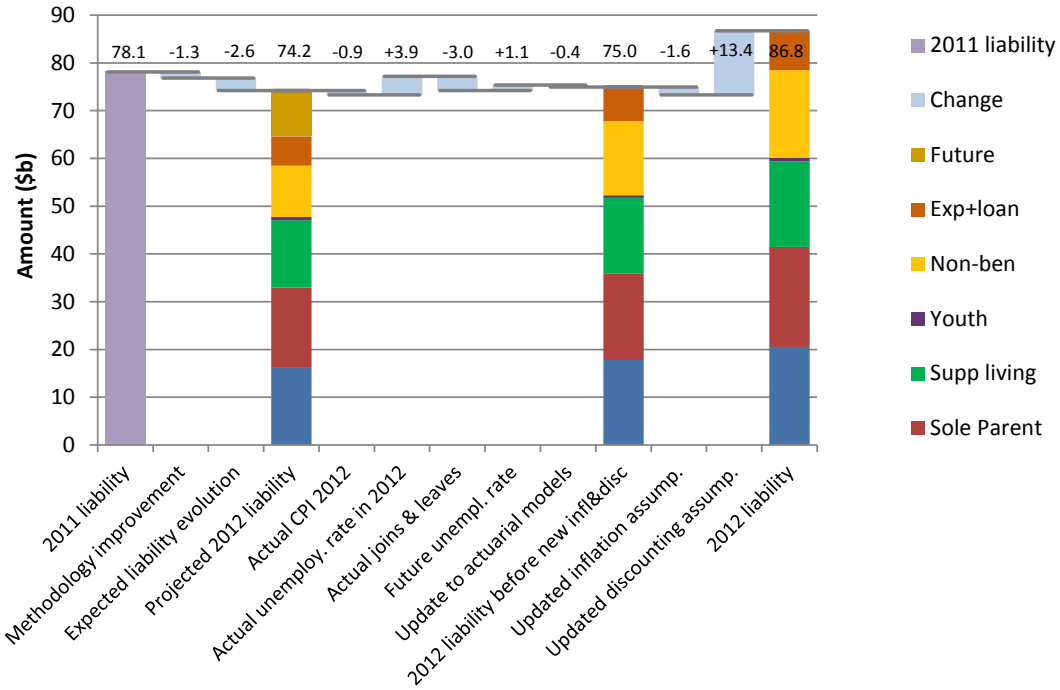
The inflated and discounted estimate of the current client liability (lifetime cost of benefits for current clients) as at 30 June 2012 is **$86.8b**. By inflated and discounted we mean that this is the sum of the projected future payments, including CPI increases to benefit rates, and discounted at Treasury rates to allow for the time value of money. This can be thought of as the amount needed to be set aside today to pay for all payments attributable to the current cohort of clients, assuming that amount would earn interest according to Treasury's discount rate schedule.

In analysing changes in the liability from the previous valuation to the current valuation, we:

- Determine what the liability was expected to be, based on the forecasts made previously, then
- Determine how actual experience has differed from expected and the impact this has had.

The liability has increased from the $78.1b reported as at 30 June 2011. We expected the current client liability at June 2012 to be $74.2b, but the actual liability is $86.8b, which is $12.6b higher than expected. The attribution of this change is given in Figure 1.1. The coloured components in the figure correspond to groupings of MSD's segments, introduced in Section 2.9.

Figure 1.1 **Movement from the 2011 current client liability to the 2012 current client liability**[3]



Of particular note:

- The 2011 valuation was recast using the Level II methodology as described in Section 16.4. This change of methodology led to a $1.3b decrease in the liability, primarily due to the change in projected hardship benefits. This produces an updated valuation of $76.8b.
- If the experience over the 12 months had matched the 2011 valuation projections exactly the liability was expected to fall by $2.6b.
- The CPI rate for 2012/2013 was lower than expected and the unemployment rate was higher than expected.
- Unemployment rate did not fall to the level forecast in the 2011 valuation. As a result the future forecast unemployment rate has risen for the next two years.
- The liability is reduced by $3.0b mainly due to a lower number of clients than expected (more leaves and fewer joins), but also partly attributable to the mix of clients on benefit. A key contributor to this is likely to be the impact of policy and operational changes related to earlier Future Focus reforms of September 2010.
- We have updated the transition and payment models to reflect emerging experience. This has had a fairly small impact on the valuation, decreasing it by $0.4b.
- The combined changes to inflation and discount rates (which are outside of MSD management control) have the largest impact, increasing the liability by **$11.8b.** This is due to:

[3] This chart is a combination of Figure 5.1 and Figure 5.2 in the main body of the report

- Inflation forecasts for 2012/13 and 2013/14 have been lowered compared to the previous valuation. This reduces the valuation by $1.6b.
- Discount rates have fallen dramatically compared to the previous valuation. This is discussed in Section 19 and has caused a $13.4b increase in the liability, by far the largest movement in this analysis.

Further details on the analysis of change are provided in Section 5.

The liability subdivided by benefit type is shown in Table 1.1. This also shows the movement in liability due to the methodology change and movement due to the change in inflation and discount rates.

Table 1.1 **Current client liability for 2011 and 2012, with impact of methodology, inflation and discounting changes split out**

Component		2011, Level I estimate ($b)	2011, after method-ology change ($b)	2012, before Infl. & disc. change ($b)	2012 result ($b)
Tier 1:	Domestic Purposes Benefit	17.8	17.7	16.5	18.7
	Invalid's Benefit	19.1	19.5	19.3	22.8
	Sickness Benefit	7.2	7.4	7.6	8.8
	Unemployment Benefit	4.0	4.0	3.5	3.9
	DPB-Care of the sick and infirm	1.8	1.5	1.8	2.1
	Emergency Benefit	0.3	0.3	0.3	0.3
	Orphans and unsupported children	2.1	1.3	1.3	1.5
	Woman Alone / Widows Benefit	0.9	1.4	1.7	2.0
	Tier 1 subtotal	**53.2**	**53.1**	**51.8**	**60.1**
Tier 2:	Accommodation Supplement	10.2	10.0	9.7	11.1
	Disability Allowance	1.9	1.9	1.8	2.1
	Child Disability Allowance	0.8	0.8	0.9	1.0
	Child Care Subsidy	0.7	1.0	1.1	1.2
	Tier 2 subtotal	**13.6**	**13.7**	**13.3**	**15.3**
Tier 3:	Hardship payments	3.8	2.6	2.5	2.9
	Employment Interventions	0.2	0.2	0.1	0.2
	Tier 3 subtotal	**4.0**	**2.7**	**2.6**	**3.0**
Other components:	MSD Expenses	6.8	6.8	6.8	8.0
	Net loans cost	0.4	0.4	0.4	0.4
	Other components subtotal	**7.3**	**7.3**	**7.2**	**8.4**
	Grand total	**78.1**	**76.8**	**75.0**	**86.8**

1.5 Key findings

There are some key observations that can be made from analysis of the valuation results, including:

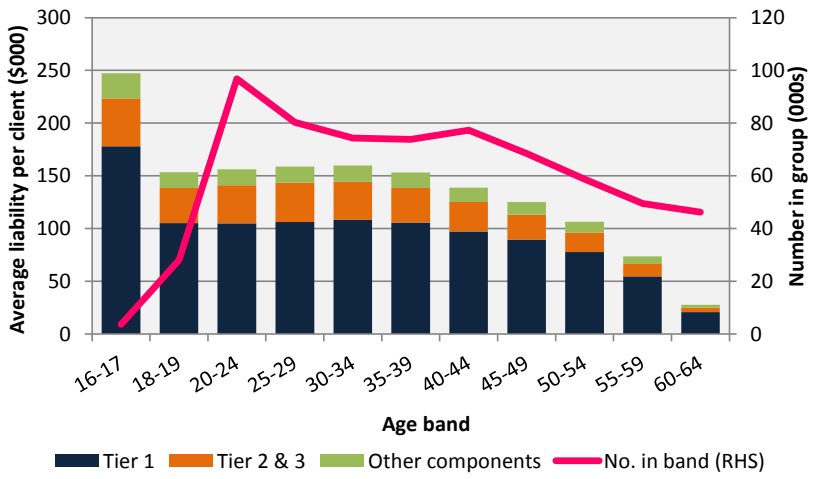
- The influence on liability of age and duration on benefit
- The different liabilities attributable to MSD's client segments
- How beneficiaries move through the benefit types over their lifetime, informed by segment level analysis
- Continuing vulnerability for some beneficiaries even after leaving the benefit system
- The residual impacts from the Global Financial Crisis (GFC)
- The significance to liability of youth entry to the benefit system

These items are discussed in turn below.

1.5.1 Age and Duration

It is possible to split the current client liability valuation across any of the variables included in the valuation model. Figure 1.2 below shows the average lifetime liabilities by age at the valuation date.

Figure 1.2 **Average liability per client by age at 30 June 2012**

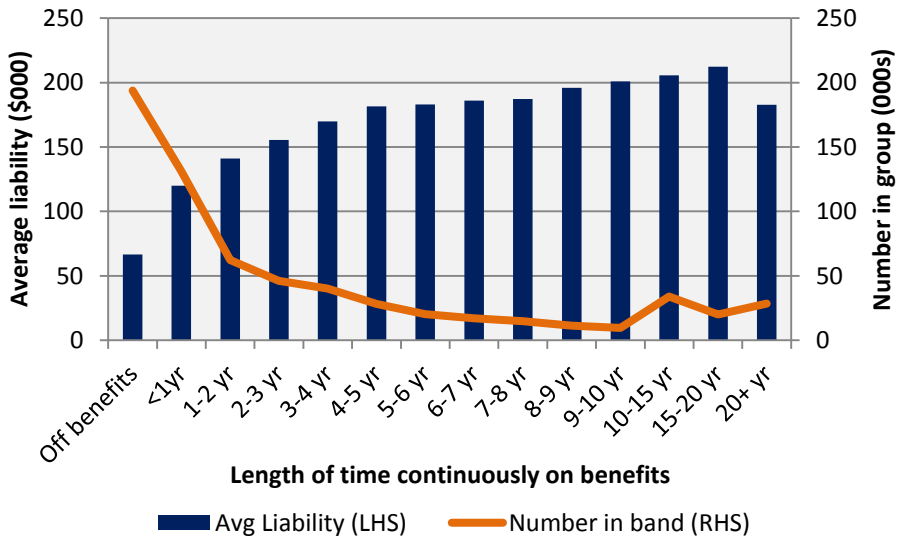


The trends shown in the chart are interesting and discussed more fully in Section 4.1.3. Firstly the cohort under age 18 has a significantly higher average liability, suggesting they are at high risk of remaining on benefits for an extended period. In contrast, the average liability per client is relatively stable across ages 18 to 39.

Another important breakdown of the liability is the allocation amongst clients with different durations on benefit. Figure 1.3 shows the average liability according to

continuous duration – that is, the time a client has continuously been on benefits (either on the same benefit or transferring across different benefits) at the valuation date. The leftmost group shows the average liability for those clients currently not on benefits. Unsurprisingly, this average liability is relatively low but is still significant. The remaining groups show the average liability for those clients who have increasingly large continuous durations. The increasing trend is clear, with clients who have received benefits for at least five years having a liability 50% higher than those in their first year.

Figure 1.3 **Average key benefit liability based on client duration**



Similar plots can be derived for other predictors used in the valuation which are detailed in Section 18.3.3

1.5.2 Segment level results

The liability may be subdivided by the segments adopted by MSD management. The definition and process for determining these segments is described in Section 15.

Table 1.2 shows the segment level current client liability results. Note that, in contrast to Table 1.1, these results are split based on a client's segment **at the valuation date**, and totals include future cash flows arising from different benefit types for that person.

Table 1.2 **Current client liability forecasts by client segment at 30 June 2012**[4]

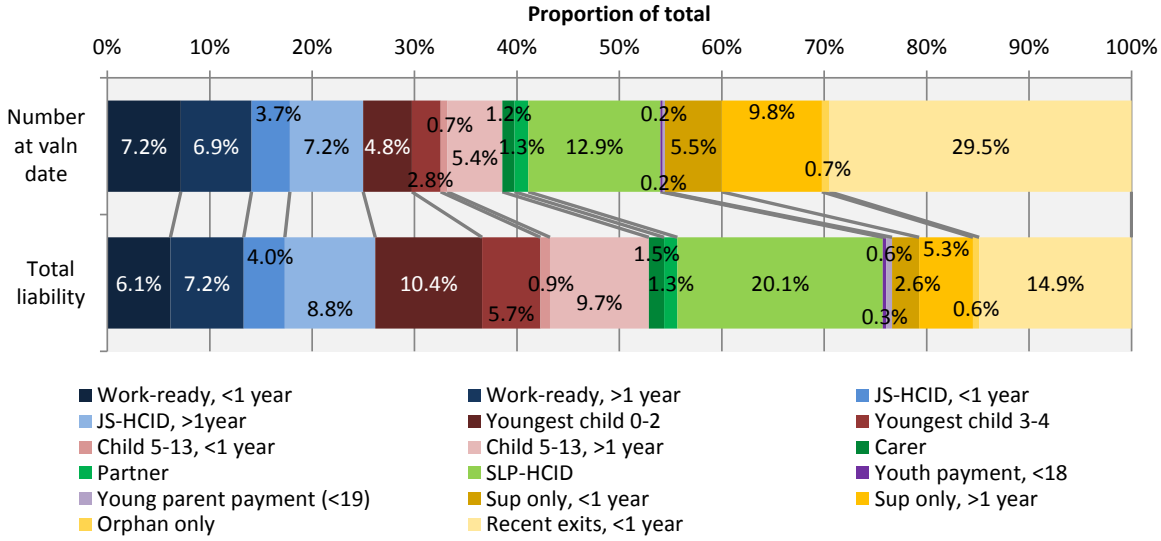
Top level segment	Segment[5]	Number at valn date	Total liability ($m)	Average lifetime cost ($k)	Average future years on benefit
Jobseeker Support	Work-ready, <1 year	47,175	4,823	102k	9.9
	Work-ready, >1 year	45,372	5,623	124k	10.0
	HCID , <1 year	24,603	3,153	128k	10.8
	HCID, >1year	47,019	6,927	147k	11.5
	Sub-total	164,169	20,525	125k	10.5
Sole Parents	Youngest child 0-2	31,332	8,172	261k	17.7
	Youngest child 3-4	18,450	4,474	243k	16.4
	Child 5-13, <1 year	4,345	723	166k	11.5
	Child 5-13, >1 year	35,411	7,582	214k	14.2
	Sub-total	89,538	20,950	234k	15.8
Supported Living	Carer	7,773	1,178	152k	10.6
	Partner	8,742	1,012	116k	8.6
	HCID	84,864	15,737	185k	13.0
	Sub-total	101,379	17,927	177k	12.5
Youth	Youth payment, (<18)	1,405	259	184k	17.5
	Young parent payment (<19)	1,544	446	289k	20.1
	Sub-total	2,949	705	239k	18.9
Non-beneficiaries	Sup only, <1 year	36,416	2,074	57k	7.1
	Sup only, >1 year	64,408	4,119	64k	8.0
	Orphan only	4,814	479	100k	7.3
	Recent exits, <1 year	193,855	11,664	60k	5.9
	Sub-total	299,493	18,335	61k	6.5
All segment sub-total		657,528	78,443	119k	9.7
Expenses			7,955		
Net loans cost			420		
Total			86,817	132k	

The difference in average lifetime cost across segments means that some segments have a disproportionately large or small impact on total liability relative to the number of clients in that segment. For instance, sole parents represent 13.6% of the clients valued, but 26.7% of the total liabilities. These differences are illustrated across all segments in Figure 1.4. It can be seen that Sole parents and Supported Living segments have a higher proportional contribution to overall lifetime cost.

[4] Costs due to net loans and expenses have not been allocated across segments

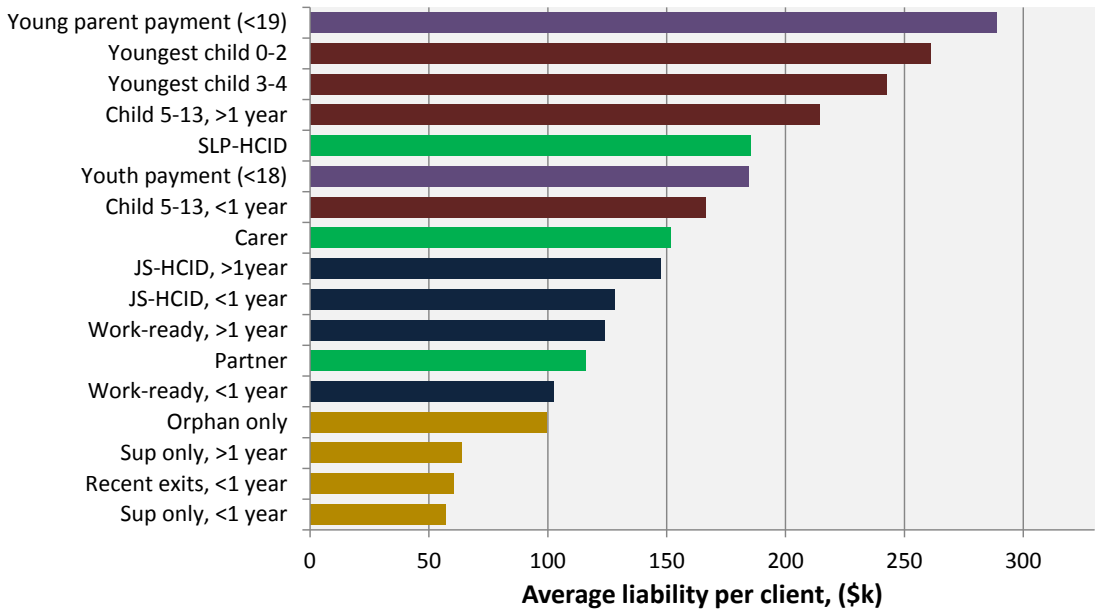
[5] The duration measure used in the segment definitions are based on "continuous duration", which means time since they last had a 14 day spell off benefits.

Figure 1.4 **Contributions of all segments towards client numbers and liability total**



Total liability in a segment is a combination of the number of clients in the segment and the average lifetime cost per client. We have ranked the segments by average lifetime cost in Figure 1.5. The costs for Youth segments (particularly Young Parent Payment) are very high due to a combination of these clients' high risk of remaining on welfare and the large number of potential years they have on benefits. The next highest segments relate to Sole Parents, reflecting their tendency to remain on DPB and move to other benefits when they leave DPB. Supported Living liabilities are also high. Non-beneficiaries represent the lowest average cost, but given their large numbers and the fact that their lifetime cost is about $60,000 (excluding net loans cost and expenses), their contribution to the overall liability is still substantial.

Figure 1.5 **Average lifetime cost per client, by segment**



1.5.3 Cohort lifetime person projections

One further way of understanding the projection results is to look at how the projection applies to individual clients, cohorts and segments. We can assess the propensity for various segments to remain on benefits, and move between different types. Figure 1.6 shows such a plot for those clients who start in the Jobseeker segment. It shows that while clients begin the projection on UB, SB, WA/WB or DPB, by 10 years into the projection:

- The majority (56%) of the cohort who have not retired are not on benefits
- Of those clients still on benefits, most are receiving SB or IB, with relatively few receiving UB – in fact, there are five times as many on SB or IB compared to UB

Figure 1.6 **Likelihood of being in various states over the course of the projection, for those clients in the Jobseekers segment at the valuation date**

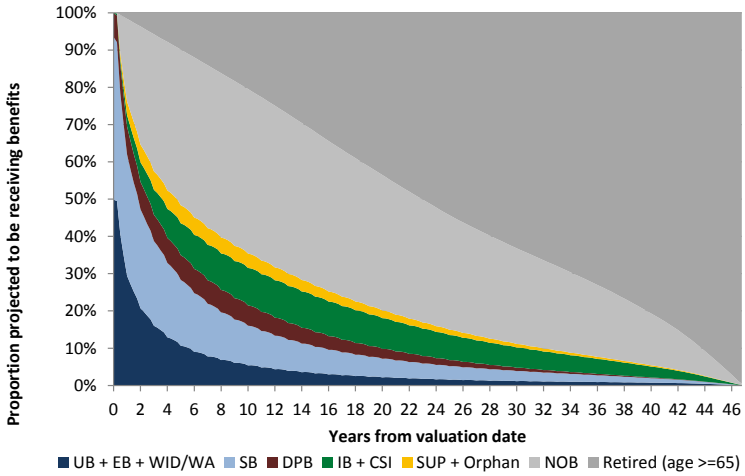
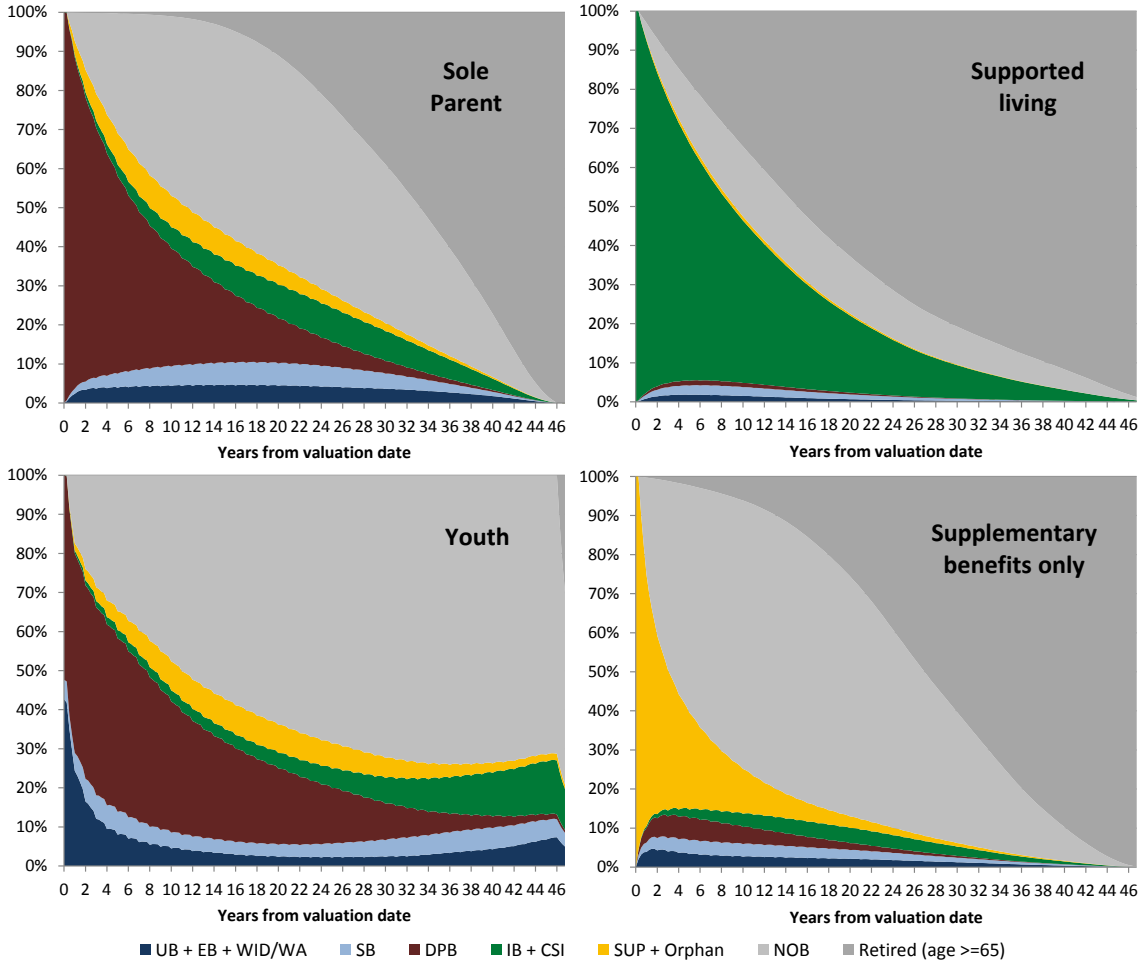


Figure 1.7 shows equivalent plots for some of the other key segment groups. We can make a number of observations:

- Clients generally remain in Supported Living (IB, CSI), rather than transfering to other benefit types
- Sole parents often remain on DPB benefits for a significant length of time, but also have a reasonable chance of moving to a new non-DPB benefit after that period
- Clients on supplementary benefits only tend to exit the welfare system the fastest, although reasonable numbers transfer back into Tier 1 benefits
- An average client in the Youth segment has **a 43% chance of being on benefits in 15 years time**, and more than 25% remain on benefits 40 years after the valuation date. This contributes to the high average lifetime liability for these segments.

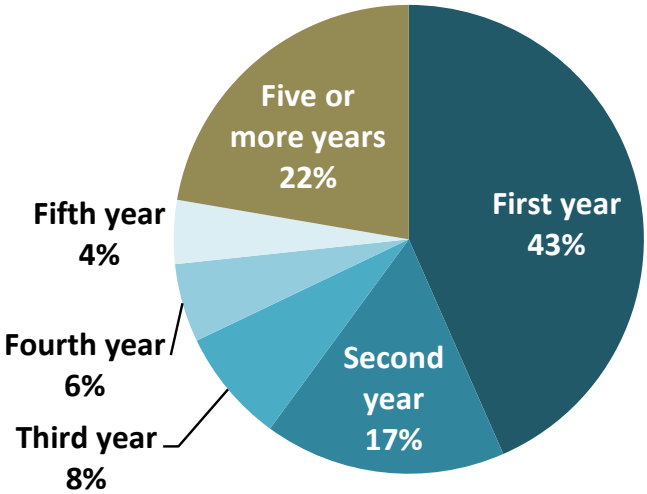
Figure 1.7 **Likelihood of being in various states over the course of the projection, for various segment groups**



1.5.4 Re-entry into the welfare system

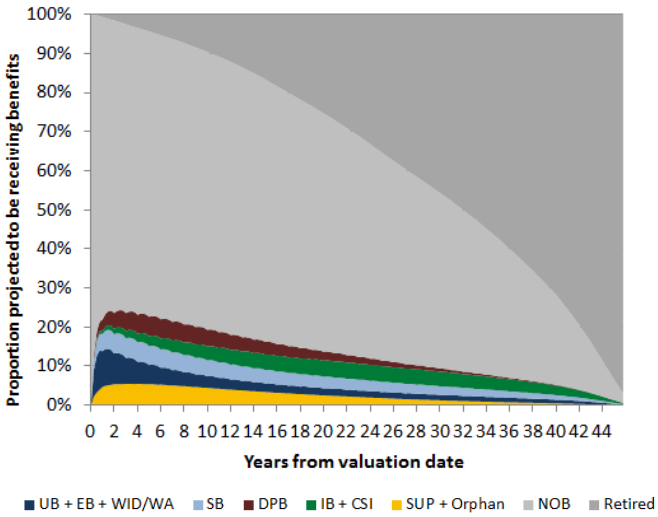
Recently off benefit clients have a higher probability of returning to benefits: of the former clients that returned to Tier 1 benefits in the 2010/11 and 2011/12 financial years, we calculate that 43% of them had been out of the system for less than a year; see Figure 1.8. This high percentage means it is appropriate to still consider them at risk.

Figure 1.8 **Duration off benefits of former clients retuning to Tier 1 and Tier 2 benefits in the 2010/11 and 2011/12 years**



This idea can also be seen in the likelihood of being on benefit chart in Figure 1.9 below. We estimate that clients who were not receiving a main benefit on the valuation date (but who had received some benefit in the previous 12 months) have a 25% chance of returning to a main benefit within two years, which represents a continued vulnerability to return to benefit for many beneficiaries after leaving the welfare system.

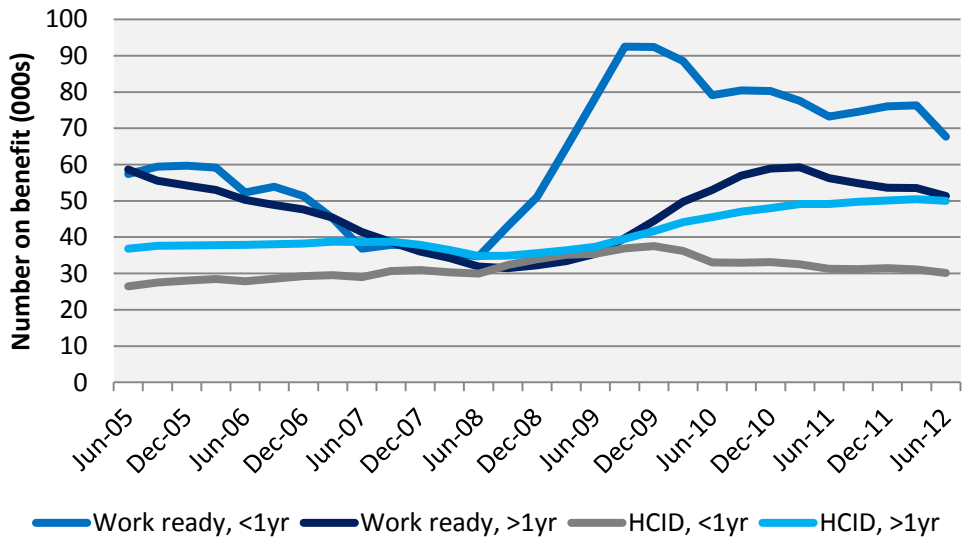
Figure 1.9 **Projected benefit state for Recent Exit segments (right)**



1.5.5 Residual impacts from the Global Financial Crisis

The Global Financial Crisis (GFC) saw a number of significant impacts on the welfare system. For instance, the number of 'Work-ready' Jobseekers (corresponding to the unemployment benefit) increased significantly in 2008/09 as shown in Figure 1.10 which shows the numbers of clients in the various segments each quarter.

Figure 1.10 **Numbers of clients in Jobseeker Support segments each quarter**



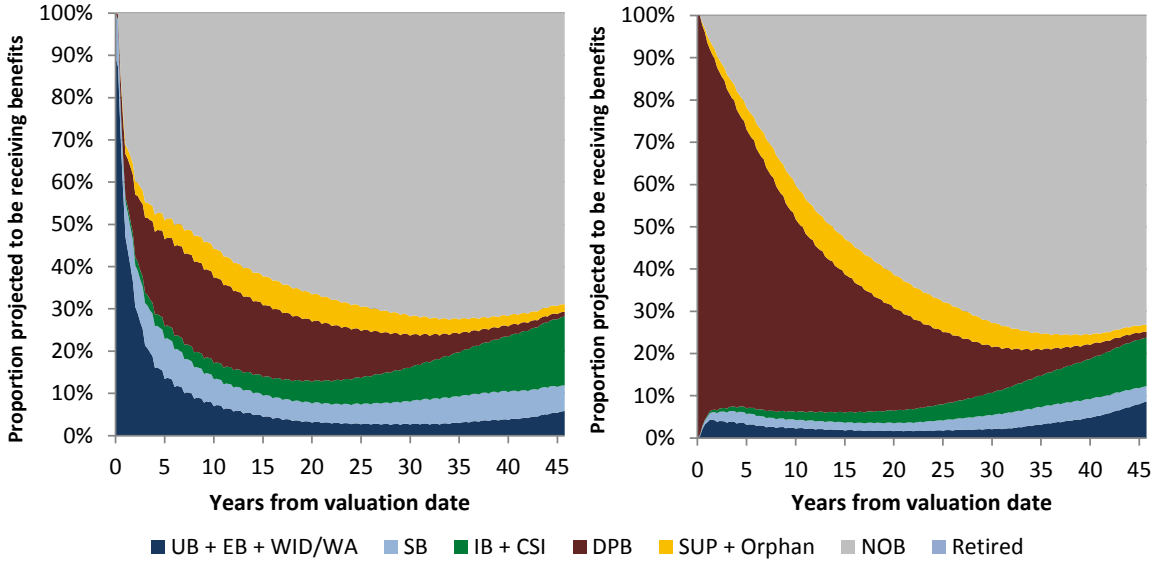
Numbers in the 'Work-ready <1yr' segment increased sharply during the GFC, as more clients began to receive unemployment benefits. This segment has decreased in numbers since late 2009 due to some clients exiting the welfare system and others remaining in and progressing to the 'Work-ready >1yr' segment.

The higher levels in the >1yr segments indicate there is still a significant number of beneficiaries in the system who started on benefit during the GFC.

1.5.6 Youth entrants

As was seen in Figure 1.6, the youth segments (Young Parent Payment and Youth Payment clients) have high average liability compared to most other groups apart from Sole Parents. The lifetime likelihood of receiving benefit for the two youth segments is shown in the charts below. The high likelihood of remaining on benefits leads to the observed high average lifetime cost for clients in these segments.

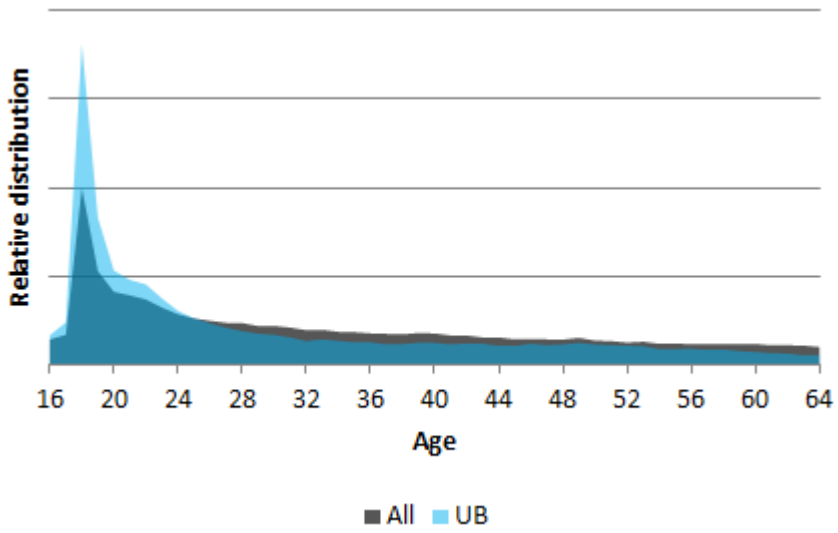
Figure 1.11 **Projected benefit state for Youth payment (left) and Young parent (right) segments**



As seen in Figure 1.11, DPB is the main contributor to the future cost of a client in the Young Parent segment. This is consistent with the low churn rate of DPB and the fact that Young Parents are at high risk of transitioning into the Sole Parent segments and receiving DPB for a considerable period of time. Of some interest is the fact that a significant portion of future payments in the Youth Payment segment will also be paid as DPB benefits, indicating that a significant share of clients receiving the Youth Payment (equivalent) on the valuation date are likely to become Sole Parents in the future.

Another dimension of the youths' interaction with the welfare system is the relatively high volume of young entrants. This can also be seen in the chart below which shows the distribution by age of clients entering the benefit system (as part of the future client liability). The largest portion is for clients under age 20. This is true for when viewed across all welfare entries, but is particularly pronounced for those people entering the Unemployment Benefit (UB).

Figure 1.12 **Age distribution of clients entering as part of future client liability**



Another view of the impact of youth is the current client liability by **age of entry**. The age at which a client enters the benefit system is highly predictive of their likely term on benefit. Table 1.3 shows the average liability split by current age and age at which a client first received a benefit.

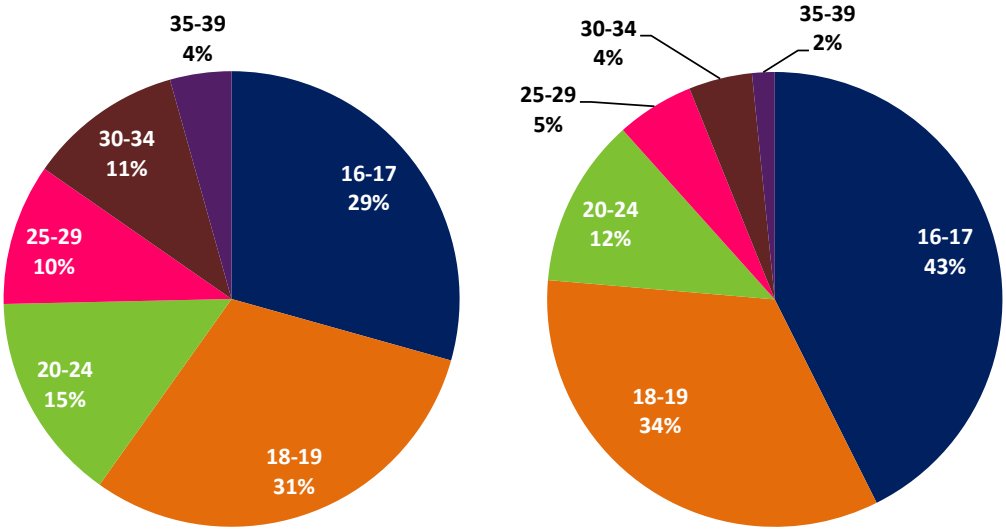
Table 1.3 **Average liability for clients by age at valuation and age of entry into the welfare system, for clients less than 40.**

Age at valuation	Age first entering the system					
	16-19	20-24	25-29	30-34	35-39	Average
16-19	164k					164k
20-24	187k	93k				156k
25-29	205k	110k	61k			159k
30-34	202k	121k	76k	56k		160k
35-39	198k	131k	103k	73k	58k	153k
Average	193k	108k	74k	64k	58k	158k

For those aged 30-34 at the valuation date, their expected future cost is well over 3 times as high if they first received a benefit under age 20 than if they first received a benefit after age 30.

Figure 1.13 shows the age of entry for clients aged 30-39 at the valuation date, by number of clients and contribution to the current client liability. About 60% of these clients entered the system on some benefit under the age of 20. Furthermore, these clients contribute more heavily to the liability. Of the total liability attached to the 30-39 year old age band, 77% is attributable to those clients who entered before age 20. This highlights the importance of the youth segment and the potential long term impacts of early intervention.

Figure 1.13 **Numbers and liability by age of entry. The left hand chart is the proportion of clients by age of entry into the welfare system for clients aged 30-39 at the valuation date. Right hand chart is their relative contribution to lifetime liability.**



1.6 Uncertainty, key risks and sensitivity

1.6.1 Uncertainty

The estimation of current and future client liabilities is subject to influences whose effect cannot be determined with complete accuracy. Consequently, it is a virtual certainty that the ultimate liability will turn out to differ from any estimate, but the extent of this difference is subject to uncertainty.

Some of the major sources of uncertainty include:

- Future changes in how people move through the welfare system due to policy or behavioural shifts
- Uncertainty related to the economy and the economic forecasts used
- The extent to which the valuation model is an oversimplification of a complex real-life system

Further commentary can be found in Section 6.

1.6.2 Sensitivity

Table 1.4 gives the sensitivities of the total current client liability to changes in the inflation and discount rates. Observe that changes of +/- 1% in these rates have a material impact on the liability.

Table 1.4 **Sensitivity of the total current client liability, excluding loans and expenses, to changes in the inflation and discount rates**

Scenario	Liability ($B)	Change ($B)	Change (%)
Base	78.4		
Inflation + 1%	87.4	9.0	11.4%
Inflation - 1%	70.9	-7.6	-9.6%
Discount rate + 1%	70.8	-7.6	-9.7%
Discount rate - 1%	87.7	9.2	11.8%

Table 1.5 provides the sensitivities of the valuation to changes in the unemployment rates. As expected, the proportionate impact is strongest for the Unemployment Benefit.

Table 1.5 **Sensitivity of estimated current client liability, excluding loans and expenses, to future unemployment rates**

Change in unemploy-ment rate	Treasury estimate (4.5% long term rate)	3.5% long term unemployment rate		5.5% long term unemployment rate		6.5% long term unemployment rate	
	Liability ($b)	Liability ($b)	Change	Liability ($b)	Change	Liability ($b)	Change
DPB	18.7	17.8	-4.6%	19.6	4.7%	20.5	9.9%
IB	22.8	22.2	-2.6%	23.3	2.5%	23.8	4.3%
SB	8.8	7.8	-11.0%	9.8	12.0%	11.1	27.0%
UB	3.9	3.2	-18.3%	4.9	24.1%	6.0	54.3%
Other Tier 1	5.9	5.5	-8.2%	6.4	7.8%	7.0	17.0%
Tier 2	15.3	14.5	-5.3%	16.2	5.5%	17.1	11.9%
Tier 3	3.0	2.8	-6.2%	3.2	6.6%	3.4	14.0%
Total	**78.4**	**73.8**	**-5.9%**	**83.4**	**6.3%**	**89.0**	**13.5%**

Table 1.6 provides the sensitivities of the current client liability (inflated and discounted) to changes in the probability of moving off the current benefit, for the most significant benefit categories. For example, if the probability of moving off benefit decreases by 5% for all key Tier 1 benefits, the liability for those benefits increases by 2.6%. Note that while a reduction in the probability of moving off one benefit type implies that there will be more clients remaining on that benefit, it also means that there will be fewer clients transitioning to other benefits.

Table 1.6 **Sensitivity of current client liability valuation results (inflated and discounted dollars) to changes in the probability of moving off the current benefit**

Probability changed	Change in probability of moving off/onto benefit	
	5% decrease	5% increase
All key tier 1	2.6%	-2.4%
Off DPB	1.1%	-1.1%
Off IB	0.5%	-0.5%
Off SB	0.7%	-0.6%
Off UB	0.4%	-0.4%
Off SUP	-0.1%	0.1%
Onto benefit (=off NOB)	-2.3%	2.3%

1.7 Approach

The methodology for the estimation of the liability is described in Part D.2. It is centred around modelling how a client's benefit status will evolve over time, based on their characteristics at the valuation date.

1.8 Reliances and limitations

In preparing this report we have relied on historical data and other quantitative information provided by MSD without audit or independent verification, though we have carried out internal consistency checks and some checks of the data against external sources for reasonableness in aggregate. Any material discrepancies in the data should be reported to us to enable us to consider whether this report should be amended accordingly.

There is an inherent limitation on the accuracy of liability estimates in this report caused by the fundamental uncertainty of attempting to predict the future. In our opinion, we have used techniques and assumptions which are appropriate, and the conclusions presented in this report are reasonable, given the information currently available. However, it should be recognised that the ultimate costs for the current and future client liability cohorts can be expected to differ, probably materially, from our estimates of those costs.

It is also worth noting that this is only the second time that a formal actuarial valuation of the NZ Social Welfare liabilities has been carried out. The benefits and data are complex, and inevitably more uncertainty arises than if there was an existing valuation framework and projections requiring only incremental re-calibration. Over time as more valuations are carried out this aspect of uncertainty will reduce.

2 INTRODUCTION AND BACKGROUND

2.1 Introduction

The Welfare Working Group ("WWG") was established by Cabinet in April 2010 to conduct a fundamental review of the welfare system and develop options to reduce long-term dependency with a focus on:

- Improving work outcomes for sole parents and for people with disabilities and ill health
- How welfare should be funded and any lessons from the insurance industry and ACC in managing forward liability
- Whether the structure of the benefit system contributes to long-term dependency

Their February 2011 report recommended a comprehensive set of 43 recommendations to the Government. At a high level, the WWG recommended a work-focused welfare system, with a cross-government emphasis on preventing the need for welfare use, with targets and accountability mechanisms to reduce future payments.

A key theme from the report is the recommendation to take a long term view:

"The welfare system needs to recognise the value of investing early to reduce the long-term social, economic and fiscal costs of welfare dependency. Adopting an actuarial approach to measuring the forward liability will therefore be an important feature of any reform." (from page 2 of the WWG Report)

Recommendation 31 of the WWG Report states that *"the new work-focused welfare system should manage the performance of the system using a regularly estimated actuarial calculation of the forward liability".*

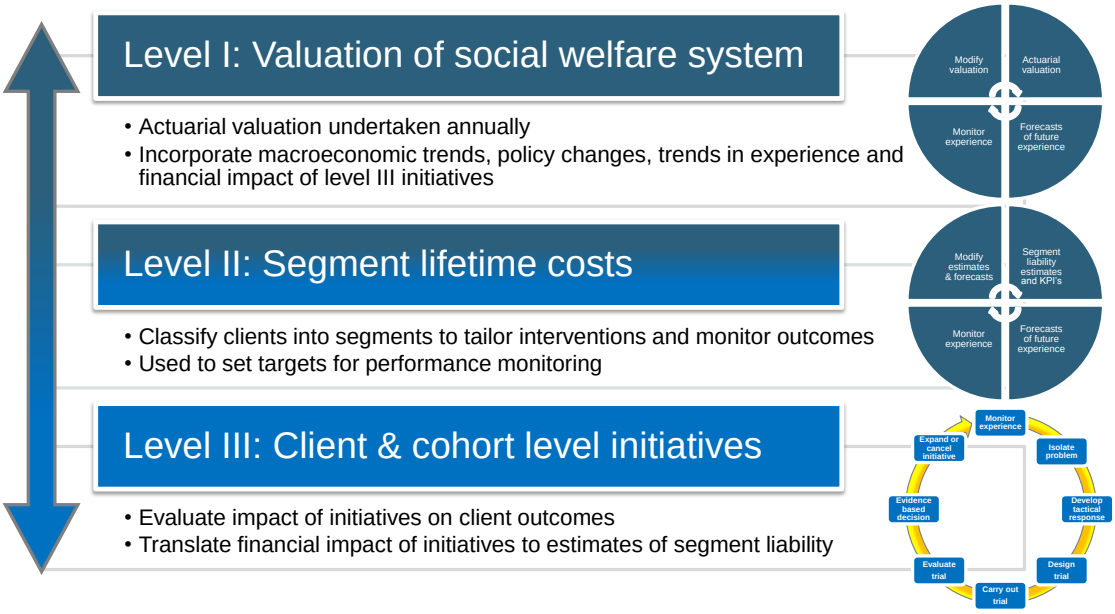
In June 2011 Taylor Fry Consulting Actuaries ("Taylor Fry") was asked to provide advice to the Ministry of Social Development ("MSD") and The Treasury in relation to:

- the feasibility of adopting a long-term investment approach to achieving better employment, social and financial outcomes through the welfare system
- how an aggregate liability for future payments in the welfare context could be calculated

That advice is contained in our "Feasibility report" titled "Actuarial advice of feasibility: A long-term approach to improving employment, social and financial outcomes from welfare benefits and services" dated 27 October 2011 and authored by Alan Greenfield[6].

The feasibility report found that an investment approach in the welfare context based on an actuarial valuation of lifetime costs for benefit recipients was novel, but feasible using best practice from social insurance and the insurance industry. The report recommended a three-level framework, shown in Figure 2.1.

Figure 2.1 **Proposed three-level framework, 2011 feasibility report**



In November 2011, the Government announced reforms to the New Zealand welfare system to be staged over three years, with the primary aim of getting people off welfare and into work. This coincided with the adoption of a long-term investment approach to welfare. Taylor Fry was commissioned to undertake the first actuarial valuation of the NZ Social Welfare system. This report valued the welfare system as at 30 June 2011 and was publically released in September 2012[7].

Subsequently, the Government passed a series of legislative reforms under the title of Welfare Reform[8]. The legislation includes simplified benefit categories, a greater work focus, new expectations for partners of beneficiaries and work preparation activities. These changes are discussed further in Section 6.2. It is important to note that the majority of these changes will be introduced after the 30 June 2012 valuation date of this report and so are not reflected in the valuation.

[6] http://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/evaluation/taylor-fry-ia-feasibility/taylor-fry-feasibility-of-an-ia-for-welfare-report.pdf
[7] http://www.msd.govt.nz/documents/about-msd-and-our-work/newsroom/media-releases/news/2012/msd-valuation-2011.pdf
[8] https://www.msd.govt.nz/about-msd-and-our-work/work-programmes/welfare-reform/

2.2 Development of the 2012 valuation

As noted above the first valuation of the NZ Social Welfare system was carried out as at 30 June 2011. This is the second such report and values the welfare system as at 30 June 2012. It is based on data collected before the most significant elements of the Welfare Reforms were implemented, so represents a baseline to much of the policy change.

This second valuation provides us with a time series to examine, for the first time, movements from year-to-year, and to compare actual experience to forecast. It also includes the impact of policy and operational changes through the earlier Future Focus reforms. Among other things, these reforms changed the way people apply for and remain on benefits.

This report also extends the actuarial framework for the investment approach, because it spans both Level I and Level II of the framework presented in Figure 2.1. The Level II parts include a break-down of the future cost into client 'segments'. This gives us a picture of clients' life-time transitions through the benefit system, including take-up of 2nd and 3rd tier assistance, and expected transfers to other benefit types. Work and Income can use this information to target employment and work-readiness services to reduce long-term benefit receipt, and by extension, the future cost of the benefit system. Annual valuations will tell a performance story about how effectively Work and Income is managing the future cost of the benefit system.

2.3 Purpose of the valuation

In the insurance context valuations of outstanding claims liabilities are required to ensure the financial solvency of the insurer or scheme. They are also carried out as a means of analysing the underlying cost of the insurance to inform the pricing and ongoing management of the portfolio.

In the context of the New Zealand benefit system there is no requirement to ensure solvency. However, the other applications noted above have relevance in the welfare context. In particular an actuarial valuation will bring a long-term perspective to the financial management of the benefit system by providing a detailed understanding of:

- The future cost of the system
- The lifetime cost of segments in the system (e.g. those entering at age 16 and 17)
- The long-term financial effects of changes to the system, for example:
  - Policy reform
  - Operational changes
  - Demographic changes
  - Economic changes
- Key drivers which affect the future costs of the system, e.g. duration on benefits, age, etc.

This detailed understanding can be used to bring a long-term perspective to managing the system, for example:

- Investment decisions (based on cost-benefit analyses) in relation to return to work measures for particular segments of the system can be carried out with an understanding of the long-term cost
- Costings of policy reforms and operational changes can consider the long-term financial impact
- The valuation can inform an internal framework for accountability based on managing the influence of the drivers of the liability that management are able to influence
- Monitoring of actual experience in comparison to forecasts from the valuation can alert managers to first signs of changing costs and assist in developing appropriate responses

Note that this second valuation of the benefit system in New Zealand (as at 30 June 2012) is a baseline valuation and makes no attempt to factor in future known reforms. Thus, future valuations will be able to estimate the impact of major reforms such as those beginning from August 2012.

2.4 Definition of liability

This valuation remains, to our knowledge, the only full actuarial valuation of an unfunded, uninsured social welfare system covering the full range of benefits such as in the New Zealand system. (Actuarial valuations are carried out for various national social security schemes covering retirement, old age and disability.) Given the similarity of social welfare to accident compensation insurance (i.e. income support for those unable to work) it seems natural to proceed in the same manner as an outstanding claims liability valuation for an accident compensation scheme. However, there is an important distinction between the two systems. The liability for outstanding claims in an insurance context is well defined, i.e. a liability arises out of the occurrence of an incident that will give rise to a claim and there is a contract between the insured and the insurer which defines the amounts to be paid.

In the case of the New Zealand benefit system, legislation sets the entitlements governments must provide to citizens in circumstances defined in the *Social Security Act 1964* (e.g. single parents, invalids, unemployed etc.). However, there are no accepted rules or standards which define exactly what amounts should be considered a "liability" at a point in time. For example, does a liability arise at the point when someone first receives an unemployment benefit? Is there still a liability for that person once they have been off benefits for a week, a month, a year, 10 years? Does the liability include only payments made for the current spell of unemployment? Should it include lifetime benefit payments under other benefit types (e.g. Invalid's Benefit)?

Given the lack of an existing standard definition of liability, it has been necessary to define the concept in the context of social welfare. Several alternatives for the definition of liability have been discussed with MSD and The Treasury. The following dates on which a liability arises have been considered:

- Birth of a NZ citizen or immigration to NZ
- Attainment of a minimum age for eligibility of welfare benefits (e.g. age 16)
- Receipt of a first benefit payment

- Receipt of a benefit in the recent past (e.g. the last 12 months)
- Currently in receipt of a benefit (i.e. as at the effective date of the valuation)

We have also discussed and considered which costs to include in the liability:

- Benefit payments only for the current spell on welfare
- Lifetime benefits only for the current benefit type
- Lifetime benefits for all benefit types.

The definition of liability agreed in consultation with the Ministry and the Treasury that best captures the policy intent of the long-term investment approach is:

The estimated future lifetime costs of all benefit payments and associated expenses for working-age clients who received a benefit payment in the 12 months up to and including the effective date of the valuation.

One of the main purposes of the valuation is to provide information to MSD to allow investment decisions to prevent long-term benefit receipt. A definition encompassing lifetime costs on all benefits best reflects this objective.

The decision to estimate the liability for all clients in receipt of a benefit in the year prior to the valuation was a compromise between the obvious choice of those on benefits at the date of the valuation and dealing with problems related to such a choice including seasonal effects and the fact that clients who recently ceased benefits have a very high chance of returning to benefits within 12 months. This is discussed further in Section 18.2.2.

Also note that benefits payable to the Youth segment (aged 16-17) such as the Independent Youth Benefit ("IYB") and Emergency Maintenance Allowance ("EMA") have been included within the definition of working-age. Understanding the transitions and lifetime costs of clients entering the benefit system at a very young age provides important insight into the management of their liabilities.

2.5 Scope of this valuation

2.5.1 "Current" & "future" liability

The definition of liability provided in Section 2.4 as applied to those clients who had received a benefit in the 12 months up to 30 June 2012 has been termed the "current client liability": the life-time cost of current clients. We have also carried out valuations of the additional liability under the same definition arising in each of the 5 years following the date of the valuation which we have termed "future client liability": the life-time cost of future clients. Thus we have:

Current client liability: the lifetime cost of current clients

The current client liability is comprised of all future lifetime costs of benefit payments and associated expenses for working-age clients who had received a benefit payment in the 12 months up to and including the effective date of the valuation.

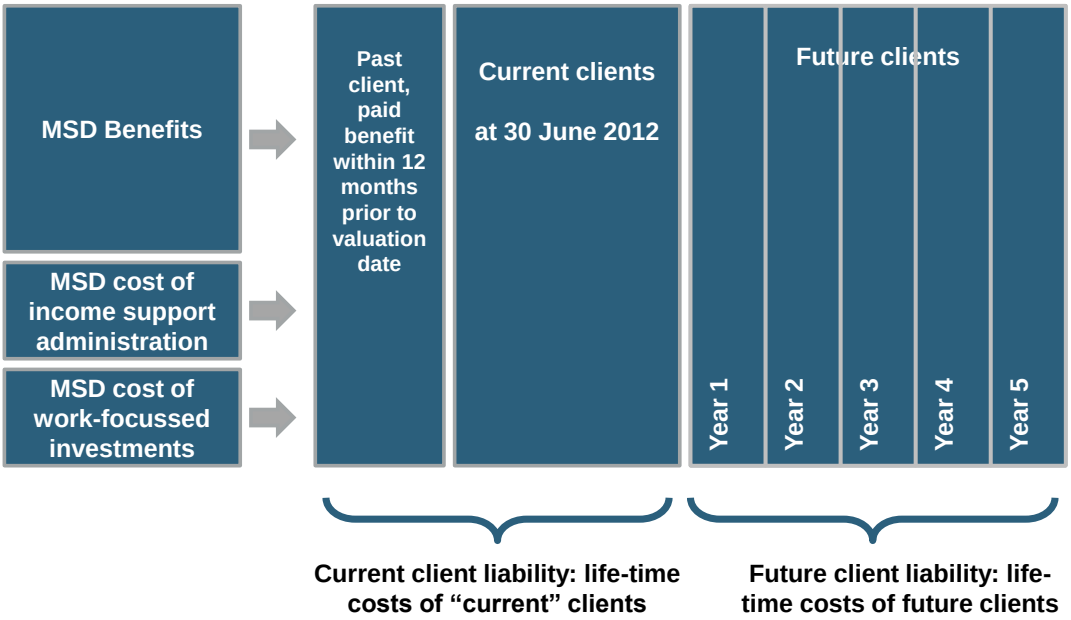
Future client liability: the lifetime cost of future clients

The future client liability is comprised of all future benefit payments and associated expenses for working-age clients who enter the benefit system in the next five years either:

- For the first time, or
- After being off benefit for more than 1 year at the previous 30 June

Note that the definition of future client liability has been modified slightly from the previous valuation – this is discussed further in Section 18.2.2. These definitions are represented graphically below in Figure 2.2, which shows the types of costs on the left (benefit payments and MSD expenditure), and current client liability and additional future client liability across the diagram.

Figure 2.2 **Definition of liability**



2.5.2 Benefits in scope

The following benefit categories have been created for use in the valuation:

- Tier 1:
  - UB: Unemployment Benefit and related benefits, including Independent Youth Benefit
  - IB: Invalid's Benefit
  - SB: Sickness Benefit and related benefits
  - DPB: Domestic Purposes Benefit – Sole parent and Emergency Maintenance Allowance
  - DPB-CSI: Domestic Purposes Benefit – Care of Sick and Infirm
  - EB: Emergency Benefit
  - OB: Unsupported Child and Orphan Benefit

    - WA/WB: Widow's Benefit and Domestic Purposes Benefit – Woman Alone

- Tier 2:
    - AS: Accommodation Supplement and related assistance
    - DA: Disability Allowance and related assistance
    - CDA: Child Disability Allowance
    - CCS: Childcare Subsidy including OSCAR payments to clients

- Tier 3:
    - EI: Employment Interventions such as training costs provided as supplementary assistance
    - HS: Non-recoverable Hardship Assistance, including Temporary Additional Support

Note that most of these categories combine several benefit types from MSD's data. For example, UB combines all unemployment related benefits including Independent Youth Benefit, Unemployment Benefit Training and Unemployment Hardship benefits. Also note that benefits payable to youth (aged 16-17) such as the Independent Youth Benefit ("IYB") and Emergency Maintenance Allowance ("EMA") have been included within scope. Understanding the transitions and lifetime costs of clients entering the benefit system at a very young age provides important insight into the management of their liabilities. The detailed listing of benefits included within each category can be found in the relevant Sections in Part C.

A complete listing of benefits within scope can be found in Appendix C.

2.5.3 Benefits excluded from scope

Some benefits have been **excluded** from scope:

- All benefits payable to clients over the age of 65, including New Zealand Superannuation, Veterans' Pensions and supplementary assistance for clients over age 65
- Student Loans and Allowances
- Unemployment Benefit Student Hardship (see reasoning in Section 18.2.2)
- Some other benefits fall outside of Vote Social Development, in particular Working for Families

The rationale to exclude benefit payments over age 65 and student benefits principally reflects the purpose of the valuation as a tool to assist in achieving **employment** outcomes for current clients.

2.5.4 Net loans cost

There are a number of ways in which clients become indebted to MSD. For the purposes of this valuation all debts to MSD are termed "loans":

Loans arise for the following reasons:

- **Overpayments:** Where a client is paid more than their entitlement, on discovery this gives rise to an amount to be recovered by repayment or deductions from benefits
- **Overpayments due to fraud:** Where there are overpayments and there is sufficient proof to refer clients for prosecution for fraud this gives rise to an amount to be recovered by repayment or deductions from benefits
- **Benefit advances:** Where a client is advanced a benefit for reasons such as hardship, which is later recovered by deductions from benefits, or repayment if the client no longer receives benefits
- **Recoverable assistance:** income-tested, interest-free recoverable financial assistance to clients and non-beneficiaries for defined needs

In this valuation the various subcomponents relating to type of loan and recovery have been valued separately. The sections below detail the approach taken to each, noting that we have combined overpayments and fraud to form one category "overpayments" and combined benefit advances and recoverable assistance to form a second category "recoverable assistance".

For completeness we should also mention underpayments which occur when MSD pays less to a client than their entitlement. When this is discovered the client is paid in full. Underpayments are not valued separately as the data supplied has been corrected for all known past underpayments.

2.5.5 MSD Expenditure

The definition of liability given in Section 2.4 includes the phrase "costs of benefit payments and associated expenses". Consistent with liability valuations in insurance which include the costs of managing claims, the expenses of running the benefit system have been included in the estimated liability.

MSD expenses included within the scope of the valuation are those required to administer the benefits for working-age adults in the valuation, and to help clients prepare for and return to work. The scope agreed with the Ministry and the Treasury is detailed further in Section 14 and Appendix C. Expenditure has been analysed and categorised under the following headings.

- Income support administration
  - Benefit processing ("income" share of Tailored Sets of Services to Help People into Work or Achieve Independence appropriation)
  - Integrity services
  - Collections
  - Temporary measures (e.g. Canterbury earthquake)

- Work focused investments
  - OSCAR (Out of School Care and Recreation subsidy to providers)
  - Training and employment support (includes Employment Assistance, Vocational Skills Training, Mainstream Supported Employment Programme, Youth Transition Services)
  - Work-focused case management (includes "work" share of Tailored Sets of Services appropriation; e.g. Job Connect, employment coordinators, work brokerage)

Note that Tailored Sets of Services were apportioned by MSD between income support administration and work focused investments on the basis of time survey data.

2.5.6 Inflation and discount basis

Under accounting and actuarial standards for insurance and accident compensation, liabilities must be estimated allowing for future inflation and the effect of investment return (i.e. discounting the estimated future cash flows to allow for the "time value of money").

However, as there are currently no required standards for the valuation of social welfare benefits (see Section 2.6), several options were discussed. It was considered whether liabilities should be estimated:

- In dollar values as at the date of the valuation (i.e. ignoring the impacts of future inflation and investment return)
- In inflated and discounted values using assumptions that are:
  - Constant, i.e. that do not change over time, perhaps based on the long term average
  - Variable based on The Treasury forecasts used by other agencies for the valuation of liabilities for Crown accounts

It is considered important to estimate liabilities allowing for both future inflation and the time value of money so that investment decisions can be made on a like-for-like basis. E.g. An investment of $100 now to save $150 in 10 years' time would result in a different decision than an investment of $100 now to save $150 next year. Note that such a basis is required whether there is a fund of assets supporting the liability or not.

Following discussion of various alternatives with MSD and the Treasury it was decided to use the Treasury forecasts for Consumer Price Index (CPI) inflation and Government interest rates for inflation and discounting of the benefit system liability. Details of the assumptions used are provided in Section 19.

Changes to inflation and discounting assumptions will have a significant impact on the valuation figures from year to year. However, these are outside the control of MSD. For this reason we separate the change in the valuation attributable to these items from other impacts to the valuation.

2.5.7 Tax basis: gross versus net

Consideration was given as to whether liabilities should be estimated gross or net of tax. Based on advice from MSD and the Treasury liabilities have been estimated gross of tax to be consistent with Crown accounts. It should be noted that this reflects the liability from MSD's perspective, but over-states the liability from a whole-of-government perspective.

2.6 Compliance with actuarial and accounting standards

There are currently no accounting or actuarial professional standards strictly applicable to the valuation of social welfare liabilities. However, in general we carried out the valuation in accordance with standards applicable to the valuation of accident compensation liabilities.

That is, we have complied generally with the New Zealand Society of Actuaries Professional Standard No. 4.1 entitled "Valuations of general insurance claims". We have also attempted to comply with International Financial Reporting Standards ("IFRS"). Specifically, estimates of liability incorporate an allowance for future inflation, investment return and administration expenses on a basis specified by the Standards.

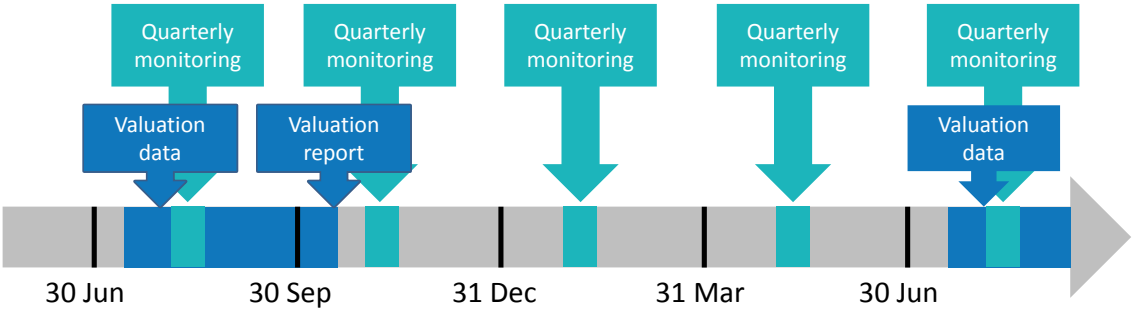
However, we have not estimated nor incorporated a prudential margin as is sometimes required by such standards. In our opinion this seems unwarranted given the use to which the valuation will be put.

It is worth noting that the International Actuarial Association has produced a draft International Standard of Actuarial Practice 2 (ISAP 2) "Financial Analysis of Social Security Programs". This standard is likely to become operational from about October 2013. We do not believe that the standard's intention is to cover the type of social welfare system in New Zealand; the focus appears to be on schemes with narrower scopes and elements of funding. In any event, it is likely that this valuation will comply with the sections of ISAP 2 that may be considered relevant.

2.7 Valuation process and timing

This is the second time that a full actuarial valuation of the New Zealand social welfare system has been carried out. It has been proposed that valuations are undertaken on an annual basis as at each 30 June. In the year between valuations it is envisaged that quarterly monitoring of experience against forecasts arising from the previous valuation would also be carried out. Figure 2.3 shows the intended timetable for future valuations.

Figure 2.3 **Valuation and monitoring timetable**



Each quarterly monitoring item in the timetable shown above has a one month delay from the end of each quarter to allow sufficient time for all new benefit recipients to be entered into the system, and for data to mature (e.g. payment adjustments due to abatement against earned income). The need for the one month delay became apparent after testing the effectiveness of monitoring without any lag.

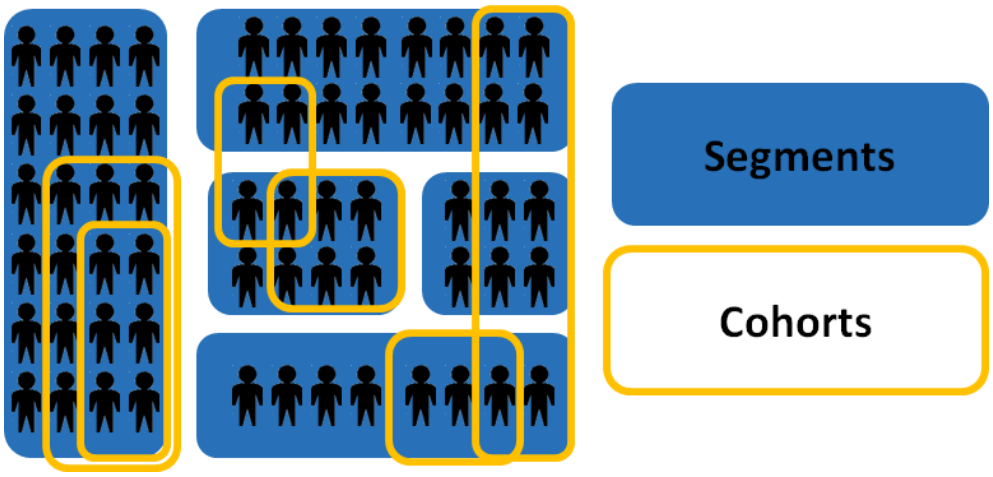
2.8 Aggregate, segment and cohort level results

The original feasibility report recommended three levels of valuation, each geared towards a different level of management:

- Level I: Aggregate liability valuation. This aims to reflect the macroeconomic environment, significant policy initiatives and trends in experience.
- Level II: Segment level liability estimates. Clients are separated into meaningful, mutually exclusive segments for operational control. Targets and KPIs can be set for each, for performance monitoring.
- Level III: Client & cohort level initiatives: Specific programmes and initiatives on small subsets of the client base can be tested and evaluated.

The distinction between segments (used for Level II) and cohorts (used in Level III) is illustrated in Figure 2.4.

Figure 2.4 **Illustration of segments and cohorts across the population of beneficiaries**



For the 30 June 2011 valuation Taylor Fry produced two sets of estimates. The aggregate, or Level I valuation is referred to as the previous report. We also completed a segment level, or Level II valuation. Some of the results of this segment level analysis are summarised in Part D.1.

After comparing the results of the Level I and Level II valuation, and after consultation with MSD, we have decided to combine the Level I and Level II valuations into a single report with common methodology. There were a number of reasons for this approach:

- **The Level II results were very close to those found in Level I.** We had originally feared that the extra complexities of the Level II valuation would lead to some overly high or low estimates. For example, the inclusion of extra modelling variables such as gender or region may have decreased the stability of the system. However, it appeared that the models remained stable even after adding the extra variables.
- **There was some degree of duplication in the Level I and Level II modelling.** Some of the models and assumptions required for Levels I and II were very similar, and could be done more efficiently in a unified approach.
- **The results of a unified approach could serve both Level I and Level II purposes.** Although our approach is closer to that used for Level II last year, it still gives aggregate liabilities and the aggregate management control required for Level I.

One consequence of this is that the current valuation report is somewhat longer than it would be otherwise. Not only does it contain aggregate (Level I) results, but also much of the segment level reporting required for Level II. Additionally, some of the 2011 Level II analysis is included as a separate section (Part D.1), for the sake of completeness. The adopted segments are also described below.

2.9 Segments adopted by MSD

Using the statistical input from Taylor Fry described in Part D.1 as well as operational considerations, MSD has chosen 17 segments to value and monitor. These can be grouped into five "top tier" segments which are defined by a person's benefit type, and then divided into "lower tier" segments using other variables such as duration (whether a client has been continuously on benefits for less than or more than a year) or child age. These are presented in the table below. Initially we expect that MSD will refine these segments to suit the changing environment and reforms currently underway. However, we also expect that once defined these segments are maintained and only changed in limited circumstances such as major policy, structural or behavioural shifts.

Table 2.1 **Summary of segments adopted by MSD**

Jobseeker support	Sole parents	Supported living	Youth	Non-beneficiaries
Work-ready, <1 year	Youngest child 0-2	Carer	Youth payment, <18	Sup only, <1 year
Work-ready, >1 year	Youngest child 3-4	Partner		Sup only, >1 year
HCID, <1 year	Child 5-13, <1 year	HCID	Young parent payment, <19	Orphan only
HCID, >1year	Child 5-13, >1 year			Recent exits, <1 year

The "HCID" acronym in Jobseeker Support (JS) and Supported Living (SLP) top tier segments stands for "Health condition, Injury or Disability". It takes the place of the pre-reform Sickness Benefits (within Jobseeker Support) and Invalid's Benefit (within Supported Living). On occasion we will use the acronyms JS-HCID and SLP-HCID to distinguish between them.

Further detail on the exact definition of each of the segments is given in 15.4.

2.10 Documentation

This report summarises our analysis and estimation of the liability, both current and future, as at 30 June 2012. The report consists of the following parts.

PART A: Executive Summary & Introduction

Section 1: Executive summary

Section 2: Introduction and background

Part B: Results

Sections 3 to 6: Presentation of summarised and more detailed results and comparisons.

Part C: Valuation by Component

Sections 7 to 14: Description and summary of all the models and forecasts by segment, with separate sections for the future liability, net loans cost and expenses.

PART D.1: The 2011 Valuation Level II Approach

Section 15: Segmentation analysis

Section 16: Segmentation and the 2011 Valuation

PART D.2: 2012 Valuation approach

Sections 17 to 19: Covering Scope, Data, Valuation Approach, Economic Assumptions.

Part E: Reliances & Limitations

Section 20.

2.11 Glossary

The following tables give definitions for common acronyms and terms used in this report.

Table 2.2 **Acronyms for benefit types**

Term	Definition
AS	Accommodation supplement (and related assistance)
CCS	Childcare subsidy (including OSCAR payments to clients)
CDA	Child disability allowance
DA	Disability allowance (and related assistance)
DPB	Domestic purposes benefit – sole parent (including Emergency Maintenance Allowance)
DPB-CSI	Domestic purposes benefit – care of sick and infirm
EB	Emergency benefit
EI	Supplementary Assistance: Employment interventions (including training provided as supplementary assistance)
EMA	Emergency maintenance allowance (combined with DPB in this valuation)
HS	Non-recoverable hardship assistance
IB	Invalid's benefit
IYB	Independent youth benefit (combined with UB in this valuation)
NOB	Not on benefits (in a given calendar quarter)
OB	Orphan and unsupported child benefits
OTH	Other benefit, referring to those clients not on a key benefit, includes supplementary assistance, but not including UBSH, CCS, EI and HS.
SB	Sickness benefit
UBSH	Unemployment Benefit Student Hardship (excluded from scope)

Term	Definition
UB	Unemployment benefit (and related benefits)
WA/WB	Domestic purposes benefit – women alone and widow's benefit

Table 2.3 **Terms used for segments**

Term	Definition
HCID	Health condition, Injury or Disability
JS	Jobseeker Support
SLP	Supported living payment
WR	Work Ready

Table 2.4 **Terms used for "Loans"**

Term	Definition
Loans	Loans covers all cases where a client can become indebted to MSD, i.e. via overpayments of benefits or assistance (inadvertently or through fraud) or via recoverable assistance (including both benefit advances and other recoverable assistance).
Net loans cost	The liability for the cost of loans after allowance for recoveries
Overpayments	Payments (benefit or assistance) where a client is inadvertently paid more than their entitlement. In the valuation overpayments include those due to fraud.
Recoverable assistance	In this report recoverable assistance includes benefit advances and recoverable assistance.
Recoveries	Repayments of overpayments and recoverable assistance to MSD

Term	Definition
Underpayments	Payments (benefit or assistance) where a client is inadvertently paid less than their entitlement. These do not appear in the valuation because payment data is automatically adjusted when an underpayment is discovered, and clients are repaid the amount of the underpayment.

Table 2.5 **Terms used for MSD expenses**

Term	Definition
Benefit processing	Expenses related to benefit processing, defined as the ("income" share of Tailored Sets of Services to Help People into Work or Achieve Independence appropriation)
Collections	Services to manage the collection of overpayments and recoverable assistance loans from former clients and other balances owed (for working-age benefits included in the scope of the valuation)
Income support administration	Expenses are analysed under two main categories, Income support administration is the category related to delivering benefits to clients
Integrity services	Services to minimise errors, fraud and abuse of the benefit system
OSCAR	Out of School Care and Recreation subsidy to providers
Temporary measures	Time-limited expenses, such as administering extra support due to the Canterbury earthquake
Training and employment support	Includes Employment Assistance, Vocational Skills Training, Mainstream Supported Employment Programme, and Youth Transition Services
Work focused case management	Includes "work" share of Tailored Sets of Services appropriation; e.g. Job Connect, employment coordinators, work brokerage
Work focused investments	Expenses are analysed under two main categories, Work focused investments is the category related to helping clients prepare for and return to work.

Table 2.6 **Other common terms and acronyms used in report**

Term	Definition
ABP	Average benefit paid per quarter to clients in receipt of a benefit that quarter.
Qualifying recipient	A client recognized as part of the current client liability as having received a qualifying benefit in the 12 months up to the valuation date. With a small abuse of terminology, the term can also be applied to the future client liability, where it means those beneficiaries who are not currently qualifying but will receive a qualifying benefit in the near future.
Qualifying benefit	Benefit types for defining a client to be "in the system" and requiring valuation. This includes DPB, IB, SB, UB, EB, DPB-CSI, WA/WB, OB, IYB, AS, DA and CDA. Notable exclusions are UBSH, CCS, EI and HS (in the absence of other benefits payable to the same client). Explanation of this is provided in section 18.2. The practical outcome of this definition is that the full future lifetime cost for CCS, EI and HS *where there is an underlying Tier 1 or Tier 2* benefit / assistance are valued.
Relative exposure	This term is used on figures throughout the report. Depending on the context it refers to the number of beneficiaries (transition and payment model figures) or the number of potential beneficiaries (*other benefits and assistance* probability models)
System/benefit system	Refers to the NZ benefit system as administered by MSD. Implicitly applied only to those benefits within scope of the liability – i.e. the main benefits and supplementary/hardship assistance listed above.

PART B
RESULTS

3 COMPARISON OF ACTUAL AND FORECAST EXPERIENCE

3.1 Introduction

The models developed in the 30 June 2011 Level I and Level II valuations were based on data to 30 June 2011. Subsequent experience, relating to the 12 months to 30 June 2012, can be compared with predictions made by these models. The results of these comparisons are given in the following sections.

Note that the expected payments throughout this section relate to the projections made by the 2011 Level II valuation. See Section 16 for further discussion on this choice.

3.2 Overall actual versus expected payments

Actual and expected payments over the 12 months to 30 June 2012 are shown in Table 3.1. Combining both payments made to beneficiaries in the current and future client liabilities, we expected $6.78b in benefit payments to be made. Actual payments were 2%, or $141m, lower than this at $6.64b ($121m from the current liability clients and $20m from the future liability clients). The largest contributors to this difference were DPB and UB benefits, which were both about $55m below projected levels. Moderate deviations were also seen for CCS ($49m larger than forecast, primarily relating to future liability clients) and Hardship ($26m less than forecast).

Most of the other larger benefit classes had experience very close to that expected. For instance IB payments, the second largest benefit category, were just 0.2% higher than the expected amount.

Table 3.1 **Actual versus expected benefit payments**

Benefit	Current liability			Future liability			Total		
	Actual	Expected	Ratio	Actual	Expected	Ratio	Actual	Expected	Ratio
	$m	$m		$m	$m		$m	$m	
DPB	1,631	1,681	97%	61	66	91%	1,692	1,747	97%
IB	1,292	1,289	100%	20	21	98%	1,312	1,310	100%
SB	708	716	99%	71	76	93%	779	792	98%
UB	639	684	93%	133	145	92%	772	829	93%
CSI	112	107	105%	6	7	85%	118	114	104%
EB	34	30	113%	7	10	74%	41	40	103%
OB	93	95	97%	5	7	80%	98	102	96%
WB	110	108	102%	7	6	112%	117	114	102%
Total T1	**4,619**	**4,710**	**98%**	**310**	**338**	**92%**	**4,930**	**5,048**	**98%**
AS	991	1,000	99%	75	99	75%	1,066	1,099	97%
DA	121	129	94%	3	5	64%	124	133	93%
CDA	86	88	97%	2	2	104%	88	91	97%
CCS	122	113	107%	47	7	659%	169	120	140%
Total T2	**1,319**	**1,330**	**99%**	**127**	**113**	**112%**	**1,447**	**1,443**	**100%**
EI	20	21	95%	5	4	122%	25	25	99%
HS	218	236	92%	21	28	72%	238	264	90%
Total T3	**238**	**257**	**92%**	**25**	**32**	**79%**	**263**	**289**	**91%**
Grand total	**6,176**	**6,297**	**98%**	**463**	**483**	**96%**	**6,639**	**6,780**	**98%**

3.3 Actual and expected numbers of clients and average benefits paid

Differences between actual and expected total payments can be attributed to differences in the numbers of clients receiving benefits or differences in the average amounts that they receive, or both. In the current situation the numbers of clients on benefit is the key driver of difference. The quarterly differences in numbers for the benefits with the largest deviations, UB and DPB, are shown in Figure 3.1 and Figure 3.2 respectively. Interestingly, most of the difference for UB was due to people leaving the benefit faster than expected in the second half of 2011. In contrast, the difference in DPB numbers grew consistently over each of the four quarters.

Figure 3.1 **Actual and expected numbers of clients on UB, 2011 current liability**[9]

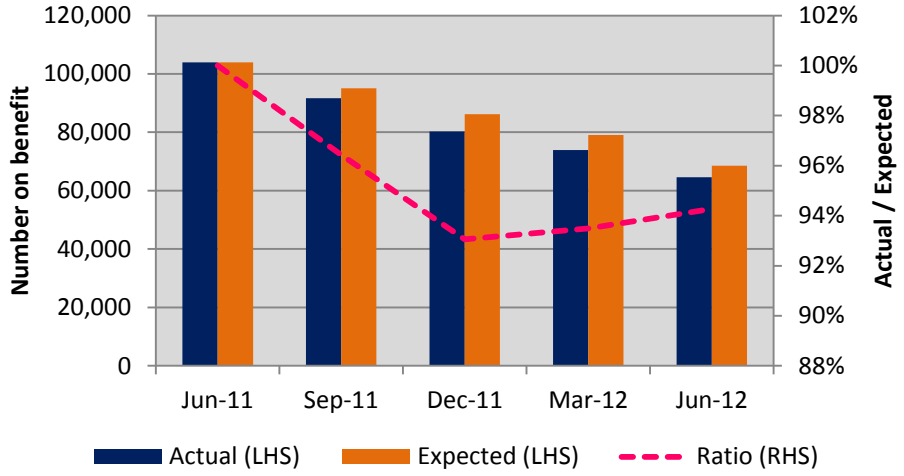
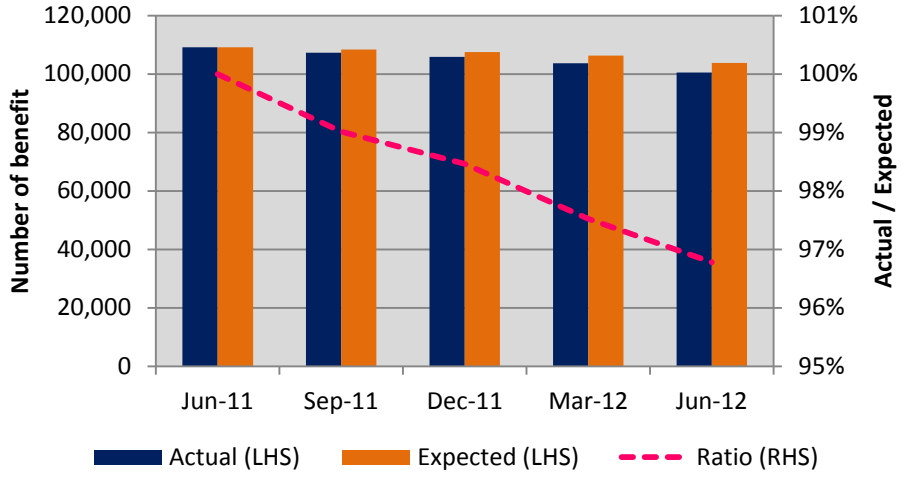


Figure 3.2 **Actual and expected numbers of clients on DPB, 2011 current liability**



Average benefits paid were generally very close to the expected levels, usually out by at most a couple of percentage points. The only exception was EB, which had an average payment about 10% higher than expected in the first half of 2012.

Additional actual versus expected results for the 2011/12 year are provided in Appendix E.

3.4 Actual and expected results by segment

In the 2011 Level II valuation, each person in the current client liability was assigned to one of 17 segments (see Sections 2.9 and 15). The actual and expected results for each of the segments are shown in the table below.

[9] Clients numbers in this section refers to our quarter based definition, discussed in 17.5 . This will tend to give higher numbers than official MSD figures, which report the numbers at the end of each quarter.

Table 3.2 **Actual versus expected benefit results for 2011 segments**

Segment		Avg qtrly number on benefit			Average qtrly benefit paid			Total payments		
		Actual	Expected	Ratio	Actual	Expected	Ratio	Actual	Expected	Ratio
		000s	000s		$	$		$m	$m	
Jobseeker Support	WR < 1	31	32	97%	2,692	2,718	99%	338	353	96%
	WR > 1	39	39	100%	3,612	3,523	103%	560	546	102%
	HCID < 1	17	17	99%	3,246	3,166	103%	221	217	102%
	HCID > 1	36	35	101%	3,602	3,516	102%	515	499	103%
Sole Parent	Ch 0-2	32	32	100%	5,271	5,276	100%	674	676	100%
	Ch 3-4	16	17	99%	5,234	5,301	99%	344	351	98%
	Ch 5-13 < 1	6	6	98%	4,843	4,952	98%	108	112	96%
	Ch 5-13 > 1	33	33	100%	5,168	5,172	100%	679	682	100%
Supp Living	Carer	7	7	102%	4,487	4,378	102%	123	117	105%
	Partner	9	9	99%	3,429	3,467	99%	122	124	98%
	HCID	82	82	100%	4,173	4,167	100%	1,365	1,364	100%
Youth	Youth payt	1	1	97%	2,616	2,428	108%	11	10	104%
	Yth Parental	2	2	100%	4,702	4,736	99%	30	30	99%
Non-ben	Sup <1yr	23	23	101%	957	1,083	88%	89	100	89%
	Sup >1yr	64	64	100%	1,065	1,069	100%	274	275	100%
	Orp only	4	4	99%	3,432	3,452	99%	59	60	98%
	Recent exits	66	68	97%	2,512	2,851	88%	665	780	85%
Total		468	471	99%	3,299	3,340	99%	6,176	6,297	98%

Again, results are very close to what was expected. Main features include:

- The work-ready segments had lower than expected payments in the low duration segment and higher than expected in the higher duration segment. This appears to reflect a larger duration related trend – see below.
- The average amount paid to those who were recent exits at 30 June 2011 but re-entered the system was significantly less than expected. The $115m difference in payments accounts for much of the total difference between actual and expected.
- The carers' segment continued to grow faster than expected. This follows a number of prior years of strong growth in numbers, which we had previously projected would level off. See Section 9 for further discussion.

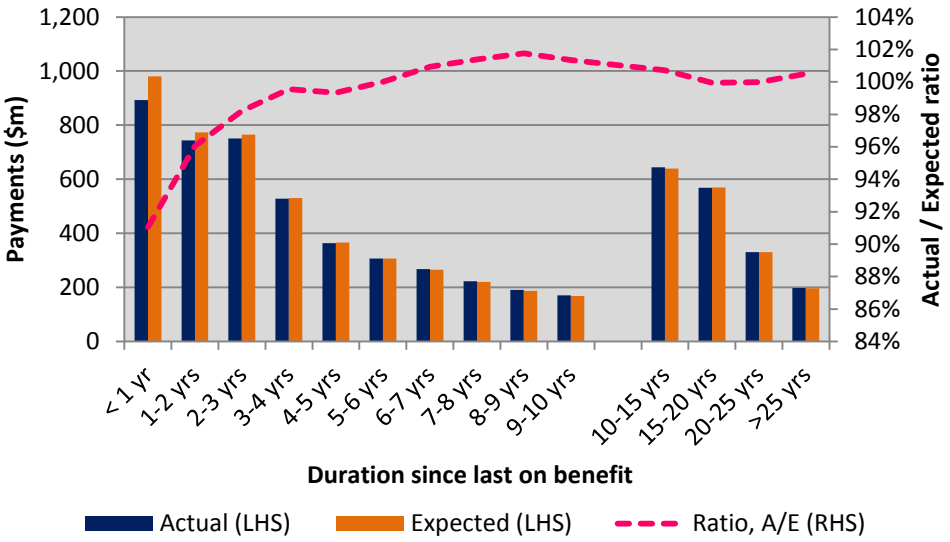
3.5 Other trends in actual versus expected results

Appendix E has actual and expected results split out in a variety of different ways. We highlight a couple of interesting results here.

The payment amounts to clients with short durations remaining on benefits were over predicted while the amounts to longer duration clients were under predicted. Generally speaking, lower duration clients tend to have higher probabilities of exiting the welfare system and these results suggest this effect was actually even larger than previously anticipated. This is possibly attributable to the Future Focus changes of 2010. A related

trend can be observed when examining results according to age. That is, fewer young people remained on benefits compared to the valuation projections. The strong correlation between duration and age makes it difficult to fully disambiguate these effects.

Figure 3.3 **Actual and expected payments by duration**



Other splits of the data by variables such as ethnicity, region and incapacity type did not suggest any other strong emerging trends.

4 RESULTS

4.1 Estimate of current client liability as at 30 June 2012

4.1.1 Overall results

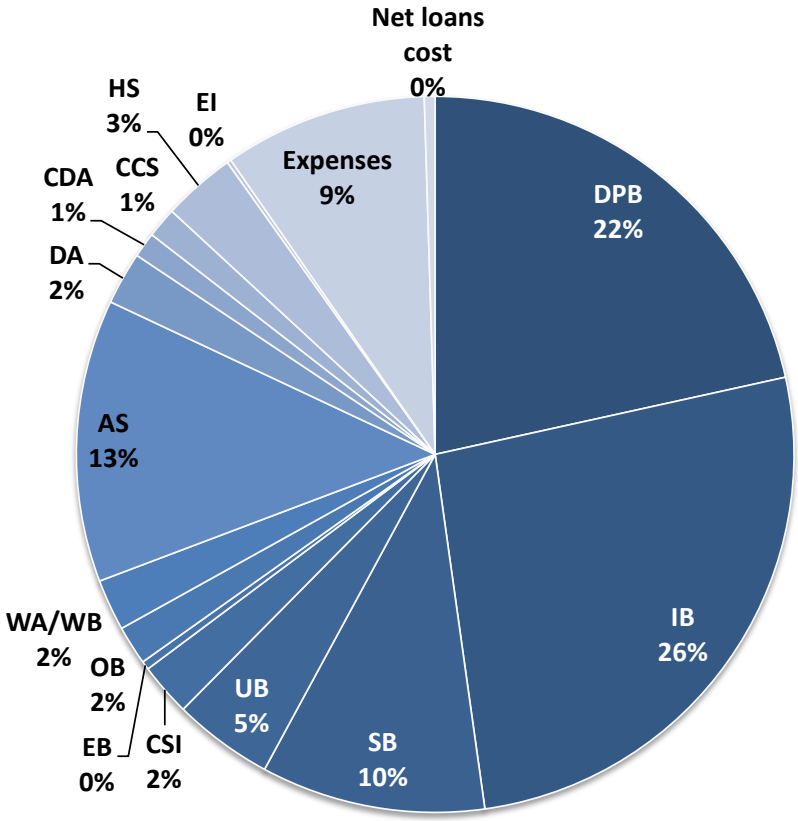
The inflated and discounted estimate of the current client liability as at 30 June 2012 is **$86.8b**. By inflated and discounted we mean that this is the sum of the projected future payments, including CPI increases to benefit rates, and discounted at Treasury rates to allow for the time value of money. This can be thought of as the amount needed to be set aside today to pay for all payments attributable to the current cohort of clients, assuming that amount would earn interest according to Treasury's discount rate schedule.

This liability can be subdivided into payments by benefit type. This is shown in Table 4.1 and Figure 4.1.

Table 4.1 **Current client liability subdivided by benefit type**

Component		Inflated and discounted liability ($b)
Tier 1:	Domestic Purposes Benefit	18.70
	Invalid's Benefit	22.78
	Sickness Benefit	8.77
	Unemployment Benefit	3.91
	DPB-Care of the sick and infirm	2.07
	Emergency Benefit	0.34
	Orphans and unsupported children	1.53
	Woman Alone / Widows Benefit	2.02
	Tier 1 subtotal	**60.12**
Tier 2:	Accommodation Supplement	11.07
	Disability Allowance	2.06
	Child Disability Allowance	0.98
	Child Care Subsidy	1.19
	Tier 2 subtotal	**15.31**
Tier 3:	Hardship Assistance: Non-recoverable	2.85
	Employment Interventions	0.16
	Tier 3 subtotal	**3.01**
Other components:	MSD Expenses	7.95
	Net loans cost	0.42
	Other components subtotal	**8.37**
Grand total		**86.82**

Figure 4.1 **Current client liability by benefit type, proportion of total**



We make the following comments regarding these benefit type results:

- The average duration on benefit has a large impact on the liability. For instance, in 2011/12 IB payments were 70% higher than UB payment amounts, yet the IB liability is nearly six times UB. This is because current clients are likely to move off UB much more quickly in the future compared to IB clients; and
- The four largest benefits (DPB, IB, SB and UB), plus their associated Accommodation Supplement payments make up the bulk of the liability, roughly three quarters;

4.1.2 Segment level results

The liability can be subdivided across the segments adopted by MSD management. These segments were introduced in Section 2.9 and their development is described in Section 15. Table 4.2 shows the segment level current client liability results. Note that, in contrast to Table 4.1, these results are split based on a client's segment at the valuation date, and totals include future cash flows arising from different benefit types for that person. Net loan cost and expenses have not been allocated across segments, as correct allocation across segments is difficult. The Youth segments make up a relatively small part of the aggregate valuation (but with a very high average lifetime cost). The remaining cost is spread fairly evenly across the other top tier segments.

Table 4.2 **Current client liability forecasts by client segment at 30 June 2012**[10]

Top tier segment	Segment[11]	Number at valn date	Total liability ($m)	Average lifetime cost ($k)	Average future years on benefit
Jobseeker Support	Work-ready, <1 year	47,175	4,823	102k	9.9
	Work-ready, >1 year	45,372	5,623	124k	10.0
	HCID, <1 year	24,603	3,153	128k	10.8
	HCID, >1year	47,019	6,927	147k	11.5
	Sub-total	164,169	20,525	125k	10.5
Sole Parents	Youngest child 0-2	31,332	8,172	261k	17.7
	Youngest child 3-4	18,450	4,474	243k	16.4
	Child 5-13, <1 year	4,345	723	166k	11.5
	Child 5-13, >1 year	35,411	7,582	214k	14.2
	Sub-total	89,538	20,950	234k	15.8
Supported Living	Carer	7,773	1,178	152k	10.6
	Partner	8,742	1,012	116k	8.6
	HCID	84,864	15,737	185k	13.0
	Sub-total	101,379	17,927	177k	12.5
Youth	Youth payment (<18)	1,405	259	184k	17.5
	Young parent payment (<19)	1,544	446	289k	20.1
	Sub-total	2,949	705	239k	18.9
Non-beneficiaries	Sup only, <1 year	36,416	2,074	57k	7.1
	Sup only, >1 year	64,408	4,119	64k	8.0
	Orphan only	4,814	479	100k	7.3
	Recent exits, <1 year	193,855	11,664	60k	5.9
	Sub-total	299,493	18,335	61k	6.5
All segment sub-total		657,528	78,443	119k	9.7
Expenses			7,955		
Net loans cost			420		
Total			86,817	132k	

One slightly counter-intuitive result from the table is that the average number of future years on benefit is similar for the two work-ready segments, despite the average liability being 20% greater for the high duration segment. This is due to an average lower age combined with a higher propensity to exit benefits in the low duration segment, which leads to two offsetting effects:

- A higher number of possible years on benefit amongst the lower duration segment

[10] Costs due to net loans and expenses have not been allocated across segments

[11] The duration measure used in the segment definitions are based on "continuous duration", which means time since they last had a 14 day spell off benefits.

- A lower probability of being on benefit amongst the lower duration segment

This leads to the similar number of projected years on benefit. However the liability for the lower duration segment is lower because more of the cash flows relate to the distant future and so they are discounted more heavily, leading to a lower liability.

Table 4.3 provides results by benefit type for top tier segments. It can be seen that although all the top tier segments (besides Youth) have similar liabilities, the benefit types that make up each of these totals is quite different. Jobseeker Support and Non-beneficiaries segment liabilities are fairly evenly spread across all benefit types, reflecting the fact that these clients transition between benefit types fairly liberally. Unsurprisingly, the bulk of Sole Parent and Supported Living segment liabilities consist of DPB and IB payments respectively.

Table 4.3 **Current client liability split by top tier segment and benefit type**

	Number at valn date	DPB ($m)	IB ($m)	SB ($m)	UB ($m)	Other T1 ($m)	AS ($m)	Other T2/3 ($m)	Total ($m)	Average ($k)
Jobseeker Support	164,169	3,057	4,515	4,782	1,940	1,663	2,948	1,621	20,525	125k
Sole Parents	89,538	11,022	1,687	1,088	439	1,453	3,304	1,958	20,950	234k
Supported Living	101,379	311	13,380	403	138	812	1,485	1,397	17,927	177k
Youth	2,949	375	51	38	35	30	107	69	705	239k
Non-beneficiaries	299,493	3,938	3,151	2,459	1,360	1,990	3,230	2,207	18,335	61k
Sub - total	657,528	18,702	22,783	8,771	3,912	5,948	11,074	7,253	78,443	119k
Expenses									7,955	
Net loans cost									420	
Total									86,817	132k

The difference in average lifetime cost across segments means that some segments have a disproportionately large or small impact on total liability relative to the number of clients in that segment. For instance, sole parents represent 13.6% of the clients valued, but 26.7% of the total liabilities. These differences are illustrated in Figure 4.2 (for top tier segments) and Figure 4.3 (for all segments). It can be seen that Sole parents and Supported Living segments have a disproportionately high contribution to overall lifetime cost.

Figure 4.2 **Contributions of top tier segments towards client numbers and liability total**

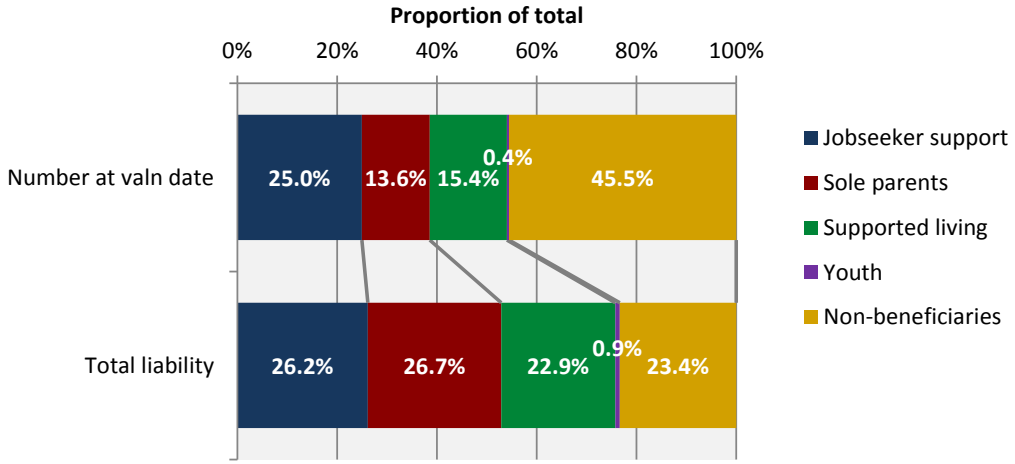
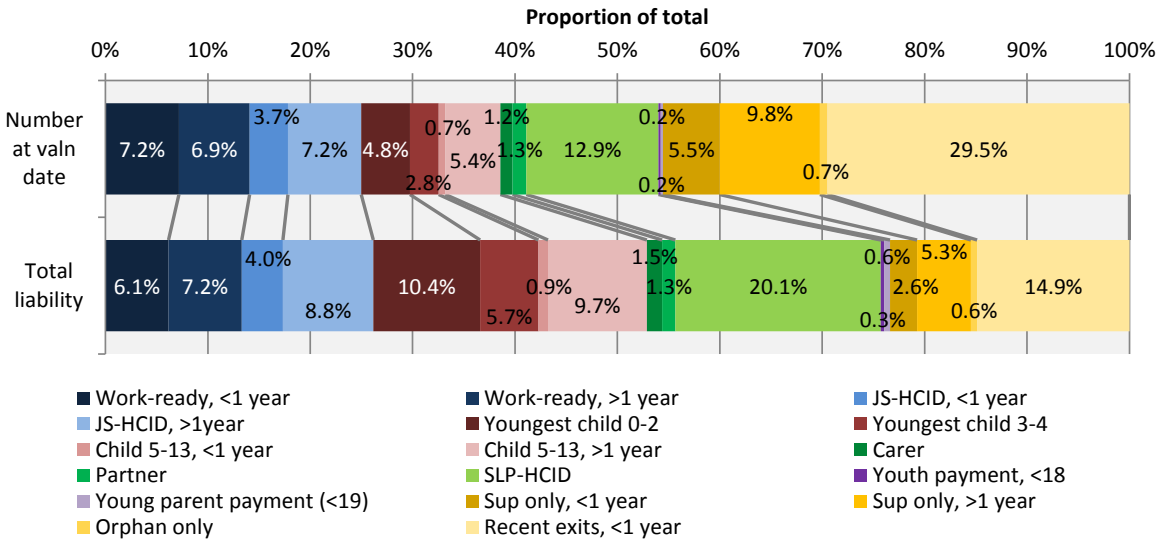
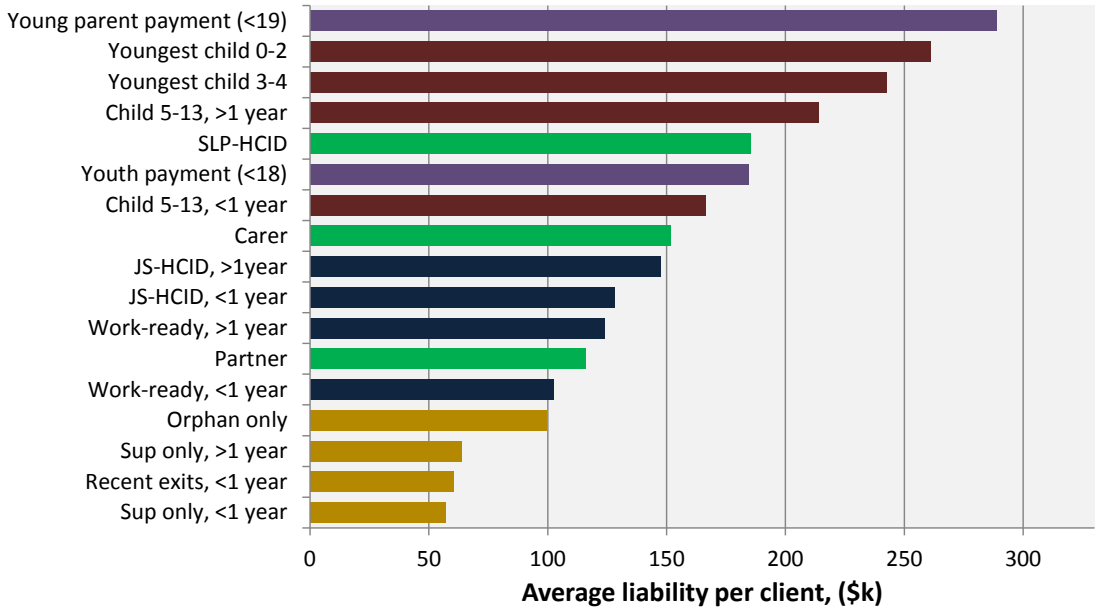


Figure 4.3 **Contributions of all segments towards client numbers and liability total**



Total liability in a segment is a combination of the number of clients in the segment and the average lifetime cost per client. We have ranked the segments by average lifetime cost in Figure 4.4. The costs for Youth segments (particularly young parent payment) are very high, a combination of these clients' high risk of remaining on welfare and the large number of potential years they have on benefits. The next highest segments relate to Sole Parents, reflecting their tendency to remain on DPB for an extended period and then move to other benefit states when they leave DPB. Supported Living liabilities are also high; they are largest for SLP-HCID (corresponding to IB), but somewhat lower for carers and partners of those on SLP-HCID. Non-beneficiaries represent the lowest average cost, but given their large numbers and the fact that their lifetime cost is about $60,000 (excluding net loans cost and expenses), their contribution to the overall liability is still substantial.

Figure 4.4 **Average lifetime cost per client, excluding net loans and expenses, by segment**



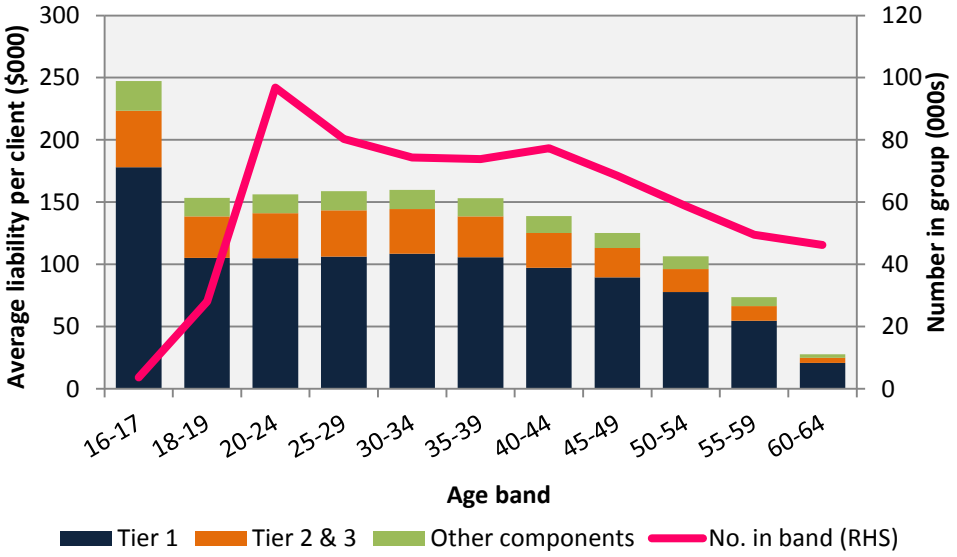
4.1.3 Splits by other variables

It is possible to split the liability valuation across any of the variables included in the valuation model. We present some here, but have included a number of others in Appendix I. The table and chart below shows the total and average lifetime liabilities by age at the valuation date.

Table 4.4 **Current client liability by client age at 30 June 2012 (in $b)**

Age band	Number	Tier 1					Tier 2		Tier 3	Other compon-ents	Total
		DPB	IB	SB	UB	Other T1	AS	Other T2			
16-17	3,691	0.23	0.31	0.04	0.04	0.03	0.10	0.04	0.03	0.09	0.91
18-19	28,067	1.32	0.82	0.35	0.28	0.17	0.57	0.22	0.15	0.42	4.31
20-24	96,812	4.80	2.69	1.22	0.77	0.67	2.11	0.86	0.54	1.46	15.14
25-29	80,284	3.77	2.47	1.08	0.57	0.65	1.80	0.72	0.46	1.23	12.75
30-34	74,389	3.08	2.66	1.14	0.49	0.71	1.64	0.61	0.42	1.15	11.89
35-39	73,871	2.37	3.00	1.21	0.44	0.79	1.48	0.54	0.40	1.09	11.32
40-44	77,342	1.70	3.30	1.23	0.43	0.86	1.33	0.48	0.37	1.03	10.73
45-49	68,484	0.92	3.01	1.05	0.37	0.79	0.97	0.35	0.29	0.83	8.58
50-54	58,810	0.38	2.45	0.79	0.28	0.67	0.64	0.24	0.21	0.60	6.26
55-59	49,560	0.10	1.52	0.47	0.17	0.45	0.34	0.13	0.11	0.35	3.65
60-64	46,218	0.02	0.55	0.16	0.07	0.17	0.11	0.05	0.03	0.12	1.28
Total	**657,528**	**18.70**	**22.78**	**8.77**	**3.91**	**5.95**	**11.07**	**4.24**	**3.01**	**8.37**	**86.82**

Figure 4.5 **Average liability per client by age at 30 June 2012**

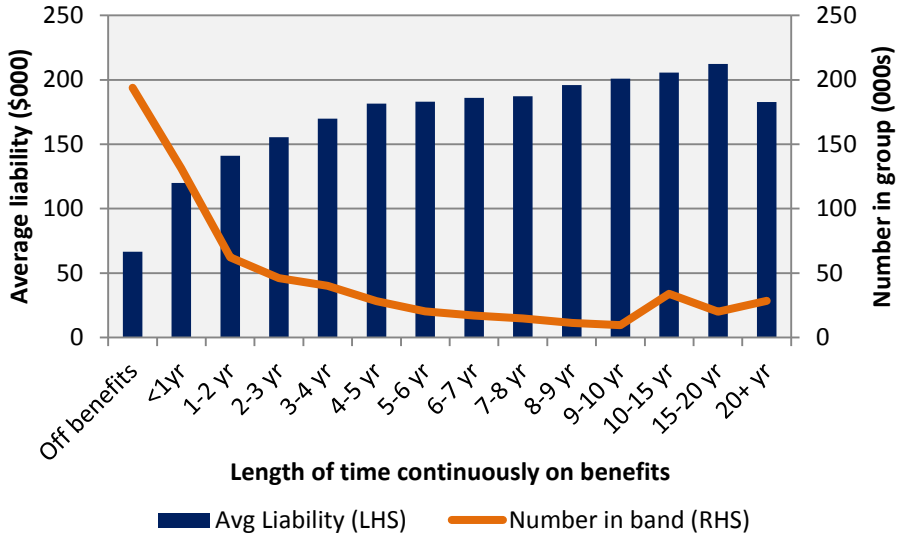


The trends shown in the chart are interesting. Firstly the cohort under age 18 has a significantly higher average liability, suggesting they are at high risk of remaining on benefits for an extended period. This difference compared to other ages arises in part due to different eligibility criteria for benefit receipt. That is, clients under age 18 also need to show circumstances such as a severe and permanent disability, illness or injury; teen parenthood, or the loss of support from their family. Qualification under these criteria leads to these clients having a higher likelihood for receiving welfare throughout their lifetime.

In contrast, the liability per client is relatively stable across ages 18 to 39. For those 40 and older, the average liability starts decreasing, as would be expected due to the approach of the retirement age.

Another important breakdown of the liability is the allocation amongst clients with different durations on benefit. Figure 4.6 shows the average liability according to continuous duration – that is, the time a client has continuously been on benefits at the valuation date. The leftmost group shows the average liability for those clients current not on benefits. Unsurprisingly, this average liability is relatively low but is still significant. The remaining groups show the average liability for those clients who have increasingly large continuous durations. The increasing trend is clear, with clients who have received benefits for at least five years having a liability 50% higher than those in their first year.

Figure 4.6 **Average key benefit liability based on client duration**

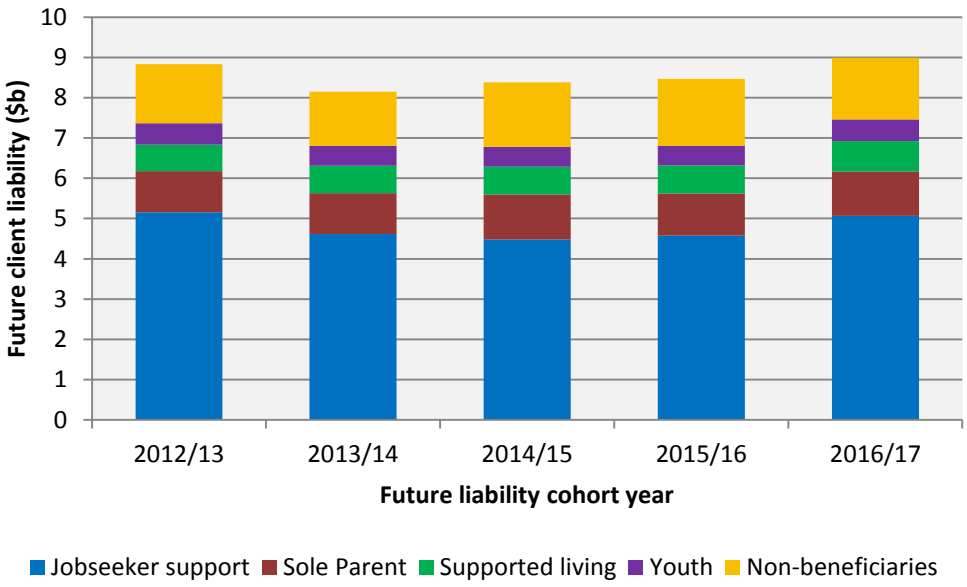


Results by duration are particularly relevant as the Government has introduced a target to reduce long-term welfare dependence.

4.2 Estimates of future client liability 2012/13 to 2016/17

The future client liability estimates are shown in the figure and table below. These amounts are inflated and discounted, with the discount date being 31 December of the corresponding financial year. Thus these figures can be thought of as the amount needed to be set aside each year in the future to meet the future costs of people entering the system.

Figure 4.7 **Future client liability for beneficiaries entering system over the next five years, split by segment at entry into welfare system**



We make the following comments:

- The definition of the future liability is slightly different to that used in the 2011 valuation. One impact of this is that the steady decreasing pattern seen across future years is replaced by trends that are more meaningful. This change is discussed in Section 18.2.2.

- The future liability is projected to decrease from 2012/13 to 2013/14 and then increase thereafter. This reflects the current projection for the unemployment rate. The number of clients entering the system is sensitive to both the **absolute level** of the unemployment rate, as well the **size and direction of recent changes**. When the rate falls quickly (2012/13 and 2013/14) relatively few new clients enter the system. However, once the rate stabilises at a new level, the number of new clients increases, partly attributable to the growth of the working age population.

- Broadly speaking, future client liability components are in similar proportions to the current client liability. The main relative differences are:
  - IB comprises 26% of the current client liability, but only about 17% of the future client liability. This is because relatively few people enter the liability directly as new IB clients each year.

- In contrast UB (8%) and SB (12%) are relatively larger than their share of the current client liability (5% and 10%, respectively). This is because they make up a greater share of clients newly entering the benefit system each year.
- DPB payments represent 22% of the future client liability, about equal to their 22% share of current client liability.

- The 2012/13 future client liability is about 10% of the current client liability. Thus the annual future client liabilities represent a significant portion of total liabilities.

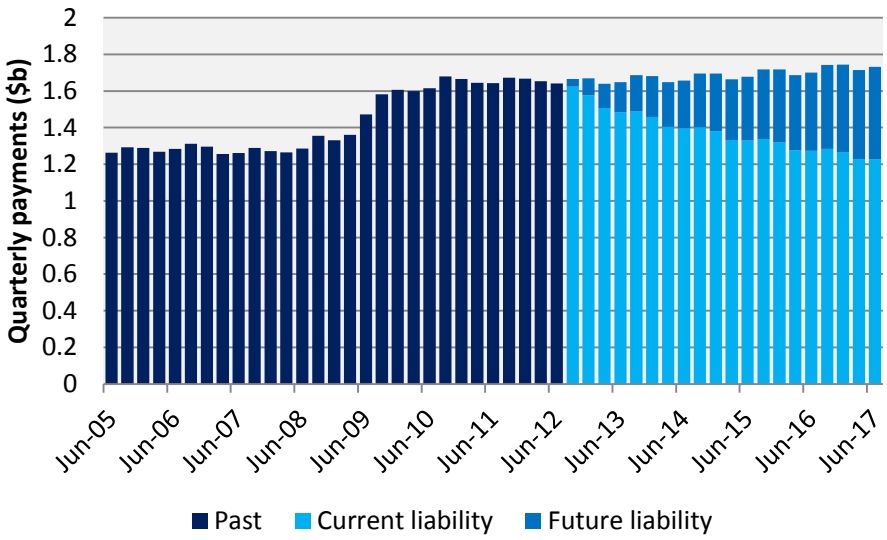
Table 4.5 **Future client liability estimates, inflated and discounted to 31 December each year**

Component	Future client liability ($b) corresponding to financial year:				
	2012/13	2013/14	2014/15	2015/16	2016/17
Tier 1					
DPB	1.98	1.85	1.95	1.95	2.08
IB	1.51	1.43	1.44	1.48	1.58
SB	1.05	0.96	0.96	0.99	1.06
UB	0.71	0.61	0.60	0.59	0.64
DPB-CSI	0.21	0.20	0.20	0.21	0.22
EB	0.06	0.05	0.05	0.05	0.06
OB	0.16	0.15	0.16	0.16	0.16
WA/WB	0.20	0.18	0.19	0.19	0.20
Tier 1 subtotal	**5.88**	**5.43**	**5.56**	**5.61**	**5.98**
Tier 2					
AS	1.29	1.19	1.24	1.26	1.32
DA	0.16	0.15	0.15	0.15	0.16
CDA	0.10	0.09	0.10	0.10	0.11
CCS	0.20	0.19	0.20	0.20	0.21
Tier 2 subtotal	**1.75**	**1.62**	**1.69**	**1.72**	**1.80**
Tier 3					
EI	0.30	0.28	0.29	0.29	0.31
HS	0.03	0.02	0.03	0.03	0.03
Tier 3 subtotal	**0.33**	**0.31**	**0.31**	**0.32**	**0.34**
Other components					
Expenses	0.81	0.74	0.76	0.77	0.81
Net loans cost	0.06	0.05	0.05	0.05	0.06
Other subtotal	**0.86**	**0.79**	**0.82**	**0.82**	**0.87**
Grand total	**8.83**	**8.15**	**8.38**	**8.46**	**8.99**

4.3 Forecast total cash flows 2012/13 to 2016/17

The cash flows arising from the current and future client liabilities can be combined to give a complete picture of projected payments over the next five years. These payments are shown in Figure 4.8.

Figure 4.8 **Total cash flows, actual values, excluding expenses and loans**



Note: the future liability cash flows have been adjusted to remove the impact of double counting of clients (see Section 18.2.2).

We make the following comments:

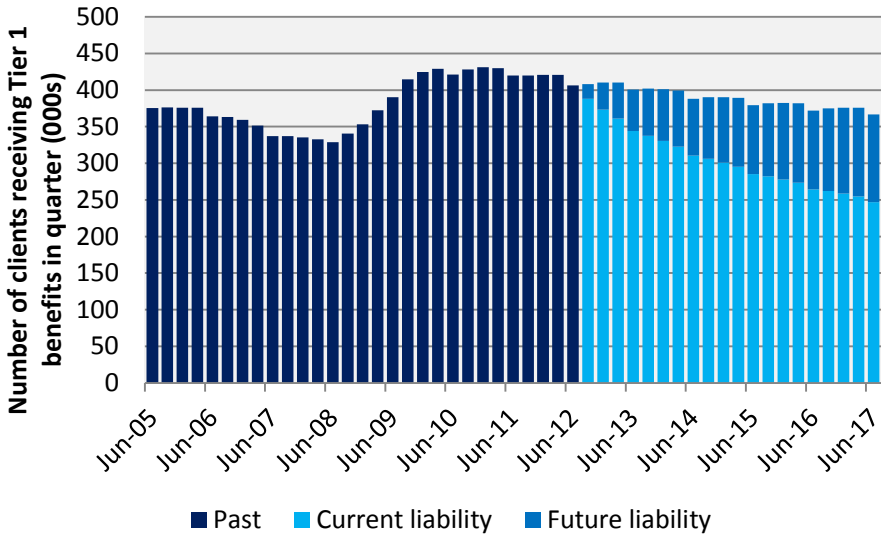
- Payments are projected to be relatively flat over the first one or two future years, and increase very slowly thereafter. This corresponds to a decrease in real terms and largely reflects improvements tied to the forecast improvement in the unemployment rate.
- Overall, payments are forecast to increase at an average rate of 0.8% p.a. over the next 5 years, significantly lower than the 2.4% average inflation rate forecast. This projected rate of increase in future total payments is due to a combination of:
    - Benefit rate inflation
    - Changes in the number of people using the welfare system
    - Changing mix of clients and benefit rates received
- The increase in total payments due to the global financial crisis at the end of 2008 can be observed in the chart
- The seasonality is observable, with March quarters about 1% lower than trend. This pattern is primarily driven by the number of days in each quarter, rather than any intrinsic differences in behaviour.
- The future client liability component grows from virtually nothing to 30% of the payments by June 2017

We can also look at the total number of clients projected to be on Tier 1 benefits. Figure 4.9 shows the number of people projected to receive some Tier 1 benefits in each quarter. Interestingly this is forecast to decrease by about 2% per year. This is largely attributable

to the forecast decrease in unemployment (see Table 19.4), which affects all key benefit types, although some more than others (see Section 6.3.1). The projected cash flow results imply that the decrease in numbers receiving key benefits is more than outweighed by the increase in ABP, both due to inflation and other factors such as the mix of clients remaining on benefits. Note that forecasts do not include the impact of planned welfare reform changes.

The increase during late 2008 and 2009 following the global financial crisis is even more apparent for the total number of clients on key Tier 1 benefits than for total payments.

Figure 4.9 **Number of clients in receipt of Tier 1 benefits**



Note: the future liability numbers of clients have been adjusted to remove the impact of double counting (see Section 18.2.2).

4.4 Other results

4.4.1 Breakdown of expenses

We have made the following allocation of expenses to the various categories:

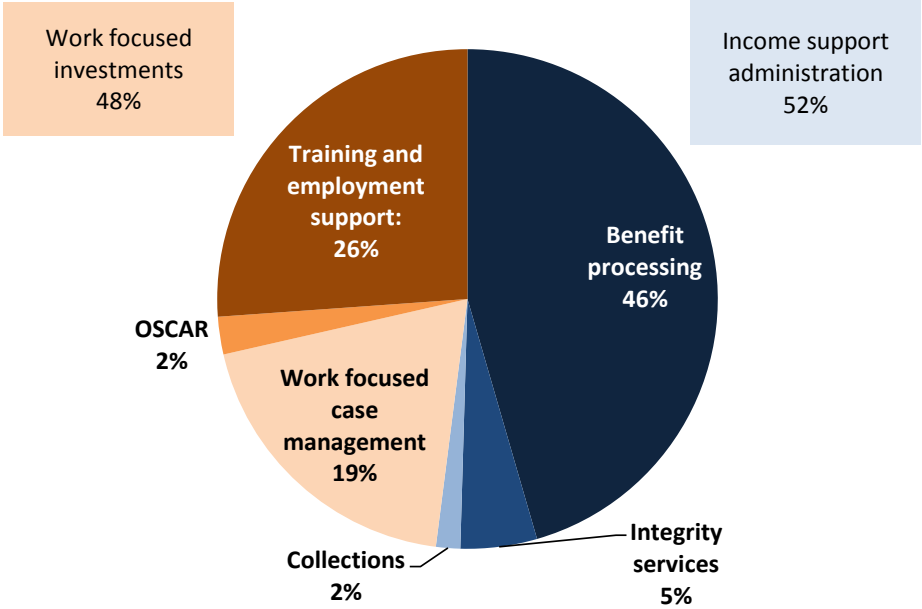
Table 4.6 **Expense category breakdown for current and future client liabilities**

Expense category	Current client liability ($m)	Future client liability 2012/13 ($m)	Future client liability 2013/14 ($m)	Future client liability 2014/15 ($m)	Future client liability 2015/16 ($m)	Future client liability 2016/17 ($m)
Income support administration						
Benefit processing	3,621	367	338	347	349	370
Integrity services	393	40	37	38	38	40
Collections	124	13	12	12	12	13
Temporary measures[12]	0	0	0	0	0	0
Sub- total	**4,138**	**419**	**386**	**396**	**399**	**423**
Work-focused investments						
Work focused case management	1,544	156	144	148	149	158
OSCAR	194	20	18	19	19	20
Training and employment support:						
Employment Assistance	1,069	108	100	102	103	109
Vocational skills training	624	63	58	60	60	64
Youth support services	341	35	32	33	33	35
Mainstream supported employment program	45	5	4	4	4	5
Job support scheme[13]	0	0	0	0	0	0
Life skills training[14]	0	0	0	0	0	0
Sub-total Training and employment support	*2,079*	*211*	*194*	*199*	*200*	*212*
Sub-total	**3,817**	**387**	**356**	**365**	**368**	**390**
MSD Expenses total	**7,955**	**806**	**743**	**762**	**767**	**813**

Figure 4.10 shows the current client liability for expenses apportioned by category.

[12] Temporary measures include payments related to special events such as the Canterbury Earthquake. No forecast of such future events has been attempted. Hence the liability is estimated as nil.
[13] Job support scheme and life skills training expenditure occurred in several of the 5 years of history used to apportion expenses between categories. However, in the most recent year, 2011/12, expenditure on both items was nil. It has been assumed that this will continue.
[14] See note above.

Figure 4.10 **Current client liability: MSD expenses by category**



Relative to last year:

- A higher proportion of expenses has been allocated to benefit processing costs
- A lower proportion of expenses has been allocated to work focused case management
- Expenses as a proportion of the total current client liability are a little higher. In the previous aggregate valuation expenses represented 8.7% of the total, compared with 9.2% in this valuation. This effect is largely due to forecast expenses being similar to last year while forecast benefits are slightly lower.

4.4.2 Breakdown of net loans cost

As described in the methodology, we have valued six separate components related to loans cost separately, which are largely offsetting. These components are shown in Table 4.7. Negative amounts represent recoveries on loans made by MSD.

Table 4.7 **Net loans liability breakdown**

Loans category	Current client liability ($m)	Future client liability 2012/13 ($m)	Future client liability 2013/14 ($m)	Future client liability 2014/15 ($m)	Future client liability 2015/16 ($m)	Future client liability 2016/17 ($m)
Further overpayments /fraud on existing debtors	73	0	0	0	0	0
Recoveries on overpayments /fraud on existing debtors	-199	0	0	0	0	0
Overpayments /fraud related to future payments	2,768	278	250	251	246	252
Recoveries on overpayments /fraud related to future payments	-2,270	-228	-205	-205	-201	-206
Net cost – overpayments /fraud	**372**	**50**	**45**	**46**	**45**	**46**
Recoverable assistance payments	1,600	177	160	161	158	163
Recoveries on recoverable assistance	-1,552	-172	-155	-156	-153	-158
Net cost – recoverable assistance	**48**	**5**	**5**	**5**	**5**	**5**
Total net loans cost	**420**	**55**	**50**	**50**	**50**	**51**

We discuss the limitations of our estimation of net loans cost in Section 13.3. In particular, we do not attempt to estimate the amount of overpayments and fraud that remains undetected in the welfare system.

4.4.3 Age of entry into the welfare system

One striking set of results relate to the liability split by the age of clients when they first enter the welfare system. The data used in this report has about 20 years of history, so age of entry is only accurately known for clients under 40. Figure 4.11 shows the age of entry for clients aged 30-39 at the valuation date. About 60% of these clients entered the system on some benefit under the age of 20. Furthermore, these clients contribute more heavily to the liability. Of the total liability attached to the 30-39 year old age band, 77% is attributable to those clients who entered before age 20. This highlights the importance of the youth segment and the potential long term impacts of early intervention.

Figure 4.11 **Numbers and liability by age of entry. The left hand chart is the age of entry into the welfare system for clients aged 30-39 at the valuation date. Right hand chart is the relative contribution to lifetime liability of those same clients.**

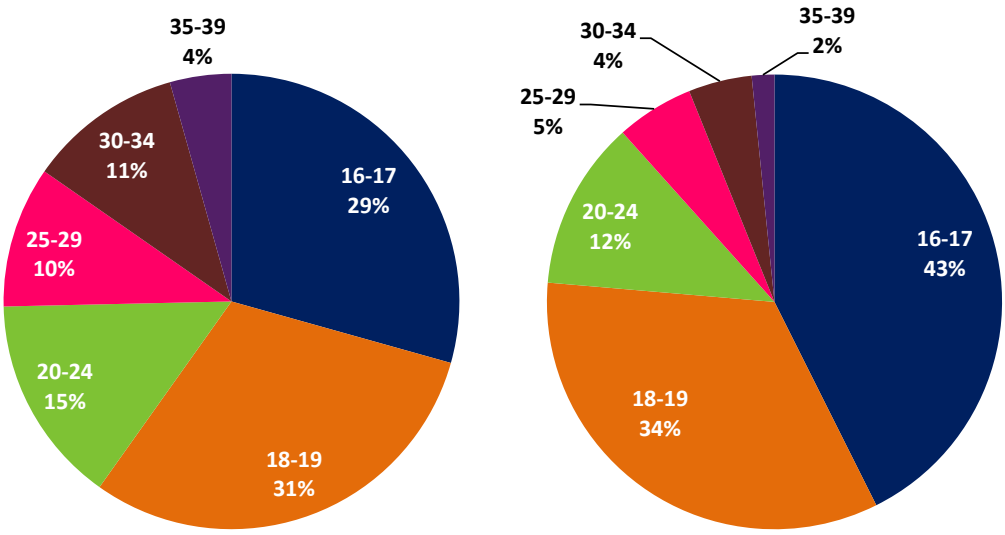


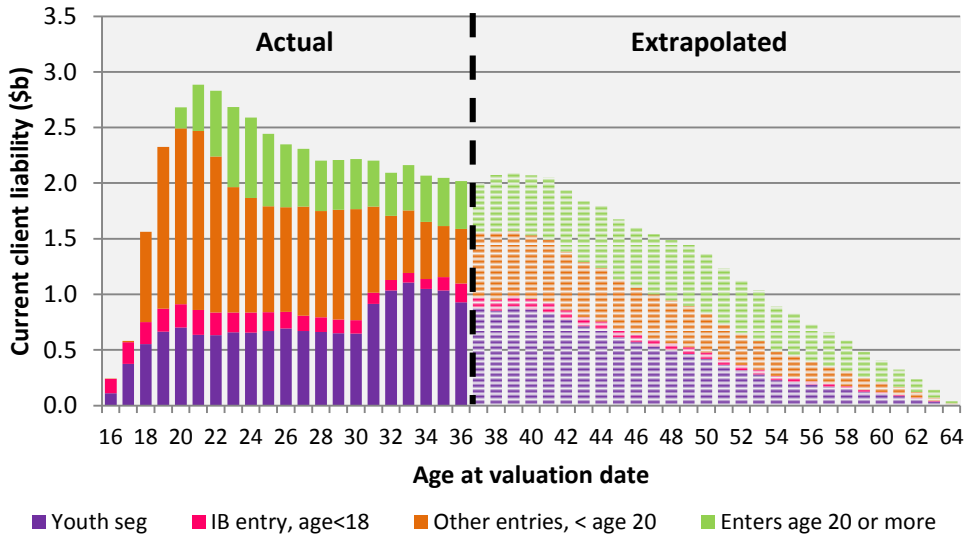
Table 4.8 shows the average lifetime liability for different combinations of age at valuation and age at entry into the system. It suggests that age at entry into the system has a far more significant impact on lifetime liability than the age at valuation. The liability for clients entering in the 16-19 age band is about 80% higher than those entering in the 20-24 band, and 160% higher than those entering in the 25-29 age band.

Table 4.8 **Average liability for clients by age at valuation and age of entry into the welfare system, for clients less than 40.**

Age at valuation	Age first entering the system					
	16-19	20-24	25-29	30-34	35-39	Average
16-19	164k					164k
20-24	187k	93k				156k
25-29	205k	110k	61k			159k
30-34	202k	121k	76k	56k		160k
35-39	198k	131k	103k	73k	58k	153k
Average	193k	108k	74k	64k	58k	158k

Finally, Figure 4.12 shows the impact of Youth and other young client entries into the welfare system across all ages. We estimate that about a third of the total liability is attributable to clients that would have entered via a youth segment. A further 40% would have entered before age 20 (but not in a youth segment). This estimation required some extrapolation for clients over age 37, owing to the lack of available data for age of first entry for these clients.

Figure 4.12 **Current client liability split by current client age and status when first entering the welfare system**



4.5 Cohort lifetime person projections

One further way of understanding the projection results is to look at how the projection applies to individual clients, cohorts and segments; we can run the projection and assess the propensity for various groups to remain on benefits, and move between different types. Figure 4.13 shows such a plot for those clients who start in the Jobseeker segment. It shows that while clients begin the projection on UB, SB, WA/WB or DPB, by 10 years into the projection:

- The majority (56%) of the cohort who have not retired are not on benefits
- Of those clients still on benefits, most are receiving SB or IB, with relatively few receiving UB – in fact, there are five times as many on SB or IB compared to UB

Figure 4.13 **Likelihood of being in various states over the course of the projection, for those clients in the Jobseeker Support segment at the valuation date**

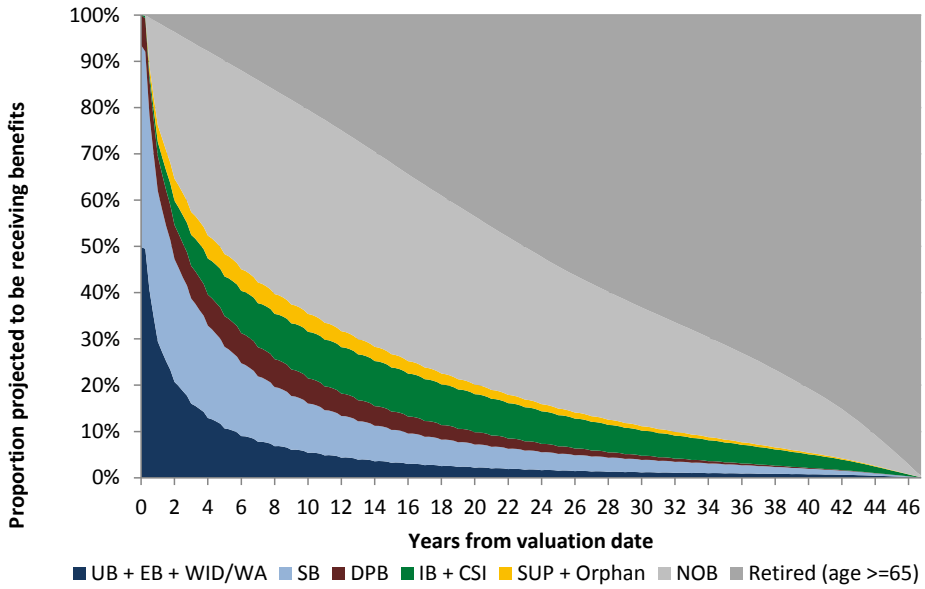
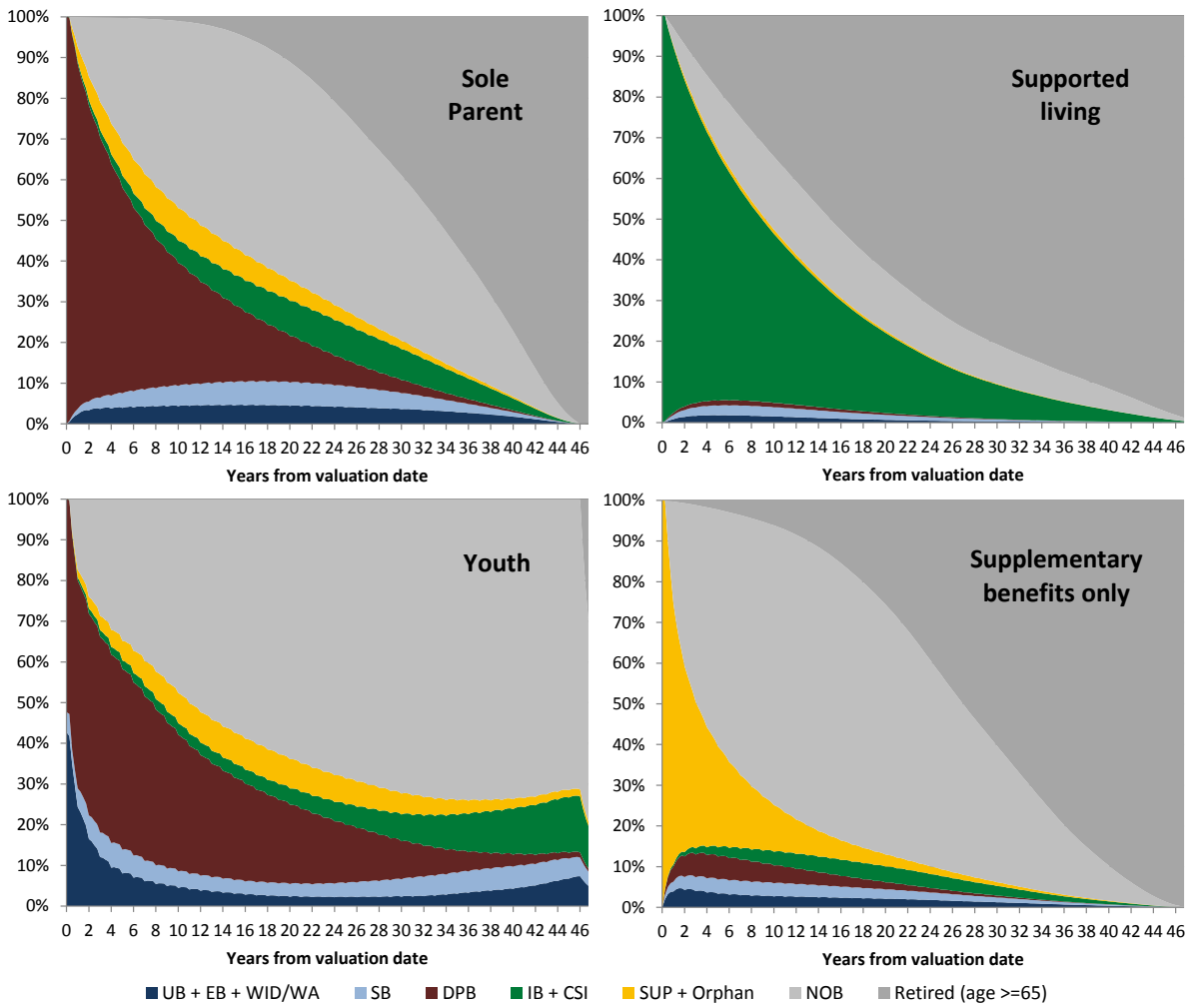


Figure 4.14 shows equivalent plots for some of the other key segment groups. We can make a number of observations:

- Clients generally remain in Supported Living (IB, CSI), rather than transfering to other benefit types
- Sole parents often remain on DPB benefits for a significant length of time, but also have a reasonable chance of moving to a new non-DPB benefit after that period
- Clients on supplementary benefits only tend to exit the welfare system the fastest, although reasonable numbers transfer back into Tier 1 benefits
- Clients who were not receiving any benefit on the valuation date had a 25% chance of returning to benefits within two years.
- An average client in the Youth segment has a **43% chance of being on benefits in 15 years time**, and more than 25% will be on benefits 40 years after the valuation date (either having remained on benefit or having cycled off and back onto benefit). This contributes to the high average lifetime liability for these segments.

Figure 4.14 **Likelihood of being in various states over the course of the projection, for various segment groups**

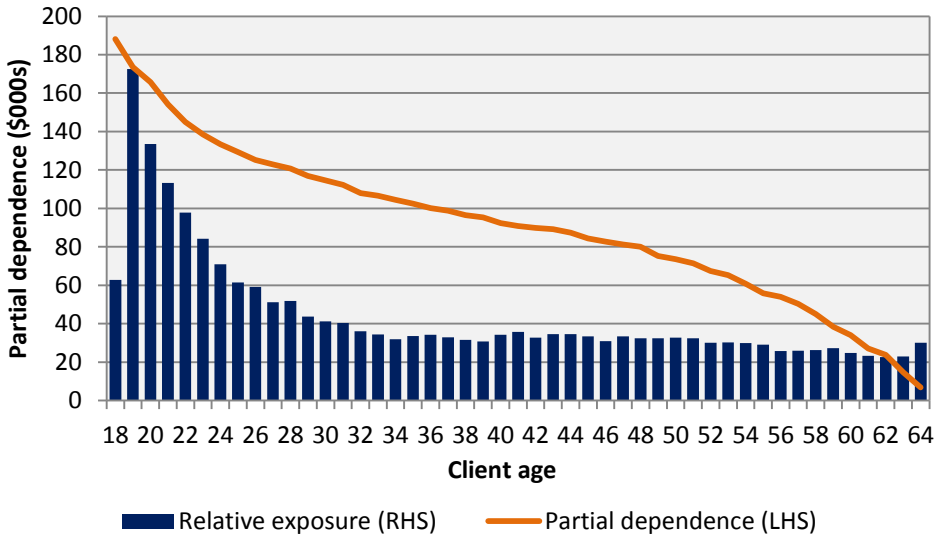


4.6 Partial dependence plots

One challenge in interpreting the results is distinguishing between the impact of correlated effects. For instance, clients with younger ages tend to have higher average liabilities and clients with a longer history of benefits will also have a higher average liability. However, these variables tend to be negatively correlated – older clients tend to have a longer history of benefits. The partial dependence plot is an attempt to isolate these effects, by looking at the average impact of a single variable across the client base while holding everything else constant.

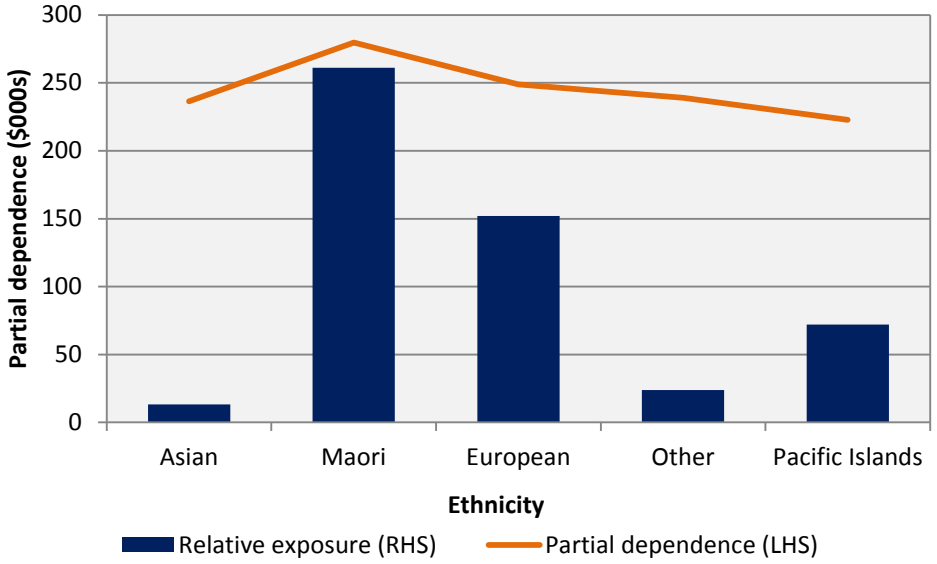
An example is shown in Figure 4.15. It is the partial dependence by age for clients in the Jobseeker Work-ready <1year segment. The age effect on the partial dependence plot, holding all other effects (such as duration and history) constant, shows a $180,000 difference in average liability between the youngest ages and the oldest. The shape also shows a steeper shape at the youngest ages; the difference between age 18 and 28 is $67k, compared to $24k for 28 to 38 years.

Figure 4.15 **Partial dependence plot for age, Jobseeker Support Work-ready <1year segment**



The second example in Figure 4.16 shows the partial dependence effect for ethnicity in the Sole parent segment for clients with children aged 0-2. Holding the distribution of other variables constant, Maori ethnicity has a partial dependence $30k higher than any other category.

Figure 4.16 **Partial dependence plot for ethnicity, Sole Parent child age 0-2 segment**



We provide a number of other partial dependence plots in Part C of this report.

5 CHANGES IN ESTIMATES OF LIABILITY FROM THE PREVIOUS ESTIMATE

This section compares the estimate of liability made in this report as at 30 June 2012 with the estimate made in the valuation report as at 30 June 2011.

From one valuation to the next it is possible to measure changes to the estimated liability arising from the following categories:

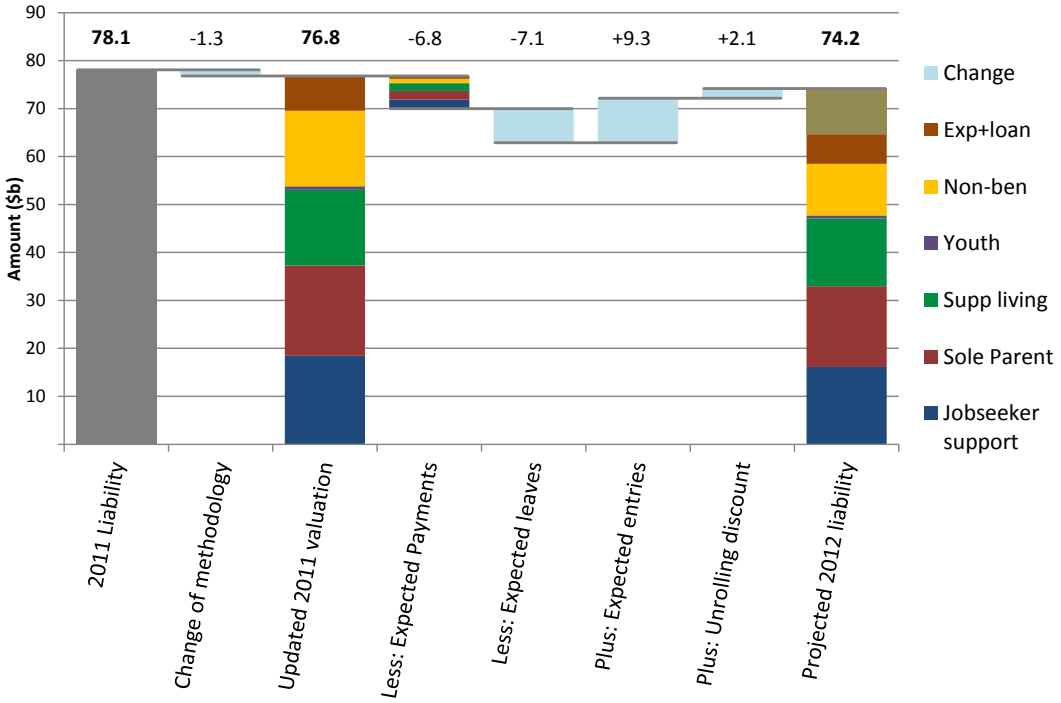
- **The expected change in the liability, i.e. changes consistent with the definition of the liability and valuation forecasts.** For example, the forecasts may predict an increased number of people on benefits due to people joining the system, resulting in an increase in the current client liability.
- **Changes due to experience differing from projected since the previous valuation.** For example, numbers receiving the unemployment benefit may not have developed as expected. Also, economic variables such as inflation and the unemployment rate may have evolved differently to that projected.
- **Changes due to updates to economic forecasts.** Changes to forecast inflation, discount rates and unemployment rates will affect the liability estimate.
- **Changes due to updated models.** Recent historical behaviour causes changes to model parameters used in the projection. For instance, if fewer people leave the sickness benefit than expected, the projected future rate of people leaving is likely to fall in accordance with this.

This valuation is the first opportunity for such an analysis.

5.1 Updating the valuation according to expectations

The first step in analysing changes in the liability from the previous valuation to the current valuation is to determine what the liability was expected to be, based on the forecasts made previously. This calculation is shown in Figure 5.1. The change in methodology relates to the adoption of an approach that supports the Level II segmentation – see Part D of this report for further detail.

Figure 5.1 **Movement from the 2011 current client liability to the projected 2012 current client liability**



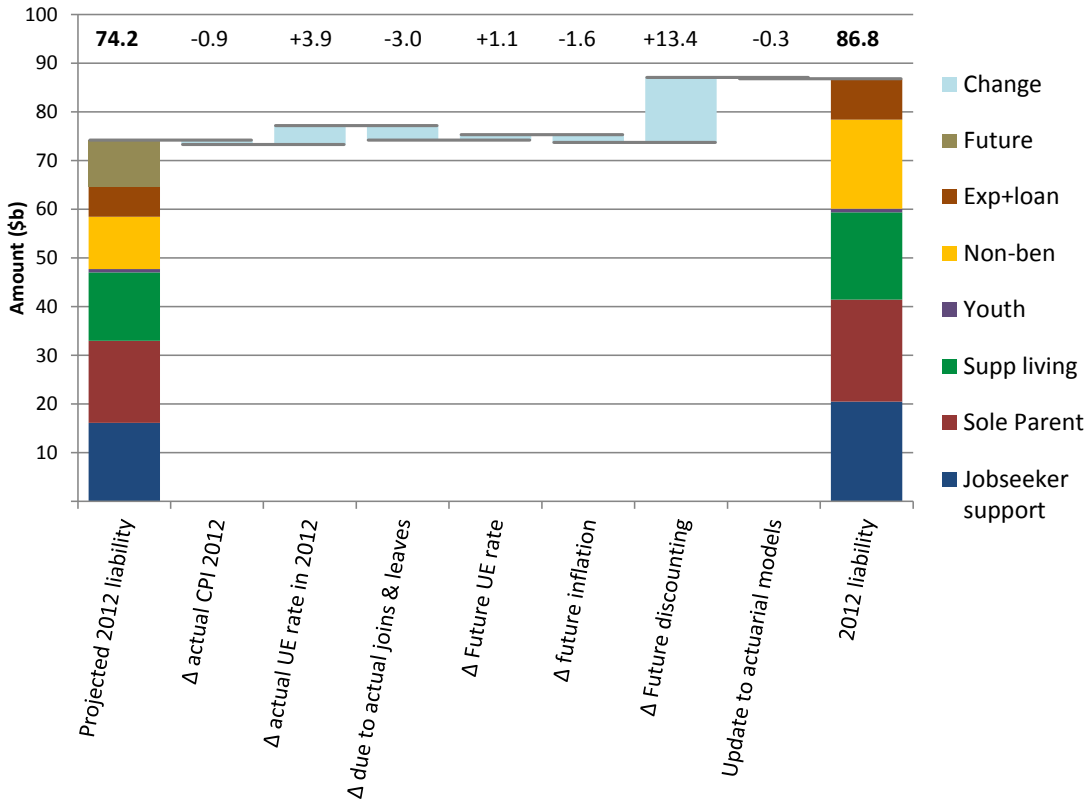
The 2011 current client liability was found to be $78.1b in the previous (aggregate Level I) valuation. Based on our projections, we expected the corresponding value in 2012 to be $74.2b, consisting of the following components:

- We recast the 2011 valuation using the Level II methodology as described in Section 16. This change of methodology led to a $1.3b decrease in the liability, primarily due to the change in projected hardship benefits. This led to an updated valuation of $76.8b, which was attributable across segments.
- We expected $6.8b in payments to be made in 2011. This reduces the value of the liability, as those payments are no longer part of the future cash flows.
- We expected a $7.1b decrease in the liability due to clients who were valued in the 2011 current client liability that are no longer in the 2012 current liability cohort. These are clients who had recently exited at the time of the 2011 valuation and have remained off benefits for the 2011/12 year. Since they have been off benefits for more than 12 months, they no longer satisfy the current liability definition.
- We expected a $9.3b increase in the liability due to people entering the system who were not in the 2011 current client liability cohort (i.e. the future client liability for 2011/12).
- Finally, we expected the liability to increase by $2.1 due to the impact of unrolling a year's worth of discount rates. This can be thought of as the interest accrued on the liability, had it been invested over the year.

5.2 Movement from the previously expected 2012 liability to the current valuation

We expected the current client liability to be $74.2b, but the actual liability as presented in Section 4 is $86.8b, which is $12.6b higher than expected. The attribution of this change is given in Figure 5.2.

Figure 5.2 **Movement from the expected 2012 liability to the actual valuation (Δ = change)**



The following components make up the difference:

- The CPI increase applied to benefits on the 1st of April 2012 was 1.77%, lower than the projected 3.0%. This reduced the liability by $0.9b, as the payment level of future cash flows is reduced by the difference.

- The unemployment rate rose from 6.5% to 6.8% over 2011/12, when it had been forecast to fall to 5.6%. All other things being equal, we would have expected this to increase the liability by $3.9b, as more people remain on benefit and additional people enter.

- The liability is reduced by $3.0b due to the composition of the current client liability cohort being different to what was expected. This is mainly due to a lower number of clients falling in the current client liability definition than expected (more leaves and fewer joins), but also partly attributable to the mix of clients on benefit.

- The future unemployment rate is now forecast to be higher over the next five years than it was at the previous valuation, mainly reflecting the adverse experience over

2011/12. This tends to lengthen stays on benefit and increase numbers entering, and increases the liability by $1.1b.

- Inflation forecasts for 2012/13 and 2013/14 have been lowered compared to the previous valuation. This reduces the valuation by $1.6b.

- Discount rates have fallen dramatically compared to the previous valuation. This is discussed in Section 19.3 and 19.4 and has caused a $13.4b increase in the liability, by far the largest movement in this analysis.

- Finally, we have updated the transition and payment models to reflect emerging experience. This has had a fairly small impact on the valuation, decreasing it by $0.3b[15]. The main impacts of these changes have been:

  - More beneficiaries entering CSI and remaining in WA/WB
  - Fewer beneficiaries remaining in UB, with a slightly higher transfer rate to SB and moving off benefits
  - Increased CCS payment levels
  - Lower HS payment levels
  - A lower average liability for clients who have recently exited the system
  - A higher average liability for clients currently on IB

  We note that some of these changes are offsetting.

The large impact of inflation and discounting assumptions means it is useful to look at the updated valuation results before applying these changes. These results, split by component, are shown in Table 5.1. Of particular note is that the net change in the current client liability due to changes in inflation and discounting is an increase of $11.8b.

[15] In the Executive Summary the corresponding figure was $0.4b, rather than $0.3b. This difference relates to the order in which changes were applied. In the executive summary, the new inflation and discount assumptions were applied after actuarial models, in contrast to the current presentation.

Table 5.1 **Current client liability for 2011 and 2012, with impact of methodology, inflation and discounting changes split out**

Component		2011, Level I estimate ($b)	2011, after method-ology change ($b)	2012, before Infl. & disc. change ($b)	2012 result ($b)
Tier 1:	Domestic Purposes Benefit	17.8	17.7	16.5	18.7
	Invalid's Benefit	19.1	19.5	19.3	22.8
	Sickness Benefit	7.2	7.4	7.6	8.8
	Unemployment Benefit	4.0	4.0	3.5	3.9
	DPB-Care of the sick and infirm	1.8	1.5	1.8	2.1
	Emergency Benefit	0.3	0.3	0.3	0.3
	Orphans and unsupported children	2.1	1.3	1.3	1.5
	Woman Alone / Widows Benefit	0.9	1.4	1.7	2.0
	Tier 1 subtotal	**53.2**	**53.1**	**51.8**	**60.1**
Tier 2:	Accommodation Supplement	10.2	10.0	9.7	11.1
	Disability Allowance	1.9	1.9	1.8	2.1
	Child Disability Allowance	0.8	0.8	0.9	1.0
	Child Care Subsidy	0.7	1.0	1.1	1.2
	Tier 2 subtotal	**13.6**	**13.7**	**13.3**	**15.3**
Tier 3:	Hardship Assistance	3.8	2.6	2.5	2.9
	Employment Interventions	0.2	0.2	0.1	0.2
	Tier 3 subtotal	**4.0**	**2.7**	**2.6**	**3.0**
Other components:	MSD Expenses	6.8	6.8	6.8	8.0
	Net loans cost	0.4	0.4	0.4	0.4
	Other components subtotal	**7.3**	**7.3**	**7.2**	**8.4**
	Grand total	**78.1**	**76.8**	**75.0**	**86.8**

5.3 Commentary on the changes in estimates

Many of the factors described in the previous section are beyond the control of MSD. In particular the unemployment, inflation and discount rates are beyond the scope of MSD's management activities. Thus the two most important items in the movement analysis are:

- The change due to leavers and entries into the system being different to expected (a $3.0b decrease)
- The change to actuarial models that reflect emerging experience (a decrease of $0.3b)

This represents an overall decrease in the liability after allowance for the macroeconomic effects. Interestingly, these decreases roughly match the expected increase due to higher unemployment than was forecast.

6 UNCERTAINTY, KEY RISKS AND SENSITIVITY ANALYSIS

The estimation of the current client liability and future client liability is subject to influences whose effects cannot be determined with accuracy. Consequently, it is a virtual certainty that the ultimate liabilities will depart from any estimate, but the extent of this departure is subject to uncertainty. If potential outcomes and their relative likelihood were expressed as a probability distribution, we would consider our liability estimates to be the mean of that distribution. In particular, the estimates provided in this report contain no deliberate bias towards over or under estimation.

We may group the sources of uncertainty into two categories:

- **Independent (non-systemic) risk**: This represents those risks to the accuracy of estimates arising due to random variability in the number and amount of benefit payments

- **Systemic risk**: This includes risks that, potentially, are common across more than one benefit type.

These are discussed in more detail below.

Independent risk

Independent or non-systemic risk arises from two sources:

- **Parameter error**: Assuming that the model structure is correct, this is the extent to which the randomness associated with the benefit payment process causes the parameters to be estimated incorrectly.

- **Process error**: Assuming that the model structure is correct and the parameters correctly estimated, this is the risk that the future projections still deviate from our projected values due to the volatility in the benefit payments process. This also includes random error introduced by the simulation based approach we use for the projection.

Relative to systemic risk, independent risk is small and therefore, we do not consider it further.

Systemic risk

Systemic risks may be divided into two groups:

- Risks which are internal to the valuation process, which may also be referred to as **model specification risk**. This risk derives from the uncertainty over to what extent the models and valuation process as a whole deviate from a perfect representation of the benefits payments process, which is a complex, real-life system.

- Risks external to the valuation process which include future changes in the environment. This uncertainty reflects the fact that, even if our valuation model was

perfectly correct, future legislative, policy, behavioural, demographic or economic changes may result in actual experience differing from our projections.

Sources of internal and external systemic risks are discussed in more detail below.

6.1 Model specification risk

As indicated above, model specification risk is a source of uncertainty internal to the valuation process and represents the uncertainty from the fact that the models are an imperfect representation of a complex real-world process.

Model specification risk may be minimised by following good modelling practices which include:

- Developing a model structure that represents the major drivers of benefit payments in a robust manner
- Testing the models thoroughly including actual versus expected analyses and backtesting (taking historical cohorts, projecting them forward in time and comparing the results with actual experience)

However, even after following these steps, the resulting models will still be an imperfect reflection of reality. There is a real risk that future results may deviate materially from projections due to factors not captured in the models.

By its nature, model specification risk is difficult, if not impossible, to quantify. However, we have looked at the sensitivity of the valuation results to one component of the model – the change in the probabilities of changing benefit for those currently in receipt of a key Tier 1 benefit. Table 6.1 presents the results for a 5% change in these probabilities, together with the results for a similar change to the probability of moving onto benefit (either a key Tier 1 or other minor benefit) from a current position of being off benefit, for the current client liability in 30 June 2012 dollars.

Table 6.1 **Sensitivity of current client liability valuation results (inflated and discounted dollars) to changes in the probability of moving off the current benefit**

Probability changed	Change in probability of moving off/onto benefit	
	5% decrease	5% increase
All key tier 1	2.6%	-2.4%
Off DPB	1.1%	-1.1%
Off IB	0.5%	-0.5%
Off SB	0.7%	-0.6%
Off UB	0.4%	-0.4%
Off SUP	-0.1%	0.1%
Onto benefit (=off NOB)	-2.3%	2.3%

If the probabilities of moving off benefit for all Tier 1 benefits fall by 5%, then the key Tier 1 liability (inflated and discounted) would increase by 2.6% since a lower probability of

moving means fewer transitions to non-key Tier 1 benefits or going off benefit. Conversely, the key Tier 1 liability would decrease by 2.4% in the wake of a 5% increase in the probability of moving off benefits.

Changes in the probability of going onto benefit from a current position of being off benefit (NOB) also have a somewhat similar impact – a 5% increase in the likelihood of transitioning onto a benefit leads to a 2.3% increase in the key Tier 1 liability.

The effects on the estimate of total current client liability of changes to individual key Tier 1 probabilities are lower.

6.2 Policy Change

Policy change is an external risk to the estimates and represents the uncertainty arising either directly or indirectly from current and future government initiatives and actions. Some hypothetical examples would include:

- Changing rules around accessing benefits and rates paid
- Job creation initiatives
- Significant operational changes to the service and delivery model

Policy change extends to include the unknown impact of ongoing and planned reforms such as the Future Focus reforms and changes to work expectations and benefit categories through Welfare Reform. These changes are discussed below.

6.2.1 Future Focus Reforms

In September 2010, Work and Income implemented a range of policy changes (collectively referred to as Future Focus). Changes included:

- Requiring recipients of a Domestic Purposes Benefit – Sole Parent whose youngest child is aged 6 years or over to meet part-time work obligations
- Increasing the amount of income recipients of Domestic Purposes Benefits, Widow's Benefit and Invalid's Benefit can earn before their benefit is abated
- Requiring clients receiving an Unemployment Benefit to reapply for their benefit every 12 months
- Requiring young people on Independent Youth Benefit to be in work, education or training
- Requiring that repeat applicants for hardship benefits undertake budgeting activities

From May 2011, clients receiving a Sickness Benefit were required to complete a reassessment for their benefit every 12 months. Those recipients who are assessed as being able to work part time may be subject to a part-time work obligation. An additional medical certificate was introduced at the early stages of benefit receipt for this group (generally at about 8 weeks on benefit).

These reforms have now been in effect for over a year and changes to the experience over that time has now been included in the valuation models. The higher transition rate out of

UB appears to be one emerging trend seen recently. However, isolating the effect of this or any other policy change is difficult. Also, some of the impacts are likely to continue to develop over time.

It is also important to bear in mind that the impact of any changes cannot be determined by considering the benefit types in isolation. For instance, as we elaborate on in later sections, there is a strong interaction between the Sickness Benefit and the Unemployment Benefit, with a tendency for individuals to move between these benefits. Considered in isolation, one could be tempted to believe that the only impact of the part-time work obligation for Sickness Benefit recipients would be to lower the probability of an individual continuing on the benefit. This would ignore the potential offsetting disincentive for people to transfer from the Unemployment Benefit to the Sickness Benefit, which would change the demographic mix of people on both benefit types.

6.2.2 Welfare Reform

The Government has recently passed legislation for some significant changes to the welfare system. The implementation for these changes are all after the 30 June 2012 valuation date, so no allowance has been made for their impact. This is deliberate:

- Measuring the impact of legislation is most effective when compared against an appropriate baseline. That is, comparing against the liability if the policy changes had not been made. This valuation fills the role of the baseline pre-reform results.
- Predicting the impact of legislation on lifetime cost is very difficult in the absence of data. In some sense assuming little or no impact is an appropriate response to this high uncertainty.

Some measurement of some of these reforms should be more visible in the 2013 and 2014 valuations. We expect that detailed impacts will be identifiable in the year following each reform's introduction.

Work requirements for DPB, Widows Benefit and Partners

From the 15th of October 2012 there are some significant changes to the DPB:

- Recipients whose youngest child is aged between five and thirteen years have part time work availability requirements
- Recipients whose youngest child is aged fourteen or older have full time work availability requirements

These are expected to have a significant impact on the Sole parent cohorts, which should be somewhat evident in the modelling of the data at the time of the 30 June 2013 valuation. Some equivalent changes were made to the Widow's Benefit and to Partners of clients on UB, SB and IB – the impact of these changes may also be visible in the next valuation.

Youth Service

A new program to help young people find options for education, training and work-based learning was introduced in August 2012. This is expected to impact the path of some young people through the welfare system.

July 2013 Welfare reforms

The most significant of the current round of reforms are set to be implemented on 15 July 2013. These reforms create a new Jobseeker's benefit. Clients on UB, SB, WA/WB and DPB (with youngest child at least 14) will be treated as a single group in terms of benefits and review. There will be work and work preparation expectations for more clients. These changes will undoubtedly affect the liability due to changes in client behaviour affecting their propensity to stay on benefit.

6.3 Economic Risks

Economic uncertainty is also an external risk. For this valuation, the uncertainty derives from future unemployment rates as well as future inflation and discount rates.

The unemployment rate is a driver for many benefits, in particular the Unemployment Benefit. Furthermore, all benefits are indexed annually in line with inflation as measured by the CPI index, so changes in the future rates of inflation relative to those assumed in the valuation will affect the results. Finally the results are discounted to the valuation date to recognise the time value of money; these results will change, perhaps materially, if actual discount rates vary sufficiently from those assumed.

We consider each of these in more detail below.

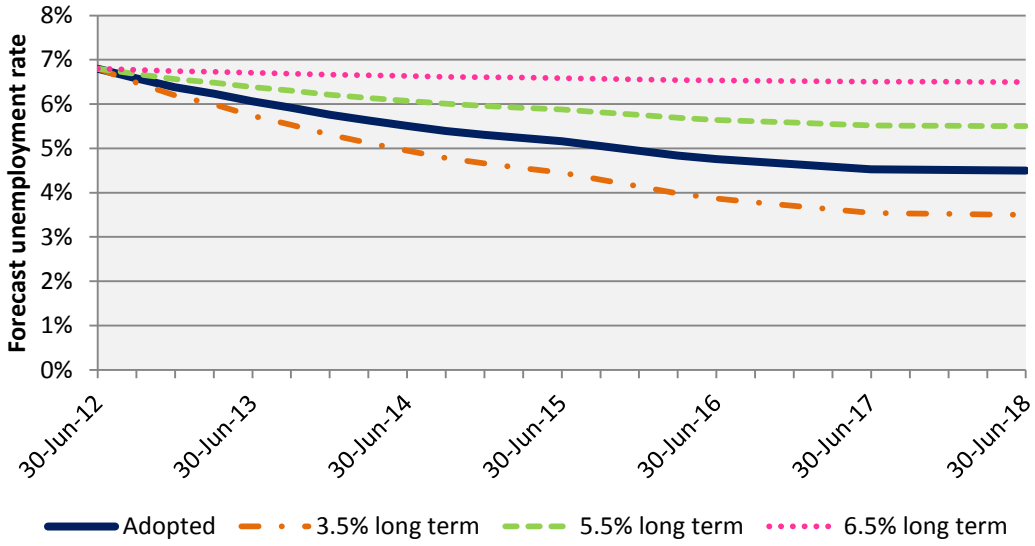
6.3.1 Unemployment Rate

Many of the projection models have a heavy dependence on the unemployment rate, the key indicator used by the valuation to measure the health of the labour market. We can test the sensitivity of the liability to the unemployment rate by inserting different scenarios and observing how the liability changes. Note that this represents the impact of a changed unemployment rate in the absence of any policy or other changes, including the 2012/13 reforms. We have considered four unemployment rate scenarios:

- Adopted (Treasury estimate): A long term trend of 4.5% is reached by June 2017
- A long term trend of 3.5% is reached by June 2017
- A long term trend of 5.5% is reached by June 2017
- A long term trend of 6.5% is reached by June 2017

These scenarios are illustrated in Figure 6.1.

Figure 6.1 **Unemployment rate scenarios tested**



The impact of the different scenarios by benefit type is shown in Table 6.2.

Table 6.2 **Sensitivity of estimated current client liability, excluding loans and expenses, to future unemployment rates**

Change in unemploy-ment rate	Treasury estimate (4.5% long term rate)	3.5% long term unemployment rate		5.5% long term unemployment rate		6.5% long term unemployment rate	
	Liability ($b)	Liability ($b)	Change	Liability ($b)	Change	Liability ($b)	Change
DPB	18.7	17.8	-4.6%	19.6	4.7%	20.5	9.9%
IB	22.8	22.2	-2.6%	23.3	2.5%	23.8	4.3%
SB	8.8	7.8	-11.0%	9.8	12.0%	11.1	27.0%
UB	3.9	3.2	-18.3%	4.9	24.1%	6.0	54.3%
Other Tier 1	5.9	5.5	-8.2%	6.4	7.8%	7.0	17.0%
Tier 2	15.3	14.5	-5.3%	16.2	5.5%	17.1	11.9%
Tier 3	3.0	2.8	-6.2%	3.2	6.6%	3.4	14.0%
Total	**78.4**	**73.8**	**-5.9%**	**83.4**	**6.3%**	**89.0**	**13.5%**

We make the following comments regarding the results:

- The overall sensitivity to the unemployment rate is quite high. A 1% increase in the long term unemployment rate tends to increase the liability by about 6%. In the high unemployment scenario this corresponds to a $5b increase to the liability.
- UB is the most heavily affected benefit. If the unemployment rate remained at current levels, the liability corresponding to UB payments would be expected to be more than 50% higher.

- SB is also heavily influenced by the unemployment rate, although not as much as UB. Its sensitivity is about twice the average of all benefits.

- Unsurprisingly, IB is the least sensitive to the unemployment rate of the large benefit types. However it still shows some difference – reflecting some people who do remain on the benefit longer due to an adverse labour market.

6.3.2 Inflation

Benefits are indexed annually on 1 April in line with the change in the CPI index in the preceding calendar year. Thus an increase in inflation relative to that assumed in this report will lead to higher cash flows whereas a decrease will have the opposite effect. Table 6.3 gives the results for the sensitivity of the total current client liability to a 1% change in the inflation rate. We note that the impact is quite material.

Table 6.3 **Sensitivity of the total current client liability, excluding loans and expenses, to changes in the inflation rates**

Scenario	Liability ($B)	Change ($B)	Change (%)
Base	78.4		
Inflation + 1%	87.4	9.0	11.4%
Inflation - 1%	70.9	-7.6	-9.6%

This sensitivity is slightly higher than the equivalent changes estimated last year.

6.3.3 Interest Rate

A change in future interest rates does not affect the future cash flows; rather it affects the value of the liability brought to book after allowing for future investment income. To value the discounted liability, we have used the discount rates provided by Treasury for use in the Crown accounts for valuations at 30 June 2012.

If future discount rates fall by 1% relative to their 30 June 2012 values, the total liability would increase by nearly 12%.

Table 6.4 **Sensitivity of the total current client liability to changes in the discount rates**

Scenario	Liability ($B)	Change ($B)	Change (%)
Base	78.4		
Discount rate + 1%	70.8	-7.6	-9.7%
Discount rate - 1%	87.7	9.2	11.8%

This sensitivity is also slightly higher than the equivalent changes estimated last year.

PART C
VALUATION BY COMPONENT

PART C.1
RESULTS BY SEGMENT

7 JOBSEEKER SUPPORT SEGMENTS

7.1 Introduction

The Jobseeker Support benefit, introduced in July 2013, is designed to cover all welfare recipients who have full-time work expectations or who are temporarily unable to seek full-time work. It represents an amalgamation of the following benefit types:

- Unemployment Benefit
- Sickness Benefit
- Domestic Purposes Benefit, with youngest child aged 14 or more
- Widow's or Woman living alone Benefit, with youngest child aged 14 or more
- Emergency Benefit

The specific benefit payment codes, and their relative contribution to 2011/12 payments, are shown in Table 7.1. Note that child age for WB/WA was unavailable, so we have allocated all WB/WA payments to jobseeker support segments.

Table 7.1 **Payment codes applicable to Jobseeker Support segments**

Benefit Type	Benefit Name	Code	% 11/12 benefit	Comment
DPB	Emergency Maintenance Allowance	313	0.2%	
	Domestic Purposes Benefit	365	9.5%	
	Emergency Maintenance Allowance	613	0.0%	Discontinued 2007
	Domestic Purposes Benefit	665	0.0%	Discontinued 2008
EB	Emergency Benefit	611	2.2%	
SB	Sickness Benefit	600	41.0%	
	Sickness Benefit Hardship	601	0.5%	
UB	Unemployment Benefit Hardship	115	0.4%	
	Unemployment Benefit Hardship Training	125	0.1%	
	Independent Youth Benefit	603	0.1%	
	Unemployment Benefit Training	608	3.6%	
	Unemployment Benefit	610	36.3%	
	Young Job Seekers Allowance	604	0.0%	Discontinued 2000
	55+ BENEFIT	605	0.0%	Discontinued 2000
WA/WB	Widows Benefit	30	0.0%	
	Widows Benefit	330	3.8%	
	Woman Alone Benefit	366	2.4%	
	Woman Alone Benefit	666	0.0%	Discontinued 2007

To reflect the importance of the new Jobseeker Support benefit, four of the segments are based around Jobseekers:

- Work-ready, duration less than one year
- Work-ready, duration more than one year
- HCID, duration less than one year
- HCID, duration more than one year

The work-ready segments include those clients with full work expectations – of the list of old benefits above it includes all but SB. The HCID segments are those clients who receive SB, and thus have temporarily suspended work requirements.

While the new benefit categories were not in force at the valuation date, we have been able to assign clients to segments based on our calculation of benefit state, duration and child age. Note that duration is defined as continuous duration (time since last off benefits for at least 14 days). This helps provide a pre-reform baseline using the new benefit categories that come into effect from July 2013.

7.2 Recent experience

Table 7.2 below shows the numbers of recipients and payment amounts for the Jobseeker support segments over the 2011/12 year. We have estimated these numbers by assigning the old benefit categories to what they would become under the new benefit structure. The table shows that although there are more clients in the work-ready segments, a higher proportion of those in the HCID segments are on for longer duration.

Table 7.2 **Recent experience in Jobseeker Support segments, 2011/12 year (payments in actual values)**

Segment	Payments ($m)	Average number on benefit during quarter (nearest 100)	Average number at end of quarter (nearest 100)	Average quarterly benefit payment (ABP) per client ($)
Work ready, <1yr	627	73,700	53,300	2,128
Work ready, >1yr	768	53,400	48,900	3,595
HCID, <1yr	312	31,000	25,800	2,514
HCID, >1yr	704	50,100	47,900	3,512
Total	2,411	208,200	175,900	2,895

The trends in numbers of clients in the various segments each quarter, as well as their average benefit payment, is shown in Figure 7.1 and Figure 7.2.

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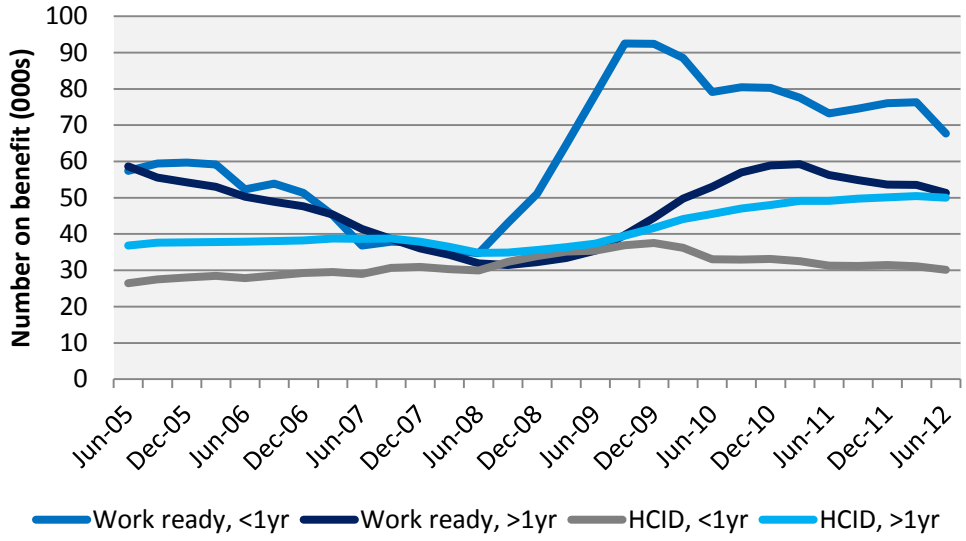
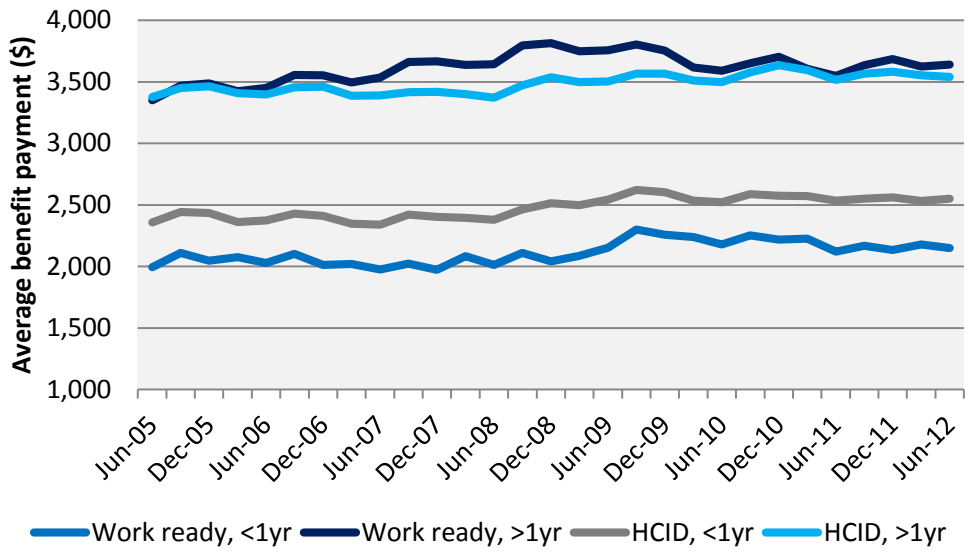
Figure 7.1 **Numbers of clients in Jobseeker Support segments each quarter**



Numbers in the 'Work-ready <1yr' segment increased sharply during the GFC, as more clients began to receive unemployment benefits. This segment has decreased in numbers since late 2009 due to some clients exiting the welfare system and others remaining in and progressing to the 'Work-ready >1yr' segment.

The Health Condition, Injury or Disability segments also grew from late 2009. In contrast to the other segments, the 'HCID >1yr' group has continued to increase in the 2011/12 year. This has led to model changes to reflect higher estimate rates of remaining on benefits for clients with high duration on the Sickness benefit.

Figure 7.2 **Average quarterly payments to Jobseeker Support segments in June 2012 values**



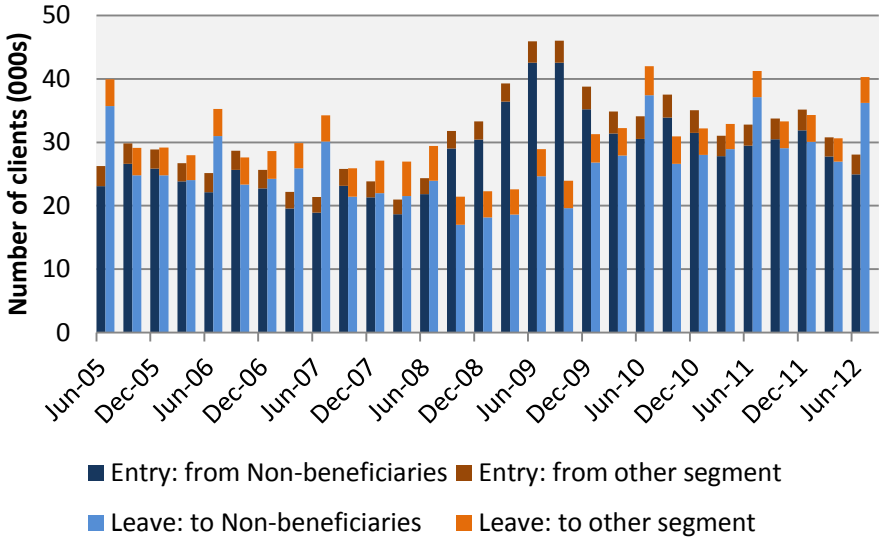
Average quarterly payments are lower for the low duration segments, as a greater proportion of clients exit the system before receiving a full quarter of benefits. Average

benefit payments for the longer duration segments have been very similar over the past few years.

Figure 7.3 shows the number of clients entering and leaving the Jobseeker Support benefit every quarter. A large proportion of the Jobseeker Support population transition each quarter and the majority enter from outside the system and leave by exiting the system. About 10% of entries and exits relate to movements to and from other benefit types.

The GFC period was characterised by both a lower number of clients leaving the segments and a significantly larger number entering. For the past two years, numbers entering and leaving have been very similar, except for a seasonal spike in exits occurring in the June quarter each year.

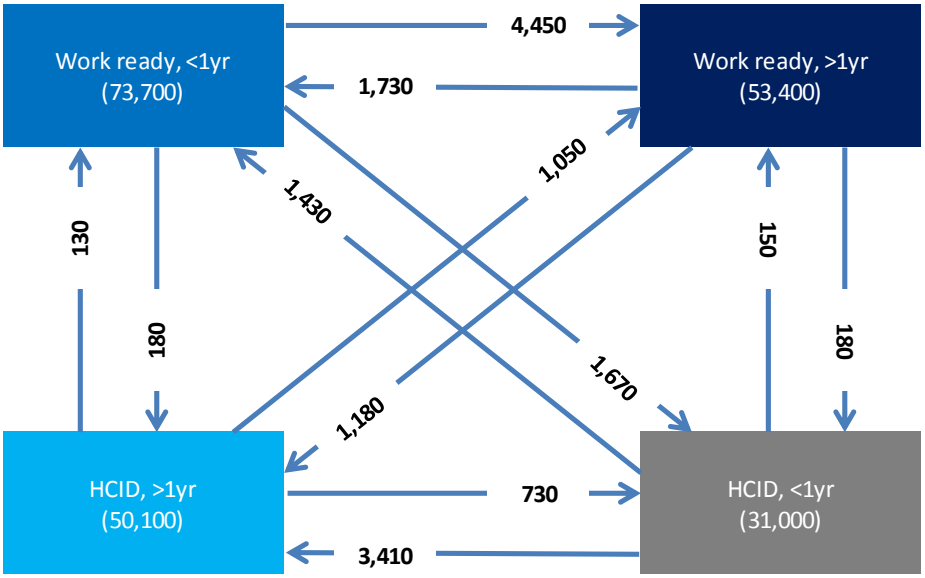
Figure 7.3 **Number of clients entering and leaving the Jobseeker Support segments.**



Note we do not count transitions from one Jobseeker segment to another in this figure.

The Jobseeker Support group represents a high transition group, with around 15% of clients entering or leaving in any given quarter. Furthermore, there is a large amount of movement between Jobseeker segments. The average number of people in each segment and the quarterly movements between them are shown in Figure 7.4. Of particular note are the 6,000 (about 3% of the total number) clients who move between work-ready and HCID each quarter.

Figure 7.4 **Average quarterly movements between Jobseeker Support segments, 2011/12**



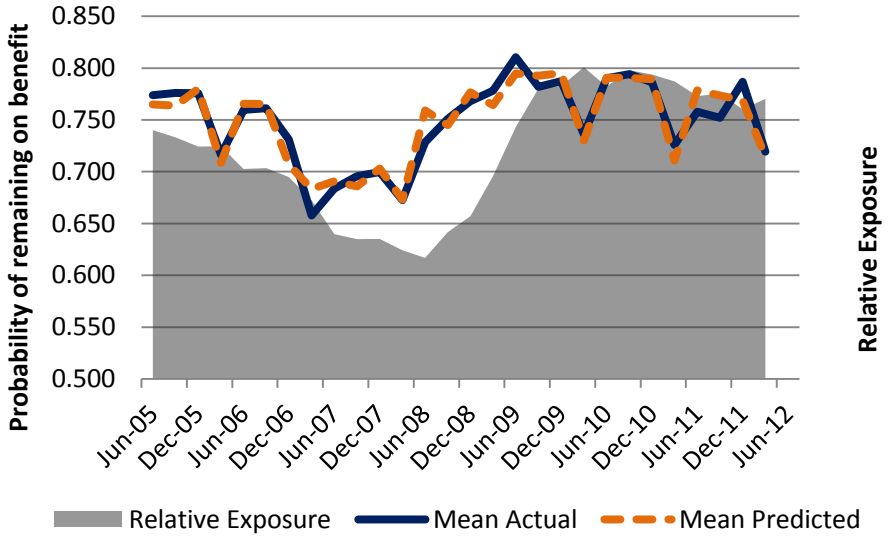
The clients moving from high duration to low duration segments are those clients that have a "break" in their benefit at some point in the quarter, which will reset their continuous duration calculation.

7.3 Modelling the Jobseeker Support Segments

Naturally, the numbers of clients in the Jobseeker support segments are strongly correlated to the unemployment rate. This connection is particularly significant for the Work-ready segments. Trends that can be observed in these segments are largely driven by models that are related to the Unemployment Benefit. Figure 7.5 shows the performance of the model that predicts the probability of a client remaining on Unemployment Benefit over the past few years. This model is one component of the transition models we use in the valuation, described in Section 18.3. It is clear that the deterioration in the economy led to a significant rise in this level in 2008/09. This is consistent with the observation of a higher number of clients on benefit during this period in Figure 7.1. However, over the last few years there has been a gradual downward trend from this high level although the official unemployment rate has remained stable. This also means that recipients are less likely to receive benefit payments over the entire quarter. The gradual downward trend is projected to continue in the future

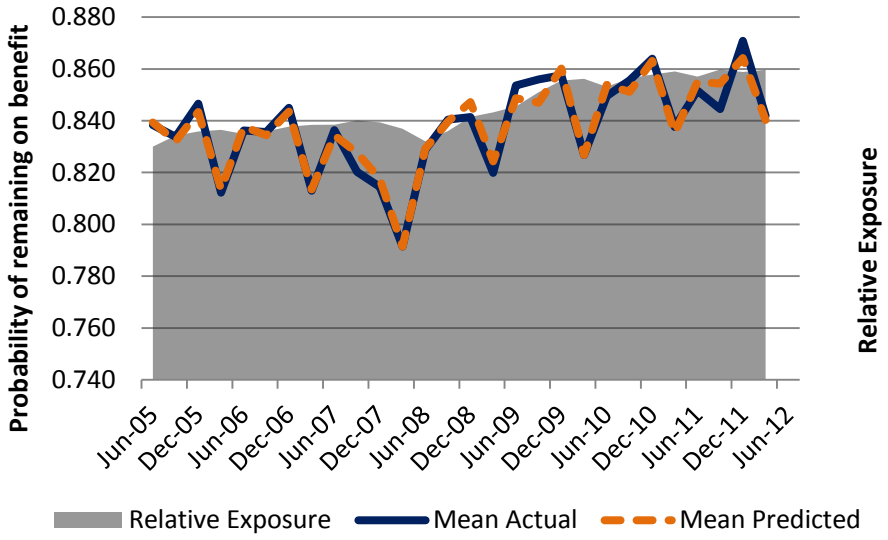
- As the economy (and in particular the unemployment rate) improves and
- Due to the continuing impact of the Future Focus reforms

Figure 7.5 **Probability client remains on Unemployment Benefit**



Similarly, trends that can be observed in the HCID segments are explained by models related to the Sickness Benefit. Unlike the Unemployment Benefit, it appears that the number of clients receiving Sickness Benefit has not started to decrease towards pre 2008/09 levels. Figure 7.6 shows that the probability of remaining on Sickness Benefit has continued to increase over the 2011/12 year. However, Treasury forecasts of gradual falls in the unemployment rate leads the model to project a slightly lower probability of remaining on benefit in the future.

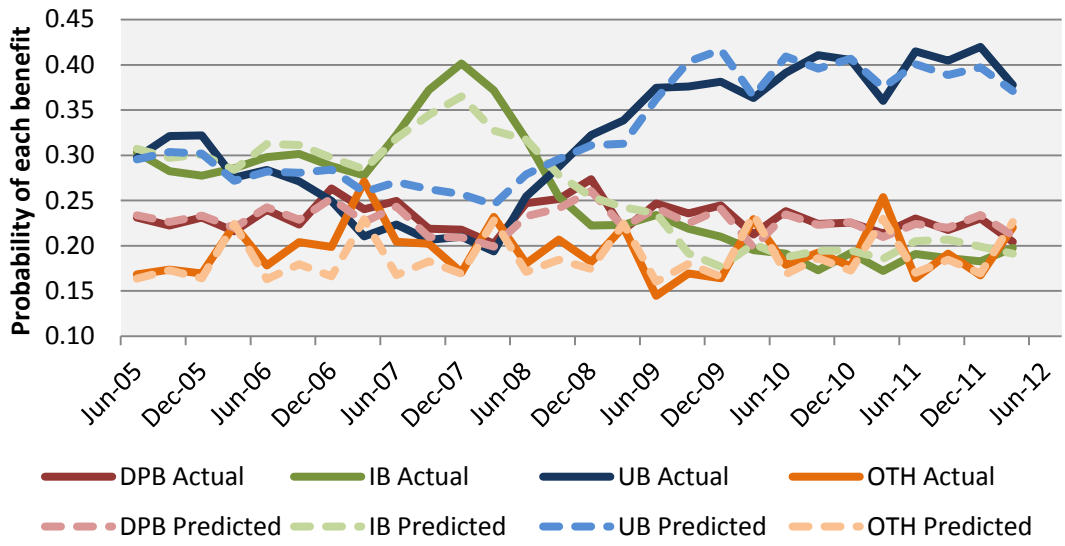
Figure 7.6 **Probability client remains on Sickness Benefit**



We have already discussed the fact that there are a large number of transitions between the Work Ready and Health Condition, Injury or Disability segments and vice versa. This is to some extent a recent phenomenon. Figure 7.7 shows the state (actual and modelled) that clients move to when they leave SB and do not exit the system, another component of the transition models described in Section 18.3. Over the past few years, about 40% of

clients who move from SB transition into UB. This is significantly higher than the equivalent proportion prior to the GFC of about 25%. The IB peak corresponds to the changes related to the IB gateway rules and may also have impacted the increase in the proportion of clients moving into UB

Figure 7.7 **Distribution of clients who move from Sickness Benefit to other benefits**



7.4 Forecasts

Table 7.3 shows:

- The number of clients in each segment at the valuation date
- The future cash flows for each segment, by future benefit type
- The average liability per client

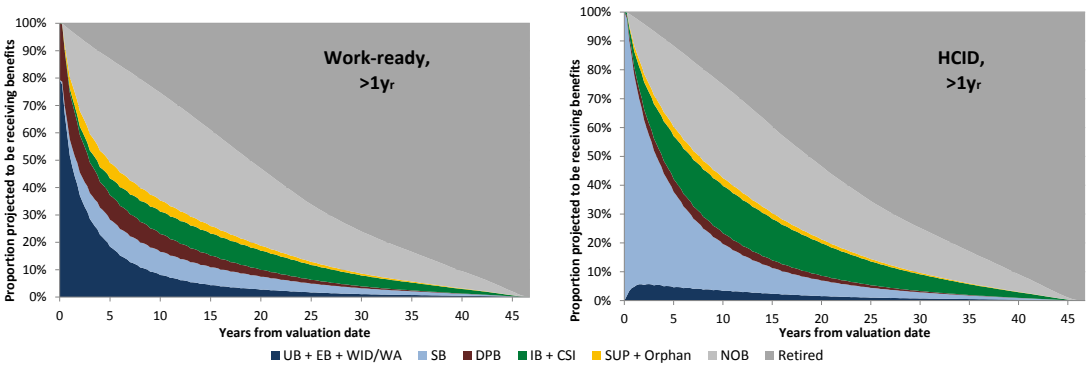
The increased liability associated with both HCID segments and the longer duration segments is clear. Also of note is the different mix of benefits. Although most work-ready clients are receiving UB at the valuation date, further UB payments represent only 15% of future lifetime cost, with many moving into DPB, IB and SB. In contrast, the liabilities associated with the HCID segments are most heavily concentrated in IB and SB payments. This different composition can also be seen in the projected benefit state diagrams in Figure 7.8.

Table 7.3 **Current liabilities by benefit type for Jobseeker Support segments (payments in actual values, discounted to June 2012 and excluding net loans and expenses)**

Jobseeker Support	Number	DPB ($m)	IB ($m)	SB ($m)	UB ($m)	Other T1 ($m)	AS ($m)	Other T2/3 ($m)	Total ($m)	Average ($k)
Work-ready, <1 year	47,175	942	826	740	813	396	730	376	4,823	102k
Work-ready, >1 year	45,372	1,130	905	748	761	873	789	417	5,623	124k
HCID, <1 year	24,603	449	817	889	141	130	459	268	3,153	128k
HCID, >1year	47,019	537	1,967	2,406	224	263	971	559	6,927	147k
Total	164,169	3,057	4,515	4,782	1,940	1,663	2,948	1,621	20,525	125k

The projected benefit charts show the tendency of clients to be on benefits at a future point in time (either through remaining on benefit or having transitioned off and then back onto benefit). Of those not above the retirement age, 40% of the Work ready >1 year clients are projected to be on benefits in 20 years from the valuation date. The equivalent figure is 45% for the HCID segment.

Figure 7.8 **Projected benefit state for 'Work ready >1yr' and 'HCID >1yr' segments**



Projected numbers and average benefit payments for the combined Work-ready and HCID states are shown in Figure 7.9 and Figure 7.10 respectively. We have combined the different durations mainly for technical reasons; the average benefit payment models depend most heavily on a different duration measure so can appear slightly misleading when split by continuous duration.

As previously mentioned, the projections for the Work-ready segment is particularly sensitive to the future unemployment rate assumptions. Given Treasury's current forecast of a gradual reduction in this rate, the future numbers in the Work-ready group continue to reduce over the next few years, approaching the record lows seen in 2008. On the other hand, the numbers in the HCID segments are projected to remain stable for the next few years. The (downward) impact of lower future unemployment rates is almost exactly offset

by the impact of increased propensity to remain on Sickness Benefit seen in the past couple of years.

Figure 7.9 **Forecast numbers of clients in Jobseeker Support segments each quarter**

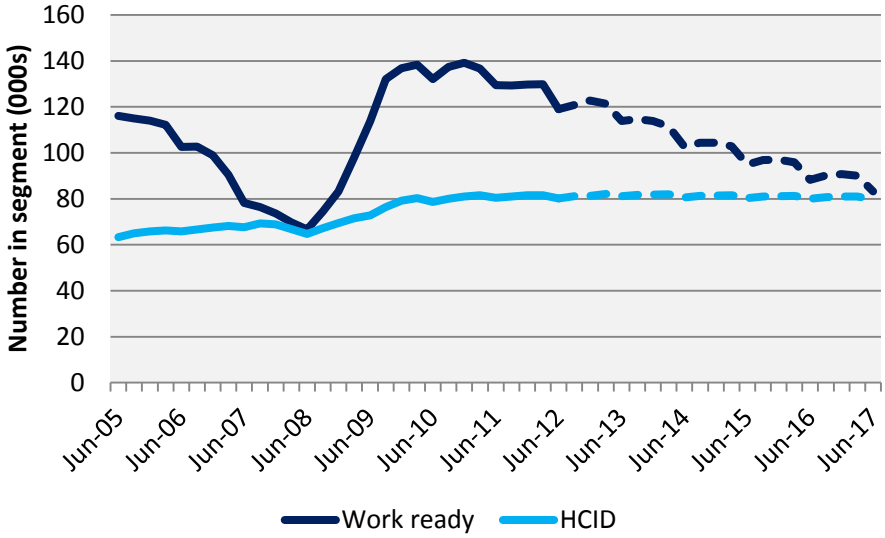
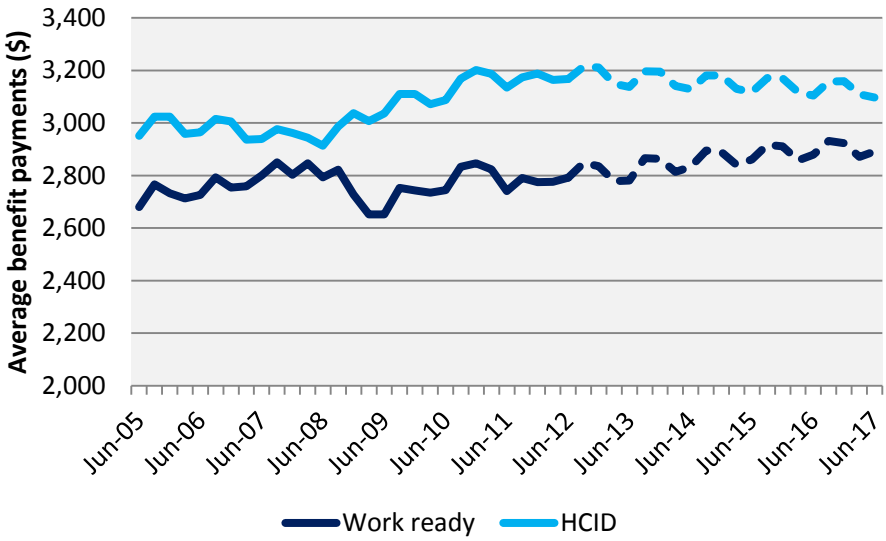


Figure 7.10 **Forecast average quarterly payments to Jobseeker Support segments in June 2012 values**

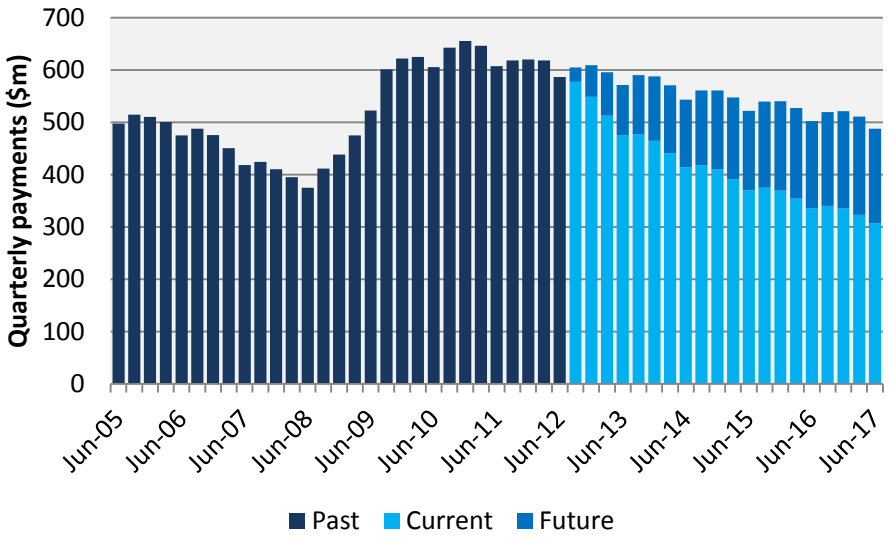


Average benefit payments are forecast to be fairly flat (in real terms) for both Work-ready and HCID clients. Seasonality is evident, mainly the effect of different numbers of days in each quarter). The slight upward trend in Work-ready benefits is partly attributable to the increasing average duration on benefits as a higher proportion of long duration clients remain in the system.

Figure 7.11 shows the projected cash flows associated with clients while they are in the Jobseeker Support segments (as opposed to those starting in Jobseeker Support

segments). They are forecast to fall by about 17% in real terms over the next five years, attributable to the fall in numbers in the Work-ready segments.

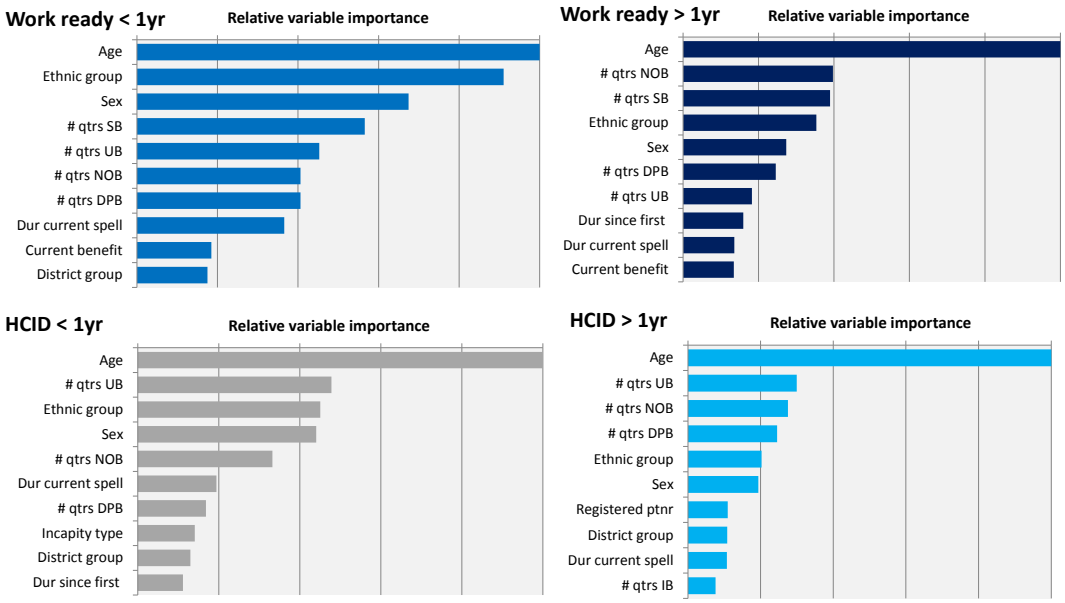
Figure 7.11 **Quarterly benefit payments for Jobseeker Support segments in June 2012 values**



7.5 Key drivers

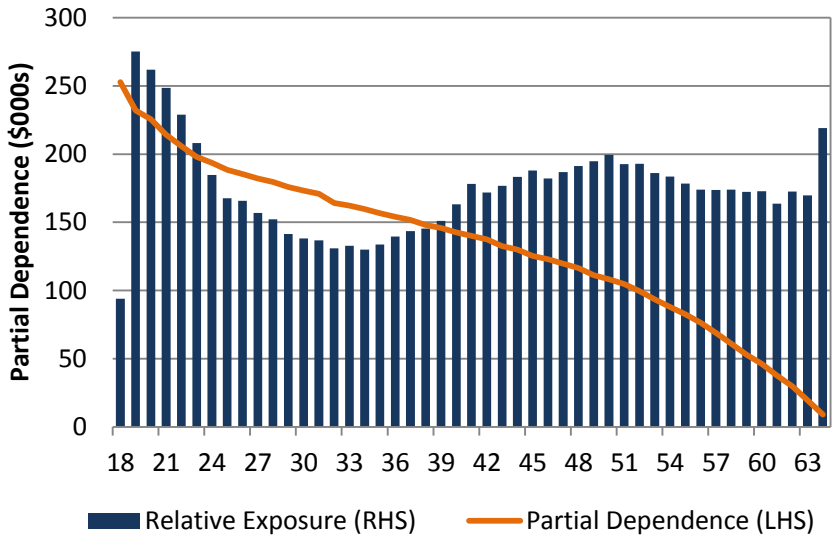
While a large number of different factors contribute to the lifetime liability estimates for clients in the Jobseeker Support segments, some variables have a much more significant impact. We have used TreeNet, a machine learning tool, to assign the relative significance of these variables:

Figure 7.12 **Relative significance of variables in Jobseeker Support segments**



Partial dependence plots were introduced in Section 4.6 as a means of distinguishing the impacts of correlated variables, which they attempt to do by looking at the average impact of a single variable across the client base while holding everything else constant.

Figure 7.13 **Partial dependence of age for the Jobseeker Support group**



Age is consistently the most important predictor in the Jobseeker Support segment. Figure 7.13 shows the partial dependence plot for age for the Jobseeker support segment, where the average liability is plotted for each age. The plot shows a large difference in average liability between the youngest and oldest ages – with the youngest being about $100,000 above the average. The shape of the plot also changes, with a steeper change at the youngest ages compared with that between ages 24 and 50 (the increasing slope for the oldest ages is due to the impacts of retirements). Thus the younger the cohort, the greater the average liability will be.

Another interesting fact of age is how it is distributed – if a segment has a disproportionately high level of young clients, this will tend to increase the average liability of the segment. We have attempted to illustrate this by comparing the age profile to the whole welfare population in Figure 7.14. For instance, the age distribution in the Work-ready <1 year segment is skewed quite young (tending to increase average liability, all other things being equal), while the long duration HCID segment has an older skew.

Figure 7.14 **Relative distribution of client age compared to welfare system population for 'Work-ready <1yr' and 'HCID >1yr' segments**

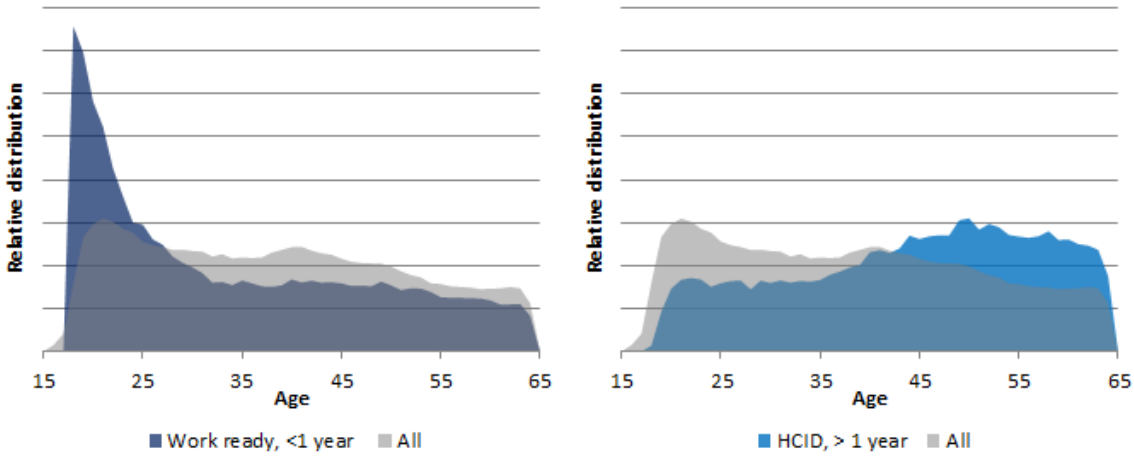
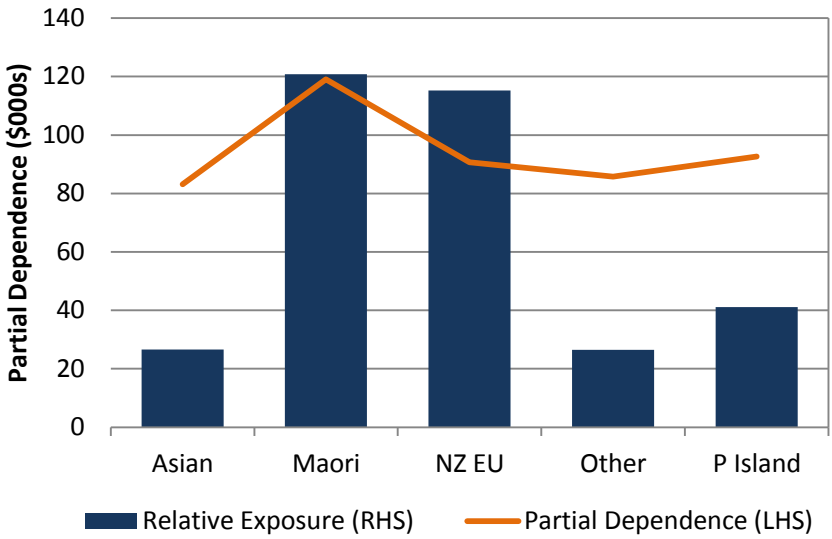


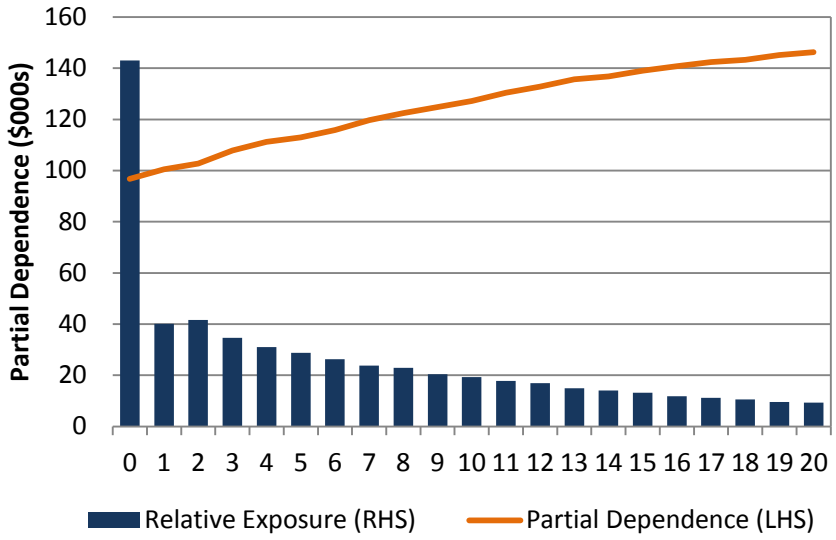
Figure 7.15 **Partial dependence plot of ethnicity for 'Work-ready < 1yr' segment**



Ethnic group is the second most important driver of lifetime cost in the low duration Work-ready segment. The average partial dependence for Maori is about $120k, compared with about $90,000 for each of the other ethnicities. Maori represent 37% of the segment, compared with about 13% of the general population (Census 2006).

Benefit history variables also have a significant impact on lifetime cost. Figure 7.16 shows the partial dependence on number of quarters receiving UB over all Jobseeker Support recipients. Spending 20 quarters on UB can increase future cost by about $50k. This highlights the cumulative impact of spells on UB for influencing long-term welfare dependence. A similar effect is seen for the number of quarters receiving SB.

Figure 7.16 **Partial dependence of 'number of quarters on Unemployment Benefit' for the Jobseeker Support group**



The partial dependence on gender (not shown graphically) suggests that females have a liability $20k-$35k higher than males across the various Jobseeker segments. This is largely due to the increased likelihood of females entering the Sole Parent segments at some point in the future, and is most significant for younger females.

8 SOLE PARENT SEGMENTS

8.1 Introduction

The Sole Parent Support benefit, introduced in July 2013, includes all single parents with children under 14. It represents an amalgamation of the following benefit types:

- Domestic Purposes Benefit – Basic, with youngest child aged less than 14
- Widow's or Woman living alone Benefit, with youngest child aged less than 14

In the data to June 2012, the child age for WB/WA was not available. For this reason we have approximated this segment by only considering Domestic Purposes Benefit – Basic (which we continue to refer to as DPB) clients with children under 14. The specific benefit payment codes, and their relative contribution to 2011/12 payments, are shown in Table 8.1.

Table 8.1 **Payment codes applicable to Sole Parent segments**

Benefit Type	Benefit Name	Code	% 11/12 benefit	Comment
DPB	Emergency Maintenance Allowance	313	2.5%	
	Domestic Purposes Benefit	365	97.5%	
	Emergency Maintenance Allowance	613	0.0%	Discontinued 2007
	Domestic Purposes Benefit	665	0.0%	Discontinued 2008

Four segments have been defined based on the new sole parent benefit. Those with:

- Youngest child aged 0 to 2
- Youngest child aged 3 to 4
- Youngest child aged 5 to 13, duration less than one year
- Youngest child aged 5 to 13, duration more than one year

Duration is defined as continuous duration (time since last off benefits for at least 14 days). We understand that duration based splits are also of interest for both the segments with younger age children (0 to 2 and 3 to 4), this section of the report also presents some results using these additional splits.

While the new benefit categories were not in force at the valuation date, we have been able to assign DPB clients to segments based on our calculation of benefit state, duration and child age (but excluding those that might be eligible from WB/WA).

8.2 Recent experience

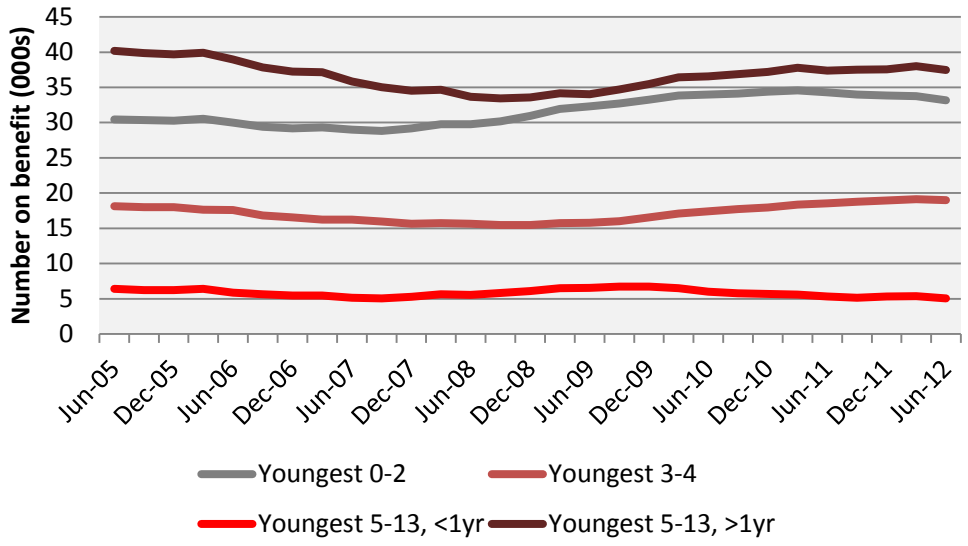
Table 8.2 below shows the numbers of recipients and payment amounts for the Sole Parent Support segments over the 2011/12 year. We have estimated these numbers by assigning the payments and client numbers based on child age and duration.

Table 8.2 **Recent experience in Sole Parent segments, 2011/12 year (payments in actual values)**

Segment	Payments ($m)	Average number on benefit during quarter (nearest 100)	Average number at end of quarter (nearest 100)	Average quarterly benefit payment (ABP) per client ($)
Youngest 0-2	700	33,700	32,600	5,193
Youngest 3-4	397	19,000	18,200	5,220
Youngest 5-13, <1yr	88	5,200	4,700	4,215
Youngest 5-13, >1yr	796	37,600	36,700	5,291
Total	1,980	95,500	92,200	5,184

The trends in numbers of clients in the various segments each quarter, as well as their average benefit payment, are shown in Figure 8.1 and Figure 8.2 respectively.

Figure 8.1 **Numbers of clients in Sole Parent segments each quarter**



While the numbers in all segments increased during the GFC, the trend is most noticeable for the 'youngest 0-2' segment. This suggests that the event had the greatest impact on single parents of newborns. While numbers in the 'Youngest 0-2' segment have started to decrease in recent years, a slight increasing trend can still be seen for the older age segments due to the progression of clients through the segments as their youngest child ages. The decrease in the 'Youngest 5-13, <1 year' segment reflects the fact that the numbers of new entrants have fallen back to pre-GFC levels.

Figure 8.2 **Average quarterly payments to Sole Parent segments in June 2012 values**

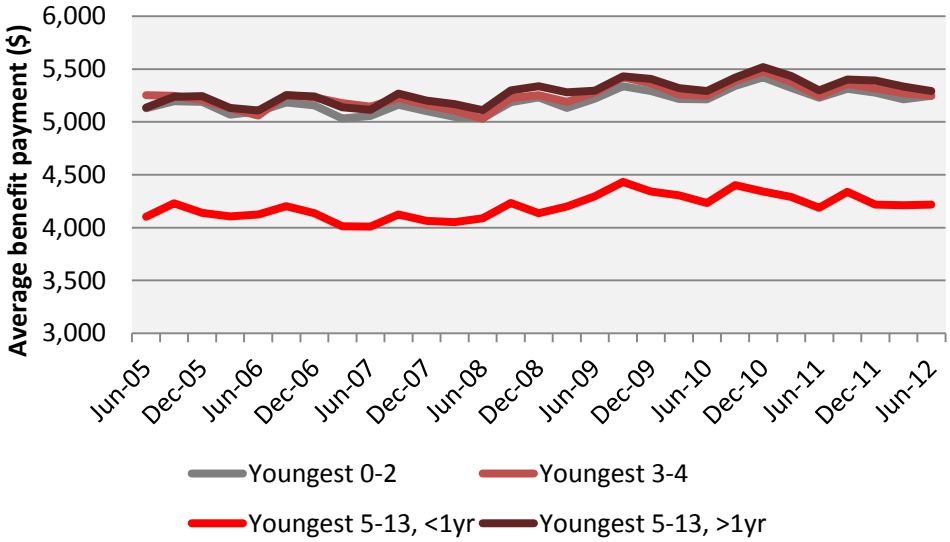
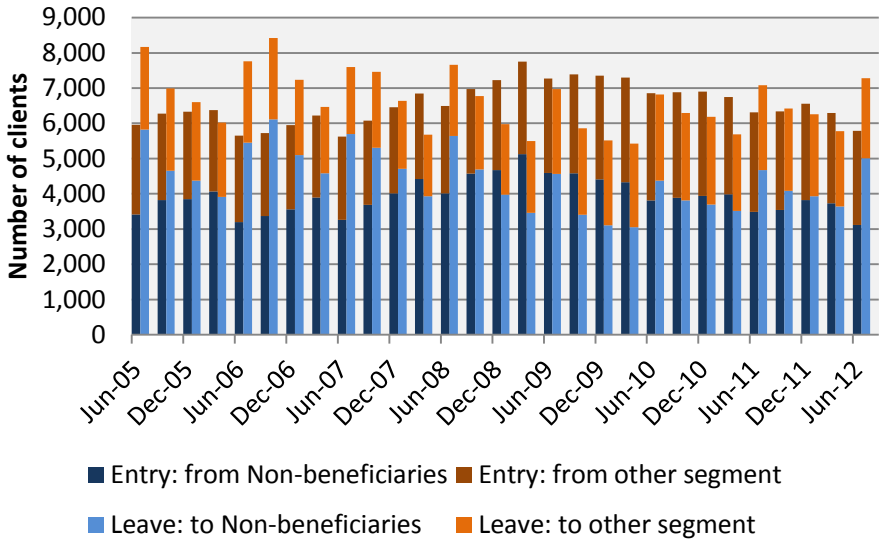


Figure 8.2 suggests that average benefit size increases with age of youngest child although the difference is subtle compared to the difference in payment size between high and low duration segments. This latter difference is almost entirely attributable to the part-payment that clients get in the quarter of joining the benefit.

Figure 8.3 **Number of clients entering and leaving the Sole Parent segments.**

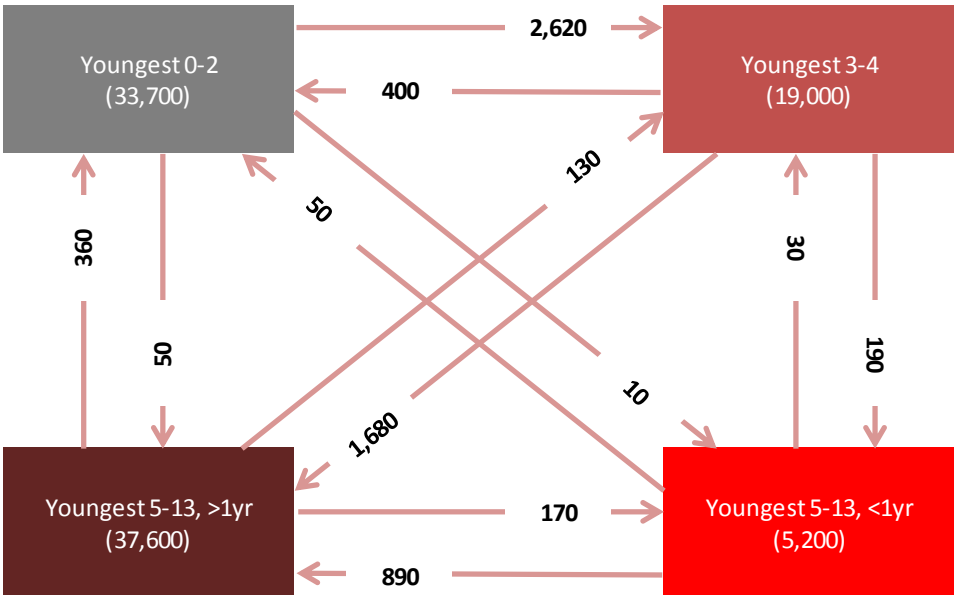


Note we do not count transitions from one Sole Parent segment to another in this figure.

Figure 8.3 shows the numbers of clients entering and leaving the Sole Parent segments every quarter. It is clear that the large increase in numbers during the GFC is attributable to both an increase in numbers entering the segments as well as a decrease in numbers leaving the segments – particularly so for entry from and exit to non-beneficiaries. During the 2010/11 and 2011/12 years, the experience of numbers of entrants and exits has improved somewhat which in turn leads to the better experience in total numbers receiving benefit seen in Figure 8.1.

Finally, a strong seasonal effect may be seen in the numbers departing the welfare scheme with larger numbers moving off benefit in most June quarters.

Figure 8.4 **Average quarterly movements between Sole Parent segments, 2011/12**



It is also worth considering how clients transition within the different Sole Parent segments. Figure 8.4 shows the average number of people in each Sole Parent segment and the quarterly movements between them in the 2011/12 year. The progression of clients into older child age segments (as their youngest child ages) explains the most significant movements. In addition, clients can also revert back to the 'youngest 0-2' segment in the event that a new child is born.

8.3 Modelling the Sole Parent Segments

Trends that can be observed in the Sole Parent Support segments can be understood by the models relating to clients on Domestic Purposes Benefit – Basic (DPB).

Section 18 describes how we model clients on DPB. Key components are the likelihood of remaining on benefit, the likelihood of leaving the system versus moving to a different benefit, and the average payment levels while on benefit. We discuss aspects of these components below. Figure 8.5 shows the performance of the probability model that tracks people remaining on DPB over the past few years. The probability is generally high (clients tend to remain on benefits) and has varied between approximately 0.915 and 0.95 over the last seven years. This is consistent with the observation that the Sole Parent segments have a relatively low churn rate.

Figure 8.5 **Probability client remains on Domestic Purposes Benefit**

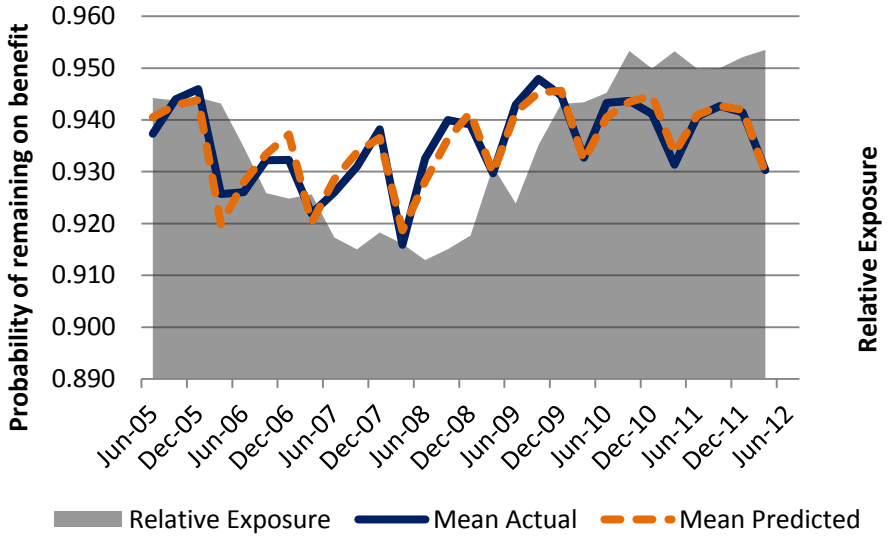
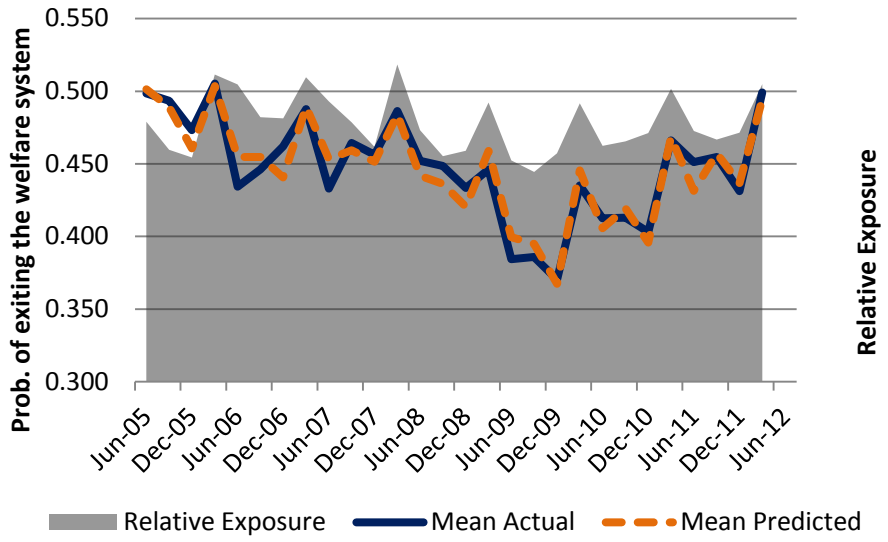


Figure 8.6 shows the probability of a client who leaves DPB (for reasons other than retirement) exiting the welfare system (as opposed to move to a different benefit). From this we see that approximately 40%-50% of beneficiaries leave the system while the remainder transition to a different benefit type. The chart also indicates that this proportion fell with the increasing unemployment rate from 2007 to 2009, suggesting that one key reason why more people would have stayed on DPB during that time was due to difficulty in finding employment. Over the past three years, there has been an increasing trend in the probability of moving off benefits amongst the recipients that leave DPB. As a result, the probability has returned to similar levels seen prior to 2007.

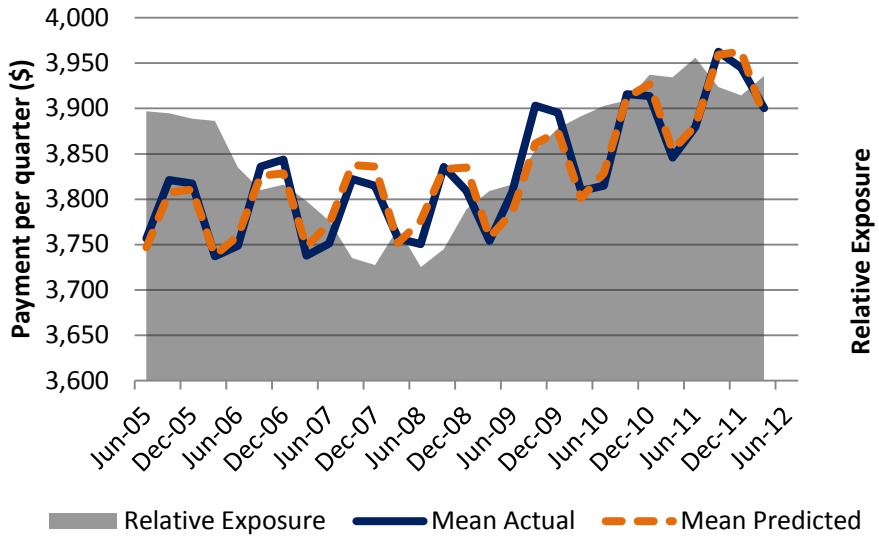
Figure 8.6 **Probability clients who leave Domestic Purposes Benefit exiting the welfare system**



Note that although the number of DPB recipients each quarter has started to stabilise in the last few years, the average benefit payment size has continued to increase over the

last year. This trend, about 1% above CPI per year, has been persistent across all durations and child age brackets.

Figure 8.7 **Actual and modelled quarterly DPB payments by calendar quarter in June 2012 values**



8.4 Forecasts

Table 8.3 shows, separately for the each of the combinations of age of youngest child (0-2 years, 2-3 years and 5-13 years) and duration on benefits (<1 year, >1 year):

- The number of clients in each segment at the valuation date
- The future cash flows for each segment, by future benefit type
- The average liability per client

Since the Sole Parent group has a low churn rate and relatively large average payment sizes, the average future costs for these segments are large and generally concentrated in DPB – 70% of future Tier 1 benefits are projected to be DPB. Furthermore, high duration segments have larger projected costs (about $53,000 per client, on average) than their low duration equivalents due to an even lower churn rate for these segments.

The projected costs are larger for the younger child age segments – this reflects the higher expected number of years before the youngest child reaches age 18[16].

[16] Following the major reforms currently underway clients would need to transfer to Jobseeker Support once the youngest child reaches age 14. However, in this valuation modeling is based on experience prior to these reforms with clients transferring to UB once the youngest child reaches age 18.

Table 8.3 **Current liabilities by benefit type for Sole Parent segments (payments in actual values, discounted to June 2012 and excluding net loans and expenses)**

Sole parents	Number	DPB ($m)	IB ($m)	SB ($m)	UB ($m)	Other T1 ($m)	AS ($m)	Other T2/3 ($m)	Total ($m)	Average
Youngest child 0-2, <1 year	6,206	760	83	56	28	74	222	143	1,367	220k
Youngest child 0-2, >1 year	25,126	3,751	470	297	123	400	1,080	685	6,805	271k
Child 0-2, all dur	31,332	4,511	553	353	151	474	1,302	828	8,172	261k
Youngest child 3-4, <1 year	2,442	261	37	26	12	30	81	48	495	203k
Youngest child 3-4, >1 year	16,008	2,143	302	190	77	254	637	378	3,980	249k
Child 3-4, all dur	18,450	2,404	338	216	89	283	718	426	4,474	243k
Youngest child 5-13, <1 year	4,345	348	69	48	20	59	116	61	723	166k
Youngest child 5-13, >1 year	35,411	3,759	726	470	180	636	1,168	642	7,582	214k
Child 5-13, all dur	39,756	4,107	796	519	200	695	1,284	704	8,304	209k
Total	89,538	11,022	1,687	1,088	439	1,453	3,304	1,958	20,950	234k

Figure 8.8 **Forecast numbers of clients in Sole Parent segments each quarter**

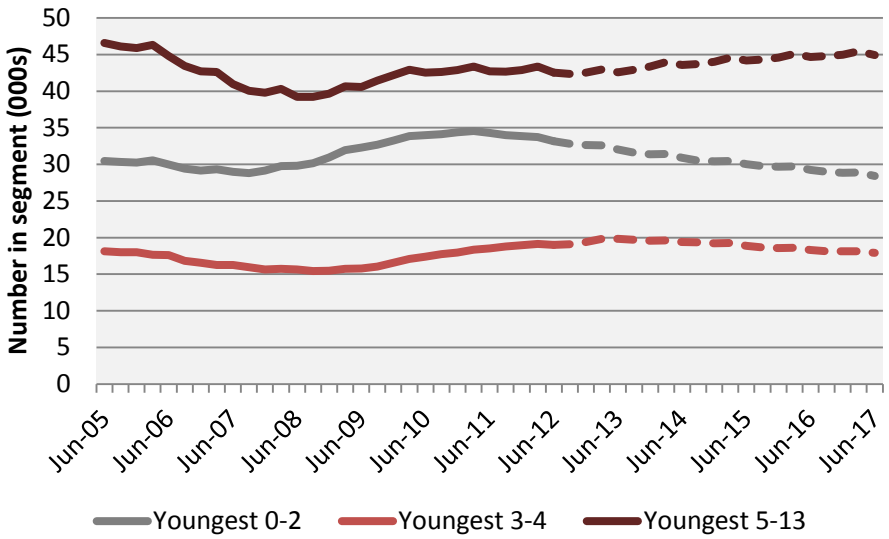
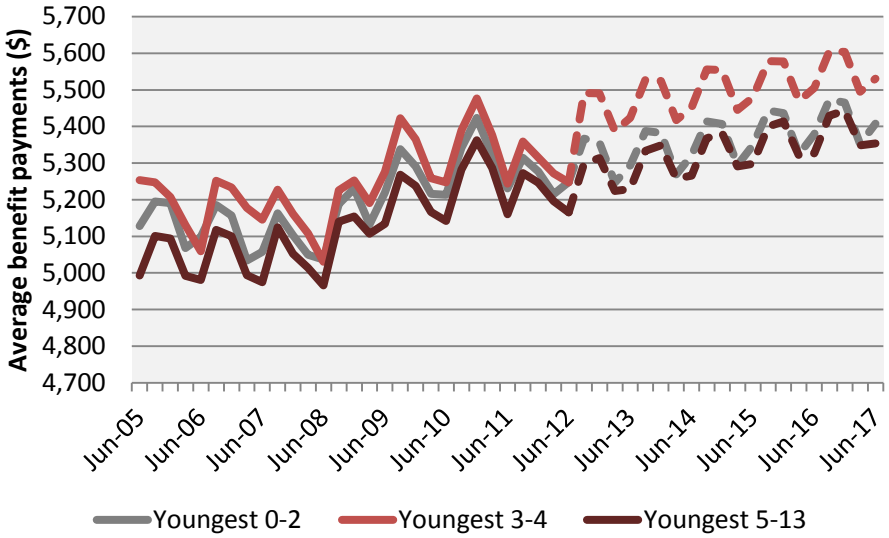


Figure 8.8 shows the forecast numbers over the next five years, split across youngest child age. The trends are reflective of lower numbers of clients entering the system, but existing clients exiting relatively slowly. As entries tend to be at the younger child ages, this segment decreases most significantly. The age 3-4 segment remains stable for a few years and then begins to fall. However, an increasing trend is still present in the 'youngest 5-13' segment due to clients that entered during the GFC with younger children progressing into the segment. In aggregate, the projection shows a slight decreasing trend for the Sole Parent group.

Figure 8.9 **Forecast average quarterly payments to Sole Parent segments in June 2012 values**

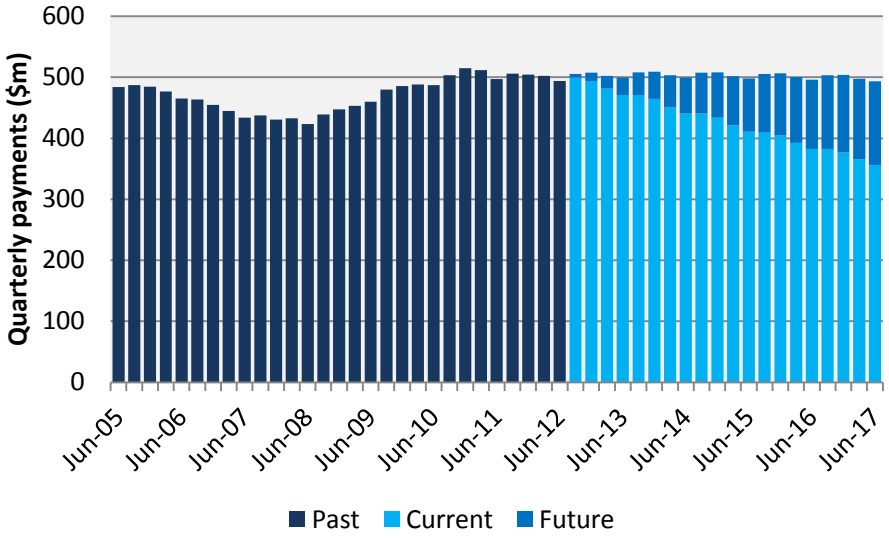


Projected quarterly payments to clients in Sole Parent segments are shown in Figure 8.9. Of note:

- Payment levels are projected to increase, consistent with recent experience. This is primarily due to Tier 1 payments and Disability Allowance payments.
- Payments to the segment with youngest child aged 3-4 are forecast to be higher than other age groups. This is consistent with historical trends (and the tendency for clients in this segment to have very low rates of leaving the benefit), although we have forecast a slight growth in the difference.

The forecast slight decrease in numbers and increase in payment rates largely offset, and future cash flows to Sole Parent segments are forecast to be flat, as shown in Figure 8.10. By 2017 cash flows related to future liability are expected to be 28% of total payments.

Figure 8.10 **Quarterly benefit payments for Sole Parent segments in June 2012 values**



8.5 Key drivers

Partial dependence relationships

Figure 8.11 **Partial dependence of age for the Sole Parent group**

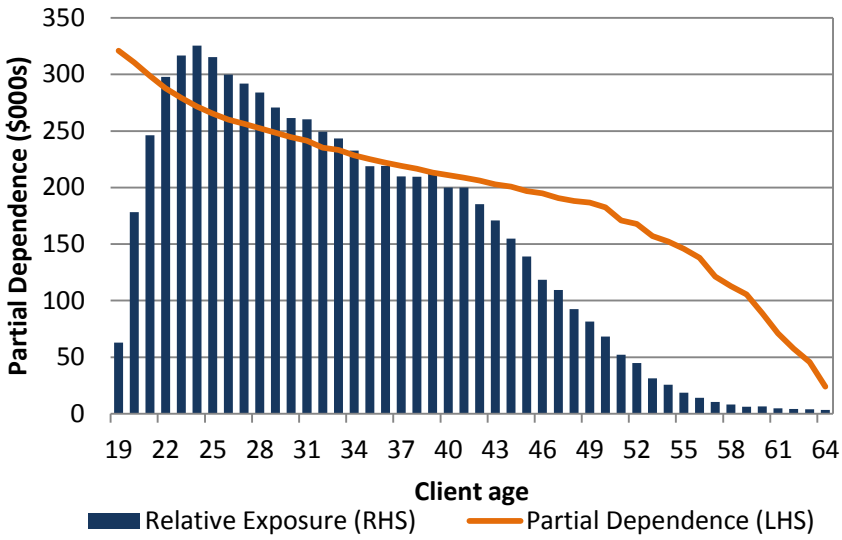
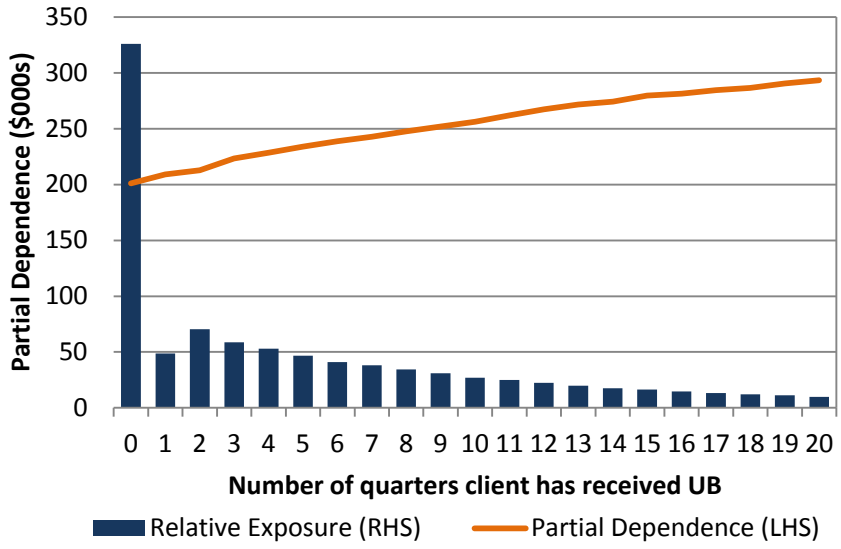


Figure 8.11 shows the partial dependence plot for client age for the Sole Parent group. The plot shows how average future liability decreases with age. The exposure bars also indicate that the Sole Parent segments are most heavily distributed in the 22-35 age range, corresponding to some of the high lifetime liabilities. The figure shows that young adults are the most common recipients of the benefit and, all else being equal, their future liability is also relatively high compared to older age clients.

Figure 8.12 **Partial dependence of 'number of quarters on Unemployment Benefit' for the Sole Parent group**



Apart from age, the benefit history of the client also has a significant impact on their predicted future liability. Figure 8.12 shows the partial dependence plot of the number of past quarters on UB for clients in the Sole Parent segments. It can be seen that predicted future cost increases almost linearly, with the cost being 50% higher if the client has received Unemployment Benefit for 5 years in the past compared to a client that has never received Unemployment Benefit. A similar trend is present for past quarters on SB, although the trend begins to level off after 10 quarters.

Figure 8.13 **Partial dependence of ethnicity for the Sole Parent group**

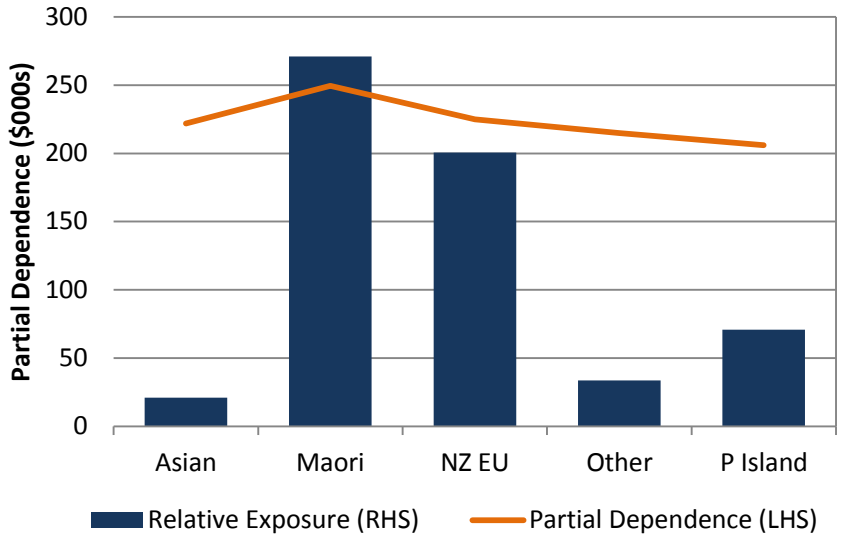
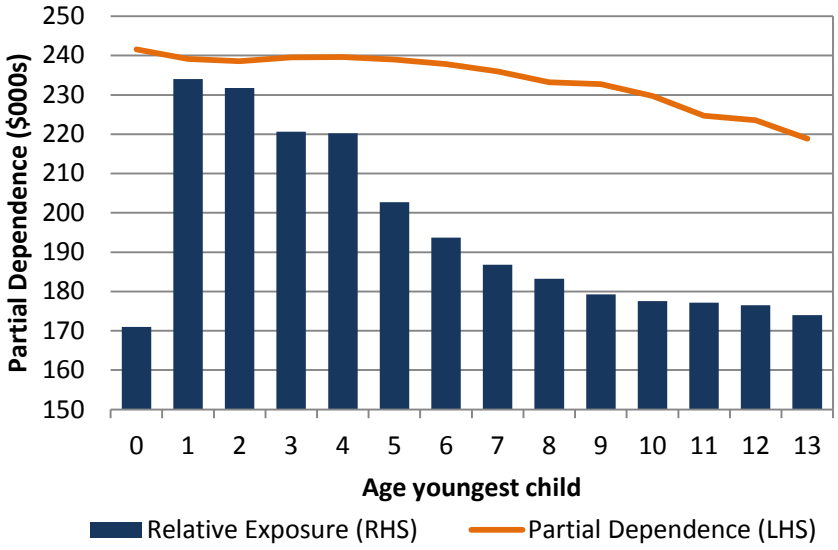


Figure 8.13 shows that the projected liabilities are similar for most ethnicities but about $25,000 higher for Maori. Additionally this ethnic group is the largest in the DPB population, higher than the proportion in the overall NZ population.

Figure 8.14 **Partial dependence of youngest child age for the Sole Parent group**



It is not surprising that the age of the youngest child has an impact on predicted liability for the Sole Parent group. Figure 8.14 shows that the partial dependence is relatively stable until the youngest child is aged five, after which it begins to decrease. A client with a child aged 13 has a $22k lower liability, all other things being equal. The plot also shows that exposure decreases as the age of the youngest child increases. We contrast the distribution of youngest child ages with the distribution of children in the NZ population generally in Figure 8.15. The younger child skew shows the degree to which clients tend to exit the benefit system as their child ages.

Figure 8.15 **Comparison of age distribution of child on Sole Parent segments and NZ population (Stats NZ, as at June 2012)**

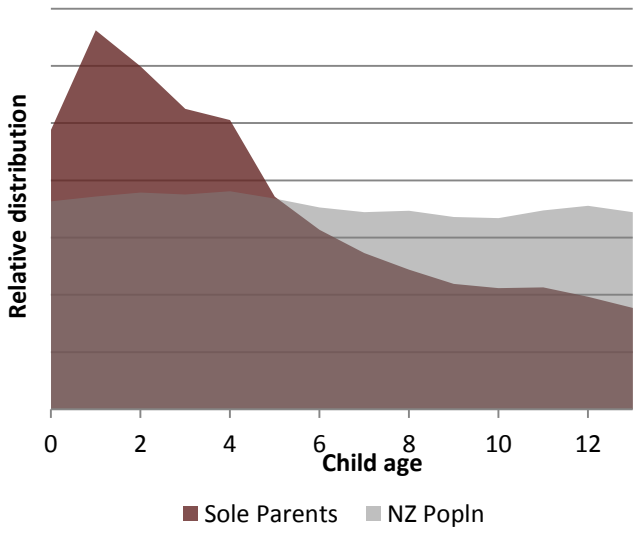
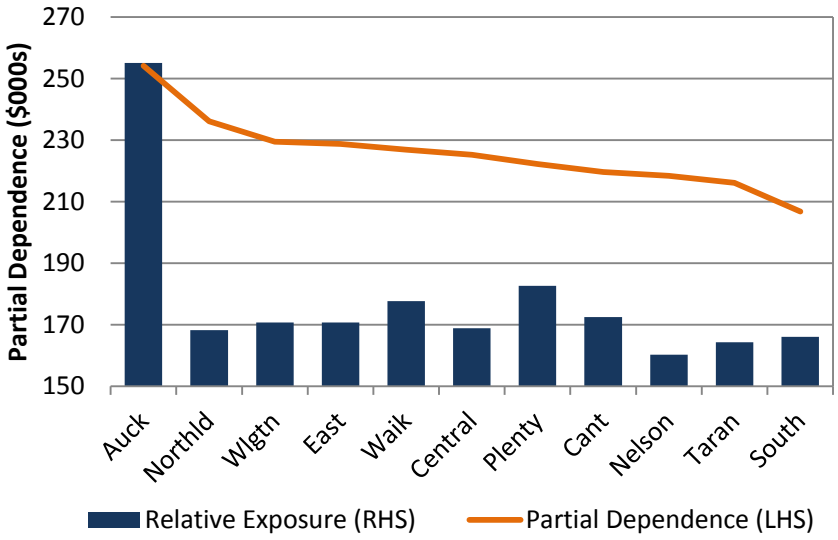


Figure 8.16 **Partial dependence of region for the Sole Parent group. Regions ordered by their partial dependence value**



Accommodation Supplement is a substantial component of payments to Sole Parents (see Table 8.3). For this reason there are significant differences in partial dependence by region, largely owing to the differing accommodation supplement amounts (but also partly due to different client behaviours). The Auckland region, easily the biggest in terms of Sole Parent recipients, has a partial dependence $30,000 to $50,000 higher than some of the other regions.

Upcoming welfare reform

Welfare reform was discussed in Section 6.2. Of particular note is that the work expectations for DPB recipients changed significantly in October 2012. This is likely to have a significant impact on the forecasts in the segment. Measuring the impact of this will be a significant area of exploration of the next valuation as at 30 June 2013.

9 SUPPORTED LIVING SEGMENTS

9.1 Introduction

The Supported Living segment, introduced in July 2013, is for people who are not able to work because they are permanently and severely restricted in their capacity for work because of a health condition, injury, or disability or total blindness or because they are caring for a person who requires full-time care and attention at home. It represents an amalgamation of the following benefit types:

- Domestic Purposes Benefit – Care of Sick and Infirm
- Invalid's Benefit

The specific benefit payment codes, and their relative contribution to 2011/12 payments, are shown in Table 9.1.

Table 9.1 **Payment codes applicable to Supported Living segments**

Benefit Type	Benefit Name	Code	% 11/12 benefit	Comment
DPB-CSI	Caring for Sick and Infirm Benefit	367	8.2%	
	Caring for Sick and Infirm Benefit	667	0.0%	Discontinued 2007
IB	Invalid's Benefit	20	2.0%	
	Invalid's Benefit	320	89.8%	

The Supported Living group has been broken down into three segments:

- Carer: those receiving DPB-CSI
- Partner: Invalid's Benefit recipients due to incapacity of partner
- HCID: Invalid's Benefit recipients due to their own incapacity

While the new benefit categories were not in force at the valuation date, we have been able to assign clients to segments based on our calculation of their benefit state at 30 June 2012.

9.2 Recent experience

Table 9.2 below shows the numbers of recipients and payment amounts for (our interpretation of) the Supported Living segments over the 2011/12 year.

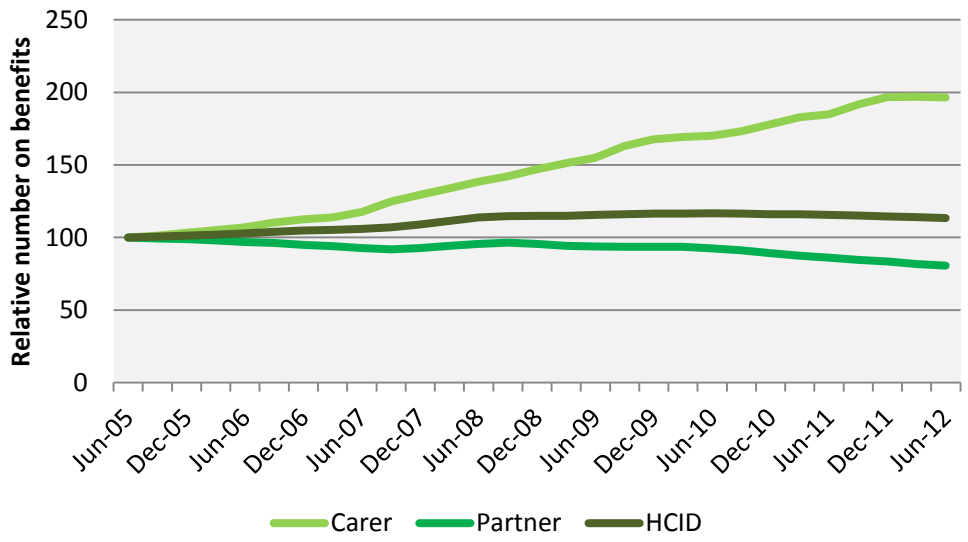
Table 9.2 **Recent experience in Supported Living segments, 2011/12 (payments in actual values)**

Segment	Payments ($m)	Average number on benefit during quarter (nearest 100)	Average number at end of quarter (nearest 100)	Average quarterly benefit payment (ABP) per client ($)
Carer	142	8,000	7,700	4,444
Partner	129	9,500	9,200	3,404
HCID	1,443	87,400	86,100	4,127
Total	1,714	104,900	103,000	4,086

Average numbers at the end of the quarter are very close to the average number during the quarter – this is in contrast to high churn segments such as the Jobseeker ones shown in Table 7.2.

The quarterly trends in numbers of clients in the various segments, as well as their average benefit payments, are shown in Figure 9.1 and Figure 9.2 respectively. It should be noted that the Supported Living segments are relatively stable and independent to the state of the economy in comparison to other segments. However the numbers in the Carers segment has grown quickly over the past few years and is currently approximately double the level in 2005. This increase is partly due to increased awareness of the benefit, as well as the larger number of carers for elderly parents in an aging population (evidenced by the strong growth in numbers of carers in the 40-65 age group). Numbers in the Partners segment has decreased by about 13% over the past two years.

Figure 9.1 **Relative numbers of clients in Supported Living segments each quarter, June 2005 = 100**



Numbers in the HCID segment (by far the largest of Supported Living) increased up until about December 2009, thereafter levelling and reducing somewhat in the last year. We believe this increase is largely attributable to the policy changes at the time concerning the IB gateway, which led to a spike in numbers moving into IB, particularly from NOB and SB.

The average benefit payments for the HCID segment has remained relatively stable through time. Average payments to the other segments have tended to increase over time while average payments to the Partner segment are considerably lower than those of the other two segments. The plot of the Partner segment is almost a parallel shift of the corresponding HCID segment plot due to the fact that the underlying benefit in both segments is IB.

Figure 9.2 **Average quarterly payments to Supported Living segments in June 2012 values**

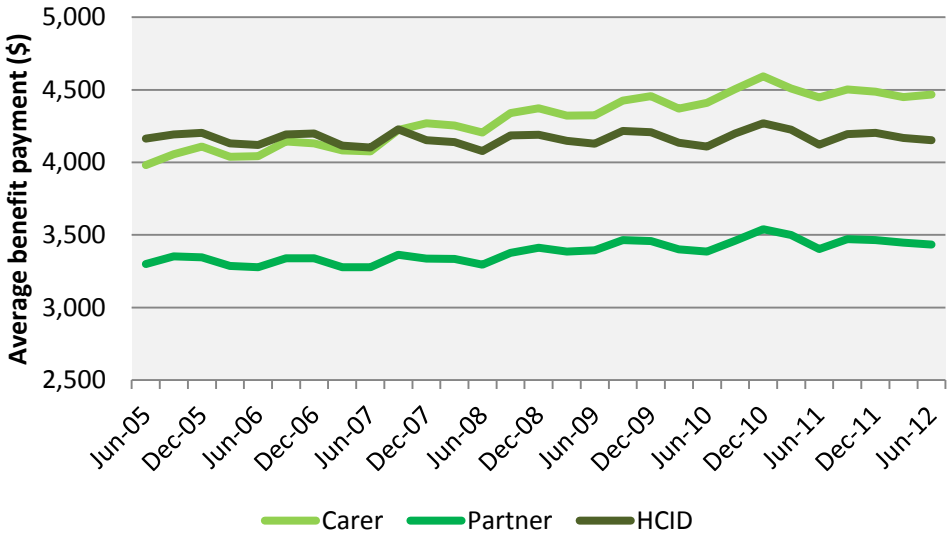
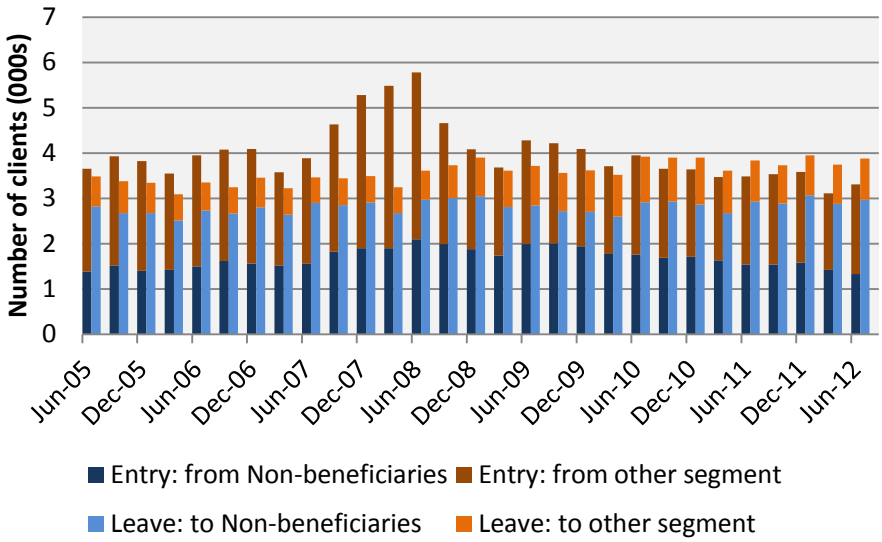


Figure 9.3 **Number of clients entering and leaving the Supported Living segments.**



Note we do not count transitions from one Supported Living segment to another in this figure.

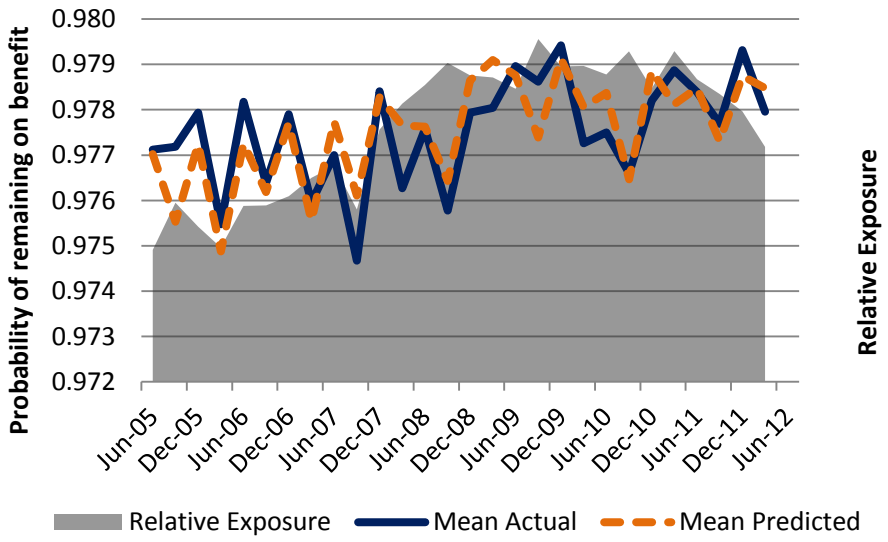
Figure 9.3 shows the number of people entering and leaving the Supported Living segment each quarter. The spike in the 2007/08 year is largely driven by the increased number of clients in the HCID segment due to changes to the IB gateway at the time, although there may be a small economy related contribution too. Entries have now stabilised with the

number of people entering the Supported Living segments being slightly lower than the number exiting for the past few years. Of those leaving the system, almost 80% leave the welfare system which is consistent with the long-term nature of this client group – clients generally stay on benefit until the incapacitated person reaches the age of 65 or dies. The number of clients leaving due to reaching retirement age has accounted for 25% of all exits on average, by far the largest in any top tier segment. In contrast, a large number of people enter these segments from some other benefit.

9.3 Modelling the Supported Living segments

Section 18 describes how we model clients receiving IB and CSI benefits. Key components of the model are the likelihood of remaining on that benefit, the relative likelihood of moving to the various benefits when they do leave IB or CSI, and the average payment levels while on benefit. We discuss aspects of each of these components below.

Figure 9.4 **Probability client remains on Invalid's Benefit**



Section 18 describes how we model clients receiving IB and CSI benefits. Key components of the model are the likelihood of remaining on that benefit, the relative likelihood of moving to the various benefits when they do leave IB or CSI, and the average payment levels while on benefit. We discuss aspects of each of these components below.

Figure 9.4 shows the actual and modelled probabilities for remaining on Invalid's Benefit. As expected this probability is high and stable – recently about 97.8% remaining each quarter – and is again consistent with the long term nature of this benefit type.

Figure 9.5 **Distribution of clients who move from Invalid's Benefit to other benefits**

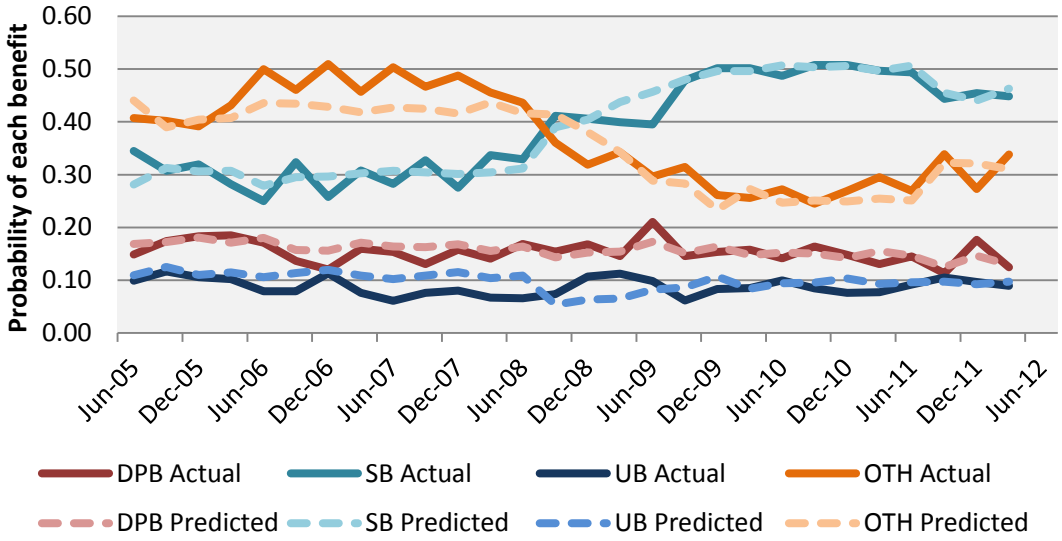
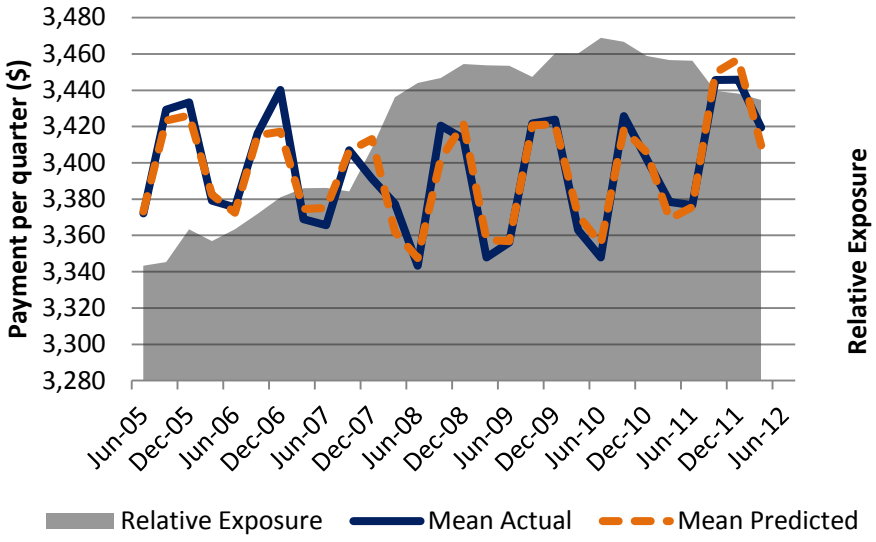


Figure 9.5 shows the destinations of those few who leave Invalid's Benefit and move to another benefit type. The most common destinations are SB or Other benefits (primarily SUP and WA/WB)

Figure 9.6 **Actual and modelled quarterly payments by calendar quarter in June 2012 values**



The actual and modelled quarterly payments are shown in Figure 9.6. The increase in average payment costs appears to be primarily due to increases for clients who have been in IB for at least 10 years, although there are also 2-3% increases for clients who have just joined IB (duration < 1 year).

9.4 Forecasts

Table 9.3 shows:

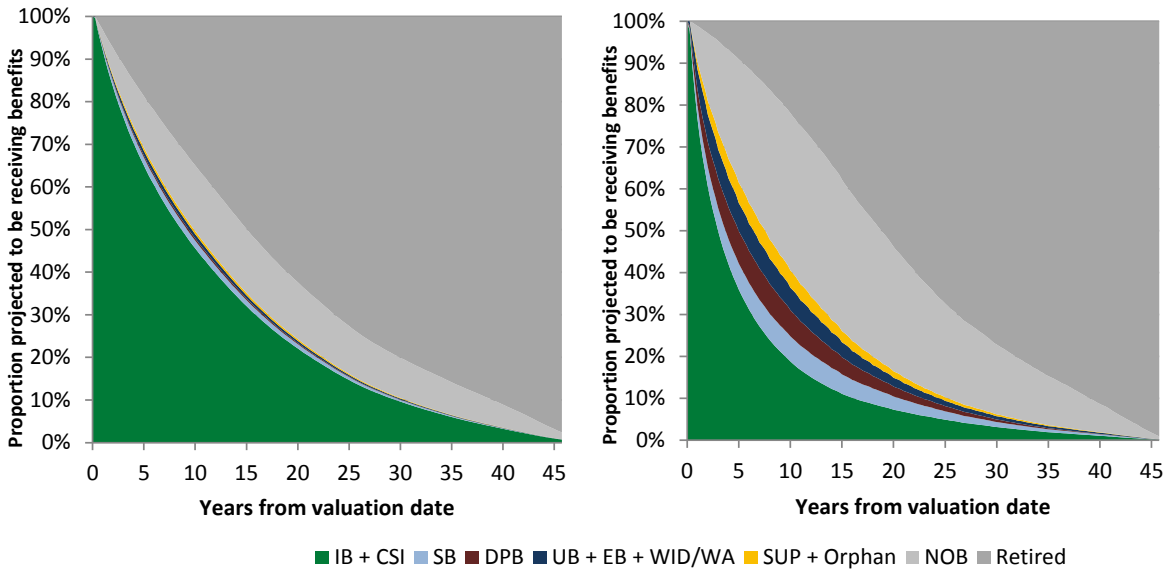
- The number of clients in each segment at the valuation date
- The future cash flows for each segment, by future benefit type
- The average liability per client

As expected, the IB payments dominate the future projected liabilities for current members of the HCID segment given the extremely low churn rate. The average liability per individual is also highest for this segment, due to the long-term nature of IB.

Table 9.3 **Current liabilities by benefit type for Supported Living segments (payments in actual values, discounted to June 2012 and excluding net loans and expenses)**

Supported living	Number	DPB ($m)	IB ($m)	SB ($m)	UB ($m)	Other T1 ($m)	AS ($m)	Other T2/3 ($m)	Total ($m)	Average
Carer	7,773	138	122	83	38	571	134	92	1,178	152k
Partner	8,742	50	652	49	14	62	95	90	1,012	116k
HCID	84,864	123	12,607	271	85	179	1,256	1,216	15,737	185k
Total	101,379	311	13,380	403	138	812	1,485	1,397	17,927	177k

Figure 9.7 **Projected benefit state for HCID (left) and Carers (right) segments**



The reason for the high lifetime cost of HCID in particular can be seen in Figure 9.7. Virtually all the clients remain in the IB benefit state over time, with nearly two thirds of the non-retired population still on IB 20 years into the projection. The outcomes for carers are more varied, with a higher proportion moving off benefits and a more significant contribution of other benefit types.

Figure 9.8 **Forecast numbers of clients in HCID and Partner segments (combined)**

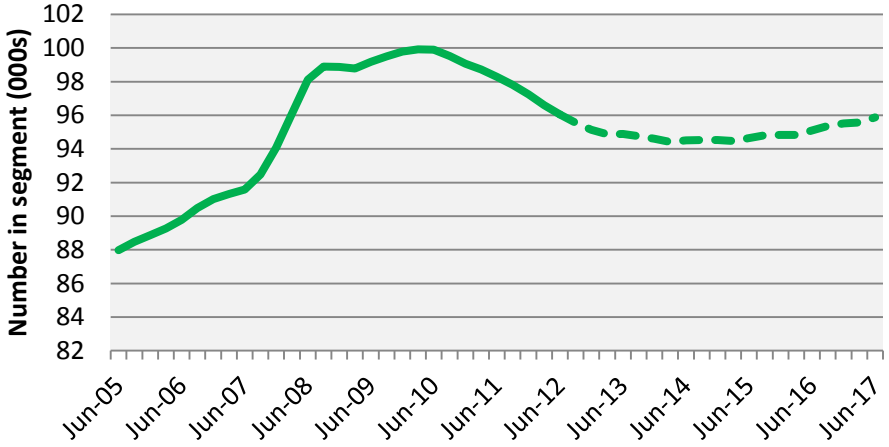


Figure 9.8 and Figure 9.9 show the projections for the future numbers of clients in the Supported Living segments. The numbers of those in the HCID and partner segments are forecast to decrease slightly for two years and then slowly increase again, reflecting long term trends prior to the GFC. The Carers segment is expected to grow strongly over the next few years, reflecting its recent upward trend.

Figure 9.9 **Forecast numbers of clients in Carers segment**

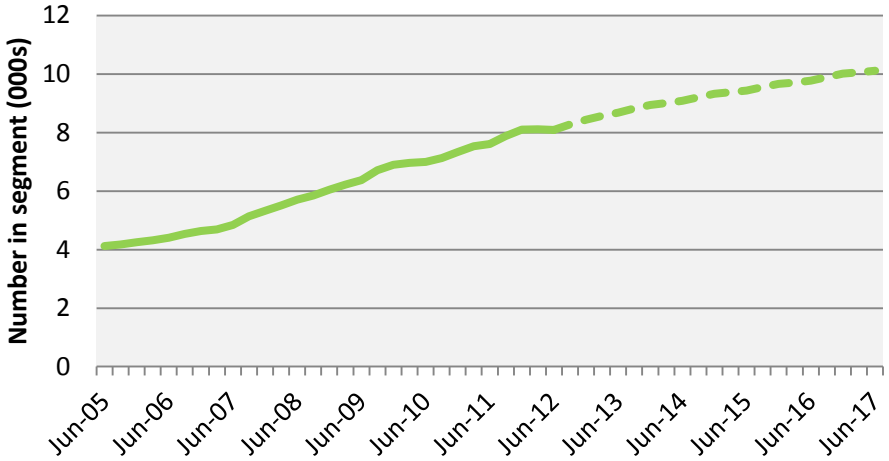
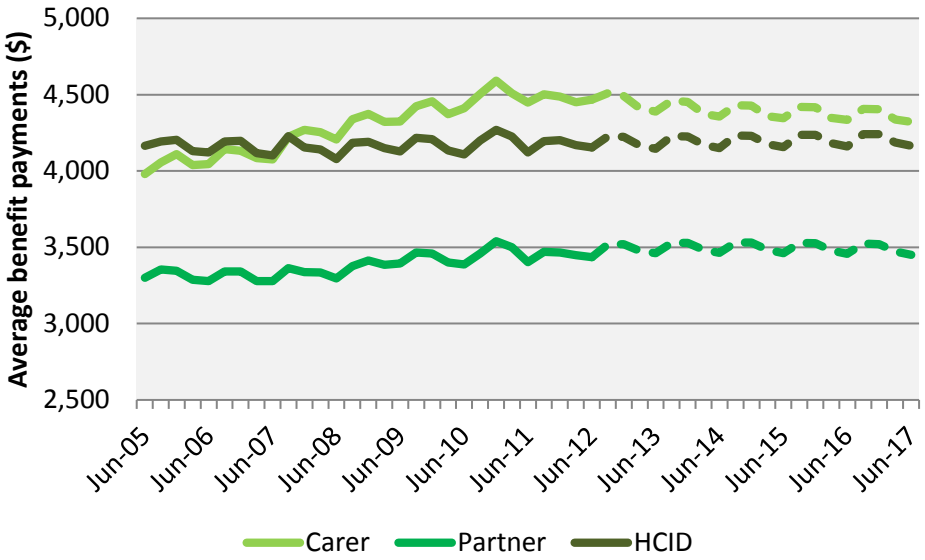
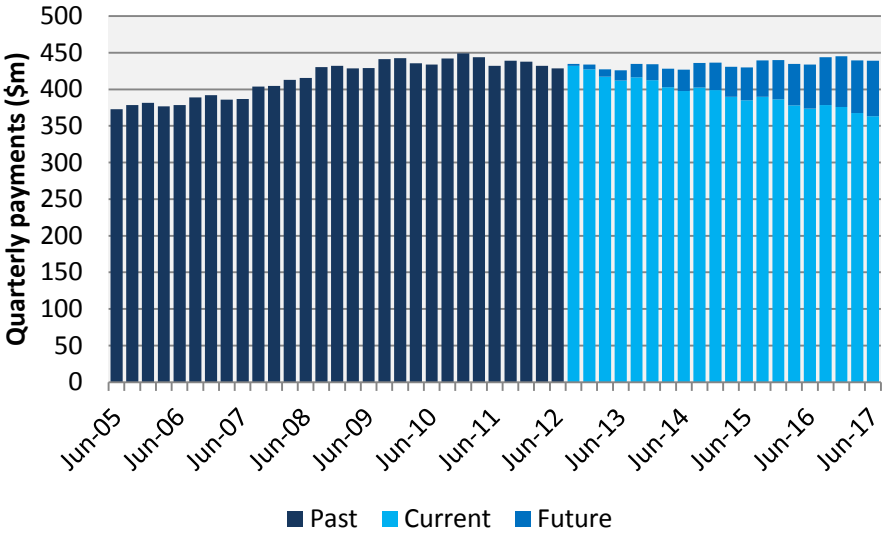


Figure 9.10 **Forecast average quarterly payments to Supported Living segments in June 2012 values**



The average benefit payments for the HCID and Partner segments are forecast to remain relatively stable over the next five years (Figure 9.10) which is consistent with the long-term nature of these benefits. The average benefit payment for the Carer segment is forecast to decrease slightly, narrowing the gap between the average amount paid to a Carer and that paid to a client in the HCID segment.

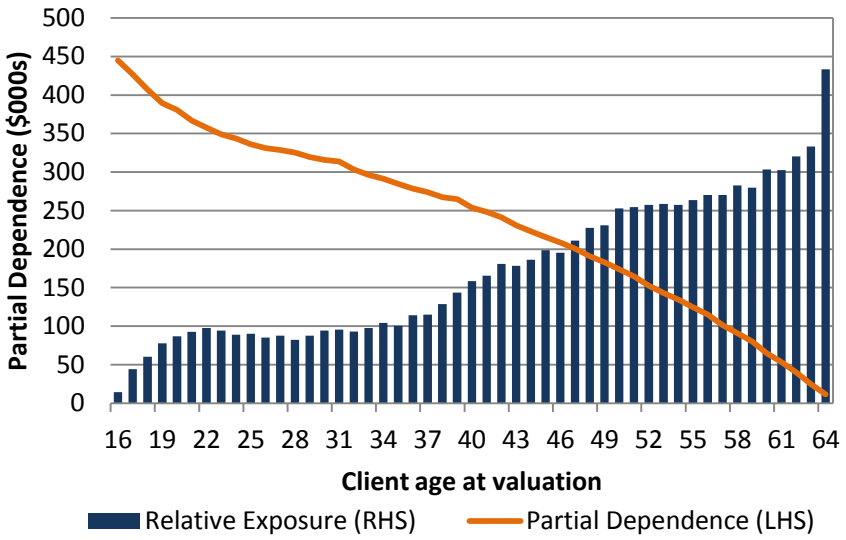
Figure 9.11 **Quarterly benefit payments to Supported Living segments in June 2012 values**



Although there are some offsetting movements, the increase in the forecast numbers in the Carers segment is enough to lead to a slight increase in future quarterly benefit payments over the next five years.

9.5 Key drivers

Figure 9.12 **Partial dependence of age for the Supported Living group**



More than any other segment, the Supported Living segments have a heavy dependence on age, reflecting the high proportion of clients who remain on benefits till retirement age. The partial dependence plot of age for the Supported Living top tier segment (Figure 9.12 above) shows a strong relationship between age and average liability with the average liability of someone aged 16 being almost $400,000 higher than that of someone aged 60.

Figure 9.13 **Partial dependence of number of quarters on Domestic Purposes Benefit for the Carer segment**

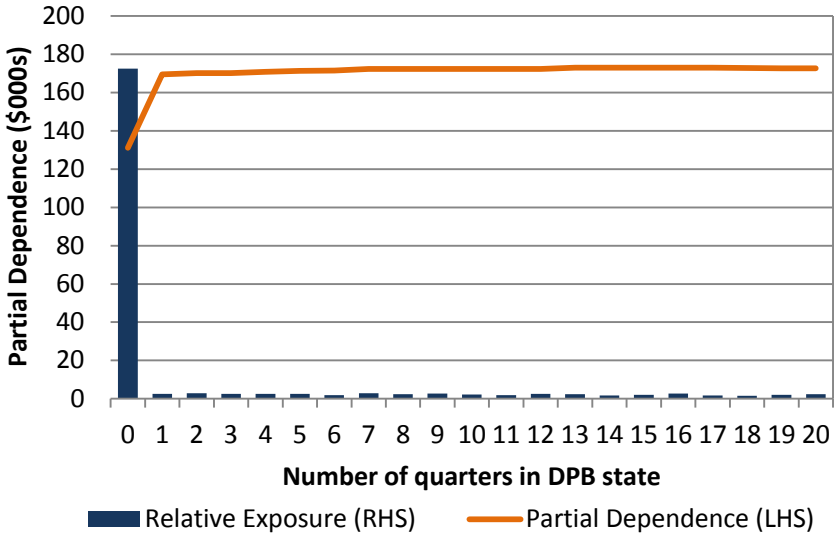
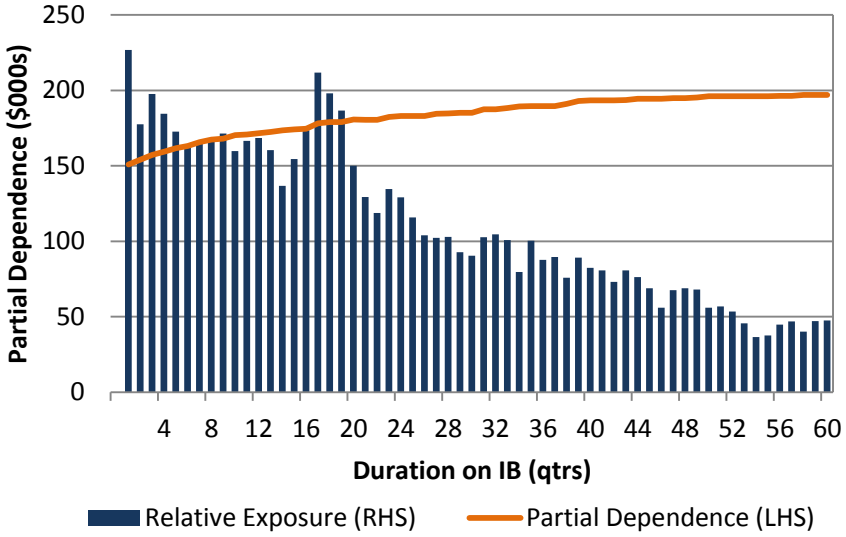


Figure 9.13 shows that there is approximately a $40,000 difference in average liability between Carers who have never received DPB and those who have received it at some point in the past. This may reflect a higher lifetime cost for clients caring for sick or disabled children.

Figure 9.14 **Partial dependence of number of quarters on current (IB) benefit for the HCID segment**



From Figure 9.14 we see that the average liability in the HCID segment is greater the longer a client has been in receipt of IB (a $45,000 difference approximately). Recall that the partial dependence plots keep all other factors constant. This includes client age, meaning that years until retirement does not affect the calculation of the partial dependence at any of the durations in the graph. Therefore, this figure shows that the longer a client has been on IB the less likely they are to be rehabilitated before retirement (or death) and thus they are increasingly likely to remain on IB until they leave the welfare system.

The figure also shows the distribution of recipients at different durations (where duration is defined as the number of quarters on IB). There are more IB clients on high durations than any other benefit.

10 YOUTH SEGMENTS

10.1 Introduction

The Youth Segments are designed to capture young people receiving welfare payments. It represents an amalgamation of the following benefit types:

- Youth Payment segment: Those under 18 receiving UB, SB, WB/WA or EB
- Youth Parent Payment segment: Those under 19 receiving DPB

However the Youth segments do not include young people receiving IB; they remain in the Supported Living segments.

The specific benefit payment codes (provided the client meets the age criterion), and their relative contribution to 2011/12 payments, are shown in Table 10.1.

Table 10.1 **Payment codes applicable to Youth segments**

Benefit Type	Benefit Name	Code	% 11/12 benefit	Comment
DPB	Emergency Maintenance Allowance	313	32.4%	
	Domestic Purposes Benefit	365	4.9%	
	Emergency Maintenance Allowance	613	0.0%	Discontinued 2007
	Domestic Purposes Benefit	665	0.0%	Discontinued 2008
EB	Emergency Benefit	611	1.0%	
SB	Sickness Benefit	600	1.3%	
	Sickness Benefit Hardship	601	4.4%	
UB	Unemployment Benefit Hardship	115	0.0%	
	Unemployment Benefit Hardship Training	125	0.0%	
	Independent Youth Benefit	603	49.7%	Paid to <18 year olds
	Unemployment Benefit Training	608	1.3%	
	Unemployment Benefit	610	4.9%	
	Young Job Seekers Allowance	604	0.0%	Discontinued 2000

While the new benefit categories were not in force at the valuation date, we have been able to assign clients to segments based on our calculation of benefit state and client age.

10.2 Recent experience

Table 10.2 below shows the numbers of recipients and payment amounts for Youth segments over the 2011/12 year.

Table 10.2 **Recent experience in Youth segments, 2011/12 (payments in actual values)**

Segment	Payments ($m)	Average number on benefit during quarter (nearest 100)	Average number at end of quarter (nearest 100)	Average quarterly benefit payment (ABP) per client ($)
Youth payt	15	1,800	1,600	2,145
Young parent payt	26	1,600	1,500	4,123
Total	42	3,400	3,100	3,076

The trends in numbers of clients in the various segments each quarter, as well as their average benefit payment, are shown in Figure 10.1 and Figure 10.2 respectively.

Figure 10.1 **Numbers of clients in Youth segments each quarter**

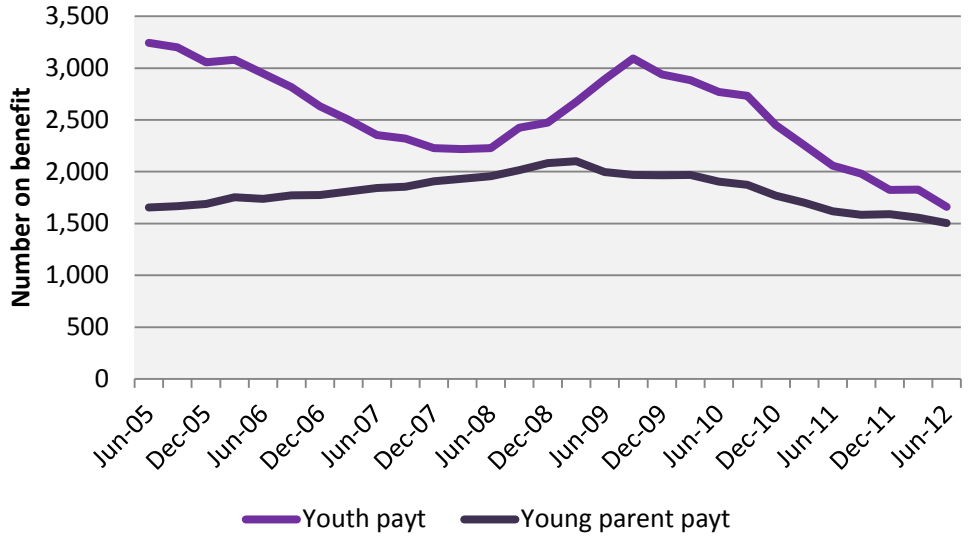
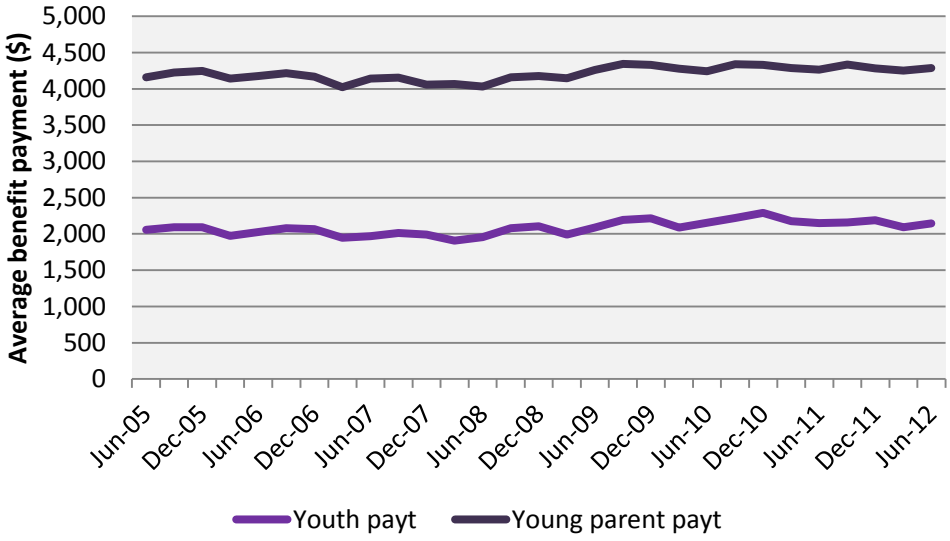


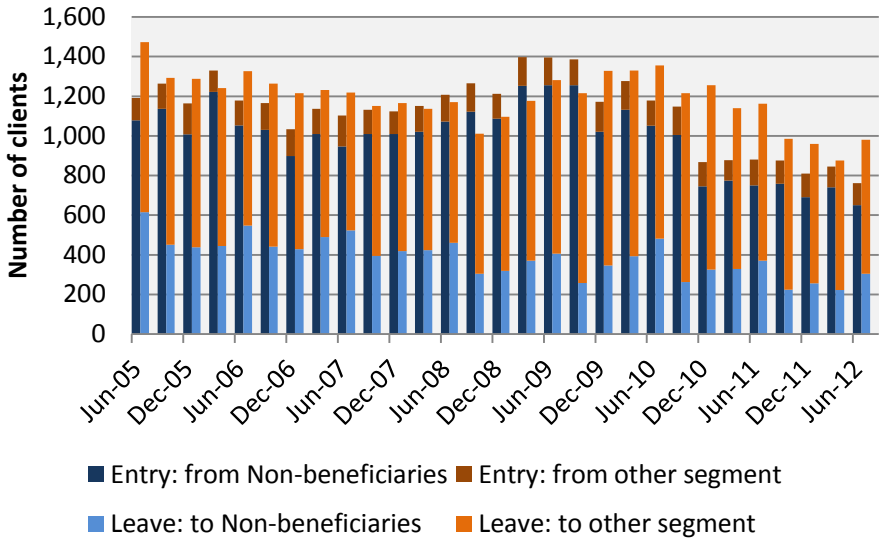
Figure 10.1 shows that the numbers receiving the Youth payment have decreased sharply over the past few years, and are now below the levels seen prior to the GFC. The numbers receiving the Young Parent payment have also been decreasing since the GFC.

Figure 10.2 **Average quarterly payments to Youth segments in June 2012 values**



The average payments to the two Youth segments have been relatively stable over time, though there were some modest increases in 2008 and 2009.

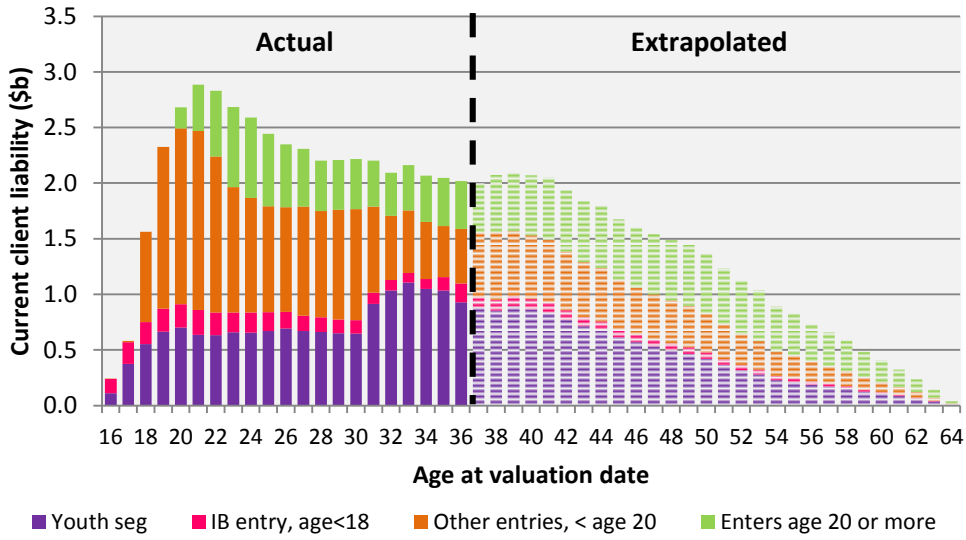
Figure 10.3 **Number of clients entering and leaving the Youth segments.**



Note we do not count transitions from one Youth segment to another in this figure.

The source and destination of clients entering and leaving the Youth segments is shown in Figure 10.3. Given the age of the recipients, the vast majority of new entrants are entering the welfare system for the first time. For those departing the Youth segment, most depart to other benefits (typically DPB for Young Parent and UB or SB for Youth Payment) indicating a high likelihood of a long duration on benefits for those who receive benefits first at a young age. We reproduce Figure 4.12 below, which illustrates the high proportion of liability attributable to clients who start in a youth segment.

Figure 10.4 **Current client liability split by current client age and status when first entering the welfare system**



10.3 Modelling the Youth segments

Unlike the other segments which capture distinct types of welfare payment, The Youth segment has been created to allow closer monitoring and better management of the liabilities for young recipients of welfare as it is known that such clients are at particularly high risk of being long-term users of the welfare system. The segment itself is an amalgamation of liabilities similar to those in the Jobseeker Support segments (Youth payment) and those in the Sole Parent segments (Young Parent payment) so the discussion on modelling in Sections 7.3 and 8.3 is also relevant for the Youth segment.

10.4 Forecasts

Table 10.3 shows:

- The number of clients in each segment at the valuation date
- The future cash flows for each segment, by future benefit type
- The average liability per client

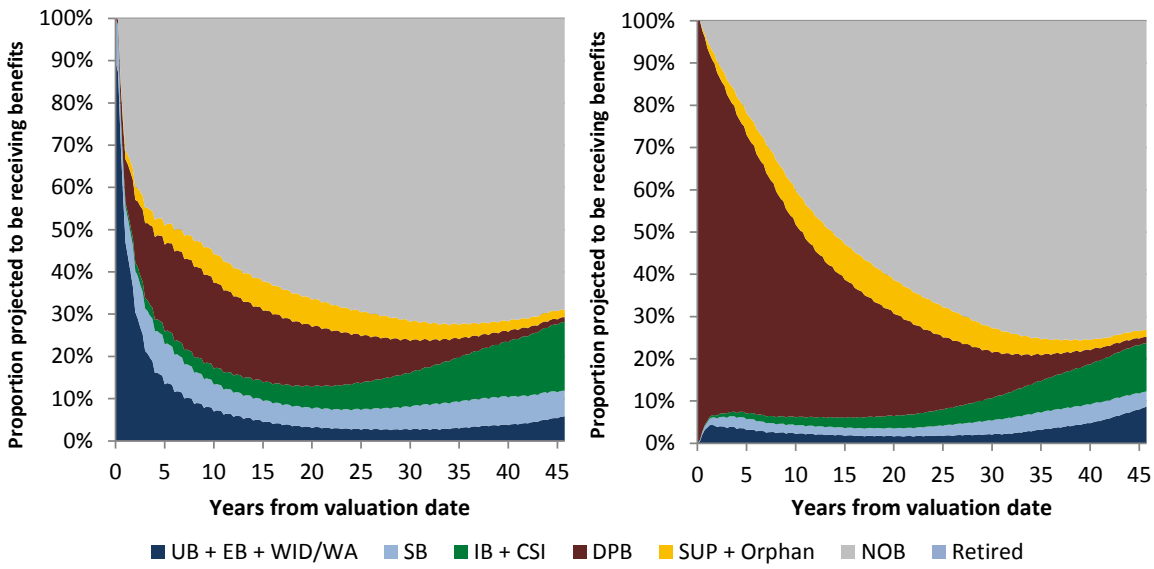
DPB is the main contributor to the future cost of a client in the Young Parent segment. This is consistent with the low churn rate of DPB and the fact that Young Parents are at high risk of transitioning into the Sole Parent segments and receiving DPB for a considerable period of time. Of some interest is the fact that the average projected liability for a client in the Young Parent payment segment is larger than that of a client in any of the Sole Parent payments, extending the trend seen in Figure 8.11.

DPB is also the major contributor to the projected liability of a client in the Youth Payment segment. This suggests that clients in this segment have a significant risk of moving into Sole Parent segments in the future.

Table 10.3 **Current liabilities by benefit type for Youth segments (payments in actual values, discounted to June 2012 and excluding net loans and expenses)**

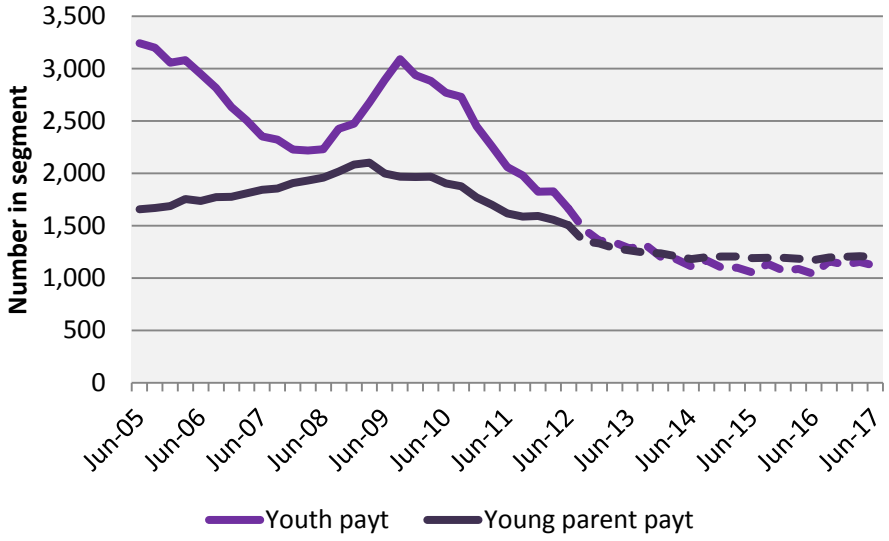
Youth	Number	DPB ($m)	IB ($m)	SB ($m)	UB ($m)	Other T1 ($m)	AS ($m)	Other T2/3 ($m)	Total ($m)	Average
Youth payment (<18)	1,405	98	33	26	28	12	39	23	259	184k
Young parent payment (<19)	1,544	276	18	12	7	19	68	46	446	289k
Total	2,949	375	51	38	35	30	107	69	705	239k

Figure 10.5 **Projected benefit state for Youth payment (left) and Young parent (right) segments**



The projected benefit state charts are shown in Figure 10.5. One obvious difference to other segments is the lack of retirements for the obvious reason. However the high rates of remaining on benefits across the next 45 years is marked and contributes to the high lifetime cost. The high amount of DPB payments going to clients currently in the Youth parent payment segment is particularly evident.

Figure 10.6 **Forecast numbers of clients in Youth segments each quarter**



The number of clients in each of the segments is forecast to continue decreasing over the next two years and then stabilise beyond that (Figure 10.6). This is mainly driven by Treasury's forecast of falling unemployment rates over that period, but also reflects the low number of entries into the youth segments in the past year. We note that the low numbers of clients in these segments, plus the particular dynamics of how these clients tend to interact with the welfare system, make these projections particularly uncertain.

Figure 10.7 **Forecast average quarterly payments to Youth segments in June 2012 values**

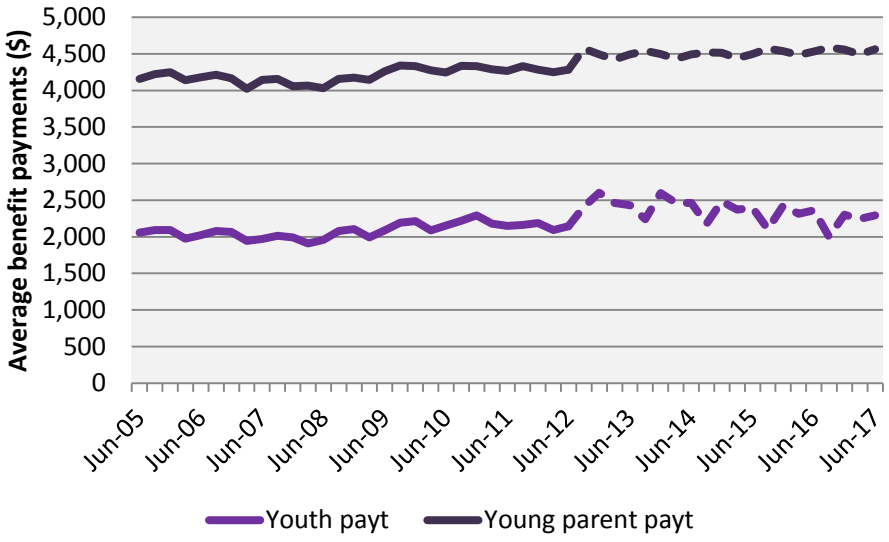


Figure 10.7 displays the forecast average benefit payments in each of the Youth segments for the next five years. These forecasts only show small changes from current levels. The Young Parent average payment is forecast to increase very gradually (which is consistent with observations for the Sole Parent segment – see Figure 8.9). The Youth payment shows a gradual decrease, which may be due to the falling forecast unemployment rate leading to slightly shorter durations on benefit each quarter.

Figure 10.8 **Quarterly benefit payments for Youth segments in June 2012 values**

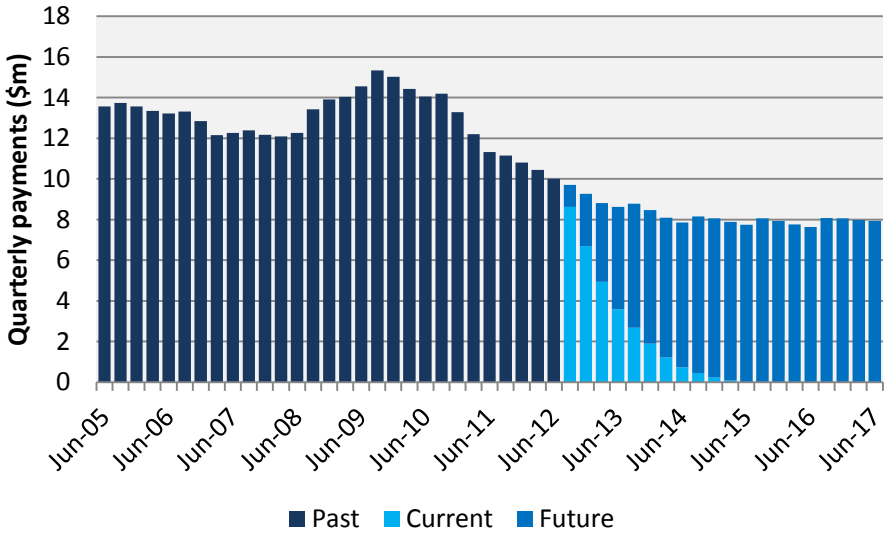


Figure 10.8 shows that total benefit payments for the Youth segments are projected to decrease for two years and then stabilise. This is mainly driven by the forecast reduction in the number of clients in these segments in the future; changes in the average benefit payment are marginal. Note that current liability is projected to decrease rapidly since clients leave the segment once they are 18 (Youth payment) or 19 (Young Parent payment). Care must be taken to not interpret the decline as evidence that clients in youth segments have a short term dependency on the benefit system.

10.5 Key drivers

Figure 10.9 **Partial dependence of gender for the Youth segments**

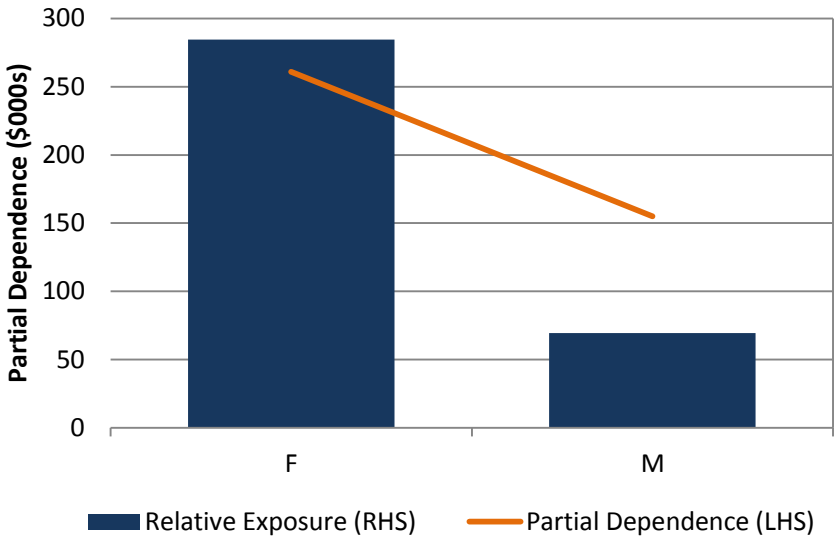


Figure 10.9 shows the partial dependence plot of gender for the Youth segments. It is clear the females form the majority of the segment and also have significantly higher predicted

costs. This can be partly explained by the fact that recipients of DPB (and therefore in the Young Parent segment) tend to be female. Additionally females in the Youth payment segment are more at risk of transitioning into DPB at some point in the future and once there, accrue high expected liabilities – we note that a similar gap remains between genders for the partial dependence plot for the Youth Payment Segment only.

Figure 10.10 **Partial dependence of benefit type for the Youth segments**

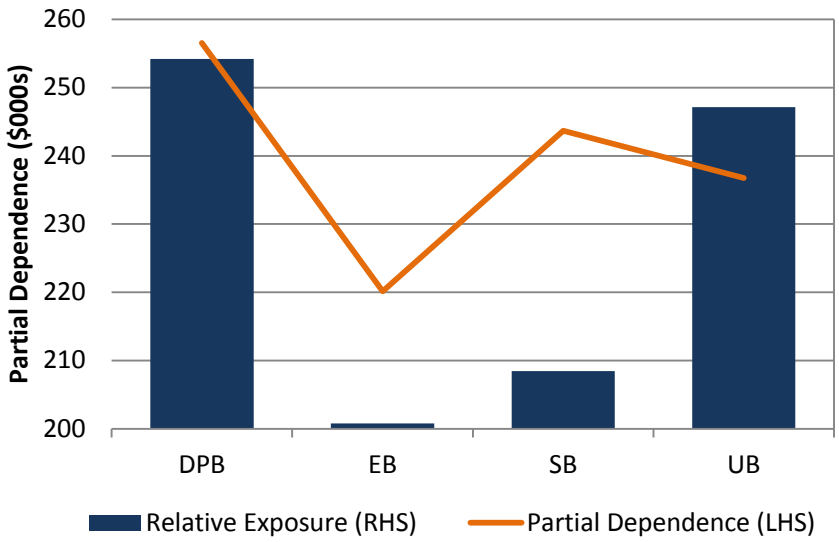
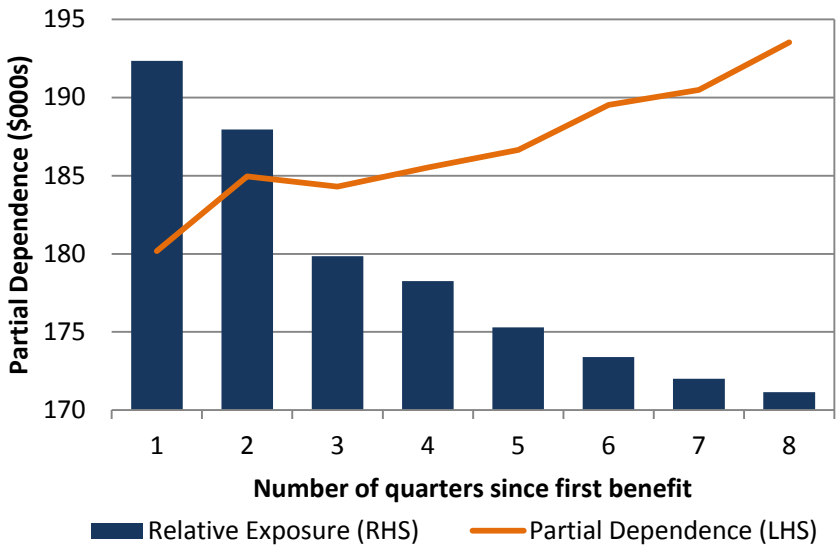


Figure 10.10 gives an ordering of the partial dependence on the current benefit type. As expected, DPB has the highest average liability, with a difference of $35,000 between a client receiving DPB and one receiving EB. Following that are SB ($244,000) and UB ($237,000). The increased average liability for SB may be due to an increased risk of transitioning to IB.

Figure 10.11 **Partial dependence of duration (number of quarters) since first benefit for the Youth payment segment**



From Figure 10.11 we see that the average liability tends to increase as the number of quarters since first receiving a benefit increases (a difference of almost $15,000 between 1 and 8 quarters since first benefit). Again given that those in the Youth Segment are at risk of being long-term benefit-recipients, we see that this risk gradually increases as duration in the welfare system increases.

11 NON-BENEFICIARIES SEGMENTS

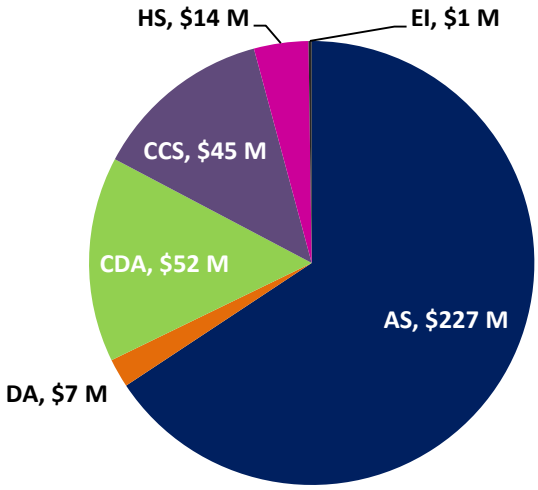
11.1 Introduction

The Non-beneficiaries segment includes those who have recently exited the welfare system as well as those receiving supplementary benefits only. This group includes recent beneficiaries (NOB), those receiving 2nd or 3rd tier benefits (SUP) and those on Orphan Benefit (OB). These clients combined have an average 5 year cost of $12,900. Four segments have been defined relating to these clients:

- Those receiving supplementary benefits only, for less than a year (SUP <1 year)
- Those receiving supplementary benefits only, for more than a year (SUP >1 year)
- Those receiving Orphan or Unsupported Child Benefit (OB), but not receiving any other Tier 1 benefit ('Orphan only')
- Recent exits (i.e. < 1 year) from the welfare system (NOB)

In Section 17.5 we describe the exact requirements for qualifying for the supplementary state – i.e. if a client receives AS, DA or CDA in the quarter but no Tier 1 benefit. The reasons for not including CCS, HS or EI in the supplementary state definition were partly practical and partly theoretical and are discussed in Section 18.2.2. Clients on supplementary only benefits primarily receive Accommodation Support, which represents two thirds of payments to these segments – see Figure 11.1. CDA and CCS benefits account for a further 15% and 13% respectively, with the other Tier 2 and 3 benefits making smaller relative contributions.

Figure 11.1 **Benefit payments in supplementary only segments by benefit type in actual values, 2011/12**



For the Orphan only segment, the specific benefit payment codes, and their relative contribution to 2011/12 payments, are shown in Table 11.1.

Table 11.1 **Payment codes applicable to the Orphans only segment**

Benefit Type	Benefit Name	Code	% 11/12 benefit	Comment
OB	Orphans Benefit	340	3.5%	
	Unsupported Child Benefit	344	96.5%	
	Orphans Benefit	40	0.0%	Discontinued 2007
	Unsupported Child Benefit	44	0.0%	Discontinued 2007

11.2 Recent experience

Table 11.2 shows the numbers of recipients and payment amounts for (our interpretation of) the Non-beneficiaries segments over the 2011/12 year. Note that the definition of Supplementary only clients means that a small amount of payments are associated with the Recent Exits segment since they can receive some Tier 2 and 3 payments (CCS, HS and EI). Additionally, in contrast to all the other segment definitions, there are more recent exits at the end of a quarter than during – this represents those clients who received benefits at some point in the quarter, but had exited benefits by the quarter end.

Table 11.2 **Recent experience in Non-beneficiaries segments, 2011/12 (payments in actual values)**

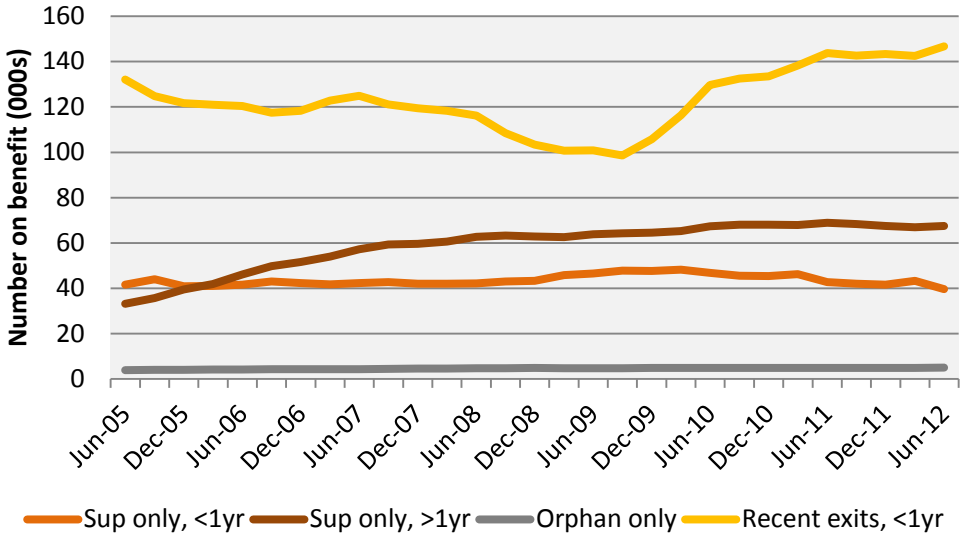
Segment	Payments ($m)	Average number on benefit during quarter (nearest 100)	Average number at end of quarter (nearest 100)	Average quarterly benefit payment (ABP) per client ($)
Sup only, <1yr	109	41,700	34,700	656
Sup only, >1yr	236	67,500	61,300	873
Orphan only	64	4,900	4,700	3,241
Recent exits, <1yr[17]	25	143,800	195,100	43
Total	433	257,900	285,800	420

The trends in numbers of clients in the various segments are shown in Figure 11.2. The impact of the GFC on numbers of clients leaving the system (recent exits) can be seen in Figure 11.2 with a significant fall in exits during 2007 and 2008. Recently, exits have increased and are currently at their highest levels since 2005.

The numbers receiving Supplementary benefits only for low durations have been relatively stable, albeit with a slight increase in 2009 and 2010. Numbers for SUP >1 year increased from 2005 but appear to have stabilised in recent years.

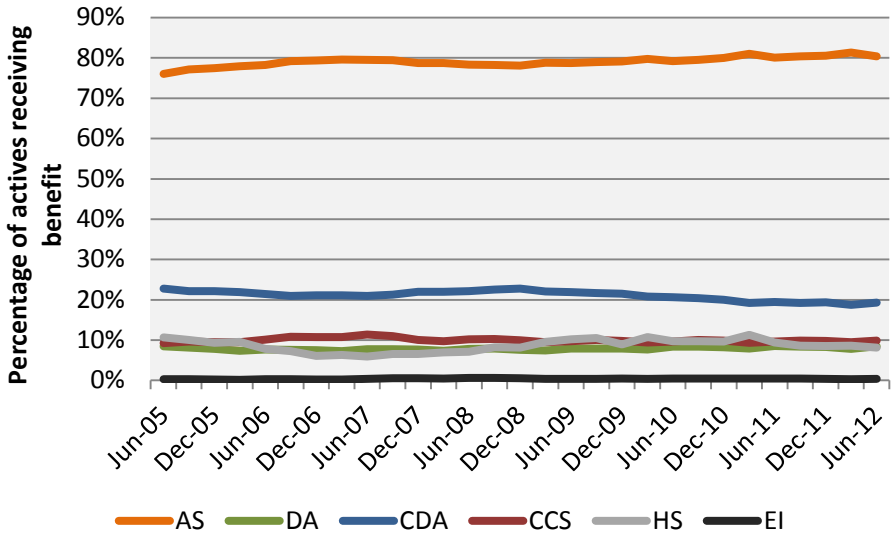
[17] Client numbers shown for recent exits are number of clients who receive no benefits during the quarter, and the number not on benefit at the end of the quarter

Figure 11.2 **Numbers of clients in Non-beneficiaries segments each quarter**



The percentages of clients in the Supplementary segments receiving the various Tier 2 and 3 are displayed in Figure 11.3 while Figure 11.1 shows the total amount paid for each of the supplemental benefit categories in 2011/12. Note that the percentages don't sum to 100% since a client can potentially receive payments from multiple benefit categories.

Figure 11.3 **Proportion of clients in Supplementary only segments receiving benefits**



The proportions of clients receiving the various supplemental payments have not changed dramatically over time, though some changes are apparent. For example, there was a slight increase in the proportion receiving AS and HS during the GFC, and the proportion receiving CDA has fallen in both relative and absolute terms.

Figure 11.4 **Number of clients entering and leaving Supplementary only segments each quarter**

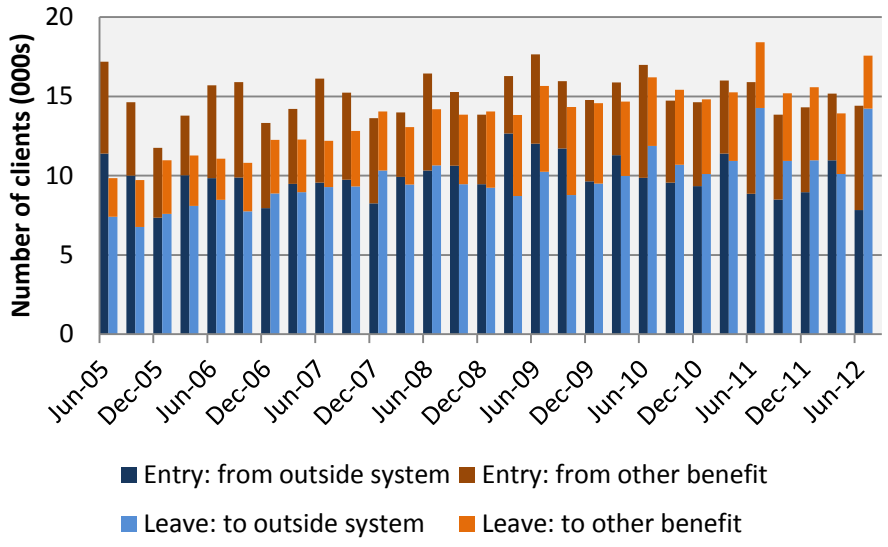


Figure 11.4 shows entrants to and exits from the Supplementary segments (>1 year and <1 year combined). The majority of entrants are new to the system rather than transitioning from other benefits and similarly exits are more likely to leave the welfare system. During the GFC, entrants from other benefits fell relative to other entrants suggesting that there was less movement off main benefits to the Supplementary segments. In a similar manner, exits to other benefits also tended to be higher from 2008 to 2010. As with other benefits, there is a strong seasonality in exits.

Figure 11.5 **Number of clients entering and leaving Orphan segment each quarter**

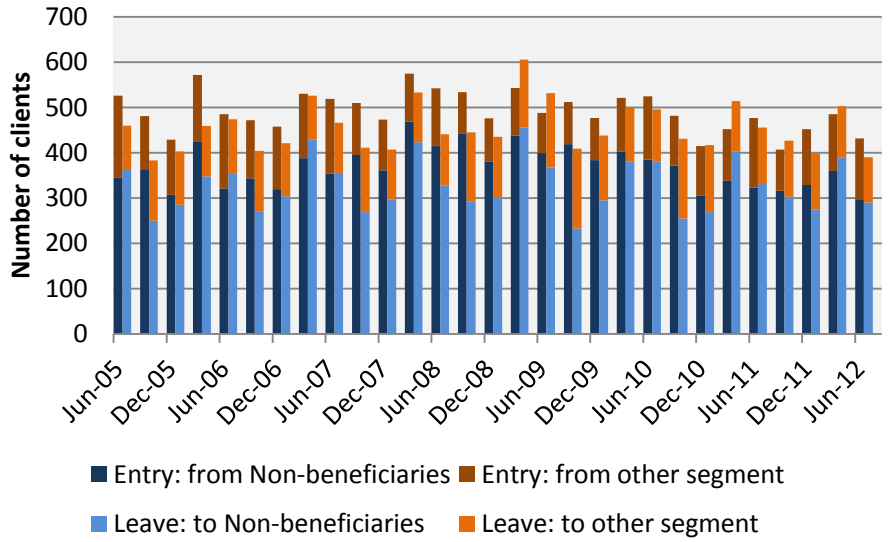


Figure 11.5 shows a similar graph, this time for the Orphan segment. Numbers of entrants and exits for this segment are low – of the order of 400 or less. Entrants are more likely to come from those outside the welfare system and similarly those leaving are more likely to move off benefit.

Figure 11.6 **Distribution of transitions of clients currently in the Recent Exits segment each quarter**

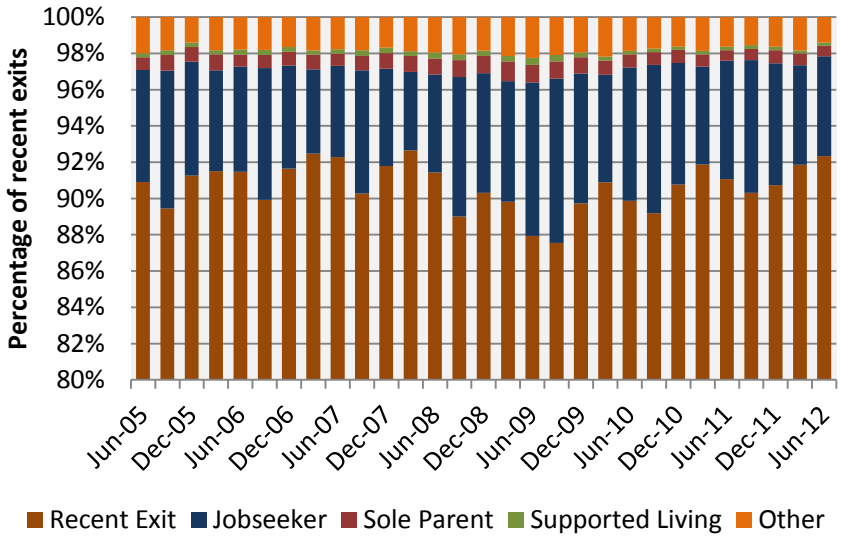


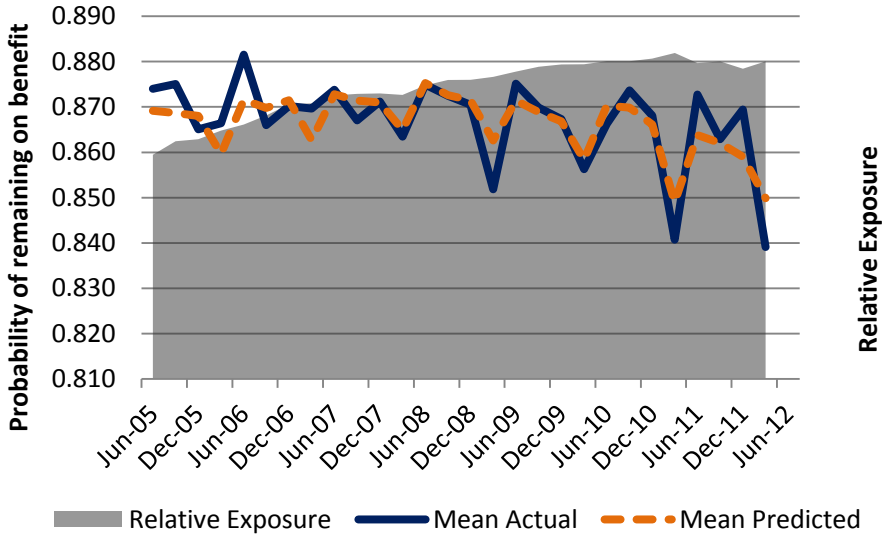
Figure 11.6 shows the proportion of recent exits that transition into the various other segments each quarter (note that transitions here include those remaining in the Recent Exits Segment). Prior to the GFC, about 92% of recent exits remained off welfare from quarter to quarter, with the remainder re-entering the system (primarily to benefit types associated with the Jobseeker segments). It is clear that during the GFC a larger percentage of recent exits returned to benefits, with an increased proportion transitioning to the Jobseeker Support segments.

11.3 Modelling the Non-beneficiaries segments

Section 18 describes how we model clients in non-beneficiary segments, which relate to the "SUP", "OB" and "Not on benefit" (NOB) states in the transition models (see Section 18.3.1). Key components of the model are the likelihood of remaining in that benefit state, the relative likelihood of moving to other benefit states and the average payment levels while on benefit. We discuss aspects of each of these components below.

Clients in the Supplementary Only segments are modelled in the "SUP" benefit state. Figure 11.7 shows the actual and modelled probability for remaining on Supplemental benefit. The probability has declined marginally in the three years to the valuation date, dropping from 0.87 to approximately 0.86. However, the seasonality has increased markedly over the past few years, adding to the uncertainty of projection.

Figure 11.7 **Probability client remains in the SUP benefit state**



The probability of remaining off benefit for recent exits is displayed in Figure 11.8. As might be expected, this probability fell during the GFC as greater numbers accessed benefits, but has been improving since 2010 and is currently at similar levels to those seen pre-GFC. Somewhat unusually, the higher rate of remaining off benefits (to record highs) has not been matched by a fall in the unemployment rate. This has led to increased uncertainty as to the likely rates of remaining off benefit as the unemployment rate improves (as it is projected to).

Figure 11.8 **Probability client remains off benefit for clients within one year of welfare system exit**

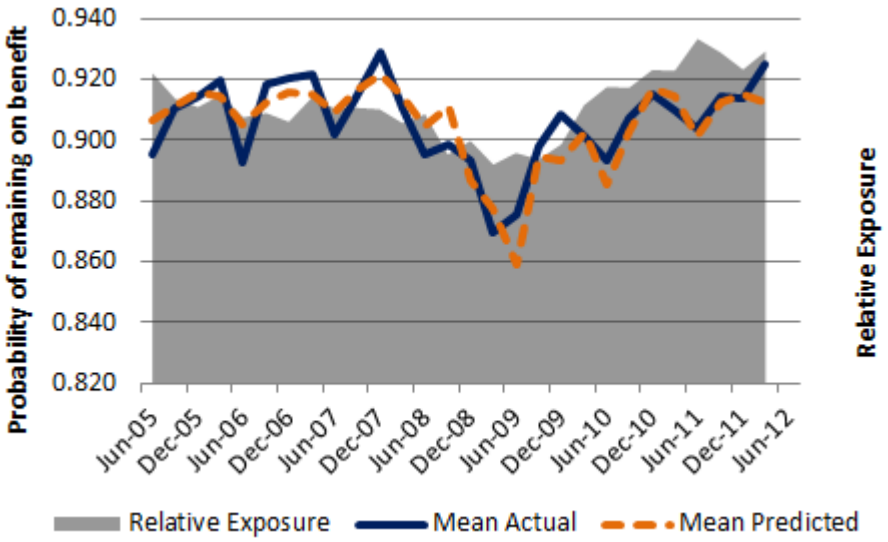
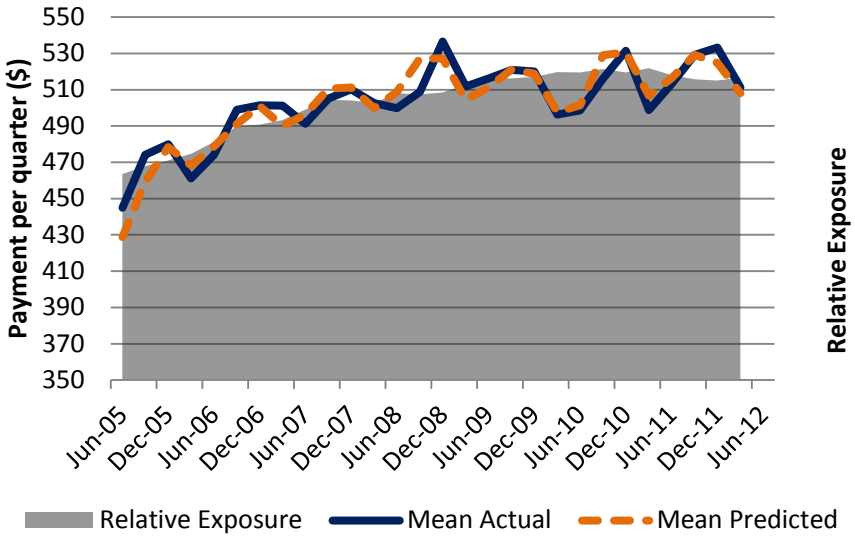


Figure 11.9 **Actual and modelled Accommodation supplement quarterly payments for Supplementary only segments, in June 2012 values**



It was observed in Figure 11.1 that Accommodation Supplement (AS) formed the bulk of all payments in the Non-beneficiaries segments. Thus, the AS model for the Supplementary only segments is the ABP model of greatest interest. The average quarterly AS payments for those in the Supplemental segments are displayed in Figure 11.9. Payments increased up to the GFC, perhaps due to increasing accommodation costs during the economic boom. Since the GFC, the average payment levels have stabilised and have remained level in the most recent year of experience.

11.4 Forecasts

Table 11.3 shows:

- The number of clients in each segment at the valuation date
- The future cash flows for each segment, by future benefit type
- The average liability per client

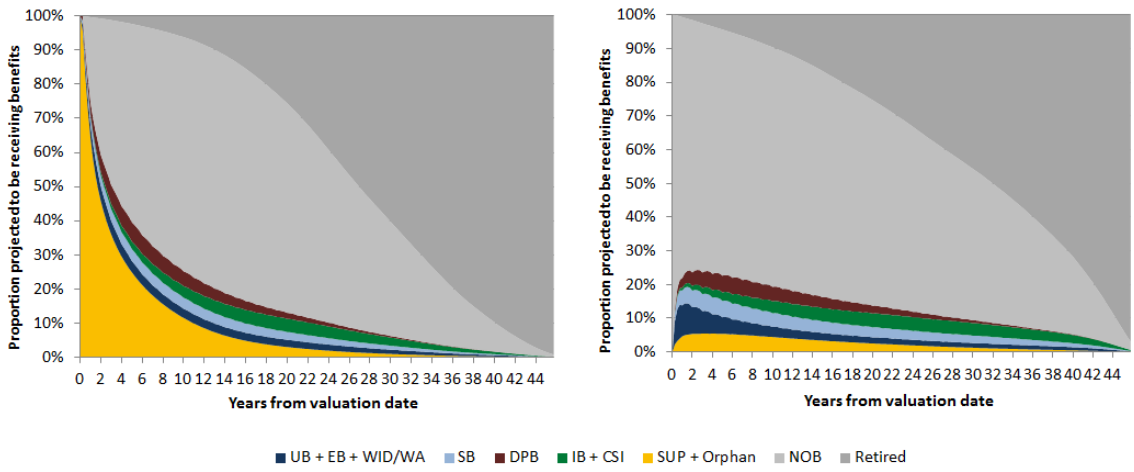
Clients in the Orphan only segment have an average lifetime liability of $110k, of which just over half is attributable to future OB payments. The lifetime liability amounts for clients in the other Non-beneficiary segments are in the vicinity of $60-70k. Interestingly, the average future cost of a client in the recent exits segment is slightly higher than that of a client currently in the low duration supplemental only segment (but lower than the high duration segment). This effect is partly attributable to the type of future benefits Recent Exits are likely to receive – a higher proportion of IB payments, for example. Despite its low average lifetime liability figure, the large number of former clients in the Recent Exit segment means that it accounts for about 15% of the entire current client liability of $86.8b.

Table 11.3 **Current liabilities by benefit type for Non-beneficiaries segments (payments in actual values, discounted to June 2012 and excluding net loans and expenses)**

Non-beneficiaries	Number	DPB ($m)	IB ($m)	SB ($m)	UB ($m)	Other T1 ($m)	AS ($m)	Other T2/3 ($m)	Total ($m)	Average
Sup only, <1 year	36,416	454	297	229	119	208	467	300	2,074	57k
Sup only, >1 year	64,408	856	584	417	177	491	899	694	4,119	64k
Orphan only	4,814	41	36	23	10	309	28	32	479	100k
Recent exits, <1 year	193,855	2,587	2,234	1,790	1,055	981	1,836	1,181	11,664	60k
Total	299,493	3,938	3,151	2,459	1,360	1,990	3,230	2,207	18,335	61k

The proportion receiving Supplementary benefits initially declines rapidly (Figure 11.10, left) before slowing down approximately four years after the valuation date. The majority of clients transition off benefit, though small numbers transition into other segments. Those that transition into other benefit segments tend to be long-term recipients of these benefits.

Figure 11.10 **Projected benefit state for Supplementary (left) and Recent Exit segments (right)**

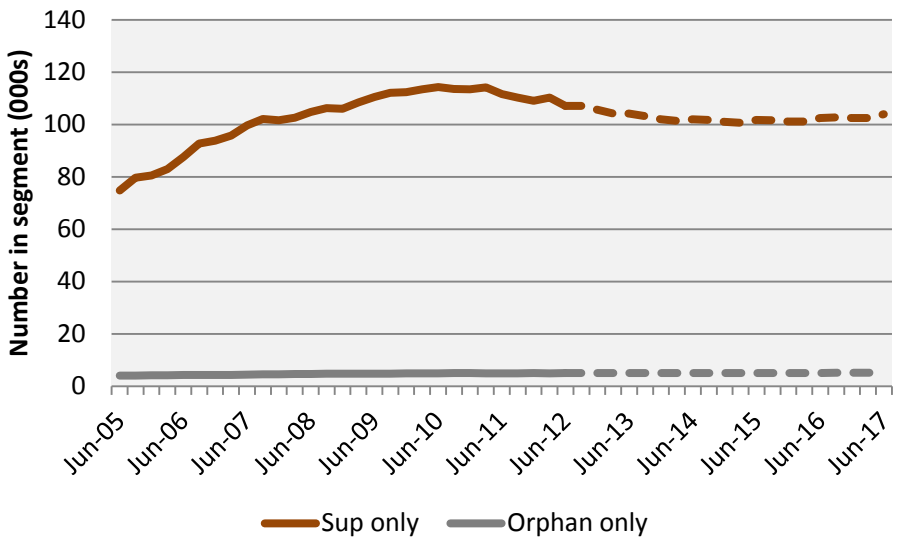


Note that 'Sup only, <1yr' and 'Sup only, >1yr' has been combined in the LHS graph.

Figure 11.10 (right) shows that about 25% of clients currently in the Recent Exits segment are projected to return to benefits within two years from the valuation date. Of those that return, many will have relatively long spells, particularly if they enter Supported Living or Sole Parent segments.

Figure 11.11 and Figure 11.12 show past and projected numbers and payment levels for the Supplementary only and Orphan only segments.

Figure 11.11 **Forecast numbers of clients in Non-beneficiaries segments each quarter**



With the exception of the slight decay in the first future projection year for the Supplementary only segments, Figure 11.11 shows that the number of clients in both Supplementary and Orphan segments are projected to be reasonably stable. This is consistent with the recent experience seen in Figure 11.2 for the Supplementary only segments.

Figure 11.12 **Forecast average quarterly payments to Non-beneficiaries segments in June 2012 values**

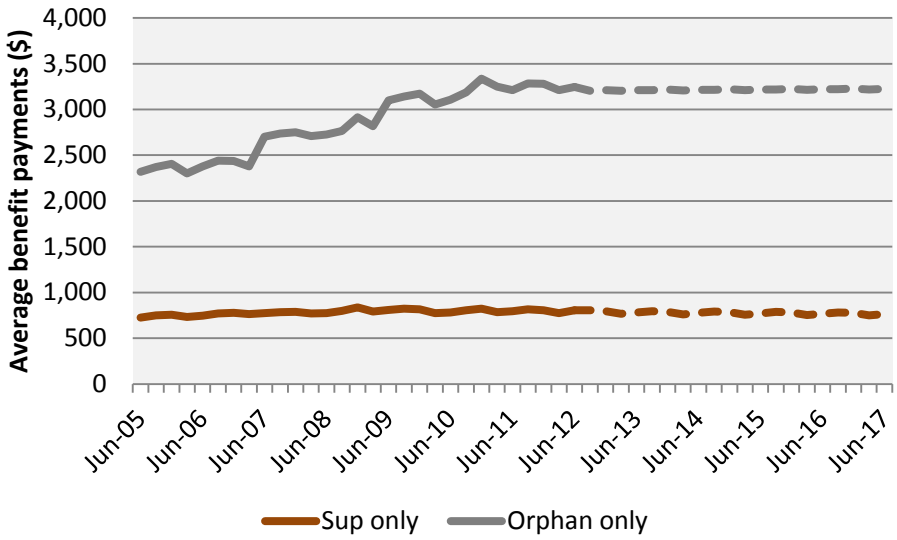
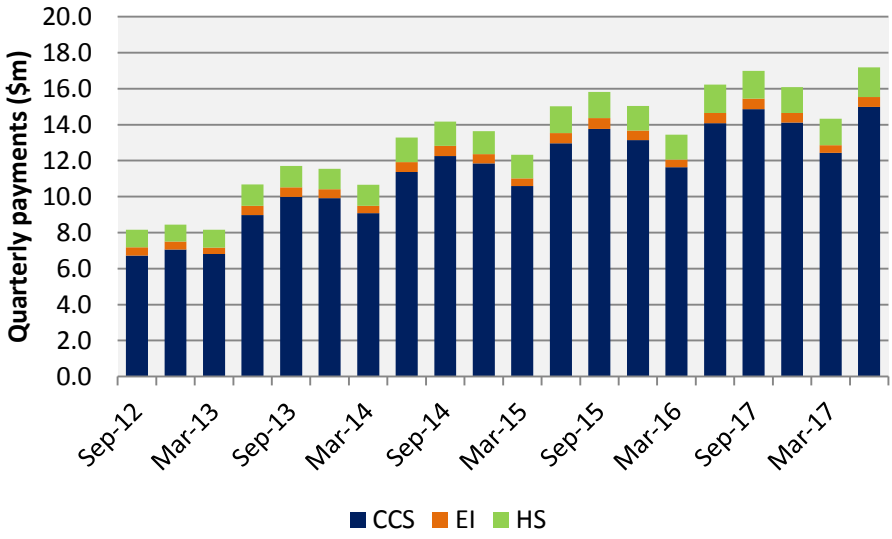


Figure 11.12 shows that average quarterly payments in both Supplementary and Orphan segments are projected to be stable. Although the number of clients in the Orphan only segment is small in comparison to other Non-beneficiaries segments, projected payment

sizes are larger. This, together with the long durations for Orphans benefit helps to explain the observation of a high projected future cost for the segment in (Table 11.3).

The forecast quarterly payments for those clients that have (or will) exit the welfare system are shown in Figure 11.13. Childcare Subsidy (CCS) accounts for most of the payments with small contributions from Hardship benefit and Employment Intervention. Payments are forecast to increase as a higher proportion of clients from the current client liability cohort move off benefits. These payment levels are small relative to those payments going to other clients in the welfare system.

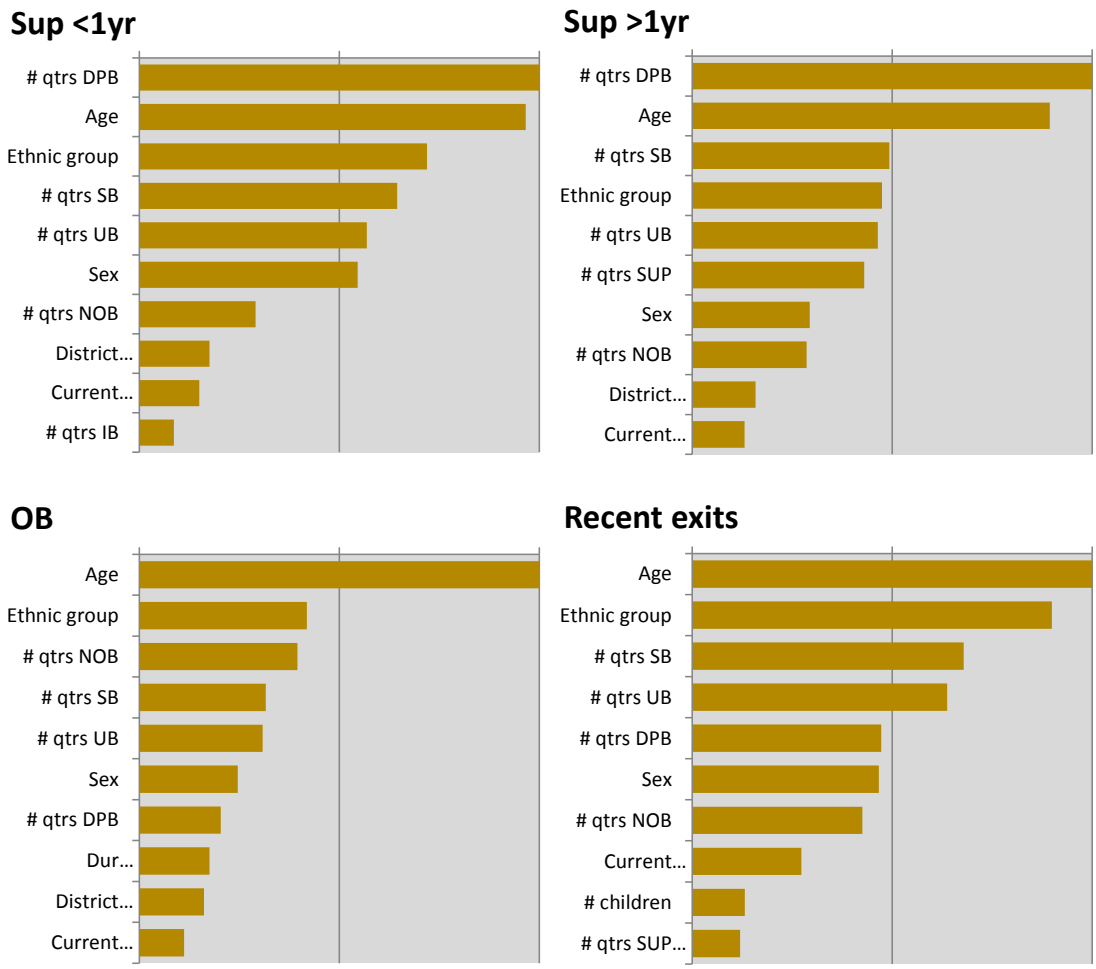
Figure 11.13 **Projected quarterly payments for clients in the current client liability and not in a Tier 1 or Supplementary benefit state**



11.5 Key drivers

There are a number of important drivers for lifetime liability for clients in the Non-beneficiaries segment. The most important ones are shown in Figure 11.14. We have used TreeNet, a machine learning tool, to assign this relative significance.

Figure 11.14 **Relative variable importance plots, Non-beneficiaries segments**



Age is a consistently strong driver of lifetime cost. Figure 11.15 shows the partial dependence of age for the high duration Supplementary only segment. There is a steep decreasing trend from age 17 to about 22 suggesting that young clients who have received supplementary benefits for an extended period are at risk of becoming long term welfare clients. In fact, a client aged 20 in this segment has a projected cost that is about twice as large as a client aged 40, although part of the difference is explained by their difference in the number of years until retirement.

Figure 11.15 **Partial dependence of age for the Sup only, >1yr segment**

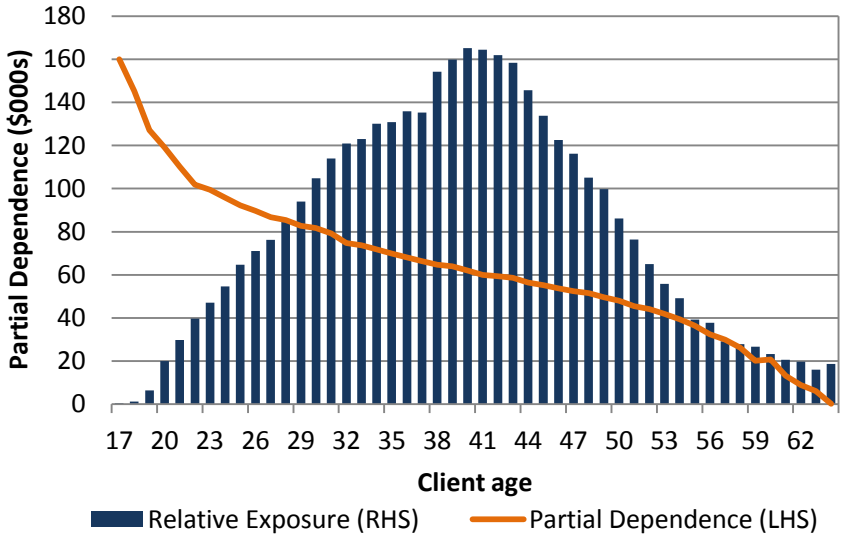
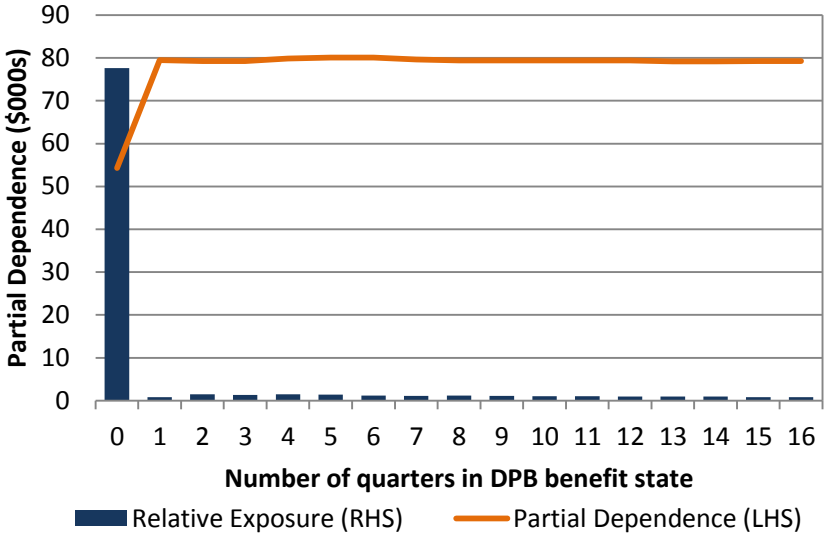


Figure 11.16 **Partial dependence of number of quarters on Domestic Purposes Benefit for the Sup only, >1yr segment**



Both Supplementary segments have DPB history variables as the most important driver of liability. This is generally because past DPB receipts increase the likelihood of future entry into a long spell on DPB, leading to a higher lifetime cost (about 20% of future lifetime cost is DPB for these segments). Figure 11.16 shows the partial dependence on a history of receiving Domestic Purposes Benefit for the high duration supplemental only segment. It shows that having a history of receiving DPB for any length of spell has a significant impact on projected future cost.

Figure 11.17 **Partial dependence of ethnicity for the Orphan segment**

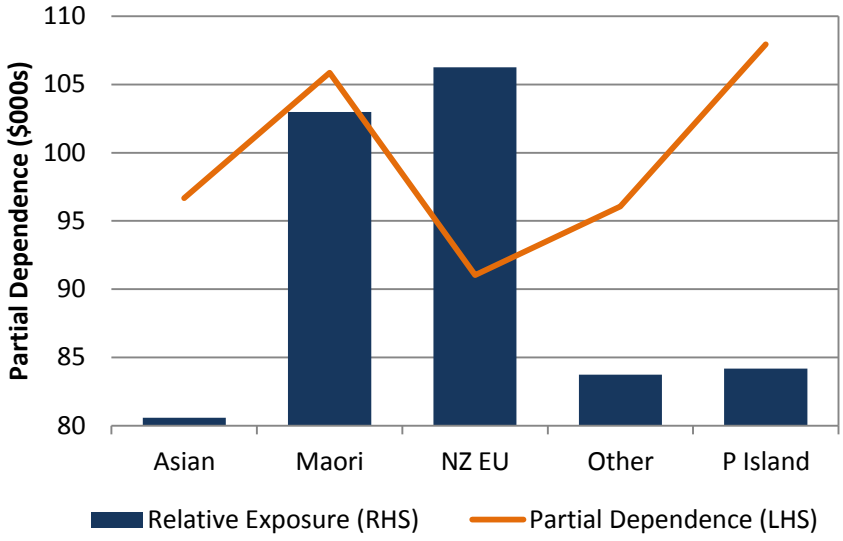


Figure 11.17 shows the partial dependence of ethnicity for the Orphan segment. The plot shows that Pacific Islanders and Maori have the highest projected costs in this segment.

Figure 11.18 **Partial dependence of number of quarters on Unemployment Benefit for the Recent Exits segment**

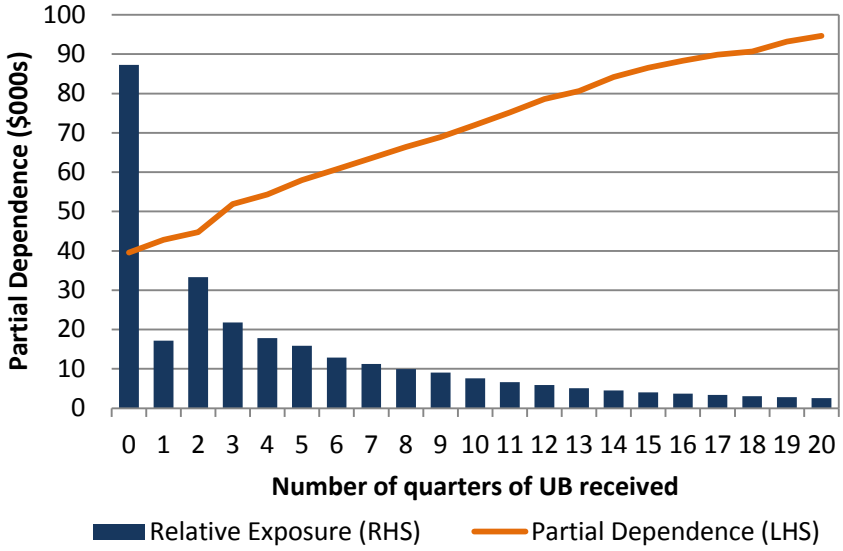


Figure 11.18 shows the partial dependence on the number of quarters receiving UB for the Recent Exits segment. There is a near linear increasing trend that spans across the entire plot. A client that has received UB for 12 quarters in the past (not necessarily consecutive) has a projected cost that is almost twice as high as a client that has never received UB. Although future UB payments is one of the smaller projected future costs for the Recent Exits segment, it may be the case that a history of receiving UB identifies those more at risk of re-entering the system and accessing other welfare benefit types.

PART C.2
MODELS FOR CALCULATING THE LIABILITY ASSOCIATED WITH FUTURE CLIENTS

12 MODELS FOR CALCULATING THE LIABILITY ASSOCIATED WITH FUTURE CLIENTS

12.1 Numbers of future clients

As discussed in Section 2.5.1, in addition to the current client liability we also estimate five years of future client liability. This relates to clients who have not received a benefit in the 12 months prior to the previous 30 June, but are expected to receive a benefit payment at some point in the following year. This section gives some further detail regarding how we estimate the number of clients entering over this five year period.

We have built a model that estimates the number of clients entering the welfare system which takes into account:

- The unemployment rate and the recent changes (smoothed) in the rate
- The benefit type at entry
- The length of time from the valuation date to the entry date
- Other time related trends as needed

The approach used for modelling the future liability is discussed in Section 18.4.2. Figure 12.1, Figure 12.2 and Figure 12.3 show the historic numbers of entries as well as what has been projected for future years.

Figure 12.1 **Past (solid line) and projected (dashed line) numbers coming onto benefit each quarter for SB, SUP and UB benefit states**

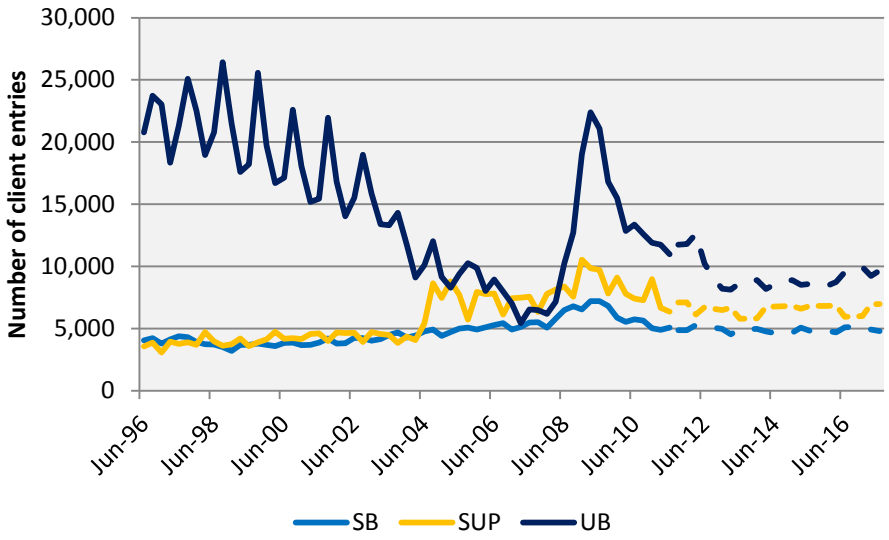


Figure 12.2 **Past (solid line) and modelled (dashed line) numbers coming onto benefit each quarter for DPB, EB, IB benefit states**

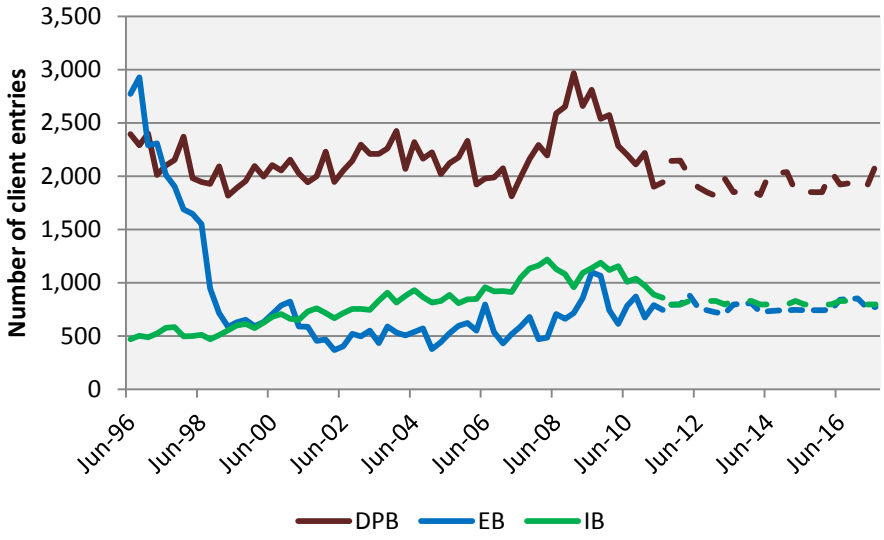
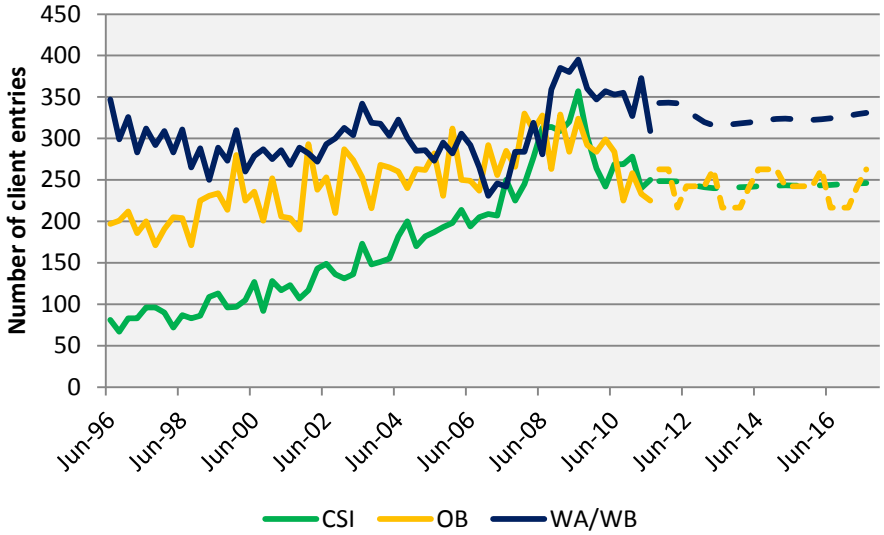


Figure 12.3 **Past (solid line) and modelled (dashed line) numbers coming onto benefit each quarter for CSI, ORP and WID benefit states**



We make the following comments regarding these three figures above:

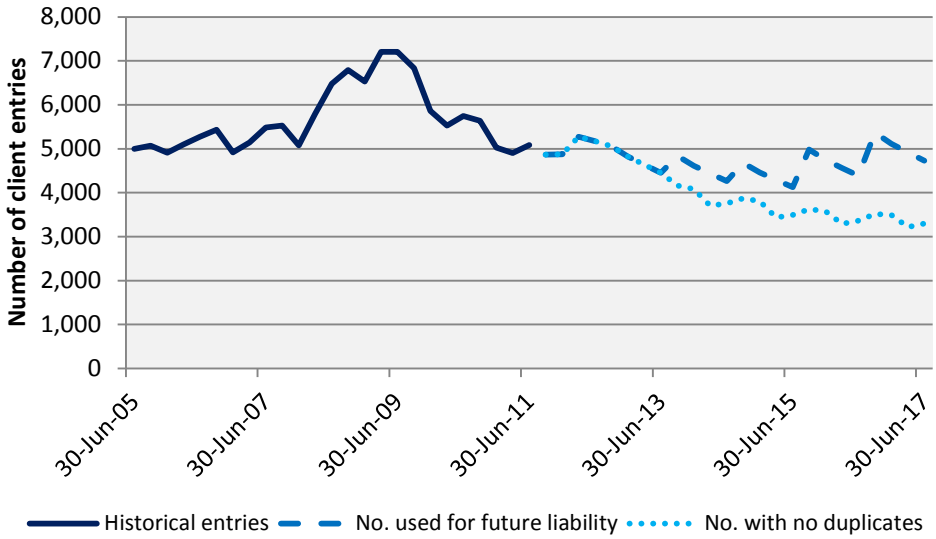
- The numbers entering CSI has tapered off slightly over the past couple of years. We have forecast around currently observed levels, but there is higher than normal uncertainty to this trend.
- DPB entries have historically been fairly stable around the 2,000 per quarter level. This is the basis of our projection.

- EB, IB, OB are all relatively stable and have been forecast close to their recent levels.

- The number of entries into UB has the highest sensitivity to the unemployment rate, and the decrease in forecast numbers reflects the projected fall in the unemployment rate.

We apply the model for future client numbers in two ways – first, to obtain the number of new entries into the welfare system relative to the cohort at the previous 30 June. This is consistent with the definition of the future liability. Second, we estimate the numbers entering who are not already accounted for in the current client liability (i.e. removing a double counting effect, which is discussed in Section 18.2.2). This second approach was used to create some of the number of clients and cash flow results presented throughout this report (see for example Figure 4.8). The difference in the number of future clients entering under these two definitions is demonstrated by using the SB benefit state as an example in Figure 12.4 below.

Figure 12.4 **Past (solid line) and projected (dashed line) numbers coming onto benefit each quarter for SB, with both numbers used in the future liability and numbers used without duplicates shown.**



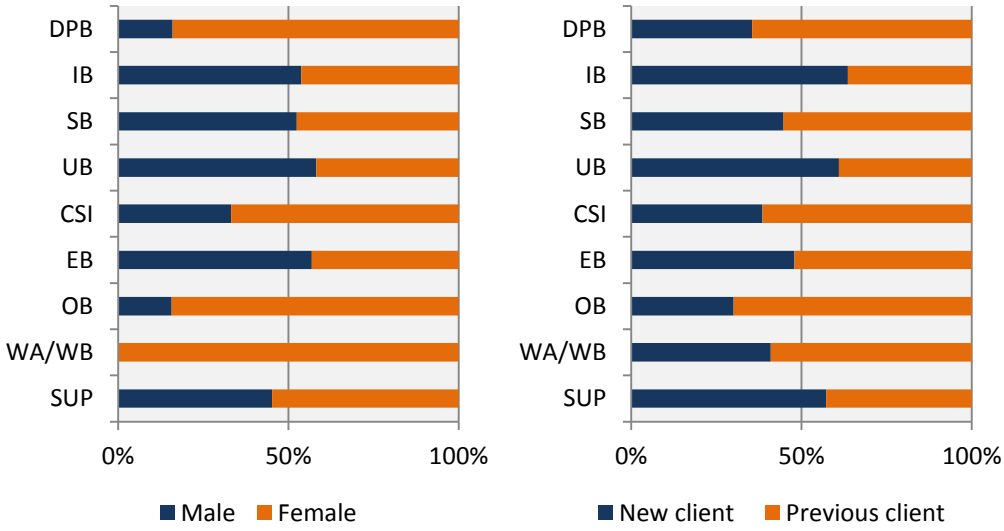
12.2 Distribution of future clients

In Section 18.4.2 we describe how characteristics of clients entering as part of the future liability are assigned by sampling from the "pool" of clients who entered in the 2011/12 year. That is, characteristics (age, previous benefit history, etc.) are assigned as part of the sampling process, on the assumption that the distribution of these characteristics will be similar to those entering as part of the future client cohorts. This sampling allows for:

- Seasonal effects: Different distributions in different quarters
- Benefit state bias: Different distributions for different benefit types

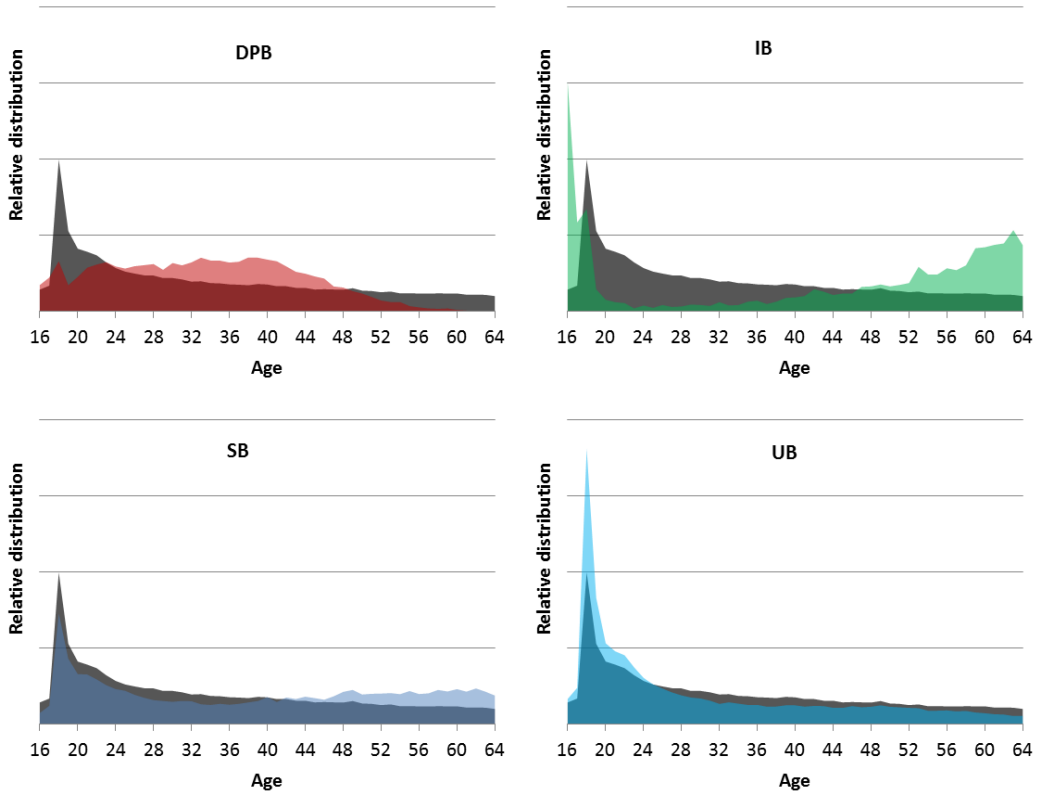
While difficult to provide a full multi-dimensional picture of the distributions of characteristics assigned to clients, we present a few of the two-way dimensions in Figure 12.5 and Figure 12.6 below.

Figure 12.5 **Distributions for gender and new versus returning clients[18] by starting benefit for future liability clients**



[18] Due to the nature of the data provided, a "new" client refers to a client who is genuinely new to the welfare system or one who has not received a benefit since 1993.

Figure 12.6 **Age distributions for future liability clients entering DPB, IB, SB and UB. Grey distribution represents future liability clients across all benefits as a benchmark**



PART C.3
NET LOANS COST AND MSD EXPENDITURE

13 NET LOANS COST

There are a number of different ways a "loan" to a client can arise. This is discussed further in Section 18.6. We have been provided with data on recoverable amounts related to:

- Overpayments, including those due to benefit fraud
- Recoverable assistance (including benefit advances)

Various subcomponents related to each of these items have been valued separately. Details are provided in the following sub-sections.

It is important to note that our entire analysis of overpayments and fraud is based on the level of previously detected amounts. We have not attempted to determine the level of undetected overpayments and fraud.

13.1 Overpayments and fraud

13.1.1 Introduction and current experience

Overpayments and fraud represent a bit over 3% of payments made by MSD. The table below shows the recent experience for payments and recoveries. Over the past year 90% of these payments relate to overpayments, with the remainder attributable to fraud.

Table 13.1 **Recent Overpayments and fraud experience**

Calendar quarter	Payments ($m)	Recoveries ($m)
Sep-09	51	30
Dec-09	50	31
Mar-10	54	30
Jun-10	57	31
Sep-10	59	33
Dec-10	55	33
Mar-11	51	30
Jun-11	58	30
Sep-11	60	32
Dec-11	57	33
Mar-12	59	32
Jun-12	60	32

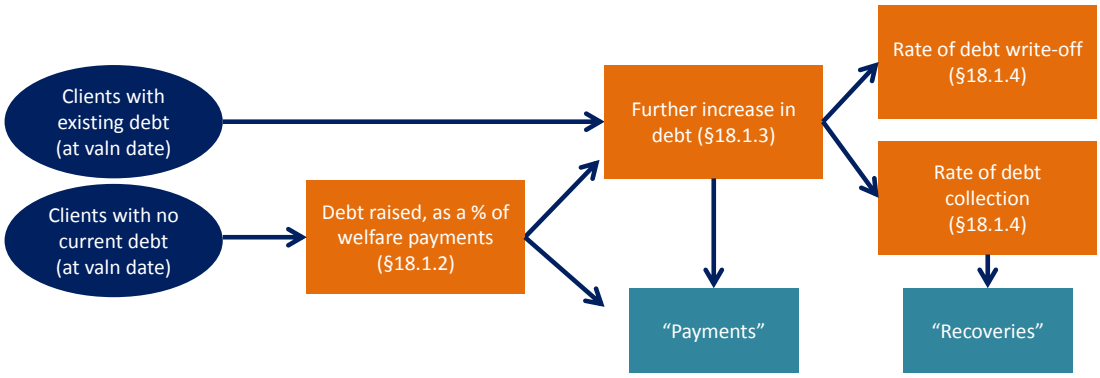
The majority of overpayments and fraud are eventually recovered – we estimate about 80% of their value (see Section 13.1.5). However, the speed of recovery is limited due to

legal requirements not to cause undue hardship on clients. In some cases there is a maximum deduction from benefits of $25 per week.

For these reasons a large amount of the debt outstanding is from debts established for past payments. At the valuation date we estimate that there is $694m of overpayments and recoveries outstanding, an increase of 9% over the equivalent amount at the previous valuation. An estimate of the proportion of this total that will be recovered is required.

We estimate future payments and recoveries for fraud and overpayment by considering a number of stages to the process. These are illustrated in Figure 13.1.

Figure 13.1 **Models for the projection of the amount of detected fraud and overpayments and their related payments and recoveries**



In brief, we model:

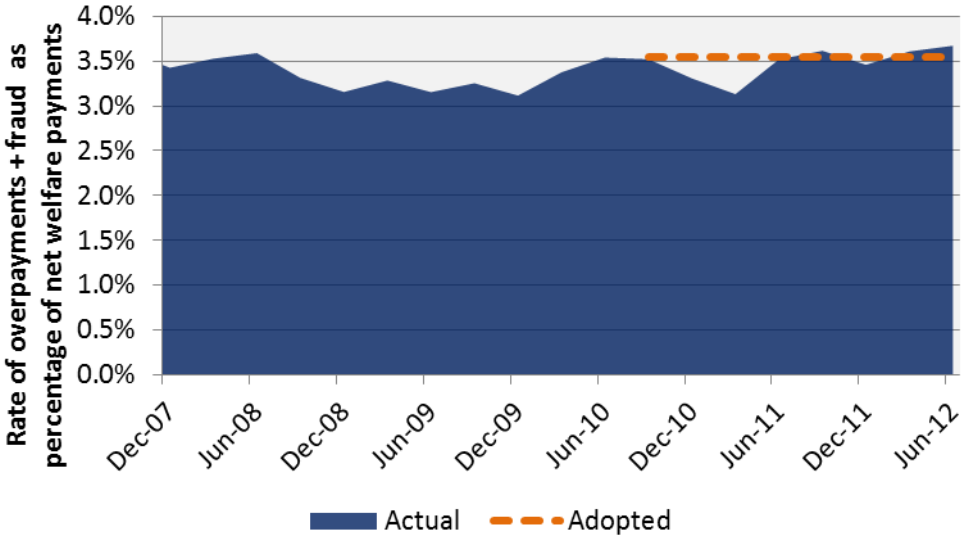
- The rate at which new debts arise amongst clients without an existing debt
- How existing debts tend to have additional fraud and overpayment over time
- How debts are recovered or written off over the time after debts are raised

Each of these elements is discussed in the corresponding section below.

13.1.2 Debts raised

Levels of **detected** overpayments and fraud have been relatively stable as a percentage of overall welfare payments. We have adopted 3.55% as the rate of detected overpayments and fraud applicable to all future payments as shown in Figure 13.2

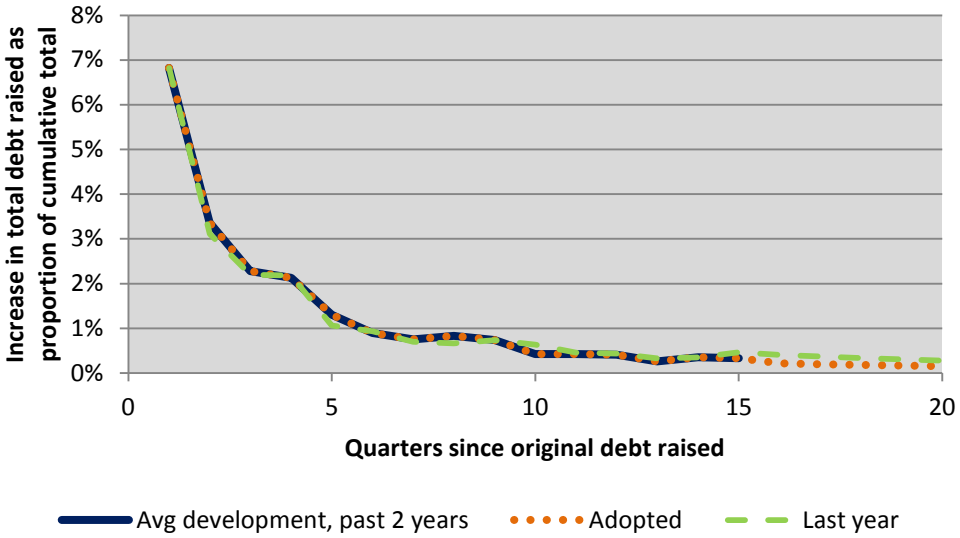
Figure 13.2 **Actual and adopted rates of detected overpayments and fraud**



13.1.3 Development on outstanding debt

One feature of the outstanding debts is that it seems to be possible for clients to accrue further debt before the existing balance is paid off. We have modelled this pattern using historical data, as shown in Figure 13.3. Debts are assumed to continue to develop for 10 years – see Section 13.1.6 on tail assumptions below for further information. Estimates are very similar to the previous valuation, although the tail assumption has been lowered somewhat in response to recent experience.

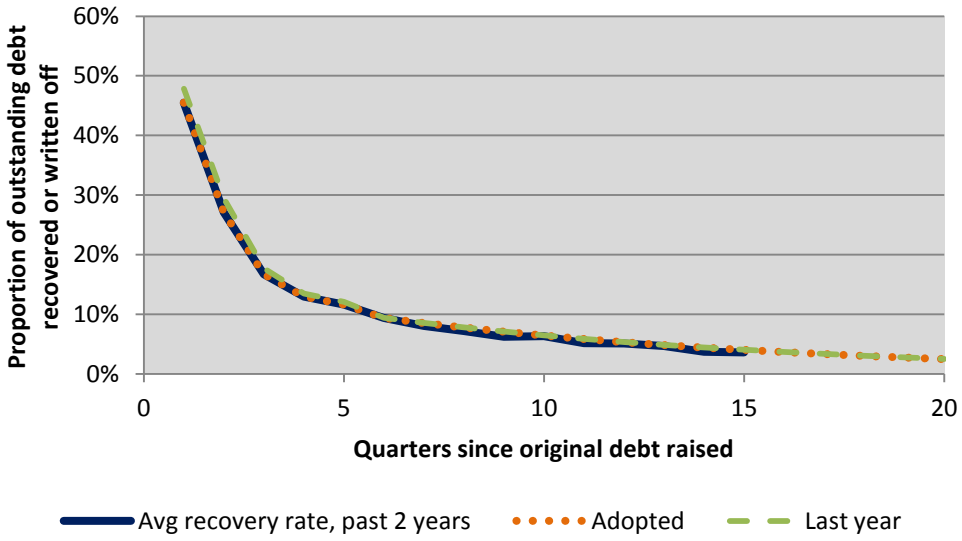
Figure 13.3 **Development of total overpayment and fraud debts amongst existing debtors**



13.1.4 Recovery and write-off rates

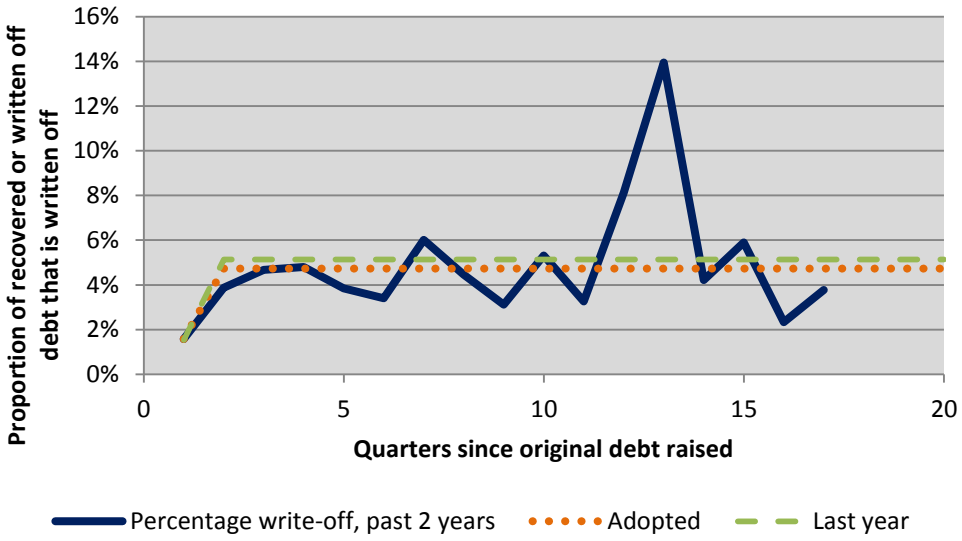
We have estimated the proportion of outstanding debts that are recovered or written off, which depends on the time since the original debt was raised. Recovery rates are strong for the first few quarters, but decay quickly to low levels. Recent history and projected rates are shown in the figure below. These rates are very similar to what was assumed in the previous valuation. For the purposes of this analysis, debt adjustments and transfers have been treated as recoveries.

Figure 13.4 **Proportion of outstanding debt recovered or written-off**



We then apportion these amounts between that recovered and that written-off. Other than the first quarter, we assume that 5.1% of the amounts are written off, with the remainder recovered (see Figure 13.5). The rate of write-off has been decreased by about 8% in light of recent experience.

Figure 13.5 **Rate of debt write-offs, relative to the total of recoveries + write-offs**



13.1.5 Applying the models

The four sets of assumptions covered in sections 13.1.2, 13.1.3 and 13.1.4 allow future cash flows related to overpayments to be calculated. First, the duration (number of quarters since original debt) of outstanding debts is calculated. This is then developed by increasing for new debts, then decreasing for recoveries and write-offs. Second, the 3.55% assumption can be applied to current and future client liability cash flows. Once the debts are established their subsequent increase and decrease due to development can be projected.

For debts established before June 2007 we needed to identify the balance attributable to overpayments and fraud. We estimated this portion to be 64%, using the distribution of outstanding balances at the valuation date for debts raised after June 2007. We also estimated that the debt had an average duration of ten quarters as at June 2007.

Combining the models gives the following implications concerning overpayments and fraud:

- After a debt is established, total debts raised are expected to increase by a further 26%. This represents extra overpayments and fraud that will be accrued by a client before their outstanding debt reduces to zero.
- Approximately 83% of overpayments and fraud are assumed to be recovered, with the remainder written off or uncollected. After allowing for the time value of money during the period the debt is collected, the recovery percentage reduces to about 80%.
- The average collection date is 1 year after the establishment of the original debt.

13.1.6 Tail assumptions

The relatively short time period for which data is available means that trends in development need to be extrapolated into durations for which there is no observed data. We have made the following assumptions, recognising that they are subject to significant uncertainty:

- Existing debts do not increase beyond ten years after original debt establishment.
- No recoveries are made beyond ten years after original debt establishment. At the ten year mark 5% of the outstanding balance is assumed to be recovered, as a means of allowing for later recoveries.

13.1.7 Results

Overpayments and fraud can be divided into four categories, related to the time the debt was established and the direction of the cash flow (to or from MSD).

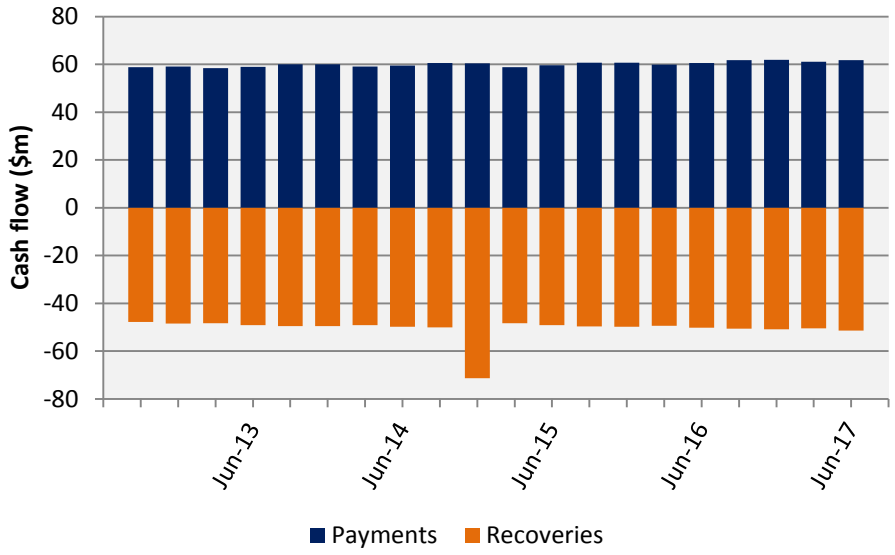
Table 13.2 **Current and future client liability estimates for overpayments and fraud**

Category	Current client liability ($m)	Future client liability 2012/13 ($m)	Future client liability 2013/14 ($m)	Future client liability 2014/15 ($m)	Future client liability 2015/16 ($m)	Future client liability 2016/17 ($m)
Further overpayments / fraud on existing debtors	73	0	0	0	0	0
Recoveries on overpayments / fraud on existing debtors	-199	0	0	0	0	0
Overpayments / fraud related to future payments	2,768	278	250	251	246	252
Recoveries on overpayments / fraud related to future payments	-2,270	-228	-205	-205	-201	-206
Net cost – overpayments / fraud	**372**	**50**	**45**	**46**	**45**	**46**

We have assumed that the cost of existing debtors is fully attributable to the current liability component of the valuation.

Finally Figure 13.6 shows the projected payments and recoveries over the next five years.

Figure 13.6 **Projected cash flows for overpayments and fraud over the next five years.**



The lump in recoveries in December 2014 reflects the tail assumptions being applied to the pre-2007 outstanding debts.

13.2 Recoverable assistance

We start by discussing recoverable assistance payments, which was modelled along similar lines to Tier 2 and Tier 3 payments, as described in Section 18.3.2. We then discuss the assumptions made relating to recoveries.

13.2.1 Introduction

The following benefit types have been classed as recoverable assistance for the purposes of this valuation.

Benefit Name	Code	% 11/12 benefit	Comment
Advance of Benefit	831	85.28%	
Special Needs Grant	620	5.10%	
Recoverable Assistance Payment	820	8.94%	
SWIFTT excess/DMS refund	930	0.53%	
Unidentified receipt refund	944	0.16%	

Advance of benefit is the dominant category, with smaller but still significant components under payment codes 820 and 620. These payments represent approximately $150m per year.

13.2.2 Current experience

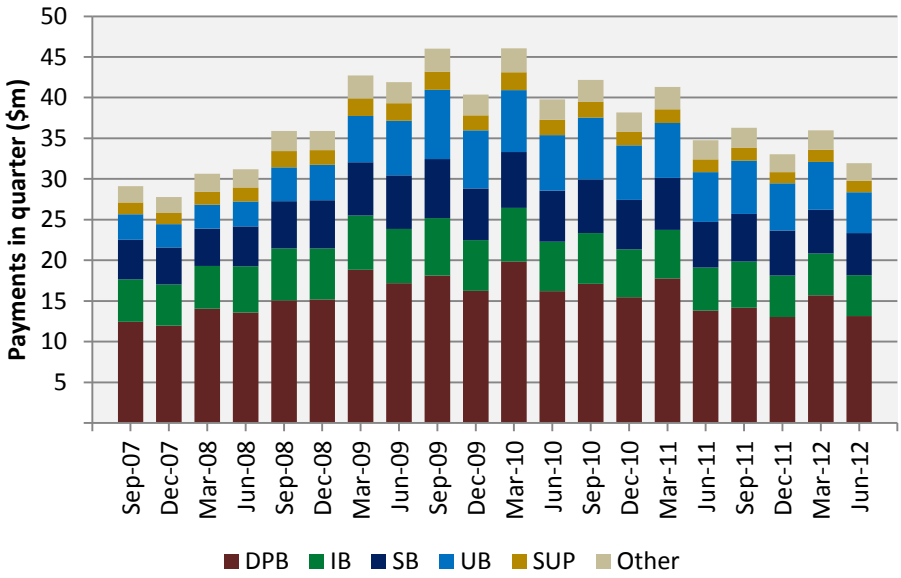
The following table and graph show the recent experience for recoverable assistance.

Table 13.3 **Recent Recoverable Assistance payment experience**

Year	Payments ($m)	Average number on benefit	Average quarterly benefit payment (ABP) per client ($)
2007/08	112	57,400	490
2008/09	146	69,500	530
2009/10	165	79,400	520
2010/11	150	74,000	510
2011/12	135	64,200	530

Recoverable Assistance payments are received right across the benefit system. Around 40% are paid to DPB recipients and around 15% paid to each of IB, SB and UB clients. The total payments in each quarter, and the underlying benefit received by the client at the time, are shown in Figure 13.7.

Figure 13.7 **Amounts of Recoverable Assistance by underlying benefit type. Payments in June 2012 values.**

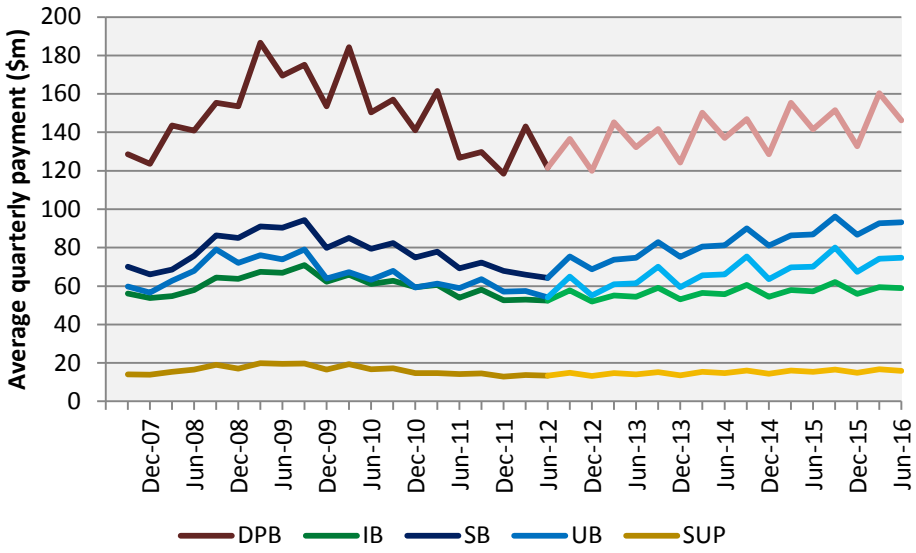


The number of clients receiving some form of recoverable assistance increased significantly from 2008 through to 2010, but has started to reduce again in recent years.

13.2.3 Modelling Recoverable Assistance payments

Recoverable Assistance payments are modelled as an average amount per client, depending on their benefit state as well as other characteristics. This is the same approach used for Tier 2 and 3 benefit types, described in Section 18.3. The past and projected payment levels for the most significant benefit states are shown in Figure 13.8.

Figure 13.8 **Average Recoverable Assistance quarterly payment per client in main benefit states. Amounts are in June 2012 values.**

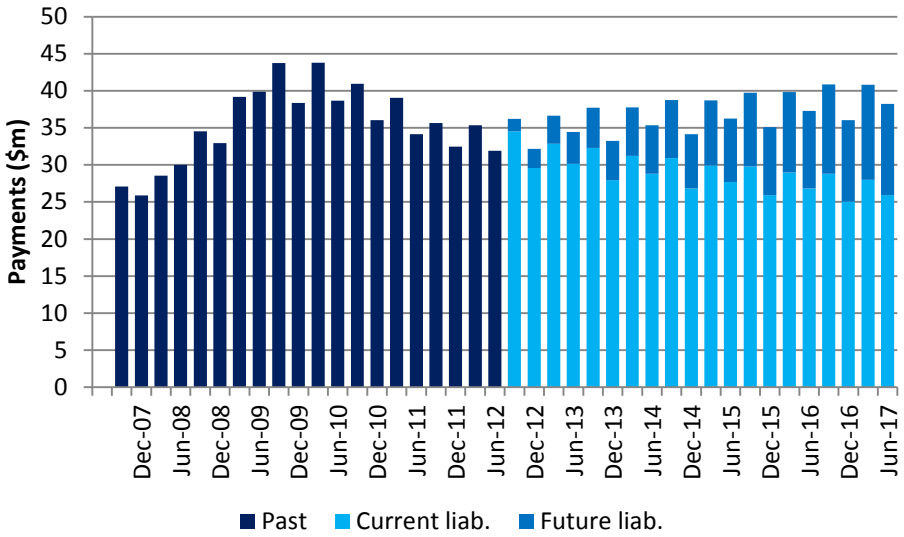


We note that average payments are forecast to increase significantly over the next five years for DPB (12%), SB (30%) and UB (25%). Rather than these being built in trends, they reflect the changing composition of the welfare population over the forecast period. Higher Recoverable Assistance payments per client are associated with higher propensity to stay on benefits:

- Middle to Older ages
- Maori and Pacific Islander ethnicities
- History of other benefits

As the unemployment rate drops, the proportion of recipients with these higher propensities tends to increase, increasing the average Recoverable Assistance payment. This is largely offset by the expected decrease in numbers on these benefit types, leading to the total payments projection seen in Figure 13.9. Payments are expected to increase by about 2.9% per annum over the next five years, slightly higher than the rate of inflation.

Figure 13.9 **Projected quarterly recoverable assistance payments by calendar quarter. Payments in actual values.**



Note: future liability payments have been adjusted to remove the impact of double-counting of some liabilities (Section 18.2.2)

13.2.4 Recoverable Assistance recoveries

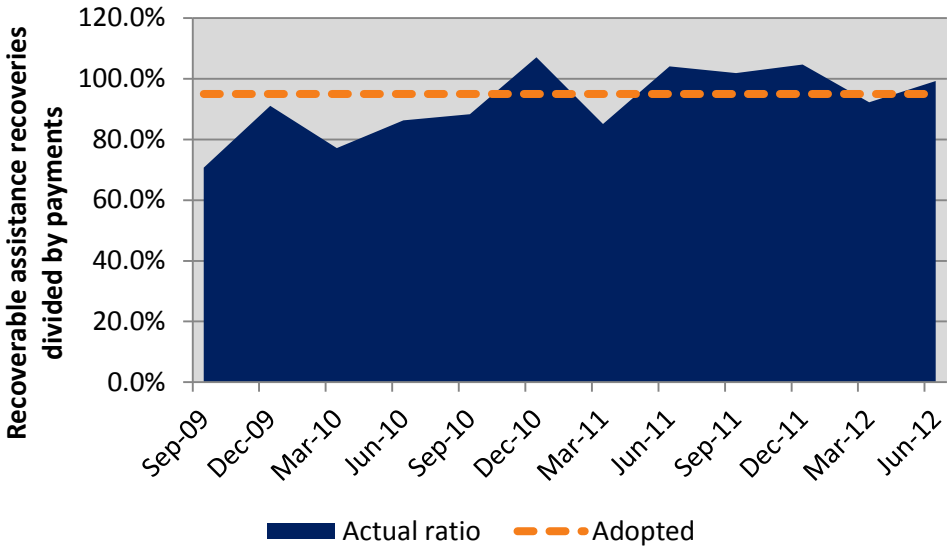
The following table and figure show the recent relationship between recoverable assistance payments and recoveries.

Table 13.4 **Total benefits paid (excluding expenses) and recoverable assistance payments recovered by calendar quarter**

Calendar quarter	Payments ($m)	Recoveries ($m)
Sep-09	44	31
Dec-09	38	35
Mar-10	44	34
Jun-10	39	33
Sep-10	41	36
Dec-10	36	39
Mar-11	39	33
Jun-11	34	35
Sep-11	36	36
Dec-11	32	34
Mar-12	35	33
Jun-12	32	32

Table 13.4 shows historical recoveries related to recoverable assistance. The recoveries have been stable over the past two years, both in absolute terms and relative to total recoverable assistance payments made by MSD. Thus for projection purposes we have assumed that these recoveries are a constant proportion of total benefit payments.

Figure 13.10 **Recoverable assistance recoveries as a proportion of recoverable assistance payments**



We have assumed that recoveries will equal 97.0% of payments, in line with the average over the past year. This means that the net cost of Recoverable Assistance is 3% of payments, which is the combined cost of non-recovery rates and the time lag associated with collecting debts. This recovery percentage is up slightly from the 95% assumed in the previous valuation.

13.2.5 Summary of forecasts

The following table shows the current and future client liabilities for both Recoverable Assistance payments and recoveries.

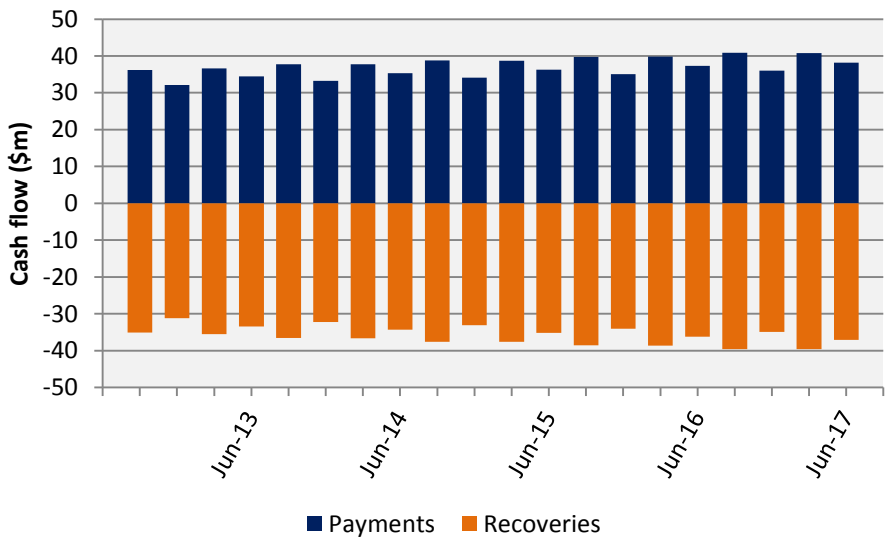
Table 13.5 **Current and future client liabilities for Recoverable Assistance**

Loans category	Current client liability ($m)	Future client liability 2012/13 ($m)	Future client liability 2013/14 ($m)	Future client liability 2014/15 ($m)	Future client liability 2015/16 ($m)	Future client liability 2016/17 ($m)
Recoverable assistance payments	1,600	177	160	161	158	163
Recoveries on recoverable assistance	-1,552	-172	-155	-156	-153	-158
Net cost – recoverable assistance	**48**	**5.3**	**4.8**	**4.8**	**4.7**	**4.9**

The net cost is reasonably small in the overall context of the valuation, but there is a significant amount of relative uncertainty in the estimate. This is because the net cost is the difference between two significantly larger numbers; a small error for either one can lead to a large impact on the net cost.

Finally Figure 13.11 shows the projected pattern of Recoverable Assistance payments. The pattern for recoveries and net cost is the same, apart from scaling numbers down by 97% and 3% respectively. As with other liability types, the future liability represents a growing proportion of the overall cost with time, increasing to about a third by June 2017.

Figure 13.11 **Quarterly benefit payments, in current values**



13.3 Key risks for loans

Some of the uncertainties relating to the modelling of loans are covered in Section 18.6. There is a larger than usual uncertainty associated with the loan estimate due to:

- The lack of data prior to June 2007
- The fact that net cost is small relative to the estimated inflows and outflows
- The dimensions of loans not considered as part of the valuation. For example, the undetected portion of overpayments and fraud
- The difficulty in setting tail assumptions
- The difficulty in setting recoveries for long term outstanding debts

While we believe the loan estimates are a plausible estimate of the future given the available data, a more comprehensive and detailed analysis of loans is likely to give superior results.

14 MSD EXPENDITURE

MSD expenses included within the scope of the valuation are those required to administer the benefits for working-age adults in the valuation, and to help clients prepare for and return to work. Expenditure has been analysed and categorised under the following headings.

- Income support administration
  - Benefit processing ("income" share of Tailored Sets of Services to Help People into Work or Achieve Independence appropriation)
  - Integrity services
  - Collections
  - Temporary measures (e.g. Canterbury earthquake)

- Work focused investments
  - OSCAR (Out of School Care and Recreation subsidy to providers)
  - Training and employment support (includes Employment Assistance, Vocational Skills Training, Mainstream Supported Employment Programme, Youth Support Services)
  - Work-focused case management (includes "work" share of Tailored Sets of Services appropriation; e.g. Job Connect, employment coordinators, work brokerage)

Note that Tailored Sets of Services were apportioned by MSD between income support administration and work focused investments on the basis of time survey data.

The payments made to these categories over the past five years are shown in Table 14.1 below.

Table 14.1 **Historical MSD expenses, actual values, plus 2012/13 budget**

Expense category	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13 (budget)
	$m	$m	$m	$m	$m	$m	$m
Income Support Administration							
Benefit processing	264	254	259	297	290	294	317
Integrity Services	33	35	37	33	35	35	34
Collections	14	13	13	13	11	11	11
Canterbury earthquake	0	0	0	0	8	0	0
Admin sub-total	**310**	**302**	**309**	**343**	**344**	**340**	**362**
Work-focused Investments							
Work focused case management	120	132	147	133	136	130	135
OSCAR	10	15	19	19	18	19	17
Training and employment support:							
Employ. Assist	92	73	71	109	113	107	94
Vocational skills training	92	94	89	86	69	55	55
Youth transition services / Youth support services	6	7	10	12	12	13	30
Mainstream employ. Support	0	0	2	4	3	3	4
Job support scheme	0	0	0	1	0	0	0
Life skills training	0	0	0	0	1	0	0
Rena Grounding Employment Support	0	0	0	0	0	0	0
Sub-total Training	*191*	*174*	*173*	*212*	*197*	*177*	*182*
Invest sub-total	**321**	**321**	**339**	**364**	**350**	**326**	**334**
Expenses total	**631**	**623**	**648**	**706**	**694**	**666**	**697**

These costs are included in the liability calculation. The main complication in determining the future expense attached to the liability is one of attribution; only a portion of future expenses will correspond to clients belonging to the current or future client liability cohorts, with the remainder attributable to those future clients falling outside the scope of the valuation. To allow for this, the following methodology has been adopted:

- Our model for future expenses assumes that the total expense costs are **fixed in real terms**. This means that they increase in line with benefit rate inflation (tied to CPI) in nominal terms. The expense level is set equal to the 2012/13 budget of $697m. This amount is 3.3% higher than that budgeted for 2011/12 in the previous valuation, slightly above the rate of inflation.

- This amount is divided into quarterly expenses, based on historical seasonality of benefit payments.

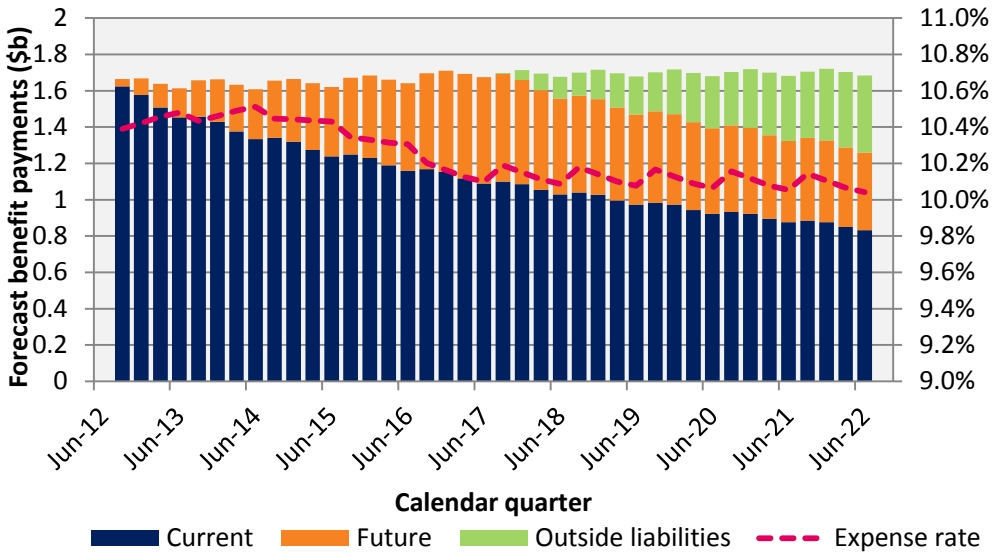
- For each future calendar quarter, expenses were allocated proportionally between current client liability cash flows, future client liability cash flows and cash flows falling outside the current and future client liability valuations. The last category was calculated assuming real benefit growth of 0.1%, equal to the forecast over the next five years.

- This allocation was converted into an expense rate for each quarter.

- Finally, total projected expenses in each quarter are allocated between administration and programs, as well as their subcomponents, based on their relative proportions in the 2012/13 budget.

Figure 14.1 shows the quarterly forecast benefit payments over the next 10 years, which drives the attribution of expenses. As future client liability has been calculated for the next five years there are no liability payments outside the scope of the valuation during this period. Thereafter a growing portion of payments fall outside the scope of the valuation liability and thus a decreasing amount of future expense is attached to the valuation liability. The slowly falling expense rate is due to expense payments being held fixed in current values while total benefit payments gradually grow.

Figure 14.1 **Projected future cash flows in current values and implied expense rate required to hold expenses fixed in real terms over the next ten years.**



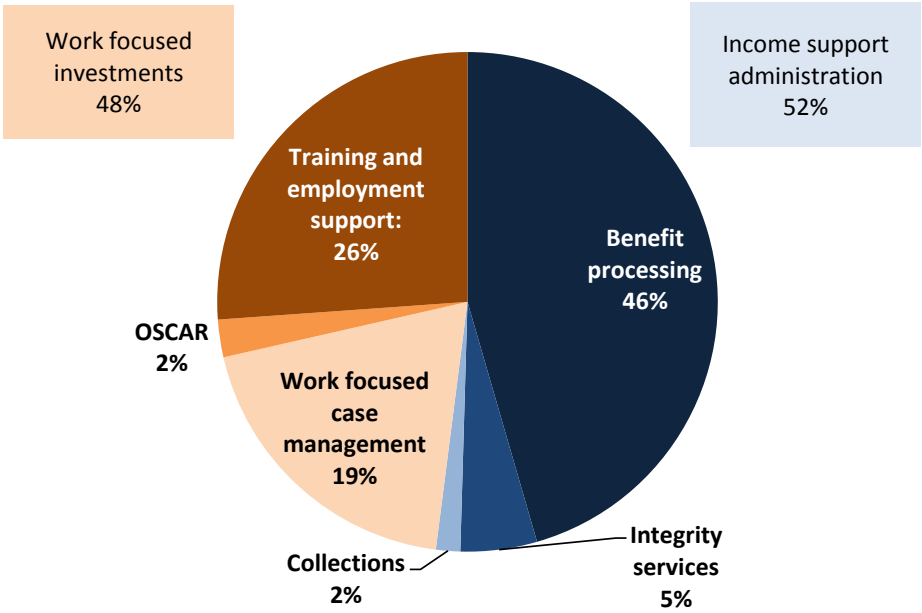
The quarterly expense rate can be used to allocate expenses across age bands and benefit types. The results can also be broken down by expense category. Overall expense results were given in Table 4.6 and Figure 4.10, but both are reproduced here for convenience.

Table 14.2 **Expense category breakdown for current and future client liabilities**

Expense category	Current client liability ($m)	Future client liability 2012/13 ($m)	Future client liability 2013/14 ($m)	Future client liability 2014/15 ($m)	Future client liability 2015/16 ($m)	Future client liability 2016/17 ($m)
Income support administration						
Benefit processing	3,621	367	338	347	349	370
Integrity services	393	40	37	38	38	40
Collections	124	13	12	12	12	13
Temporary measures[19]	0	0	0	0	0	0
Sub- total	**4,138**	**419**	**386**	**396**	**399**	**423**
Work-focused investments						
Work focused case management	1,544	156	144	148	149	158
OSCAR	194	20	18	19	19	20
Training and employment support:						
Employment Assistance	1,069	108	100	102	103	109
Vocational skills training	624	63	58	60	60	64
Youth support services	341	35	32	33	33	35
Mainstream supported employment program	45	5	4	4	4	5
Job support scheme[20]	0	0	0	0	0	0
Life skills training[21]	0	0	0	0	0	0
Sub-total Training and employment support	*2,079*	*211*	*194*	*199*	*200*	*212*
Sub-total	**3,817**	**387**	**356**	**365**	**368**	**390**
MSD Expenses total	**7,955**	**806**	**743**	**762**	**767**	**813**

[19] Temporary measures include payments related to special events such as the Canterbury Earthquake. No forecast of such future events has been attempted. Hence the liability is estimated as nil.
[20] Job support scheme and life skills training expenditure occurred in several of the 5 years of history used to apportion expenses between categories. However, in the most recent year, 2012/13, expenditure on both items was nil. It has been assumed that this will continue.
[21] See note above.

Figure 14.2 **Current client liability: MSD Expenses by category**



Relative to the previous valuation:

- A higher proportion of expenses has been allocated to benefit processing costs
- A lower proportion of expenses has been allocated to work focused case management
- Expenses as a proportion of the total current client liability are a little higher. In the previous aggregate valuation expenses represented 8.7% of the total, compared with 9.2% in 2012.

PART D
VALUATION APPROACH

PART D.1
2011 VALUATION
LEVEL II APPROACH

15 SEGMENTATION ANALYSIS

15.1 Introduction

The current (2012) valuation is designed to be applicable to both the aggregate (Level I) and segment (Level II) frameworks. One of the key decisions in the Level II framework is the definition of the segments themselves. This has the potential to impact MSD operations in a number of ways, such as:

- The division and allocation of responsibilities
- Targeting work-focused investments
- Performance monitoring.

To assist MSD to define appropriate segments, Taylor Fry undertook statistical analysis of possible subgroups to assess the relative importance of potential predictor variables. The analysis was performed using datasets related to the 2011 valuation data. In particular, it only used payment and client characteristics up to June 2011. It uses a "snapshot" based approach for determining differences between various cohorts of clients. This approach differs from the main valuation methodology (the transition model approach). The snapshot approach and the reasons for its use are described further in Section 15.2.

The results presented here are largely identical to those enclosed in the letter sent to MSD on 12 October 2012 and titled *Discussion paper for Level II segmentations – revised first layer segmentation*. However there are some small additions to this letter, namely:

- Longer snapshot history (10 years instead of 5) for low churn benefits (CSI, IB)
- An extra variable considered for Supported Living: time between incapacity reviews for IB
- Improved treatment of child related variables for DPB clients

Sections 15.2 and 15.3 describe the methodology and results of the segmentation analysis. A description of the segments ultimately adopted is provided in Section 15.4.

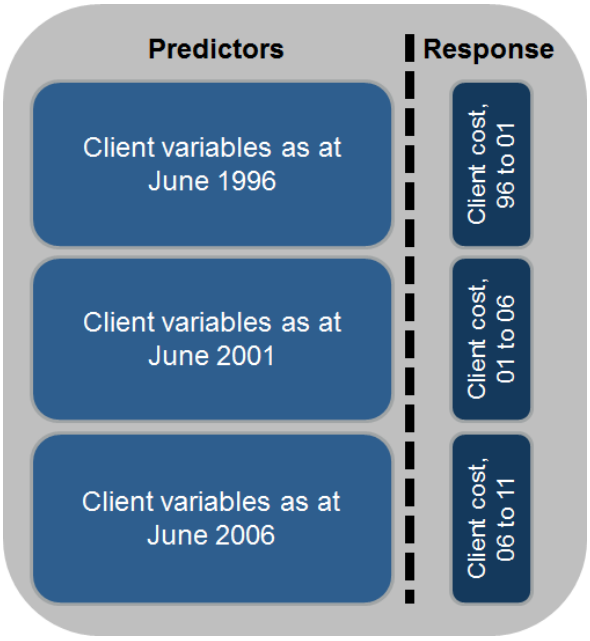
15.2 Five year snapshot approach

15.2.1 Rationale for an alternative approach

The segmentation analysis uses a different methodology to that used for the Level I or Level II valuation. The full valuation uses a transition model structure (see Section 18.3), where the path a particular individual takes though the welfare system is calculated as a set of probabilities each quarter. The size and complexity of the welfare system means that a large number of sub-models are required (see Appendix D). Determining variable significance under this approach would involve fitting all these transition models with **all** the potential predictors. The effort involved in doing this is prohibitive.

Thus we adopted a "snapshot" approach for the segmentation analysis. We have taken a view of the welfare system population as at 30 June 1996, 2001 and 2006. For each of these we have calculated the total cost (across all benefit types, in 30 June 2011 values i.e. "current values") attributable to each individual over the subsequent five years. This idea is illustrated in Figure 15.1. We have then constructed models to identify which variables best distinguish between high cost and low cost over the 5 year period and explored possible segmentations using these variables.

Figure 15.1 **Illustration of the snapshot modelling approach**



The CSI and IB benefits were treated slightly differently. Instead of five year snapshots, a single ten year snapshot was used based on client characteristics at June 2001. The rationale is that clients receiving these benefits have a much higher likelihood of remaining on for many years. The extra years are needed to better discriminate between higher and lower cost cohorts.

15.2.2 Data and predictors used in snapshot modelling

Further discussion of the data preparation is contained in Sections 16 and 17. Below we provide additional comments on data preparation specific to the segmentation analysis and the predictors used.

- Recent exits were included (i.e. those clients not on benefits at the snapshot date, but who had received benefits in the previous 12 months). This is consistent with our valuation philosophy.
- Clients aged more than 60 were excluded from the analysis. These people would automatically have a lower five year cost due to being near retirement, and including them would add little insight.
- The following variables were included as predictors:
    - Education level
    - Gender

- Age
- Ethnicity (UCVII field)
- Partner indicator (whether partner is registered on the benefit, where appropriate)
- Region (metro/rural categorisation as well as general region categories)
- Benefit type (benefit received at snapshot date)
- Duration on current benefit (in quarters)
- Duration since first benefit (in quarters)
- Number of quarters various benefits have been received, as well as number of different types of benefits received
- Type of incapacity (where appropriate)
- Time till incapacity status is reviewed (where appropriate)
- Child related variables (where appropriate)
- Current earnings information

15.2.3 Limitations to the snapshot methodology

This **five year cost is intended to be a proxy for the lifetime cost**. It is expected to be a reasonable proxy, although we note it has the following limitations:

- The impact of age on lifetime cost is less apparent; someone aged 25 has potentially 40 years in the welfare system, compared to 5 years for someone aged 60. These people may appear to be very similar in terms of five year cost but would have significantly different lifetime costs. Thus **age is likely to be a much more significant predictor than has been reflected in this analysis.**
- The "low churn" benefits (those with high probabilities of remaining on benefit like IB, DPB) show less discrimination on five year cost. This is because a high proportion of these recipients remain on benefits for the full five years. Thus **this analysis is less effective for low churn benefits**. This has been partly allowed for by using a 10 year snapshot for the CSI and IB categories.
- The allowance for time related trends is crude. For instance, the latest snapshot is taken in 2006, meaning that composition changes in the welfare population since that time have been ignored. Also, economic events such as trends in the unemployment rate and the GFC are averaged over the snapshot, rather than explicitly identified and allowed for. Thus **potentially significant changes to client behaviour in the last few years are not explicitly allowed for**.

These limitations are automatically overcome when using the transition state based model of lifetime cost, which we use for the principal segment level valuation.

15.3 Segmentation results

15.3.1 Overall results

We make the following general comments concerning some of the predictors used in this analysis:

- The current benefit received (as defined under the current benefit structure) is a strong predictor within each of the five top layer segments, which are based on the benefit types being introduced in July 2013. This implies that **there is significant benefit in retaining information that would allow clients under the new July 2013 benefit categories to be "allocated" to their previous benefit structure.**
- Gender, age, ethnicity and duration (on current benefit) are consistently strong predictors.
- Existence of previous DPB benefits is quite predictive, even in non-DPB categories. This suggests these clients are consistently "at risk" of remaining on and returning to benefits.
- Earnings and partner information are consistently strong predictors, although these are harder to interpret since they directly link to benefit rates. For instance, lower benefits are paid to those with reasonable part time earnings, so the fact that those clients have lower five year costs is unsurprising.
- There are a number of ways of defining client duration, of which we use just one in this analysis (duration of current benefit). Durations measures tend to be highly correlated, so comments applicable to one are also usually true of the other. This would also be true of MSD's definition of continuous duration. There may be practical reasons why one of these duration variables is preferred over the other in different segments.

15.3.2 A first layer of segmentation by (new) benefit type

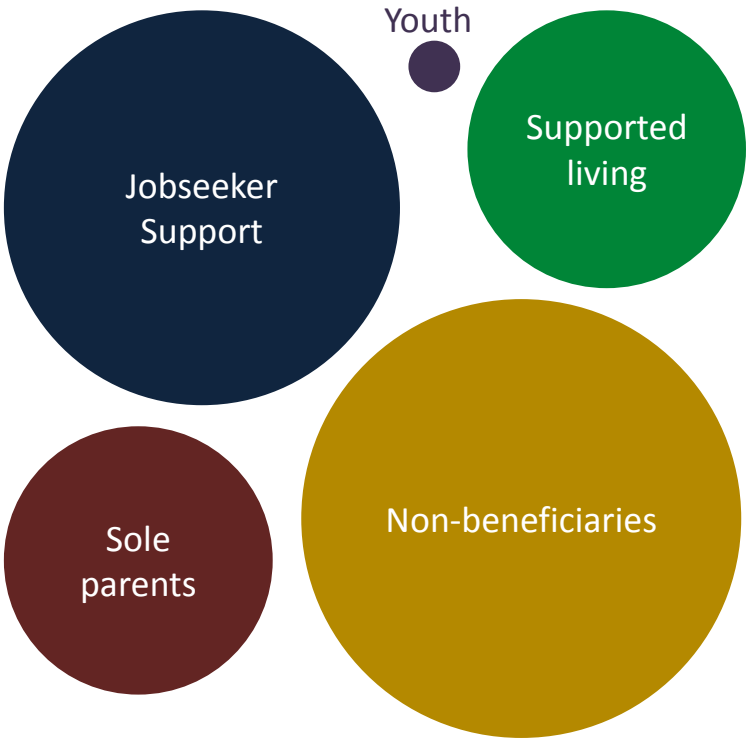
The statistical analysis showed that the current benefit paid was easily the most important predictor in determining five year cost. For this reason we recommended that the segment definitions start by making some key splits by benefit type, followed by further splits using other available variables. We refer to this first layer as the "top tier" segments. Our initial advice split the client base into segments using the current benefit system definitions:

- **Non Tier-1:** Those recently exiting the welfare system or on supplementary benefits only
- **High churn:** Those receiving EB or UB
- **Medium churn:** Those receiving WB/WA, SB, CSI or OB
- **Low churn:** Those receiving DPB or IB

In consultation with MSD, we modified these segments to align more closely with the new benefit categories, applicable July 2013. These are shown in Figure 15.2 and Figure 15.3 below. The benefit types are divided into:

- **Non-beneficiaries:** This group includes recent beneficiaries (NOB), those receiving 2nd or 3rd tier benefits only (SUP) and those on Orphan Benefit (OB). These have an average 5 year cost of $12,900.
- **Jobseeker Support:** This group includes clients on Unemployment Benefit (UB), Sickness Benefit (SB), Widow's and Woman Alone Benefit (WB/WA), Emergency Benefit (EB) and Domestic Purposes Benefit (DPB) where the youngest child is aged 14 and above. These have an average 5 year cost of $39,200.
- **Youth:** This group includes all clients younger than 18 (except those on Invalid's Benefit), and those receiving DPB aged 18. These have an average 5 year cost of $46,900.
- **Supported Living:** This group includes clients on IB (and their partners where they too receive benefits) and care-givers (CSI). These have an average 5 year cost of $71,900, and an average 10 year cost of $127,500.
- **Sole Parents:** This group includes those clients on DPB where the youngest child is under age 14, except those included in the Youth Group. These have an average 5 year cost of $76,500.

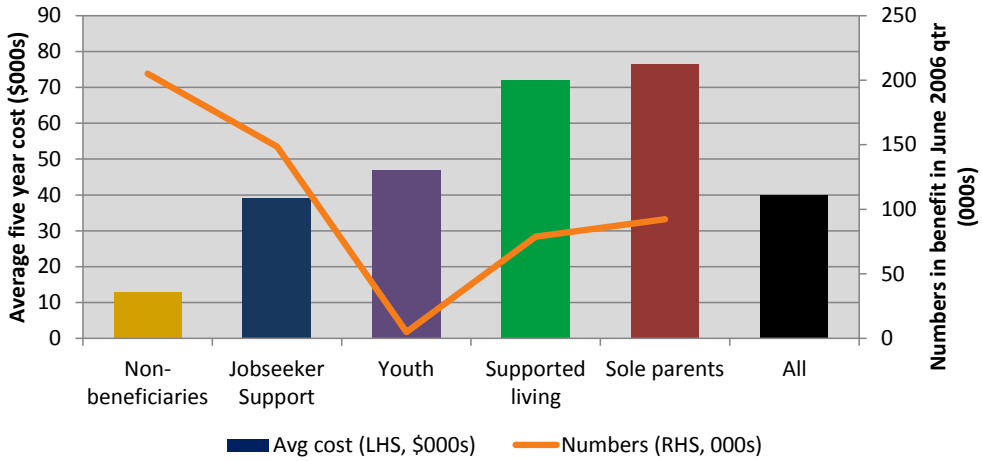
Figure 15.2 **Relative numbers in each top tier segment**



Consistent with our initial analysis, the splits are made using only benefit type, with two exceptions:

- Youth was identified as a key priority area, and so separated out from other clients (*age based split*) reflecting high average lifetime cost and different expectations for this group
- DPB-basic has been split between the Sole Parents and Jobseeker Support segments based on child age, to better align it with work expectations (*child age based split*)

Figure 15.3 **First layer split for segmentations, as well as number of clients at June 2006 and average costs in the next five years.**



Note also that exposure in some groups is "dominated" by particular benefits. For instance, clients on UB make up 65% of the Jobseeker Support group so conclusions on this group will be driven largely by UB behaviour. Similarly, IB makes up 95% of the Supported Living group.

Alternative first layer segmentation

As part of this segmentation analysis MSD has requested investigation on alternative splits on the top layer. Results are presented in Table 15.1. In the table, relative split strength uses a score that combines the average five year costs of the different groups as well as the relative numbers in each group; statistically speaking, a "good" split should have large differences in average costs and favour relatively even numbers across groups. It should be noted that splits with more sub-groups have a natural advantage over splits with fewer sub-groups when it comes to the relative split strength measure.

Table 15.1 **Alternative splits across all beneficiaries**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength
Current benefit	A	DPB	325	74,800	100%
	B	IB	184	72,400	
	C	Other	1,269	26,400	
Duration current spell	A	<= 4	953	25,400	78%
	B	4 < and <= 12	370	48,200	
	C	12 < and <= 20	178	56,500	
	D	> 20	276	68,800	
Incapacity group	A	Psych	118	67,300	53%
	B	Substance	12	61,000	
	C	Other	205	61,400	
	D	None	1,443	34,500	
Education	A	Post Sch, Degree, NCEA 1/2/3/4	499	31,000	26%
	B	None, Other Sch, NCEA<1, Unknown	1,279	43,500	
Age	A	< 18	29	40,500	16%
	B	18 <= and < 25	377	33,700	
	C	25 <= and < 45	959	40,800	
	D	> 45	412	43,800	
Age first received benefit	A	< 18	301	47,300	16%
	B	18 <= and < 25	511	37,300	
	C	25 <= and < 45	773	39,400	
	D	> 45	193	38,000	
Partner flag	A	Has partner	226	40,300	1%
	B	No partner	1,551	39,900	

As can be seen, current benefit type provides the strongest split of five year cost in the table above. This is consistent with our earlier comments and both our initial first layer segmentation (Not T1 / High Churn / Medium Churn / Low Churn) and the new first layer segmentation by new benefit structure. However the pre-reform benefit groups (UB, DPB, etc.) provide differentiation over and above that provided by the new benefit groupings (Youth, Jobseeker Support, etc.). In other words, the existing benefit structure is a good differentiator of average cost within the top tier segments defined by the new benefit structure.

The results for duration of the current spell on benefit indicate that clients who have been on the current benefit for longer are more likely to remain on benefits over the next five years.

The next few sections contain a more detailed analysis of each of the five benefit groups presented in Figure 15.2, using the benefit types coming into effect from July 2013. In these sections we consider what further subdivisions provide strong differentiation

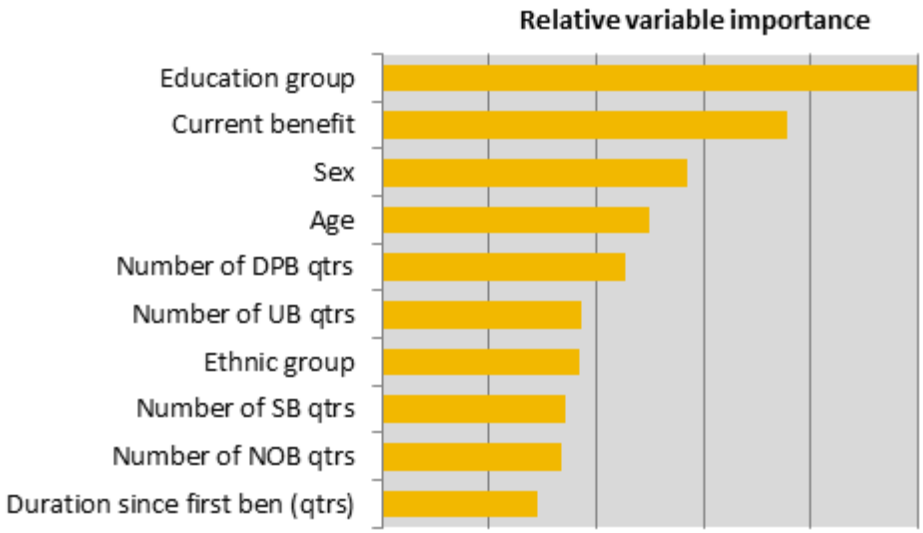
between groups. The figures and tables show the importance of the top variables, arising from TreeNet analysis (a type of machine learning tool) and binary split analysis respectively.

15.3.3 Segmenting the Non-beneficiaries

The Non-beneficiaries segment includes people who were recently on a main or supplementary benefit, those on supplementary benefits and those on the Orphan Benefit.

Figure 15.4 shows the relative importance of the top 10 variables arising from a TreeNet analysis. This is intended to be indicative of how much power each variable has in separating high and low expected cost. Education is the most important predictor, although this effect is somewhat overstated due to the way missing education data is present on the supplied data.

Figure 15.4 **Relative variable importance for Non-Beneficiaries**



In terms of specific splits, we present a "best split" for those variables judged important, summarised in the table below. The ordering in this table and the previous chart are slightly different. This is primarily because a single split contains less information than the overall variable. For example there could be an age effect that can be seen running across all ages, making it a powerful variable, but the single best split (age 18) conveys only a fraction of that power. As discussed in Section 15.3.2, relative split strength uses a score that combines the difference in five year cost with the numbers in both groups.

Table 15.2 **Possible splits for Non-Beneficiaries**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength
# DPB qtrs	A	> 0	109	20,100	100%
	B	= 0	499	11,300	
Current benefit	A	OB	9	36,400	85%
	B	NOB, SUP	599	12,500	
Ethnicity	A	Maori/Pacific People	181	17,000	80%
	B	Asian, NZ EU, Other	427	11,100	
Dur since first ben	A	>= 12	388	14,700	73%
	B	< 12	220	9,600	
Gender	A	F	327	15,000	69%
	B	M	281	10,300	
# SB qtrs	A	> 0	130	16,800	61%
	B	= 0	478	11,800	
# UB qtrs	A	>= 9	166	15,900	55%
	B	< 9	443	11,700	
Education	A	None, Other Sch, NCEA <L1 or =L1, Unknown	456	13,800	47%
	B	Post Sch, Degree, NCEA L2/L3/L4	152	10,100	
# NOB qtrs	A	= 0	98	15,500	34%
	B	> 0	510	12,400	
Age	A	<= 18	7	23,000	31%
	B	> 18	602	12,700	

Those who have a history of DPB benefit are more likely to re-enter the benefit system (or move back onto Tier 1 benefits) than those without. Also, clients of Maori or Pacific people ethnicity have higher average cost than clients of other ethnicities.

MSD have adopted a split for non-beneficiaries that combines both their benefit status and their duration on benefits. This is shown in the table below.

Table 15.3 **Adopted segmentation for Non-Beneficiaries**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength (rel. to Table 15.2)
Current benefit and duration current spell	A	NOB	423	11,300	105%
	B	SUP & dur < 1yr	87	17,200	
	C	SUP & dur ≥ 1yr	88	13,800	
	D	OB	9	36,400	

People currently not on benefit cost the least over the next five years, followed by clients on Supplementary (Tier 2 and 3) benefits and those on Orphan benefit. The relative split strength for this segmentation is 105% (relative to the top split in the previous table) which is better than any of the splits in Table 15.2 that rely on individual variables.

15.3.4 Segmenting the Jobseeker Support benefit

Here we look at the Jobseeker Support benefit – which under the current benefit structure encompasses the Unemployment, Sickness, Widow/Woman Alone, Emergency and Domestic Purposes Benefits where the youngest child is aged 14 and above. For this segment, the figure and table below show the relative variable importance and possible splits respectively.

Figure 15.5 **Relative variable importance for Jobseeker Support**

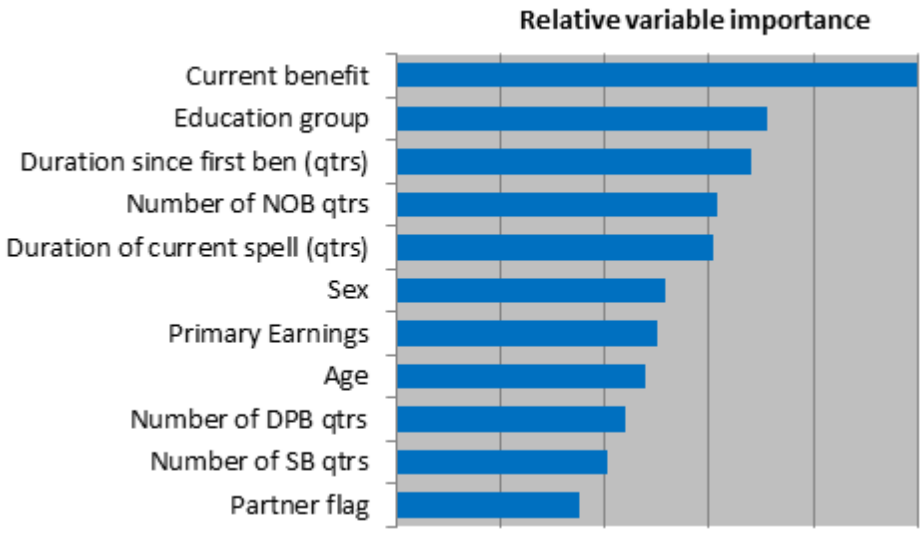


Table 15.4 **Possible splits for Jobseeker Support**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength
Current benefit	A	SB, DPB, WB/WA, EB	228	51,700	100%
	B	UB	432	32,600	
# SB qtrs	A	>= 4	137	53,500	80%
	B	< 4	523	35,500	
Dur since first benefit	A	>= 14	434	44,400	79%
	B	< 14	226	29,300	
Duration current spell	A	>= 7	275	47,500	77%
	B	< 7	385	33,300	
# DPB qtrs	A	> 0	99	53,500	66%
	B	= 0	560	36,700	
Education	A	None, Other Sch, NCEA <L1, Unknown	472	42,800	63%
	B	Post Sch, Degree, NCEA L1/L2/L3/L4	187	30,200	
Age	A	>= 31	394	43,600	58%
	B	<31	266	32,800	
Gender	A	F	308	44,500	54%
	B	M	352	34,600	
# NOB qtrs	A	< 3	451	41,800	42%
	B	>= 3	208	33,600	
Earnings	A	< 98.5	617	40,100	36%
	B	>= 98.5	43	26,700	
Partner flag	A	No partner	490	40,300	20%
	B	Has partner	170	36,100	

Clients currently on UB have an average five year cost that is 37% lower than clients currently on other benefits. Those who have a longer history of being on SB, those who started receiving benefits earlier, those who have been on the current spell longer and those with a history of DPB all have higher average costs over the next five years.

Education, age and gender also provide good differentiation of average costs with less educated, older females costing more than their counterparts in each of the three splits.

MSD requested that some additional splits be investigated for the Jobseeker Support segment. These splits are presented below.

Table 15.5 **Additional splits for Jobseeker Support**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength (rel. to Table 15.4)
Current benefit	A	UB, EB	458	33,200	100%
	B	SB	152	51,400	
	C	DPB, WB/WA	50	56,600	
Duration current spell	A	= 1	115	30,800	84%
	B	<= 4	204	32,700	
	C	<= 12	180	42,100	
	D	> 12	160	50,300	
Age first received benefit	A	< 18	105	39,400	43%
	B	18 <= and < 25	181	33,100	
	C	25 <= and < 45	274	41,500	
	D	>= 45	100	43,700	
# WB/WA qtrs	A	> 0	24	58,900	42%
	B	= 0	635	38,500	

Again there is a strong relationship between the length of the current spell and the average cost over the next five years. Clients aged below 18 when they first received a benefit cost more over the next five years. Average cost for the next age group (18 to 25 year olds) decreases before increasing again for the next two age groups.

MSD has adopted a split for Jobseeker Support based on both current benefit and current duration. This is shown in Table 15.6. It is a powerful split, providing more differentiation than any based on individual variables explored above.

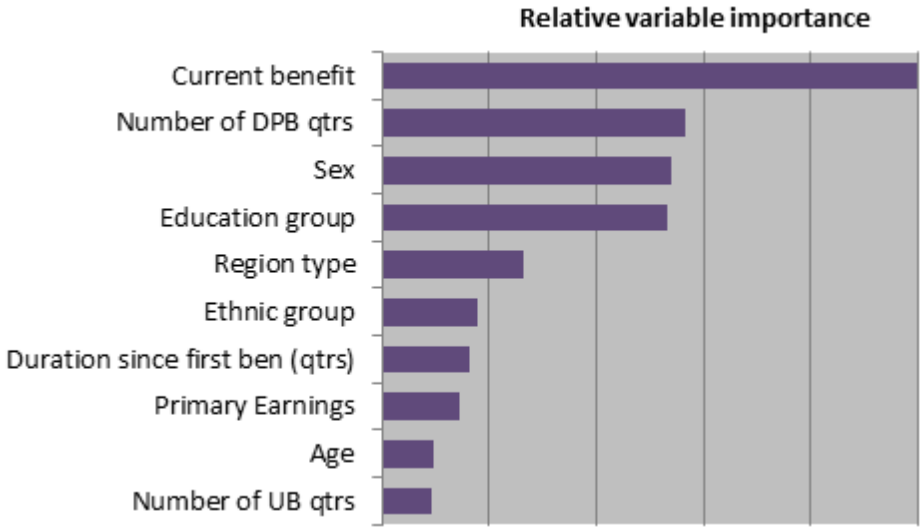
Table 15.6 **Adopted segmentation for Jobseeker Support**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength (rel. to Table 15.4)
Current benefit, duration current spell	A	Work-ready (not SB), dur <1yr	242	28,100	108%
	B	Work-ready (not SB), dur >=1yr	265	42,300	
	C	HCID (On SB), dur <1yr	78	44,300	
	D	HCID (On SB), dur >=1yr	75	58,900	

15.3.5 Segmenting Youth

The Youth segment includes all clients younger than 18 (except those on IB) and those receiving Domestic Purposes Benefit (DPB) aged 18. These have an average 5 year cost of $46,900.

Figure 15.6 **Relative variable importance for Youth**



It is noteworthy that within the Youth segment, the most important predictor of 5 year costs is their current benefit type. The "Number of DPB quarters" variable suggests that current (and former) DPB recipients are more "at risk" of remaining on benefits.

Table 15.7 **Possible splits for Youth**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength
Current benefit	A	DPB, EB, SB	6	79,900	100%
	B	CSI, OB, SUP, UB	18	35,200	
# DPB qtrs	A	> 0	5	84,400	99%
	B	= 0	20	36,900	
Gender	A	F	16	58,300	79%
	B	M	9	25,600	
Age	A	>= 18	3	85,000	76%
	B	< 18	21	41,100	
# UB qtrs	A	= 0	5	70,700	58%
	B	> 0	20	41,500	
Duration since first benefit	A	>= 7	4	70,300	49%
	B	< 7	21	43,000	
Ethnicity	A	Maori/Pacific People	14	51,300	26%
	B	Asian, NZ EU, Oth, Oth EU, Subcont, Unknown	10	41,000	
Earnings	A	< 1	23	47,800	20%
	B	>= 1	1	30,300	
Education	A	None, NCEA <L1, Unknown	21	47,900	11%
	B	Other Sch, Post Sch, Degree, NCEA L1/L2/L3/L4	4	42,100	
Region	A	02-04, 08-10, 14-18	10	48,800	8%
	B	01, 05-07, 11-13, 19	15	45,600	

Youth who are currently on DPB, EB or SB receive on average 127% more over the next five years than those currently on CSI, OB, SUP or UB. A similar split between those who had historically been on DPB and those who had not produces a 128% difference in average costs. The age split is just a different representation of the DPB split, as all those aged ">= 18" are on DPB benefit.

Another informative split is gender, where females receive more than twice the benefit that males receive. The rest of the splits can be interpreted in a similar fashion.

MSD have adopted a segmentation of Youth based on benefit type. It is very similar to the first split listed in Table 15.7.

Table 15.8 **Adopted segmentation for Youth**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength (rel. to Table 15.7)
Current benefit	A	DPB	5	84,600	98%
	B	All other	20	37,000	

This split is similar to the statistically derived "# DPB qtrs" split in the previous table, the difference being that one indicates the client is currently on DPB, whilst the other indicates the client had been or is on DPB. The relative split strength is also close to 100%.

15.3.6 Segmenting Supported Living

The Supported Living segment includes people receiving the Invalid's and Caring for Sick and Infirm Benefits under the current benefit structure. The "churn" rate (the rate at which people leave this benefit) in this segment is very low. One consequence of this is that there is little variation in the 5 year cost when split by possible variables. For this reason we have used a 10 year cost to encourage better discrimination. In practice this means examining a single 2001 cohort.

The relative variable importance results are shown in Figure 15.7. Of particular note is that age comes through as relatively important. This is not surprising; the main reason for this is that a smaller time till retirement age will reduce the expected lifetime cost quite considerably.

Figure 15.7 **Relative variable importance for Supported Living**

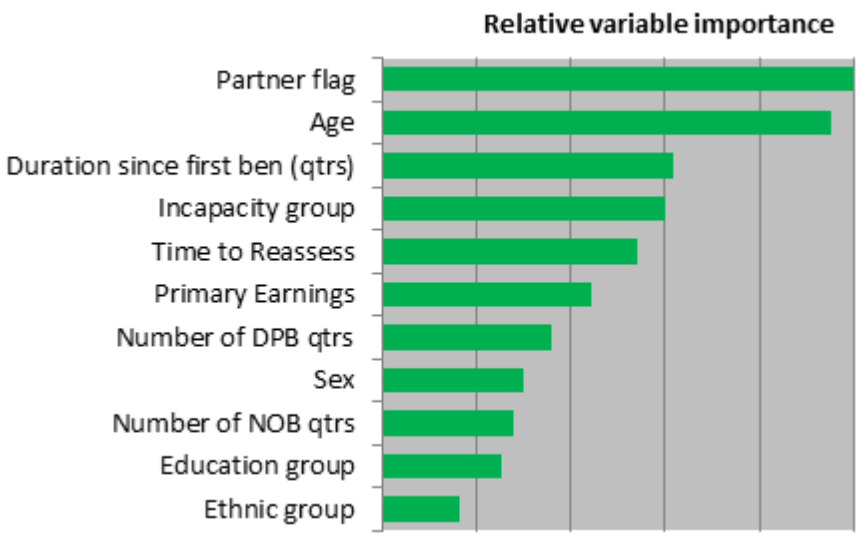


Table 15.9 **Possible splits for the Supported Living**

Predictor	Group	Description	Numbers (000s)	Average 10 year cost ($)	Relative split strength
Partner flag	A	No partner	46	139,600	100%
	B	Has partner	18	96,400	
Age	A	<= 52	46	137,900	85%
	B	> 52	18	101,100	
Partner earnings	A	0	61	130,200	57%
	B	> 0	4	81,900	
Duration since first benefit	A	>= 15	58	130,600	47%
	B	< 15	7	100,700	
Earnings	A	<= 220	63	128,900	46%
	B	> 220	2	71,000	
Incapacity group	A	All other	63	128,800	42%
	B	Cancer	2	79,400	
IB reassessment flag	A	N/A, 2 or 5	35	120,100	41%
	B	Never	30	136,100	
Duration current spell	A	>= 15	38	152,300	41%
	B	< 15	27	125,100	
# DPB qtrs.	A	>= 6	6	152,300	40%
	B	< 6	59	125,100	
# NOB qtrs	A	< 3	56	130,200	37%
	B	>= 3	8	108,400	
Gender	A	F	32	130,200	14%
	B	M	32	124,800	

Clients with partners cost less than those without; a reasonable number of these clients are those without a registered incapacity themselves, but rather have a partner with a registered incapacity. Those with partners earning an income experience a further reduction in average cost. Relationships similar to those seen in the previous benefit groups also exist in the Disabled/Ill/Carers group.

Clients with cancer on average cost $49,400, or 39%, less than all other clients over 10 years, presumably due to a shorter average period on benefit.

MSD requested that some additional splits be investigated for the Supported Living segment. These splits are presented below.

Table 15.10 **Additional splits for Supported Living**

Predictor	Group	Description	Numbers (000s)	Average 10 year cost ($)	Relative split strength (rel. to Table 15.9)
Reassessment flag	A	N/A	14	95,100	87%
	B	2 years	20	136,000	
	C	5 years	1	136,300	
	D	Never	30	136,100	
Incapacity group	A	Psych	26	142,500	66%
	B	Substance	1	139,500	
	C	Other	37	116,600	
Incapacity group	A	Psych or Substance	27	142,400	66%
	B	Other	37	116,600	
Age	A	< 18	1	130,900	69%
	B	18 <= and < 25	5	134,300	
	C	25 <= and < 45	27	141,800	
	D	>= 45	32	113,900	
Duration current spell	A	> 4	53	130,400	33%
	B	<= 4	11	113,300	

At first glance it appears the reassessment flag performs well as a splitter. However, the bulk of its performance is because the lifetime cost of the "N/A" category (those on CSI and IB partners) is very different to the IB clients who all have a 2/5/never flag. However, the average liabilities for the 2/5/Never levels are very similar. In fact, **the IB reassessment flag appears to have no power in predicting 10 year cost**. This result is intriguing and worthy of further investigation; if there really is no difference in cost attributable to these people, it could be for a number of reasons:

- The assignment of flags (at least in 2001) was poor at identifying people likely to recover
- The reassessment process itself is relatively easy for a client to satisfy
- If people are moved out of IB, they may collect other benefits rather than gaining employment

Without further analysis we can offer little insight as to which of the explanations are more likely, or whether the situation has changed in recent years.

The adopted split is shown below, based on benefit type and whether IB is received due to a partner's incapacity. It is reasonably powerful in differentiating lifetime cost and is intuitively attractive as it separates clients into groups that are likely to require separate policies or interventions. However, it is a little weaker than the best split in Table 15.9; this seems to be because the existence of a partner (whether the client or partner is the invalid) is more predictive than the partner of invalid flag.

Table 15.11 **Adopted segmentation for Supported Living**

Predictor	Group	Description	Numbers (000s)	Average 10 year cost ($)	Relative split strength (rel. to Table 15.9)
Benefit type, partner of IB	A	HCID (IB with a registered incapacity)	52	134,700	78%
	B	Partner (IB with no registered incapacity)	9	94,300	
	C	Carer (CSI client)	3	102,000	

MSD will continue to refine the Supported Living segments with a view to developing a finer grained segmentation, particularly for the invalids with registered incapacity.

15.3.7 Segmenting the Sole Parents benefit

The Sole Parents segment includes clients currently receiving Domestic Purposes Benefit with a youngest child aged below 14. Relative variable importance is shown in Figure 15.8, and the power of possible splits in Table 15.12.

Figure 15.8 **Relative variable importance for Sole Parents**

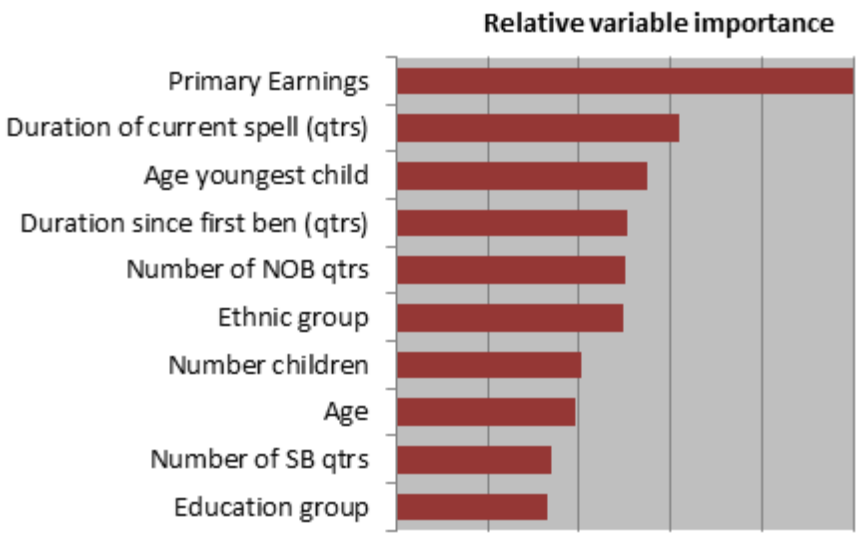


Table 15.12 **Possible splits for Sole Parents**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength
Earnings	A	<= 76.5	250	79,500	100%
	B	> 76.5	42	58,900	
Age youngest child	A	Missing	3	33,800	82%
	B	< 5	152	80,200	
	C	< 10	93	75,300	
	D	>= 10	46	69,200	
# children	A	Missing	3	33,800	80%
	B	1	131	73,000	
	C	2	97	78,700	
	D	3 or more	63	82,300	
# NOB qtrs	A	< 2	204	79,600	65%
	B	>= 2	89	69,400	
Dur current spell	A	>= 7	200	79,600	62%
	B	< 7	93	69,900	
Dur since first ben	A	>= 10	266	77,700	53%
	B	< 10	27	64,400	
Region	A	02-04, 15, 17-19	92	81,700	49%
	B	01, 05-14, 16	201	74,100	
Region group	A	AWTQ, N/A	112	80,700	46%
	B	Other Met, Town/Rural	181	73,900	
Gender	A	F	268	77,400	42%
	B	M	25	66,400	
Education	A	None, NCEA <L1, Unknown	209	77,900	31%
	B	Other Sch, Post Sch, Degree, NCEA L1/L2/L3/L4	83	72,900	
# SB qtrs	A	>= 4	19	84,100	28%
	B	< 4	274	76,000	
Age	A	< 22.5	28	80,500	18%
	B	>= 22.5	265	76,100	

Note the first split includes an obvious effect – the payment rate for those with reasonable part time earnings is currently lower. We believe that this accounts for much of the observed difference in average cost.

Age and number of children have predictably large impacts on the results, with younger ages and more children both significantly increasing the cost over five years.

The results also imply the following subgroups cost more over the next five years:

- People who have been off benefits for shorter periods
- Those that have been on the current spell longer
- Those who started receiving benefits earlier

Beyond the first few splits, the impact of the other splits appears limited. This is partly attributable to the fact that DPB is a relatively low churn benefit (a fair proportion of clients remain on for the full five years).

MSD requested that some additional splits be investigated for the Sole Parents Segment. These splits are presented below.

Table 15.13 **Additional segmentation for Sole Parents**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength (rel. to Table 15.12)
Age youngest child	A	Missing	3	33,800	79%
	B	0-2	96	81,500	
	C	3-4	56	78,000	
	D	5-13	138	73,300	
Dur current spell	A	<= 4	68	68,600	70%
	B	4 < and <= 12	82	75,500	
	C	12 < and <= 20	49	78,200	
	D	> 20	93	82,200	
Age	A	< 25	58	78,900	17%
	B	25 < and < 35	129	76,100	
	C	35 < and < 45	88	75,400	
	D	>= 45	19	77,000	

The segmentation adopted by MSD makes use of age of the youngest child as well as current duration to reflect operational considerations. This split is presented in the table below. It is reasonably powerful, albeit not as predictive as earnings information. This may become more powerful after July 2013 when new work expectations will come into effect.

Table 15.14 **Adopted segmentation for Sole Parents**

Predictor	Group	Description	Numbers (000s)	Average 5 year cost ($)	Relative split strength (rel. to Table 15.12)
Age youngest child, Dur current spell	A	Child 0-2	96	81,500	72%[1]
	B	Child 3-4	56	78,000	
	C	Child 5-13, duration < 1 yr	22	61,500	
	D	Child 5-13, duration >=1 yr	119	74,500	

1. Note that the relative strength here is somewhat lower than other child age splits shown in the 2 previous tables because the missing child ages from those earlier tables have been distributed across the categories here; if shown separately, the relative strength would be 94%, which is more directly comparable to the figures in Table 15.12 and Table 15.13. However, the 72% figure is the statistical power we would expect to see in practice, compared to earnings.

15.4 Segments adopted by MSD

Using the statistical input from Taylor Fry described above as well as operational considerations, MSD has chosen 17 segments to value and monitor. These can be grouped into five "top tier" segments which are defined by a person's benefit type, and then divided into "lower tier" segments using other variables such as duration (whether a client has been continuously on benefits for less than or more than a year) or child age. These are presented in the table below. Initially we expect that MSD will refine these segments to suit the changing environment and reforms currently underway. However, we also expect that once defined these segments are maintained and only changed in limited circumstances such as major policy, structural or behavioural shifts.

Table 15.15 **Summary of segments adopted by MSD**

Jobseeker support	Sole parents	Supported living	Youth	Non-beneficiaries
Work-ready, <1 year	Youngest child 0-2	Carer	Youth payment, <18	Sup only, <1 year
Work-ready, >1 year	Youngest child 3-4	Partner		Sup only, >1 year
HCID, <1 year	Child 5-13, <1 year	HCID	Young parent payment, <19	Orphan only
HCID, >1year	Child 5-13, >1 year			Recent exits, <1 year

Some specific comments on the definition of these segments follow:

- The Jobseeker Support top tier segment includes the following old benefit types:
  - Unemployment benefits
  - Sickness benefit (now HCID)
  - Widows and women living alone benefits
  - Emergency benefit
  - DPB-basic where the youngest child is at least 14 years old
- The Sole Parents segment are those receiving DPB-basic benefit, but have a youngest child less than 14 (and thus lower work requirements compared to Jobseeker Support).
- The Supported Living top tier segment contains those receiving carer's benefit (CSI) and Invalid's Benefit (IB), and has been divided into three segments. The first segment is for those clients receiving CSI. The second is for partners of people with an incapacity (generally both an incapacitated person and their partner will receive IB). Finally the HCID segment in Supported Living (SLP-HCID) is for those clients who receive IB and have an incapacity.
- The Youth segment is split into those receiving a sole parent payment and those who do not. As shown in the table, these segments have slightly different age cut-offs to be consistent with MSD benchmarks.
- The Non-beneficiaries segment contains people not receiving Tier 1 benefits (other than the Orphan benefit). For our valuation we have classified someone as receiving supplementary benefits if they receive AS, DA or CDA (equivalently, this is any Tier 2 benefit excluding CCS). Supplementary recipients are further split based on their duration. The definition of monitoring recent exits until they have had a full year off benefits is somewhat arbitrary, but consistent with our approach to Level I and Level II valuations.
- We have agreed with MSD to use a continuous duration measure for duration related splits to top tier segments. Continuous duration is the length of the current spell on benefits since the client was last off benefits for at least 14 days. This definition has some awkwardness in reconciling to other duration measures used in the valuation modelling – these issues are discussed in the next section.

15.5 Current limitations to segment definitions

There are some data related issues associated with the current definitions of segments. None of them are significant enough to warrant changing the segment definitions, but are listed here so that future data requirements can be considered and potentially improved.

- The segment for partners of IB clients is defined in a fairly manual way – based on recorded incapacity codes. There is some error in the recording and matching of these codes, which will then flow to errors in allocation between Supported Living segments. Ideally future data extractions would include a field indicating whether an IB payment relates to a partner or not.
- Based on historical data the experience from widows and women living alone is close to the Supported Living segment than Jobseeker Support, as clients on the

WB/WA benefits have a low probability of leaving the benefit and high average cost. However, their behaviour is expected to change markedly when their work requirements are brought into line with other Jobseeker Support in welfare reforms. This means that their behaviours are more likely to be similar in the future.

- There is some difficulty in the definition of duration:

  - It can be defined as time in a segment, time since being a non-beneficiary, or time since any benefits were received.

  - The measure could conceivably reset if the client has a single day off benefits, or 14 days (MSD's preferred definition), or require a quarter off benefits (most consistent with our modelling structure).

  The choice of definition can have a reasonably large impact on how reported numbers appear (e.g. numbers in a particular segment or off benefit etc.), despite the fact that such a decision in itself does not impact the amount of the total valuation. There are also practical issues in reconciling our duration measures with the ones selected by MSD. These are discussed in significant detail elsewhere in the report (see Section 17.7).

- There is also some subjectiveness in the definition of those on supplementary benefits (versus recent exits). To restate our current approach, AS, DA and CDA count as qualifying for supplementary benefits, while CCS, EI and HS do not. The rationale is discussed in Section 18.2.2. This is consistent with the Level I valuation, but we recognise that it is not the only possible definition.

16 SEGMENTATION AND THE 2011 VALUATION

16.1 Background

The valuation approach used in the aggregate (Level I) valuation in 2011 was not suitable for a segmentation level valuation, for two main reasons:

- Smaller benefits were not attached to specific individuals and thus could not be assigned to segments
- Additional variables judged necessary for cohort and segment definitions needed to be included in the analysis

This led to a modified methodology for the Level II valuation, which Taylor Fry performed as at 30 June 2011. We have since judged the methodology to be superior to the original Level I approach, and have adopted this as the single valuation approach for the 30 June 2012 and subsequent valuations.

This section gives some further background on the Level II 2011 valuation, which was completed in March 2013. Results for this analysis are given in Section 16.5.

16.2 Input datasets

The datasets used for performing the Level II valuation were virtually identical to those used in the 2011 Level I valuation. However, we used a few additional fields based on a subset of those considered in Section 15. These were sourced from the MSD Benefit Dynamics Data Set:

- Additional benefit history fields
- Gender
- Region
- Ethnicity
- Education level
- Partner status (for IB, SB, UB and EB recipients)
- Incapacity type (for IB and SB recipients), and number of incapacities

Other data sources were identical to the aggregate 2011 valuation.

16.3 Other data preparation

The remaining data preparation for the 2011 Level II valuation followed the same process as the current 2012 valuation, which is described in Section 17. In particular the:

- Allocation to quarterly states
- Interpolation of missing values
- Allocation of payments to benefit states

all followed a virtually identical process to that used in the 2012 valuation. There were two slight differences:

- The OB was treated equally with the other Tier 1 benefit states. This was not continued in 2012, given that clients sometimes received OB plus another Tier 1 benefit simultaneously.
- Education level was included as a modelling variable for this Level II work, but has been dropped for the 2012 valuation. This was because it was viewed as a lower quality variable in its collection and maintenance. A comparative valuation including education level as a predictor was run subsequent to the main valuation. This showed that the inclusion did not materially alter the overall liability, and results given in Appendix K. MSD are investigating providing improved data for the 2013 valuation of liabilities.

16.4 Modelling methodology for the 2011 Level II valuation

The approach developed for the 2011 Level II valuation was virtually identical to that used for the (current) 2012 valuation. Readers are referred to the description of the 2012 valuation methodology in Section 18 for further detail. Compared to the methodology described in Section 18, the main differences were:

1. Net loans cost and expenses were not estimated
2. Numbers on benefit at the end of the quarter and a client's continuous duration were not estimated
3. Future client liability numbers and benefit payments were not estimated
4. Education level was modelled in the 2011 Level II valuation, but has been dropped for the 2012 valuation (see comments in Section 16.3)

16.5 Level II valuation results as at 30 June 2011

Overall the Level II valuation came out about 2% lower than the aggregate valuation. Upon examination of these differences, we have concluded that the Level II approach is preferred. Further discussion of these results can be found in the reconciliation in Section 5. There were two key causes for the difference:

- Improved transition methodology: Rather than modelling the smaller benefit types as independent payment streams, they have been integrated into the transition

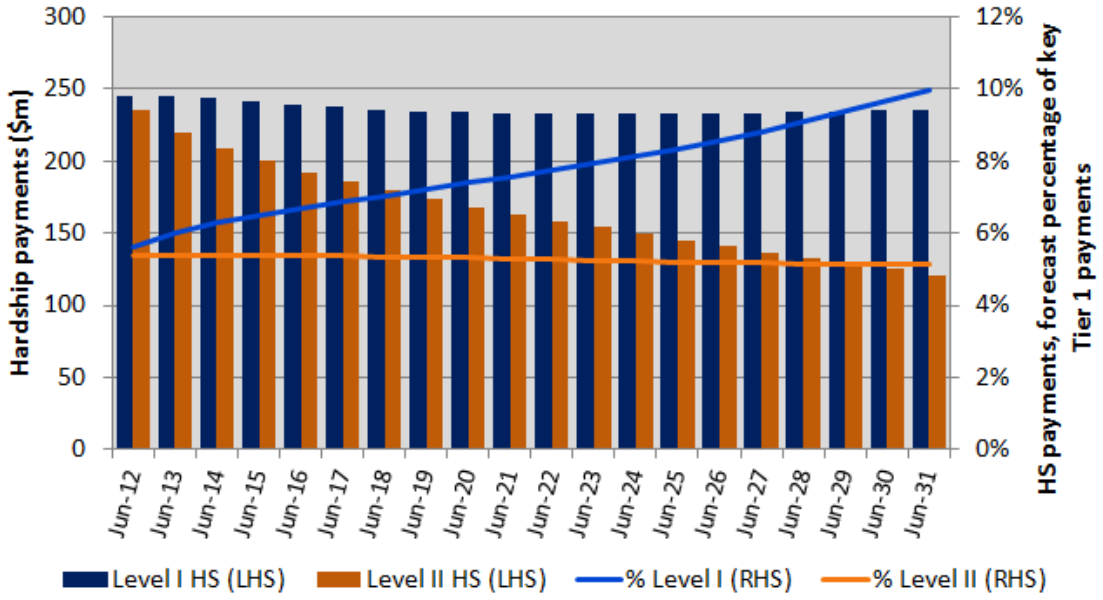
structure. We believe this gives more credible results. Changes to these benefits (primarily the Hardship benefit projection) have reduced the liability by 1.6%.

- Treatment of client status at the valuation date: A larger than expected number of clients who received benefits in the June 2011 quarter had stopped receiving benefits by June 30. Properly allowing for this experience reduced the liability slightly.

In addition, some differences are also caused by the introduction of the new variables (region, incapacity etc.) into the transition and payment models. These differences, in terms of their effect on the total liability, are small compared to the two listed above.

We illustrate this change with the Hardship Benefit forecast. The change in the estimated lifetime cost for this benefit type explains most of the difference between the Level I and "like basis" Level II results. In both cases the forecast payments decayed with time (as clients leave the benefit system), but they depart more quickly in Level II, matching the rate for clients leaving the welfare system generally. As a result Hardship payments are now a more stable proportion of Tier 1 benefits. This is an improvement, because the majority of Hardship benefits go to people who also receive Tier 1 benefits.

Figure 16.1 **Projected hardship payments and payments as a proportion of Key Tier 1 (UB/SB/IB/DPB) payments**



In a similar fashion we have reviewed all the benefit type payment projections that were modelled differently in Level I and Level II. We are satisfied that, where differences exist, the Level II results appear to be superior.

PART D.2
2012 VALUATION APPROACH

17 DATA

17.1 Privacy

To protect the privacy of individuals, original social welfare numbers (SWN's) were not supplied in the datasets described below. The client identification numbers used for matching datasets were separately created by MSD. Other personal information such as names and addresses were not supplied.

17.2 Data supplied

SAS datasets

The following SAS datasets supplied by MSD were used to conduct the valuation. All data is up to 30 June 2012 but extracted as at 31 July 2012 (see Section 17.3):

1. **rate_period_30jun2012.sas7bdat:** Rate file with one record per client and benefit spell that contains:
   - Client identification number
   - Benefit type code (plus codes for supplementary benefits)
   - Gross and net payment amounts for primary benefit
   - Payment amounts for any supplementary benefits
   - Spell date start and end

   The dataset covered spells from March 1993 through to 30 June 2012, the valuation date.

2. **ahpy_lumpsum1_30jun2012.sas7bdat:** Lump sum file which covers those payment types recorded on system in a lump sum fashion (single date, rather than spell start and end dates). Fields include:
   - Client identification number
   - Benefit type code
   - Gross and net payment amounts
   - Input and effect dates

3. **ahpy_ccs_30jun2012.sas7bdat:** Similar to the ahpy_lumpsum1 file, except specific to the child care subsidy benefit, which was not included on the original lump sum file.

4. **rate_cda_30jun2012.sas7bdat:** Similar to the rate_period file, but specific to the child disability allowance benefit, which was not included on the original rate_period file.

5. **Spel1206.sas7bdat:** File with one row per spell per client, containing a variety of fields related to the spell. In particular, the "oldcomdt" field contained the first

payment date for the spell, which was used to overwrite spell commencement dates before the 1993 system change.

6. **swn1206.sas7bdat:** File with one row per client, with a range of static variables. This dataset was used to determine date of birth, gender and ethnicity for each client.

7. **swns_not_on_bdd.sas7bdat:** File with one row per client, containing client ID and date of birth for those not included in the swn1206 file.

8. **chd1206.sas7bdat:** File containing one record for every "child spell" per spell per client. This effectively provides child records to attach to all benefit spells which depend on the age and number of children. Child date of birth is also included.

9. **Dist1206.sas7bdat:** File containing one record for every district per spell per client. This allows the assignment of each client spell to their district and region.

10. **dv_debt_summary_extract_tf.sas7bdat**: Dataset containing loans cost information.

Quarterly monitoring datasets

In addition to datasets supplied for the purpose of performing the valuation, we have also been supplied with datasets for performing quarterly monitoring of projections. The supplied material contains the files:

- A rate file, analogous to rate_period_30jun2012.sas7bdat
- A Lump sum file, analogous to ahpy_lumpsum1_30jun2012.sas7bdat
- A CDA payment file, analogous to rate_cda_30jun2012.sas7bdat
- A CCS payment file, analogous to ahpy_ccs_30jun2012.sas7bdat
- A file containing dates of birth for new clients

Each dataset is supplied as at the end of the quarter, but extracted one month after the end of the quarter to allow for some retrospective changes to the payment history.

Loan data

Data on client loans in the form of recoverable assistance was provided in a SAS dataset, **dv_debt_summary_extract_tf.sas7bdat**. Fields include:

- Client identification number
- Debt number (a unique number for each debt)
- Breach type (Overpayment, Fraud, or Recoverable Assistance)
- Year and quarter
- Debt established
- Total recoverable for debt and quarter
- Total adjustment for debt and quarter
- Total write-off for debt and quarter

There is an entry for every client who had a debt balance at 1 July 2007, plus one entry per client per change to their debt status (e.g. repayment made or debt issued) from 1 July 2007 to 30 June 2011. Pre-1 July 2007 data is not split by breach type.

The file **prov9yr_details_Jun12_tf.xlsx** was also provided. It is a spreadsheet giving the outstanding provision for debts owed to MSD as at 30 June 2012. It contains one row per client, their aggregated debt plus a range of other static variables.

Benefit rates

Our analysis requires the conversion of historical payments to "current values". A series of pdf documents **BenefitRateSummary_1999-04-01.pdf**, **BenefitRateSummary_2000-04-01.pdf** etc. were provided showing all benefit rates whenever they were updated (typically 1 April, and occasionally 1 September, each year). A spreadsheet **Benefit Rates pre 1999.XLS** was provided with values applicable before 1999.

Historical and forecast economic variables

- **fsm-befu.xlsx**: Treasury fiscal strategy model, 2012 version. Excel spreadsheet containing historical quarterly values as well as Treasury forecasts for the next five years for each of:
  - Population
  - Employment and unemployment rates.

- **PREFU 2011 major working-age benefit generator.xlsx**: Excel spreadsheet containing 50 years of annual projections for:
  - GDP related variables
  - Labour market variables, including the unemployment rate
  - Numbers and expenditure on selected welfare benefits.

- **disc-rates-feb13.xls**: Excel spreadsheet containing Treasury assumptions for government accounts for future discount and inflation rates for a number of dates, including June 2012.

Miscellaneous files

A number of other files were either supplied or carried across from the previous valuation that aided investigation and interpretation, but did not directly feed into the valuation:

- **revwt.sas7bdat**: SAS dataset key containing identifiers for codes related to reasons why people leave benefit
- **benefit_codes.sas7bdat**: SAS dataset with identifiers for different benefit codes
- **district_codes.sas7bdat**: SAS dataset identifying district codes and corresponding regions
- **20111123 - BDD intro for Taylor Fry.PPT**: Slide presentation entitled "The Benefit Dynamics Data Set," describing some of the key data files
- **bendyn.doc**: Document entitled "Benefit Dynamics Data Set documentation," containing a description of the BDD data files, dated February 2011
- **Benefits 101#2.doc**: Document entitled "Benefits 101: An overview of social assistance benefits in New Zealand," giving a broad description of the social welfare system

Various other summary files, file descriptors and overviews were also provided on an ad hoc basis.

Datasets for segmentation analysis

The segmentation analysis of Section 15 uses 30 June 2011 data rather than the 30 June 2012 data used in this valuation. The files provided were equivalent to those listed above, but without the last year of data. A full list of these files is provided in our previous valuation report.

17.3 Investigations regarding reliability of data

The following checks and reconciliations were performed on the supplied data.

Checks on internal consistency of rate files

This included, amongst other checks:

- Checks that clients are on at most one spell at any time
- Checks for duplicate spells and payments
- Checks for presence and consistency in spell start and end dates
- Checks that payment amounts are reasonable given the spell length
- Checks that ratios between gross and net payment levels are plausible
- Checks for missing or clearly inappropriate entries in each field

Consistency across provided files

This included, amongst other checks:

- Checks that client IDs matched properly across files and appeared consistent
- Checks that payments went to appropriately aged clients (i.e. at least age 16)
- Checks on plausibility of child and parent ages, for child related benefits
- Checks on number of benefit days and payment amounts by benefit type for rate files provided at different snapshot dates

Consistency with files used in previous valuation

The files supplied by MSD for the 2012 valuation should be largely identical to the ones used in the 2011 valuation. That is, the newly supplied files should simply be updated versions of those previously used. After processing the given files into a form suitable for modelling (as discussed in Section 17.5), the data was examined to identify changes from the previous version that cannot be explained by the extra year of experience. There were about two million client IDs that were common between the new and old data. In addition, about 90 million records were common in the way that they shared the same benefit quarter and client ID information. The results of the comparison are highlighted below:

- There were 1,138 records in the new data that did not exist in the old data, even though they were dated at or before the June 2011 quarter. The majority of these records are dated in either the March 2011 or June 2011 quarter.
- There were 973 client quarterly records that were in the old data that do not appear in the new data. In particular, 69 clients have had their records partially removed while 106 clients have been removed completely.

- At an individual level, there were about 163,000 records (common to both old and new data) where the recorded payment amounts differed by more than 1%. The majority of these transactions were dated in the March 2011 and June 2011 quarter.
- There were 771 clients that have a different birthdate recorded compared to the previous data. We note that in the majority of cases, the change is subtle in the way that the new date is similar to the old. For example, the month June may have changed to July. In addition, date of birth information that was missing for six clients in the previous data is now available. However, birthdate information that was available for three clients previously is no longer present in the new data.
- There were 44 clients that have a different gender recorded.
- There were about 5,000 clients that have a different primary ethnic group recorded.
- There were about 3,000 records where the district office assigned is different.
- There were about 2,000 records where the recorded incapacity type differed from the old data.

While differences in the input data has the potential to change the estimated parameter values of the projection models and hence the liability valuation, the inconsistencies here are relatively minor in the context of the millions of client ID's and tens of millions of records and the impact should be negligible. We believe that a majority of the noted differences can be explained as retrospective corrections made by MSD.

Conclusions

Based on our checks and reviews we believe the datasets are sufficiently accurate, consistent and coherent and are satisfied that they appropriately represent benefit payments made by MSD. This conclusion is subject to the following limitations:

- There appears to be some evidence of retrospective changes to payment levels. MSD has confirmed that backdated benefit grants do exist and can change; for some benefit types, total payments can fall by about 1% compared to the earliest available dataset. This has led us to conclude that a one month lag should be allowed before using data for the liability valuation; this will allow most of the payment changes to be made while not unduly delaying the valuation. This has implications for the timing of quarterly monitoring results.

- A small but non-trivial number of clients have start dates that do not reconcile between the provided spell and rate files. Responses from MSD suggest this is either a consequence of:
  - Retrospective data amendments
  - The cleaning process applied to the spell data
  - Treatment of partners of clients receiving benefits

  Where these differences have occurred we have used the rate file start date as authoritative. We do not believe this has a material impact on the valuation results.

Note that while we make significant efforts to check the quality of data used in our analysis, we do not take ultimate responsibility for the accuracy and completeness of the data. Section 20.2 also discusses our reliance on the data provided.

17.4 Data adjustments

17.4.1 Benefit state and payments

No direct adjustments were needed for the benefits and payments on the provided datasets, although some allowance for retrospective payment changes may need to be made for quarterly monitoring. However we note here, to prevent later confusion that some aspects of our approach may be different to that typically seen at MSD:

- Numbers on benefit per quarter in this report means the number who receive **any** benefit payment in a quarter, rather than number receiving a benefit at the end of a quarter.

- Some benefit type definitions have been broadened to include small payments that may sometimes be considered separately. For instance, the following payment types have all been classed under the Unemployment Benefit:
  - Unemployment Benefit Hardship
  - Unemployment Benefit Hardship Training
  - Unemployment Benefit Training
  - Unemployment Benefit
  - Independent Youth Benefit
  - Young Job Seekers Allowance
  - 55+ BENEFIT

  These groupings are covered in detail in Sections 7-13, as well as Appendix C.

- All modelling of average benefits paid per quarter has been done in current (30 June 2012) values. This means older payments have been increased in line with historical CPI inflation. This is done so that attention can be concentrated on detecting shifts in payment levels apart from the standard CPI increase.

17.4.2 Interpolation of missing values for modelling variables

A number of variables had a significant percentage of missing variables:

- Gender
- Ethnicity
- District
- Incapacity (type and number)
- Education

In some circumstances missing variables are reasonable and can be included in the modelling process as an extra categorical level. In this case however, one of the main determinants of missing variables was a fast exit from the benefit system, presumably as there was insufficient time to collect client information fully. **This means that missing variables appear to predict a fast exit from the welfare system, where in actual fact the causality is the reverse.**

To avoid this bias we have interpolated missing values – that is, we randomly allocated values in cases where they were missing. This allocation was performed based on the distribution of variables for the clients with non-missing values when they first enter the

welfare system. We believe this is the most effective way of handling missing values (while avoiding having to delete them entirely). Extra check variables were created to indicate when variables had been interpolated.

17.5 Quarterly format and allocation to state

We have assigned a single state to each client for every quarter. Each allocation is to one of ten states, which represents an extension to the six states used in the previous valuation:

1. UB (Unemployment benefit)
2. SB (Sickness benefit)
3. DPB (DPB-basic)
4. IB (Invalid's benefit – as a partner or as the invalid)
5. CSI (Carer's benefit)
6. EB (Emergency benefit)
7. WB/WA (Widow's or Women living alone benefit)
8. OB (Orphan or unsupported child benefit)
9. SUP (Supplementary benefits only)
10. NOB (Not on benefits)

We recognise that it is possible to receive more than one benefit in a quarter; however the incidence of this is low enough that the single state approximation is appropriate and significantly simplifies the analysis. Where it is possible to assign more than one state to a client in a quarter, we use the following precedence rules:

- If a client receives UB, SB, DPB, IB, CSI, EB or WB/WA, assign to whichever benefit is received for the most number of days
- Otherwise, if any OB is received in the quarter, assign to this
- Otherwise, if any AS, DA or CDA is received in the quarter, assign to SUP
- Otherwise, assign to NOB

There are two immediate implications of these precedence rules. First, a client can only be NOB if they receive no Tier 1 or Tier 2 benefits (excluding CCS). Second, a client can only be in SUP if they receive no Tier 1 benefit.

This assignment uses the broader definitions of benefit types discussed in Section 17.4.1.

17.6 Payment information

All payments are allocated to the appropriate client quarter. Payment spells that span more than one quarter are allocated pro rata based on number of days of the spell lying in each quarter. We also make the following transformations:

- All payments are scaled to June 2012 benefit levels, using the CPI index applied to benefit payments over the past 20 years. We have used the increases in DPB payment levels to infer these CPI increases.

- All Tier 1 payments (excluding Orphan benefits) are aggregated for each client quarter and assigned to the client's benefit in that quarter. The impact of this reallocation has been tested and is very small.
- The remaining benefit types (OB, AS, DA, CDA, CCS, EI, HS) are not aggregated and are modelled separately using additional payment models.

17.7 Reconciling Taylor Fry and MSD definitions

17.7.1 Client benefit status

There are two key points of difference in how client status is determined in our valuation definitions compared to MSD's standard definitions:

- **Whether a client is on benefit:** Under our definition, a client is on benefit if they receive any payment in the quarter. In comparison, MSD typically defines this to be whether a client is on a spell at the end of a quarter; and
- **The continuous duration of a client:** We calculate continuous duration as time since the client had a full quarter off benefits. In contrast, MSD typically uses a 14 day rule to reset the continuous duration counter.

These issues affect the allocation of clients to segments. To allow for this, we have received an extra file from MSD with each client's status and continuous duration at the valuation date, to enable a consistent allocation between segments.

These definition issues still exist to some extent in the projection; the projected number of people on benefits in each quarter generally uses our definition, but we have also used this to estimate the corresponding number of people on benefits at the end of the quarter, and a corrected measure of continuous duration. Also, some additional adjustments have been made to ensure that the liability estimates are accurate at a segment level.

17.7.2 Treatment of partners

MSD typically counts the number of primary beneficiaries. Partners of these beneficiaries may also receive benefits, but are not typically counted. We take an individual level approach to the valuation, where we treat these partners as beneficiaries in their own right. This will give higher numbers of clients on benefit than other MSD estimates.

18 VALUATION METHODOLOGY

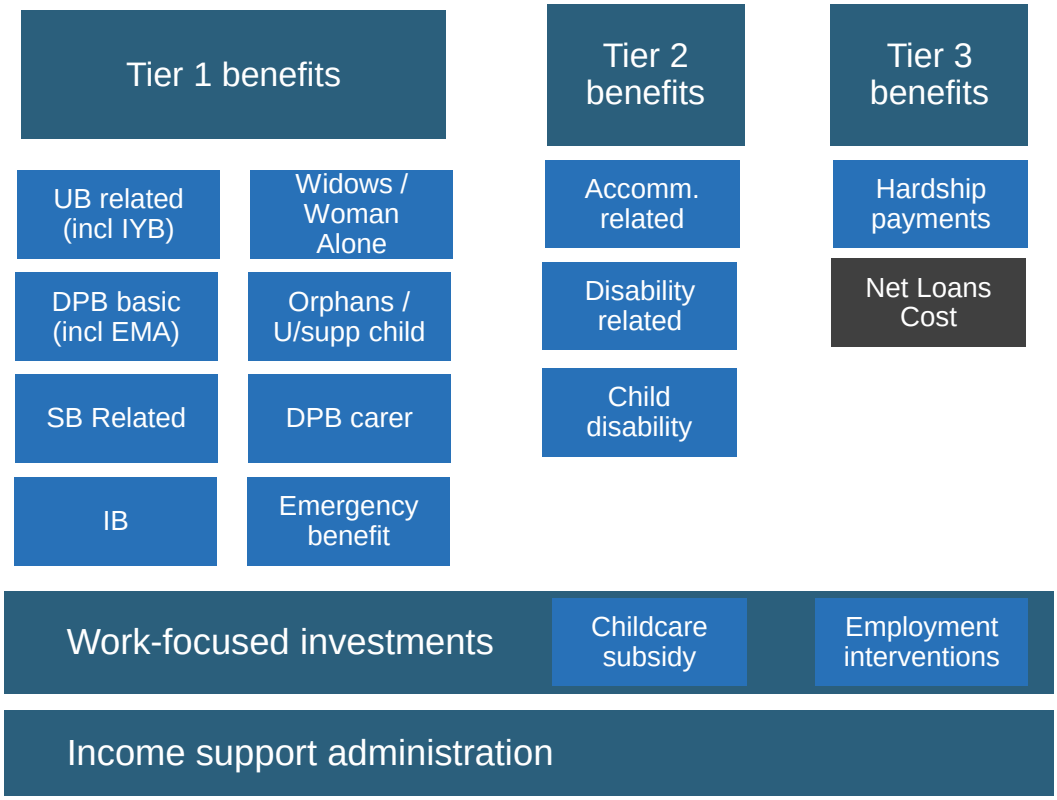
18.1 Structure of the valuation model: overview

In its broadest outline, the methodology for the estimation of the liability for future benefit payments consists of:

- Predicting the **future number of working-age clients** receiving benefits in all future quarters and **the payments** received by these clients, starting in the September 2012 quarter.
    - Note that in this report clients are restricted to those who have received a benefit in the year to 30 June 2012 or those who are expected to receive a benefit in the five years following that date**.**
- The payments are initially estimated in 30 June 2012 dollar values but are subsequently increased to allow for **inflation** from that date to the date of payment.
- The liability is estimated by:
    - Discounting these inflated claim payments to allow for **investment return**
    - Adding components for loan recoveries and MSD expenses.

The liability is estimated separately for each of the various components which are shown in Figure 18.1.

Figure 18.1 **Overview of valuation structure**



Section 18.2 discusses the definition of the liability and some of its implications in further detail.

In the previous valuation the Tier 1 benefits were separated into key benefits (Unemployment Benefit, Domestic Purposes Benefit, Sickness Benefit and Invalid's Benefit) and non-key Tier 1 benefits. These classes were modelled using different approaches. For the 2012 valuation all Tier 1 benefits have been modelled using the transition approach, as described in Section 18.3.

The Tier 2 and Tier 3 benefits (including childcare subsidy and employment interventions but excluding net loans cost) are modelled as additional amounts paid to clients, depending on their benefit state. Again, this is a departure from the 2011 Level I liability, where some of these benefits were modelled as independent payment streams.

Finally net loans cost, work-focused investments (excluding CCS and EI) and income support administration each have their own specific valuation approaches. These are discussed further in Sections 18.6 and 18.7.

18.2 Definition of the liability

Section 2.4 introduced the concept of the liability. This is divided into the following components:

- **Current client liability:** All future lifetime costs of benefit payments and associated expenses for working-age clients who received a benefit payment in the 12 months up to and including the effective date of the valuation

- **Future client liability years 1, 2, 3, 4 and 5:** All future benefit payments and associated expenses for working-age clients who enter the benefit system in the next five years either for the first time, or after being off benefit for more than 1 year at the previous 30 June

18.2.1 Benefit groups

The liability has been calculated for the following benefit groups. Translation to specific groups of payment codes is provided in Sections 7-13 as well as Appendix C:

- Tier 1 benefits include:
  - Unemployment Benefit (UB)
  - Invalid's Benefit (IB)
  - Sickness Benefit (SB)
  - Domestic Purposes Benefit – Sole parent (DPB)
  - Domestic Purposes Benefit – Care of Sick and Infirm (DPB-CSI)
  - Emergency Benefit (EB)
  - Unsupported Child and Orphan Benefit (OB)
  - Widow's Benefit (WB) and Domestic Purposes Benefit – Woman Alone (WA)

- Tier 2 benefits include:
  - Accommodation Supplement (AS)
  - Disability Allowance (DA)
  - Child Disability Allowance (CDA)
  - Childcare Subsidy (CCS)

- Tier 3 benefits include:
  - Employment Interventions (EI)
  - Hardship Assistance (HS)

18.2.2 Further discussion of the definition

Inclusion of recent recipients in current client liability

The current client liability includes those recipients who are currently receiving benefits as well as those who are not currently receiving but have received benefits sometime in the previous 12 months. We believe this choice is appropriate for the following reasons:

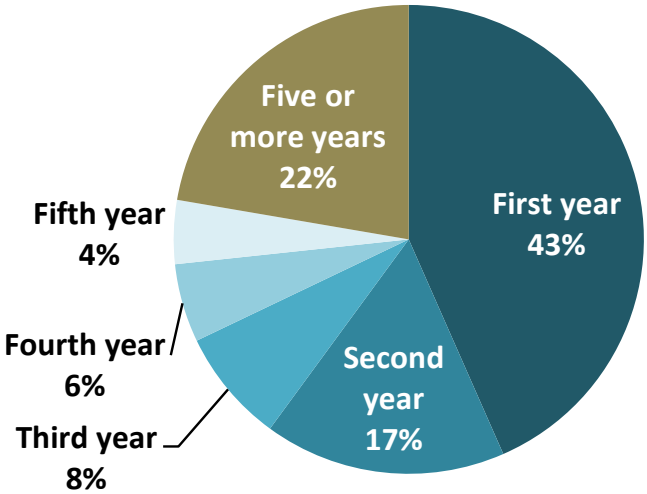
- **Reducing spell definition issues:** Defining those people on benefit at a specific point in time can cause complications. For instance, some benefits are provided in lump sum form so the spell duration is not obvious and some benefits can have small

breaks in spells. These factors have the potential to bias the liability upwards or downwards.

- **Recently off benefit clients have a higher probability of returning to benefits:** Of the former clients that returned to Tier 1 benefits in the 2010/11 and 2011/12 financial years, we calculate that 43% of them had been out of the system for less than a year; see Figure 18.2. This high percentage means it is appropriate to still consider them at risk. By contrast, only 17% of clients returning were in their second year off benefits and 8% in their third.

- **Reducing the potential for seasonal impacts:** The particular choice of the valuation date has relevance as there are many benefits that show seasonal effects, with differing numbers on various benefits on each quarter due to annual cycles in the economy. The 12 month rule helps mitigate this seasonality.

Figure 18.2 **Duration off benefits of former clients retuning to Tier 1 and Tier 2 benefits in the 2010/11 and 2011/12 years**



Working-age beneficiary assumption

The definition only includes those recipients of working-age; at least 16 and less than 65. We recognise that a small but not insignificant amount of benefits go to people beyond age 65, but have not valued this because:

- These payments are highly interrelated with New Zealand Superannuation, which is outside the scope of this valuation

- MSD intends to manage the liability by achieving better employment outcomes amongst current recipients. This objective has less relevance amongst clients over age 65

- Limiting attention to ages below 65 significantly simplifies the analysis and reporting of the liability

Also note that benefits payable to youths (aged 16-17) such as the Independent Youth Benefit ("IYB") and Emergency Maintenance Allowance ("EMA") have been included within the definition of working-age. This is because understanding the transitions and lifetime costs of clients entering the benefit system at a very young age provides important insight into the management of their liabilities.

Treatment of partners

Some benefits depend on relationship status and there are cases where both partners are on benefit. In theory it would be possible to value couples as a unit as their future lifetime cost are likely to be dependent. However, in the valuation we have treated all clients individually which is unlikely to make a material difference on the quantum of valuation.

One practical implication for this approach is that much of MSD's reporting is based around counting couples as single units. Thus there will be some differences in attempting to reconcile numbers in this report to other published numbers. It also means that partners of the primary recipients need to be allocated to segments, requiring us to generate our own measure of continuous duration, rather than using a measure supplied by MSD, which does not incorporate partner spells.

Future benefits different to those currently received

The definition above includes benefits payable in the future of a different type to those currently being received. For instance, a person who is currently receiving Unemployment Benefit may in the future receive Invalid's Benefit; these cash flows have been included. The purpose of incorporating all future cash flows regardless of benefit type is to provide a basis for understanding long term benefit dependency and to provide a framework for investment decisions to reduce such dependency.

We recognise that this property can cause a "gearing" effect in the valuation, in that distant liabilities that MSD may have little current control over are included or excluded from the liability depending on current circumstances. For instance, suppose it is expected that a person will begin receiving Invalid's Benefit in 20 years' time:

- If the person has not been on a benefit during the last 12 months, these cash flows are excluded from the liability
- However, if the person is currently or has been during the last 12 months on a different benefit (Unemployment Benefit say), these future cash flows are included.

Thus, helping an Unemployment Benefit recipient off benefits today would have a compound effect of removing both their Unemployment Benefit payments and other benefits from the current client liability as measured at a future valuation one year from now, even if those later benefits will still occur.

Some alternative liability definitions exist that would not be subject to this effect. For example, the liability could be defined as payments until a client is off benefits for 12 months. While we recognise some advantages to alternative definitions, we believe the current one is to be preferred for the following reasons:

- **Clients who are "in the social welfare system" are more likely to make use of other benefits:** For instance, in the example above an Unemployment Benefit recipient is

more likely to make use of the Invalid's Benefit in the future than someone who has never been in the system. Thus it is important to capture these effects to be able to manage long term dependency

- **Robustness:** The current definition is likely to be applicable under possible MSD policy and system changes, whereas this may be more difficult under more complex definitions;

- **Given the level of switching between benefits, it encourages a holistic view of client liability**: Under the current definition the key means of reducing the liability is to encourage people to leave the system entirely, rather than simply leaving their current benefit. We believe this most closely ties in with MSD's philosophy of encouraging long-term employment outcomes; and

- **Simplicity**: More complex definitions would be harder to communicate effectively and reconcile from year to year.

Relative size of future client liabilities

As agreed with MSD, we have calculated the future liability for each of the next five years where the future liability is the cost relating to clients that enter the welfare system in that year. In our 30 June 2011 report we defined the future liability as the amount relating to all clients that entered the system in the following years that had not received a benefit in the year to 30 June 2011 (i.e. those not included in the current liability). One practical difficulty of this definition is that the future liability appears to decline over time as the pool of potential clients who had not entered the system shrinks.

In this valuation we have changed the definition of future liability to the lifetime cost relating to all clients that receive a benefit in each future year who had not received a benefit in the previous 12 months.

To illustrate the differences in these definitions, consider a client who:

- Had received UB in March 2012
- Was not on benefits at the valuation date
- Received no benefits over the 2012/13 year
- Received further UB benefits in 2013/14

Under the previous definition, this client was counted only in the current client liability. However under the new definition the client received no benefits in the year to 30 June 2013, so is counted in the 2013/14 future liability year.

While we prefer this new definition a practical issue that arises is that there is some double counting of cash flows in the current and future liabilities. In the example above, cash flows relating to the client are now included in both the current liability and the future liability for 2013/14. Thus if the cash flows (or liabilities) related to this client were added without adjustment there would be some double counting. In general all future liability, years apart from the first future year, will have some degree of double counting of liabilities.

Therefore, in our results sections where we present future cash flows and numbers on benefits, combining current and future liabilities, we have adjusted the projections related to future liability to remove this double counting.

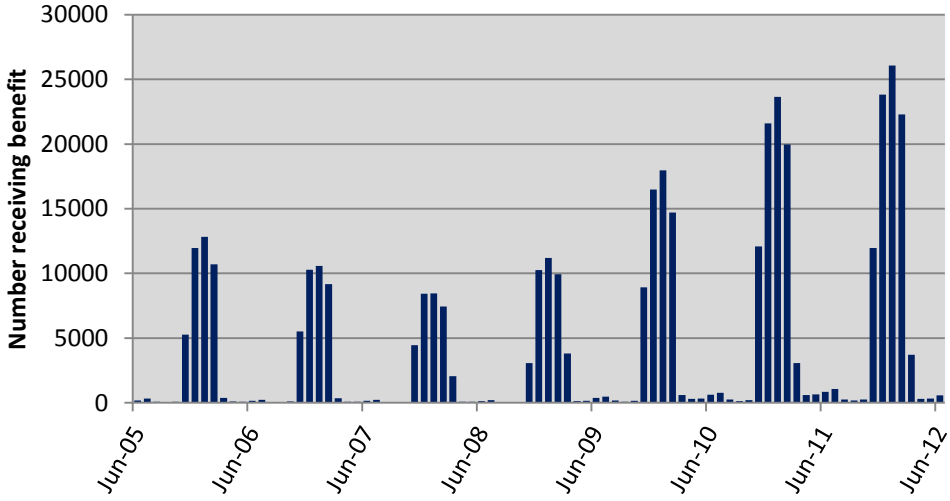
Exclusion of Unemployment Benefit – Student Hardship

As in the previous valuation, it was judged that the Unemployment Benefit – Student Hardship was not an appropriate benefit type to include in the valuation for the following reasons:

- All other financial assistance provided to students is excluded.
- The benefit is highly seasonal - students only receive the benefit if they cannot find employment in the summer holidays – see Figure 18.3. This pattern is less amenable to management, as the concept of a long term beneficiary is not applicable.
- The relationship between this benefit and other key benefits is fairly uncertain and has the possibility of skewing the main valuation transition models.

Therefore client spells on this benefit have been ignored, both in terms of projecting cash flows and determining qualifying clients to include in the cohort to be valued.

Figure 18.3 **Monthly numbers receiving Unemployment Benefit - Student Hardship**



Valuation of CCS, EI and HS components

The estimation of liabilities for Childcare Subsidy (CCS), Employment Interventions (EI) and Hardship Assistance (HS) was treated somewhat differently as it was considered that clients receiving these benefits should only be judged as being in the benefit system if they were also receiving another benefit. For CCS, there were three main reasons behind this decision, both theoretical and practical:

- (Theoretical) The receipt of CCS only is not a strong indicator of a greater chance of receiving the main benefits.

- (Practical) It is useful to separate those receiving CCS only from those receiving CCS in conjunction with another benefit. For example MSD might want to reduce overall benefits being paid by increasing the number receiving CCS.

- (Practical) The data for CCS is in an ad hoc file with no spell information.

Similar points apply to the two (groups of) Tier 3 liabilities. Additionally, HS and EI benefits cover a range of payment codes whose relationship to the other Tier 1 and 2 benefits varies. For this reason it was judged simplest to exclude them from the definition of being in the system for the purpose of liability.

In the 2011 valuation we valued CCS, HS and EI payments to clients who had received at least one of those benefits in the past 12 months but not any other Tier 1 or Tier 2 benefit. These components were relatively small (<0.5% of the current client liability) and have not been valued in 2012.

18.3 Main modelling structure

Each client is assumed to be in a single benefit state each quarter, out of a possible ten states. The rationale for this and the actual definitions for the 10 states were discussed in Section 17.5. Clients then move between states from quarter to quarter and have expected payments assigned, depending on their state. Given this general structure two broad types of model are needed:

- Transition models, which model the probability of remaining in the current state, or moving to each of the other 9 states, for each quarter
- Payment models, which calculate the average benefits received by the client given their current state

We discuss these two groups in turn.

18.3.1 Transition models

The modelling involves producing probability estimates for transitioning from any given state to any other each quarter. These probabilities will depend on a client's state as well as other modelling variables, listed in Section 18.3.3. Further detail on the exact nature of the transition models are given in Appendix D.

Rationale for the transition model approach

The transition model approach focuses on understanding how people move through the system over time. It is worth mentioning here that there exist alternatives to such an approach (see for instance, the snapshot based approaches used in Section 15 for the segmentation analysis). However, we have chosen the transition approach for a number of reasons:

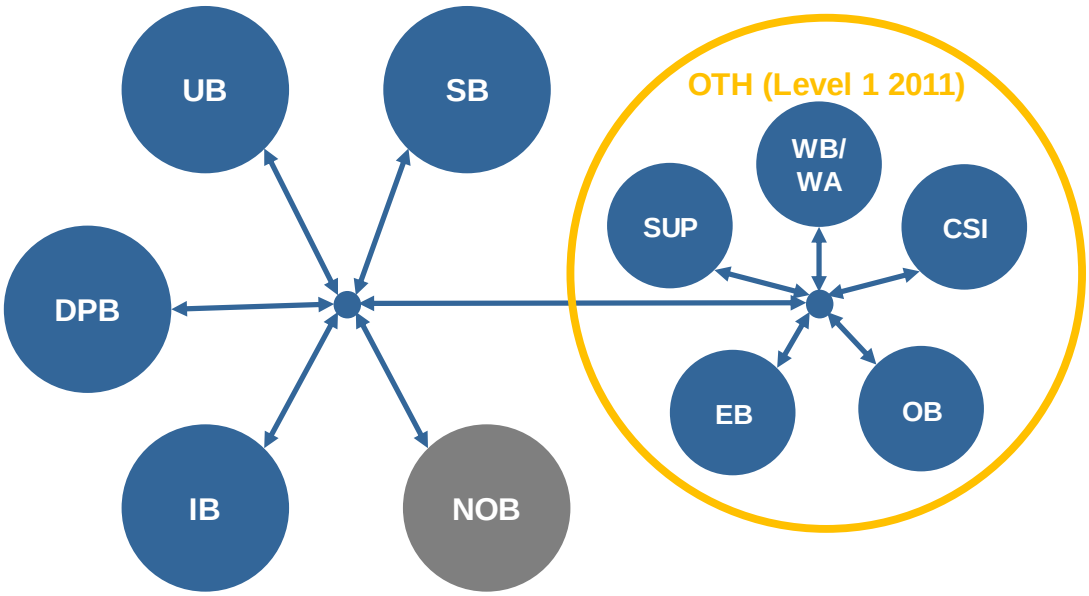
- **Responsiveness:** Changes in movement behaviour observed in recent years can be correctly reflected in the models.

- **Long range accuracy:** We are able to leverage the behaviour of clients at various stages of the welfare system to make appropriate long range assumptions. For instance, the behaviour of older clients can be used to model the behaviour of the younger clients in the distant future.
- **Intuitive appeal:** A focus on measures such as probability of entering/exiting benefits is natural, and will allow easier drill down analysis.
- **Consistency:** The approach worked well in both the first aggregate level (Level I) valuation and the first segment level (Level II) valuation performed on 2011 data.

The 2012 valuation approach compared with the 2011 Level I valuation

The ten states are illustrated diagrammatically in Figure 18.4. In the 2011 Level I valuation, the five smaller states in the figure were aggregated into a single state ("Other"). However in the current valuation a few extra models have been added to separate the transitions into the smaller states; this provides a much more complete picture of movement through the system, necessary for understanding the current client liability at a segment and cohort level.

Figure 18.4 **States in the adopted 2012 valuation transition model**



18.3.2 Payment models

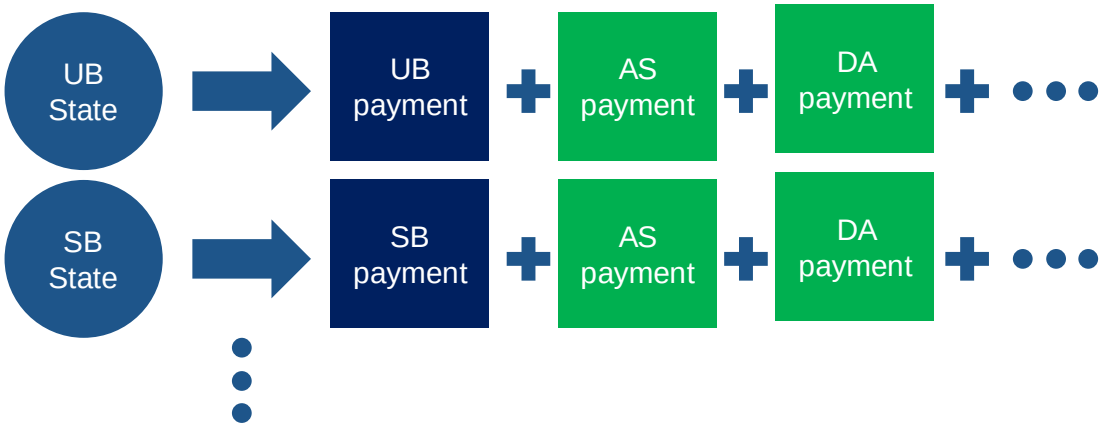
Clients in each state can receive a number of different benefit types simultaneously:

- Their main Tier 1 payment
- Accommodation supplement
- Disability allowance
- Child disability allowance
- Childcare subsidy
- Hardship assistance

- Employment intervention payments

If we want to be able to distinguish between these various benefits, then separate models are required to estimate each. The models also need to be sensitive to the current state of a client, as well as all their other characteristics listed in Section 18.3.3.

Figure 18.5 **Schematic of payment models fit to benefit state**



These models are summarised in Table 18.1, which shows the payment models required for each of the states. More detail on the modelling approach adopted for each is given in Appendix D. The "Main T1" column reflects our approach to aggregate all Tier 1 benefits paid to an individual in a given quarter. These payments are allocated to the one benefit state, notwithstanding the possibility a client might receive more than one type of Tier 1 benefit in a quarter (see Section 17.6). The Loa1 model refers to recoverable assistance payments made to clients. These are later partly offset by recoveries of recoverable assistance – see Sections 18.6 and 13.

Table 18.1 **Payment models attributable to each state**

Benefit state	Benefit type								
	Main T1 (excl OB)	OB	AS	DA	CDA	CCS	HS	EI	LOA1
DPB	●	●	●	●	●	●	●	●	●
IB	●	●	●	●	●	●	●	●	●
SB	●	●	●	●	●	●	●	●	●
UB	●	●	●	●	●	●	●	●	●
CSI	●	●	●	●	●	●	●	●	●
EB	●	●	●	●	●	●	●	●	●
WB/WA	●	●	●	●	●	●	●	●	●
OB	●		●	●	●	●	●	●	●
SUP			●	●	●	●	●	●	●
NOB						●	●	●	●

There is an important point to note regarding the non-main payment models (that is, every column of models except the first in Table 18.1). These payments represent an average value across people in a given benefit state; thus to take an example, the AS model for those in the UB state model estimates the average AS paid to clients receiving UB, conditional on all their attributes like age, gender etc. However in reality some UB clients receive AS and some do not, so at an individual level these payment models are misleading since the actual AS payments will usually be much higher (if the client receives AS) or much lower (if they do not). Thus these payment levels are appropriate for the aggregate and segment level valuation, but must be interpreted carefully when inspected at an individual level. Distinguishing between the cases of receipt of supplementary payments at an individual level is beyond the scope of this valuation.

While there are a large number of payment models, we note that the relative significance of them differs greatly. Table 18.2 shows the percentage of total payments in 2011/12 that apply to each of the models. The main Tier 1 benefits for DPB, IB, SB and UB plus their corresponding AS benefits equals 80% of the total payment cost, with the remaining 74 payment models representing the remaining 20%.

Table 18.2 **Relative size of payment category, 2011/12 financial year**

Benefit state	Benefit type								
	Main T1 (excl OB)	OB	AS	DA	CDA	CCS	HS	EI	LOA1
DPB	25.0%	0.2%	5.4%	0.2%	0.3%	0.7%	1.2%	0.1%	0.8%
IB	19.4%	0.1%	1.9%	1.0%	0.1%	0.0%	0.7%	0.0%	0.3%
SB	11.5%	0.1%	2.4%	0.3%	0.0%	0.0%	0.6%	0.0%	0.3%
UB	11.4%	0.1%	2.1%	0.0%	0.0%	0.0%	0.5%	0.2%	0.3%
CSI	1.7%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EB	0.6%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WB/WA	1.7%	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
OB	0.9%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SUP			3.3%	0.1%	0.8%	0.7%	0.2%	0.0%	0.1%
NOB						1.0%	0.1%	0.0%	0.1%

18.3.3 Modelling variables

Both the transition and payment models use a number of variables to adjust predictions for the client being simulated. The following variables were allowed for in the valuation:

- Benefit quarter and the corresponding unemployment rate
- Client age
- Gender
- Number of quarters:
  - On current benefit
  - Since first benefit
  - Spent in each of the various benefit states
- Ethnicity
- Region
- Youngest child age and number of registered children (for DPB clients)
- Partner flag (IB, SB, UB and EB clients)
- Incapacity type (IB and SB clients)
- Whether the incapacity belongs to the client's partner (IB and SB client)

Education level was considered as a predictor (and was included in the Level II work of Part D.1), but was omitted for a number of practical reasons:

- A large number of clients did not have their education level collected
- It was unclear how often the field was updated, or how regularly client's education level changed

The omission of certain variables does not mean they are unimportant. Rather, it indicates that our results can be viewed as an average over that variable. Thus in the case of education level, although it is highly predictive the results for individual cohorts reflect the average education level for that cohort.

MSD subsequently requested the valuation be performed including education level as a predictive variable, notwithstanding the poor quality of the data. The results of this valuation are included in Appendix K. Improved education data is being sought from MSD for the 30 June 2013 valuation.

18.3.4 Further implications for the transition methodology

One assumption imposed by the key benefit transition model is that each client can be on just one benefit per quarter. This is clearly a simplifying assumption, because in reality:

- Unless someone transitions to a new benefit on the last day of the quarter, any transition would involve more than one actual state in the quarter
- There are quite often gaps in spells, meaning that NOB in conjunction with another benefit is common

The key advantage of the assumption is that the sum of the number of clients in each state equals the number of clients being modelled, reducing difficulties related to double counting. The average benefit payment models are fitted to balance out the impact of multiple payment types in the one quarter.

Given the one state assumption, an obvious question is how that state is assigned when more than one is present in a quarter. This treatment was discussed in Section 17.5.

Three implications of this formulation are:

- The sum of numbers of clients in the eight Tier 1 states gives the number of people who receive any Tier 1 benefit in a given quarter
- The sum of numbers in the eight Tier 1 states plus those in SUP gives the number of people who receive any qualifying benefit in a given quarter
- The numbers in NOB are genuinely those who receive no (qualifying) benefit. One further implication of this is that anyone who has been in the NOB state for all of the four quarters to 30 June 2012 is not part of the current client liability definition.

These properties, particularly the last, mean that the definition of benefit states aligns well with the definition of the liability.

18.3.5 Retirements

Recall that the definition of the liability only includes payments to working-age recipients. The age of individual clients, in quarter years, is tracked throughout the projection and increased each quarter. This allows us to remove clients from the liability when they turn 65. Thus, when someone is aged 64.75, all transition probabilities other than the transition

to retirement are set to zero, meaning that the probability of retiring is one. When a client is younger than 64.75, the probability of retiring from the system is zero.

Additionally, we have allowed for the change in the retirement age from 60 to 65 (which occurred over the period 1992 to 2001) in the historical data modelling; to not do so would bias upwards the probability of moving to the NOB state in ages 60-65.

18.4 Projecting the client base

18.4.1 The projection cohort

The projection of the current client liability commences with the June 2012 current client liability cohort: this consists of those who have received a benefit in the previous 12 months. For each of the recipients, the appropriate modelling variables are collected and they are also allocated to segments.

For each future quarter starting with September 2012, the transition probabilities are calculated and then applied to the cohort at the start of the quarter.

Simulated versus exact projection

A key choice in projection design was between calculating an exact liability and using a simulation approach:

- **Exact:** tracks every possible outcome for each client for every future quarter and its associated probability. This process has a heavy computational load due to the many possible outcomes.

- **Simulation:** follows each person through time, using the transition probabilities to simulate their path. This process is then repeated many times. This is also computationally intensive, though less so than the exact approach unless a very large number of simulations are run.

In many ways the exact approach is preferable – for instance it gives more correct estimates of the mean and on the relative likelihood of rarer events. This approach was taken in the 2011 valuation. However, the addition of extra benefit states and modelling variables makes the exact approach computationally infeasible.

We have adopted the simulation based approach for the 2012 valuation. The results presented make use of 200 independent runs of the projection. Based on an analysis of simulation variability, we believe the estimated mean should be within 0.01% of the true mean that would have been obtained from an exact approach.

Further details on computational aspects of the projection are included in the electronic appendices.

18.4.2 Projection of future client liability

In principle, the future client liability projection works in the same manner as the current client liability, i.e.:

- First, identify the number of clients entering the benefits system as part of the future client liability for each quarter of the next five years (twenty quarters in total)
- Choose appropriate modelling variables for these clients (age, gender etc.)
- Project the benefit payments to these clients using the approach described in Section 18.4.1 above
- Repeat the simulation a number of times to obtain a reliable estimate of the mean

The future client liability is defined as comprising those cohorts who receive benefits in the next five years who are either new to the system or have been off benefits for more than 12 months before the most recent 30 June (Section 2.5.1). We model this by:

- Building a model of aggregate numbers entering each benefit type each quarter. This depends on macroeconomic variables such as population growth and unemployment rates.
- Randomly sampling client characteristics from the equivalent population of people entering the system in 2011/12.
- Projecting the sampled clients forward.

In the previous valuation the future client liability was split into client returns and new entries. The current approach treats these groups simultaneously, and assumes that the distribution of new entrants versus returns will be similar to that seen in 2011/12.

Total results are obtained by summing the 20 quarterly cohorts of future clients into five annual cohorts and discounting their lifetime liabilities into the middle of each year. Related results are presented in Section 4 and Section 12.

18.5 Dynamic variables

Some of the modelling variables tend to remain fixed over the projection – for example gender and date of birth. However other variables, such as duration and registered children will evolve over the course of the projection. We refer to these variables as "dynamic". The pattern of this evolution needs to be modelled and allowed for. We describe our treatment for each of the dynamic variables below.

The performance of the dynamic variables is checked in the back-testing process, described in Section 18.8.2. More detail on the adopted models for dynamic variables is given in Appendix D.

18.5.1 Client duration

A number of duration measures are tracked over the course of the valuation – number of quarters on the current benefit, number of quarters since first benefit, a continuous duration measure, and counters of the number of quarters in various states. These evolve in a fairly natural manner:

- Number of quarters on current benefit is incremented each quarter and reset upon transition.
- Number of quarters since first benefit is incremented each quarter.
- Continuous duration is incremented each quarter if the client is not in the "Not On Benefit" state. Further, a model is run to determine the likelihood of a brief spell off benefits during the quarter, which is used to reset the continuous duration.
- The variables indicating the number of quarters in various states are incremented depending on the client's projected state.

18.5.2 Region

We have built simple models to simulate how people move between regions, while they are on benefits and while they are off. These depend on

- A client's current region
- Their benefit and duration on that benefit
- Time trends
- Age
- Ethnicity

The probability of moving to a different region is calculated each quarter as part of the projection. If they do move, they are randomly allocated to a region based on historical movement patterns.

18.5.3 Incapacity type

While clients are in IB or SB their incapacity type is used as a predictor variable, using about 15 different incapacity groups. We have models that allocate:

- Incapacity type upon entry into SB or IB
- The probability of incapacity type changing while in SB or IB
- The type of incapacity changed to if there is a change while in SB or IB

These models rely on a number of client characteristics:

- Age
- Client duration
- Current incapacity type (if applicable)
- Current benefit state
- Ethnicity
- Trends over time

18.5.4 Partner related variables

Two partner related variables are maintained in the projection. The first is a flag indicating whether the partner is also registered on the benefit, applicable for UB, SB, IB and EB. Secondly we have a flag indicating whether it is the partner who carries the incapacity for IB and SB. We estimate the evolution of these flags:

- When people enter the appropriate benefits
- While people remain on benefits

These models depend on:

- Client age and gender
- Duration on benefits
- Current benefit type
- Existing partner status
- Ethnicity
- Trends over time

18.5.5 Child related variables for DPB recipients

The number and ages of registered children for DPB recipients is highly predictive of both average benefits paid and the likelihood of moving to other benefits or out of the system. However, the use of the child related variables introduces a number of issues:

- People not currently on DPB do not necessarily have any child related information recorded

- There will be changes to the children of a DPB beneficiary going forward in time (new children being born, children becoming older than 18 and therefore becoming independent, children living with a different carer etc.)

- There is a cost to adding more variables in terms of computation time, both from the requirement to update more variables and from the need to store more information at each iteration

Consequently, a number of pragmatic decisions have been made to deal with children, striking the balance between retaining useful information for modelling and projecting and keeping the computational burden at manageable levels. We retain two child related variables, being the **number of children** and **age of youngest child**. There are three possible values for number of children: 1, 2 or “3 and higher”. We then model:

- The distribution of child numbers and youngest age upon entry into DPB. These depend on client age only.
- The probability of a change in the youngest registered child while on DPB. This depends on age, gender, child age, duration on benefit, ethnicity, plus some time trends.
- The distributions of child numbers and youngest ages, given the outcome of the new youngest child model. These also depend on the same variables as listed in the previous bullet point.

18.6 Net loans cost

There are a number of ways in which clients become indebted to MSD. For the purposes of this valuation all debts to MSD are termed "loans":

Loans arise for the following reasons:

- **Overpayments:** Where a client is paid more than their entitlement, on discovery this gives rise to an amount to be recovered by repayment or deductions from benefits
- **Overpayments due to fraud:** Where there are overpayments and there is sufficient proof to refer clients for prosecution for fraud this gives rise to an amount to be recovered by repayment or deductions from benefits
- **Benefit advances:** Where a client is advanced a benefit for reasons such as hardship, which is later recovered by deductions from benefits, or repayment if the client no longer receives benefits
- **Recoverable assistance:** income-tested, interest-free recoverable financial assistance to clients and non-beneficiaries for defined needs

In this valuation the various subcomponents relating to type of loan and recovery have been valued separately. The sections below detail the approach taken to each, noting that we have combined overpayments and fraud to form one category "overpayments" and combined benefit advances and recoverable assistance to form a second category "recoverable assistance".

For completeness we should also mention underpayments which occur when MSD pays less to a client than their entitlement. When this is discovered the client is paid in full. Underpayments are not valued separately as the data supplied has been corrected for all known past underpayments.

Results for all loan subcomponents are discussed in Section 13. Summary results in Section 4 present the combined total of all subcomponents as a "net loans cost".

18.6.1 Overpayments

The rate file data provided is net of the first two items listed in section 18.6 – overpayment and fraud are corrected when MSD is made aware of them. If recoveries were made immediately and in full then there would be no need to value these components as part of the liability. However,

- Not all overpayments and fraud debts are fully recovered
- It can take a number of quarters to collect amounts that are recovered. Since no interest is charged on these amounts, this lag represents a cost to MSD due to the time value of money

For this reason we have constructed models for combined overpayments and fraud combined. These models involve:

- Estimating the level of overpayments/fraud as a percentage of total welfare payments.
- Estimating quarterly factors for the growth in total debts raised for clients who have nonzero outstanding debt. That is, modelling how raised debts can continue to increase.
- Estimating the proportion of outstanding debts that is either recovered or written off, given the number of quarters since the original debt was raised.
- Estimating the allocation of this last amount to recoveries and write-offs.

These models can then be applied to both the outstanding balances at the valuation and the projected future welfare payments, giving four distinct components related to overpayments and fraud:

- Further overpayments/fraud on existing debtors
- Recoveries on overpayments/fraud on existing debtors
- Overpayments/fraud related to future payments on new debtors
- Recoveries on overpayments/fraud related to future payments on new debtors

18.6.2 Recoverable assistance

As noted above we have used the term "recoverable assistance" to include all types of benefits and assistance that are recoverable (excluding overpayments and fraud). Thus recoverable assistance includes benefit advances and recoverable Special Needs Grants (SNGs), as well as a few very minor related payments. In the provided data the payments related to recoverable assistance are included under specific benefit codes, and recoveries are included in the loan datasets. As with overpayments/fraud, the costs associated with recoverable assistance relate to the non-recoverability of some assistance as well as any associated time lags.

The following methodology has been used for recoverable assistance:

- The payments have been estimated in the same fashion as the *other benefits and assistance*
- The recoveries have been estimated as a simple percentage of recoverable assistance payments

The amount of recoveries related to recoverable assistance has been relatively stable over the past few years when compared to recoverable assistance payments. For this reason we believe that a simple percentage adjustment to the liability for loan recoveries is appropriate. This is discussed further in Section 13.

18.6.3 Limitations to the loans methodology

Although we believe our valuation of the net loans cost is a plausible forecast of future cash flows, there are a number of significant limitations to the approach:

- Consider that the amount of fraud and overpayments recovered is comprised of the following 3 components:

    - The total amount of fraud and overpayments and as a percentage of total benefit payments in the system
    - The percentage of total fraud and overpayments detected
    - The percentage of detected fraud and overpayments recovered

- The valuation provides an assessment of the last component listed but neither of first two. In our opinion, the first two items are at least as important if not more so than the last. Hence, for complete financial control of the fraud and overpayments in the system an expanded framework compared to what is possible within this valuation is required. Also note that caution needs to be exercised when using results from the valuation in relation to this component. Without knowing whether the total amount of fraud and overpayments in the system is stable it would be difficult to draw definitive conclusions about performance in recoveries. For example, reduced recoveries may not be indicative of deteriorating performance in detection but a sign of an overall reduction in fraud and overpayments.

- Data for debts raised prior to June 2007 are not available. This makes modelling the behaviour of "old" debts very difficult – the extrapolations carry extra uncertainty. Furthermore, outstanding debts raised before this date are not classified according to overpayment/fraud/recoverable assistance, so this split must be approximated.

- There was some uncertainty as to whether the main rate files were net of loan adjustments (e.g. when it is realised that an overpayment was actually correct). Adjustments represent about 7% of total recoveries.

- A small proportion (about 9%) of both existing and new debts relate to clients outside the scope of the valuation, i.e. to clients over age 65. Removal of these debts would be difficult due to the format of the data. In any case, the overall impact of their inclusion is negligible in the context of the valuation.

- The assumption that Recoverable Assistance recoveries are a straight proportion of corresponding payments assumes the dynamics of this loan type are stable. For instance, it ignores the amount of Recoverable Assistance debt outstanding at any given point in time, even though changes in this could well impact the size of recoveries.

We believe a more detailed analysis of loans is possible that better captures the dynamics of loans and recoveries, as well as giving some insight into the total level of overpayments and fraud, not just the detected level. However, such an analysis is beyond the scope of the current valuation.

18.7 MSD Expenses

MSD incurs expenses in delivering benefits, services and programmes in addition to the cost of the benefit payments. These can be broadly categorised into:

- Administration costs, such as costs related to processing benefits for working-age adults

- Programme costs, such as those services provided to help clients prepare for, and return to work, which prevent or reduce the duration of benefit receipt

These costs, to the extent they are attributable to the current and future client liability cohorts, are added to the liability estimates. The detailed scope of expenses included within the valuation can be found in Appendix C.

Unlike demand-driven benefit receipt, the level of expenditure is determined each year through the budget process, and tends to remain relatively stable. Annual expenses as well as 2012/13 budget expenses have been provided to us. Our methodology for determining the liability for administration and programs is:

- To assume the total expense costs are **fixed in real terms**
- Allocate expense costs to either current client liability, future client liability, or clients outside the scope of this valuation
- Proportionally allocate these expenses into the various categories listed below.

The categories used for allocation of expenses are:

- Income support administration
  - Benefit processing ("income" share of Tailored Sets of Services to Help People into Work or Achieve Independence appropriation)
  - Integrity services
  - Collections
  - Temporary measures (e.g. Canterbury earthquake)
- Work focused investments
  - OSCAR (Out of School Care and Recreation subsidy to providers)
  - Training and employment support (includes Employment Assistance, Vocational Skills Training, Mainstream Supported Employment Programme, Youth Transition Services)
  - Work-focused case management (includes "work" share of Tailored Sets of Services appropriation; e.g. Job Connect, employment coordinators, work brokerage)

Note that Tailored Sets of Services were apportioned by MSD between income support administration and work focused investments on the basis of time survey data. Results for expenses are discussed in Section 14.

18.8 Model checking and validation

As with the previous valuation, all aspects of the modelling were heavily tested for appropriateness. The two main tools for this were:

- Generalised linear model (GLM) based diagnostics for the individual transition and payment models
- Backtests on historical cohorts to check the projected cohorts tracked the actual reasonably closely.

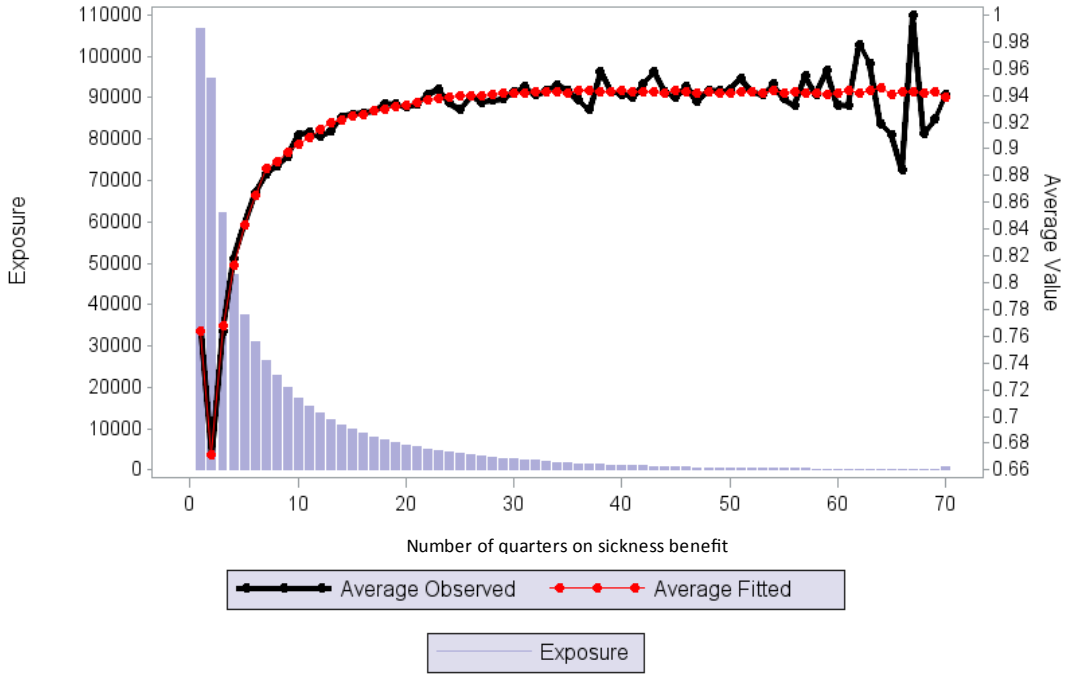
More details are provided in the following subsections.

18.8.1 Typical GLM diagnostics

Actual versus expected plots

One key graphical diagnostic is the actual versus expected plot. As the name suggests this involves graphing the average actual values and the average expected (or "fitted") values against a chosen predictor.

Figure 18.6 **Probability of remaining in SB by number of quarters on benefit**



Studying a range of these charts allows identification of possible regions of misfit. The diagnostic is also very flexible, for example:

- By choosing specific cohorts of the modelling datasets, it is possible to test the need for further interactions. For instance, plotting the Actual versus expected chart for age using only male clients can reveal age-gender interactions.
- The charts can be used to determine whether variables can be omitted completely, simplifying an analysis – this is useful when variables are highly correlated.
- Plotting against the time variable and comparing to key economic variables gives insight into the extent to which the economy impacts on behaviour.

We have produced and checked thousands of actual versus expected charts in constructing the various GLMs.

Parameter significance tables

The statistical significance of every term (for instance, an effect for a specific client age range) is tested. This is useful in determining whether an effect is "real", or likely to be an artefact of the random fluctuations in the datasets. These tables give significant insight into the appropriate complexity needed for the GLMs.

AIC monitoring

The Akaike Information Criterion, or AIC, is a useful overall score for goodness of fit for a model. This is particularly useful in simplifying and grouping effects relating to each variable; for example, if two districts can be grouped together and the AIC improves, this is good evidence that they behave similarly and a more parsimonious model is achieved.

This score is monitored throughout the modelling process, particularly for the transition models.

18.8.2 Backtests

It is difficult to gain a sense of the overall performance of the transition structure without combining them into a backtest, where the models are applied to some pretend historical valuation date and the projected evolution of the models compared to the actual evolution. We have done this, breaking down the results in a number of ways, such as:

- Examining backtest performance at different historical starting dates
- Examining performance at an aggregate, benefit, and segment level
- Examining the evolution of predictor variables as well as benefit state

These tests are done "in-sample", in the sense that the make use of time effects added over the course of modelling. Thus it cannot be used to estimate of accuracy of the valuation projection, which does not allow for new trends emerging from policy changes and other sources.

As an example of the types of results investigated, we present a few outputs from the 30 June 2000 backtest. Figure 18.7 shows the comparison for number of people in the UB state, which performs well with the exception of the GFC years which is slightly overfit. Figure 18.8 shows how the average age for these UB recipients slowly grows, with a slight reversal in the GFC years where many young people entered the benefit.

Figure 18.7 **Total number of UB clients, June 2000 backtest**

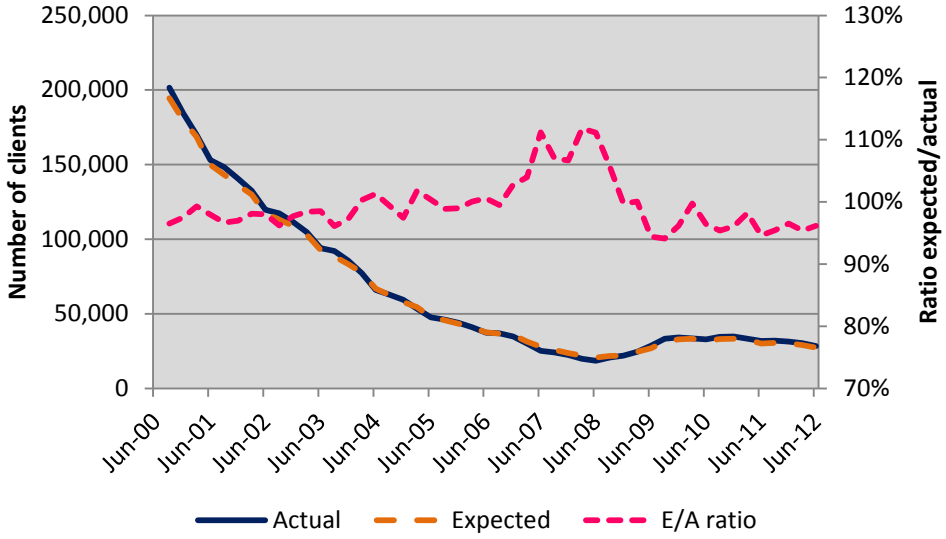


Figure 18.8 **Average age of UB clients for June 2000 backtest**

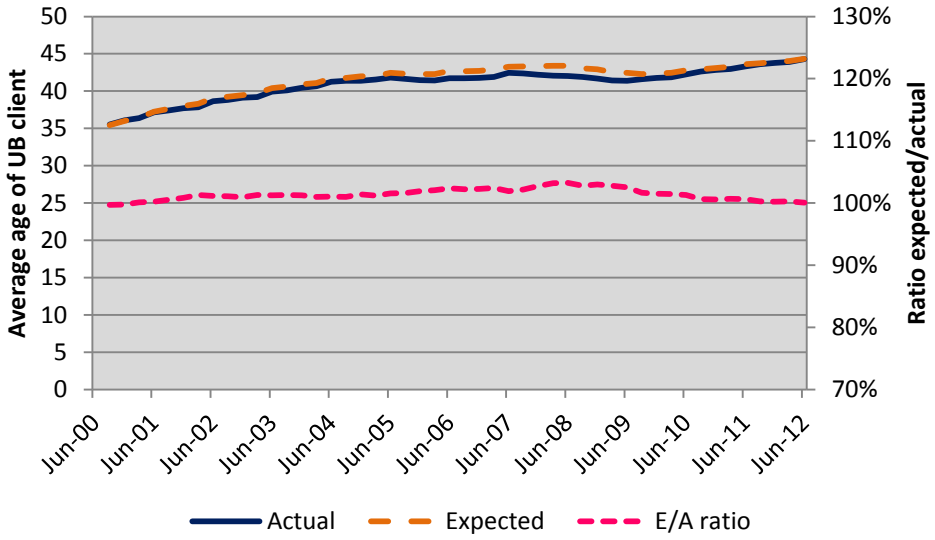


Figure 18.9 shows the number of DPB clients of those that start in the sole parent segment with youngest child aged 3-5 at June 2000. Again, the decay pattern has been captured fairly accurately. Figure 18.10 shows how the average number of registered children in this group grows and then shrinks over the 12 years of the backtest.

Figure 18.9 **Number of DPB recipients, of those starting in the sole parent child aged 3-5 segment**

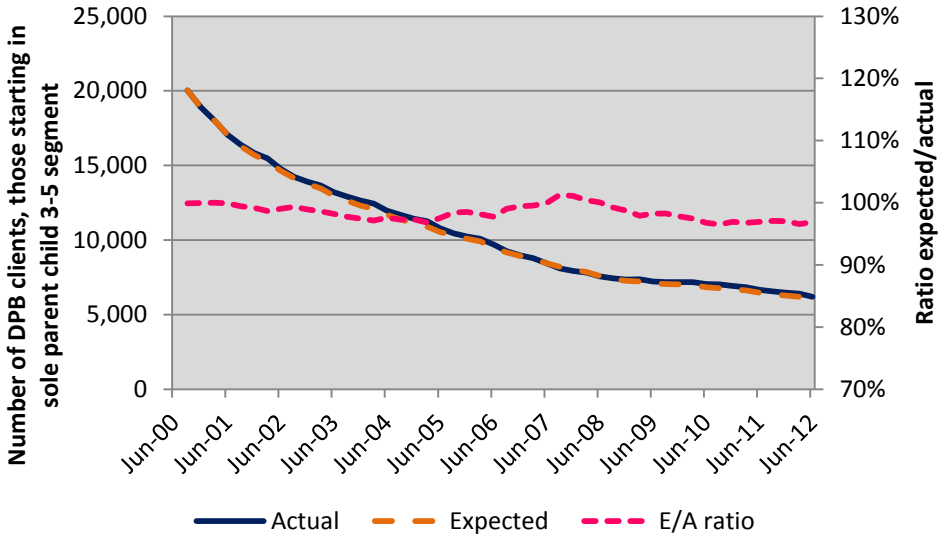
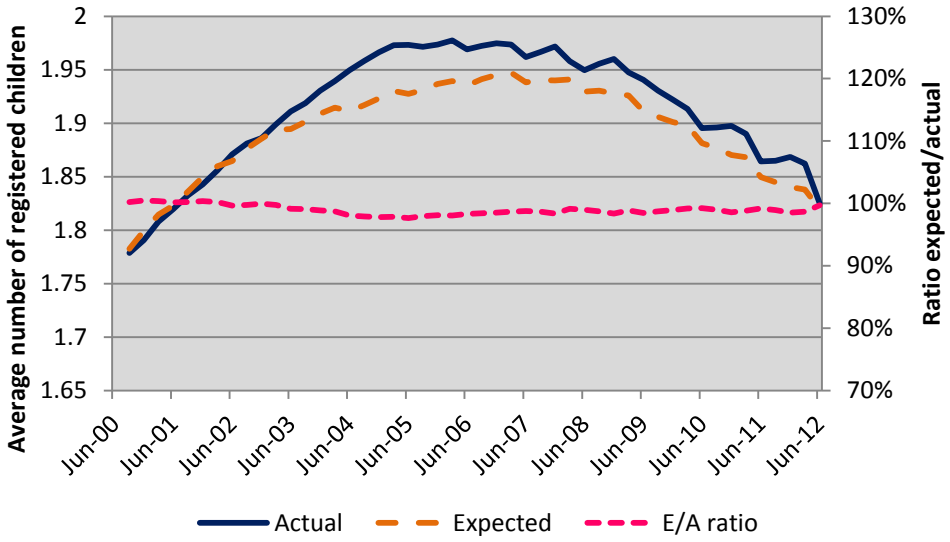


Figure 18.10 **Average number of children, of those starting in the sole parent child aged 3-5 segment**



19 ECONOMIC ASSUMPTIONS

19.1 Introduction

Section 2.5.6 discussed that the liabilities estimated in this report are on an inflated and discounted basis. Furthermore many of the models described in Section 18 use the level of unemployment as a predictor. Therefore the following economic assumptions are required:

- Future inflation rates
- Future discount rates (also referred to as rates of investment return)
- Unemployment rates (as published by Statistics New Zealand in its Household Labour Force Survey)

In order to ensure consistency across valuations reported to the Crown, Treasury releases account assumptions for CPI and discount rates. As agreed with MSD and the Treasury these rates as applicable at 30 June 2012 are used here. Projected unemployment rates have also been provided by Treasury, with some slight modification to reflect experience since their May 2012 forecast.

Quarterly series of adopted assumptions are included in Appendix B.

19.2 Future benefit (CPI) inflation

The future assumptions for CPI inflation are given in Table 19.1.

Table 19.1 **Future benefit (CPI) inflation**

Year ending 31 March	CPI
	%
2013	2.1
2014	2.4
2015 & later	2.5

CPI adjustments to benefit rates are usually made annually on the first of April each year. We have allowed for CPI inflation adjustments on this annual basis, although we recognise that this perhaps over-simplifies some issues, such as the region based recalculation of AS rates.

19.3 Future rates of investment return

Treasury has supplied a schedule of future rates of investment return to be used for discounting liabilities as at 30 June 2012. These are detailed in Table 19.2.

Table 19.2 **Rates of investment return assumed**

Year ending 30 June	Years from valuation date	Forward rate at June	Spot (discount) rate
		%	%
2013	1	2.43	2.43
2014	2	2.47	2.45
2015	3	2.77	2.56
2016	4	3.25	2.73
2017	5	3.66	2.92
2018	6	3.93	3.08
2019	7	4.07	3.23
2020	8	4.17	3.34
2021	9	4.25	3.44
2022	10	4.29	3.53
2023	11	4.32	3.60
2024	12	4.43	3.67
2025	13	4.58	3.74
2026	14	4.73	3.81
2027	15	4.88	3.88
2028	16	5.03	3.95
2029	17	5.18	4.03
2030	18	5.33	4.10
2031	19	5.48	4.17
2032	20	5.63	4.24
2033	21	5.78	4.32
2034	22	5.93	4.39
2035	23	6.00	4.46
2036	24	6.00	4.52
2037	25	6.00	4.58
2038	26	6.00	4.63
2039	27	6.00	4.69
2040	28	6.00	4.73
2041	29	6.00	4.78
2042	30	6.00	4.82
2043 & later		6.00	

19.4 Future real rates of investment return

The estimate of the outstanding claims liability is sensitive to the differences between rates of claims inflation and investment return assumed, rather than to either one of these sets of assumed rates alone. These differences may be referred to as the "gap" or real rates of investment return and are recorded in Table 19.3.

Table 19.3 **Real rates of investment return assumed**

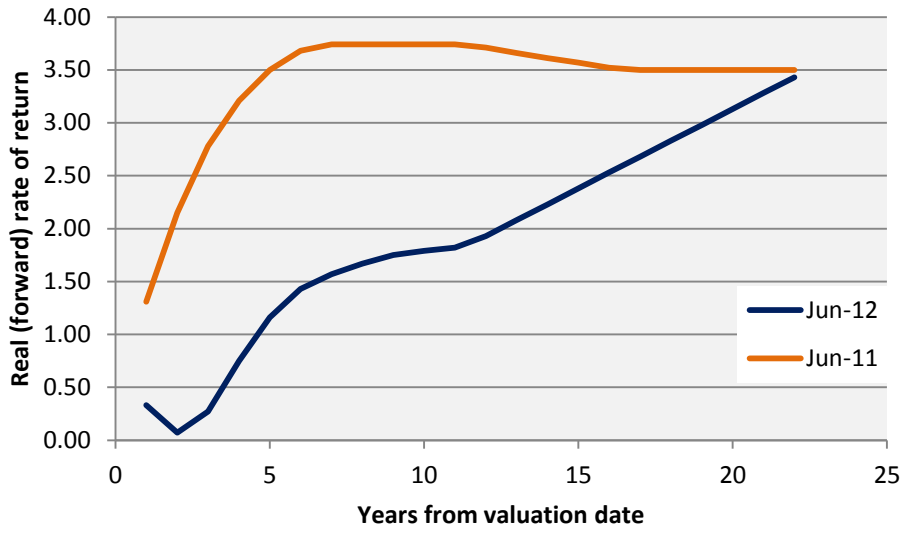
Year ending 30 June	Years from valuation date	Real (forward) rate of return
		%
2013	1	0.33
2014	2	0.07
2015	3	0.27
2016	4	0.75
2017	5	1.16
2018	6	1.43
2019	7	1.57
2020	8	1.67
2021	9	1.75
2022	10	1.79
2023	11	1.82
2024	12	1.93
2025	13	2.08
2026	14	2.23
2027	15	2.38
2028	16	2.53
2029	17	2.68
2030	18	2.83
2031	19	2.98
2032	20	3.13
2033	21	3.28
2034	22	3.43
2035	23	3.50
2036	24	3.50
2037	25	3.50
2038	26	3.50
2039	27	3.50
2040	28	3.50
2041	29	3.50
2042	30	3.50
2043 & later		3.50

Note: Real rate of return is defined as the assumed rate of investment return minus benefit rate inflation. Note that the discount rates are for years ending 30 June whereas the assumed inflation rates are for years ending in 31 March.

The real rates of investment return at June 2012 are significantly below what they were assumed to be a year ago. The real rates of returns used in the current and previous valuation are shown in Figure 19.1. The difference between them is of the order of 1-2% for the first 15 years of the projection, after which they slowly converge to the 3.5% long range rate of return assumption. This change is primarily driven by a fall in New Zealand

Government Bond yields. It leads to a very large increase in the valuation estimate, as any money notionally set aside would earn a lower rate of return than previously assumed. The exact level of the increase is discussed in the reconciliation in Section 5.

Figure 19.1 **Real forward rates of return**



19.5 Future unemployment rate assumptions

Future unemployment rate assumptions were based on forecasts provided by Treasury and are given in Table 19.4.

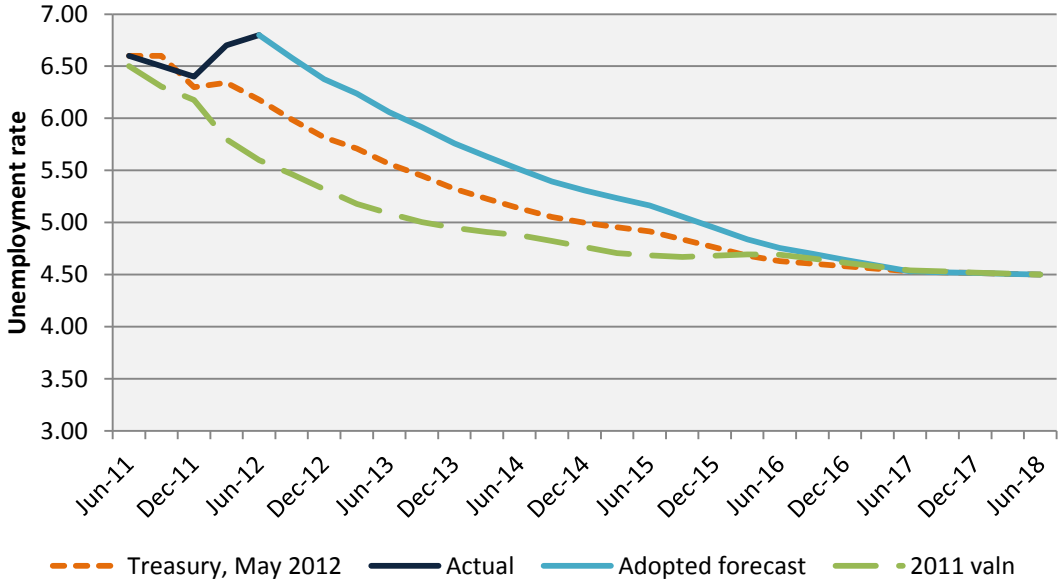
Table 19.4 **Future unemployment rate assumptions**

Projected level at 30 June	Unemployment rate
	%
2012	6.80
2013	6.06
2014	5.51
2015	5.16
2016	4.75
2017	4.53
2018	4.50
2019 & later	4.50

The forecasts were based on the Treasury projections in the Budget Economic & Fiscal Update 2012, released in May 2012. However, actual unemployment rates at June 2012 (released by Statistics New Zealand in August 2012) were already 0.6% higher than what Treasury had forecast. For this reason we modified the Treasury curve to make the projection compatible with the June 2012 rates. This is illustrated in Figure 19.2. While the long term unemployment rate is unchanged at 4.5%, we start at the actual unemployment

level and amortise the difference between actual and Treasury projected rates over five years.

Figure 19.2 **Forecast unemployment rates**



PART E
RELIANCES AND LIMITATIONS

20 RELIANCES AND LIMITATIONS

20.1 Purpose and use

This report has been prepared for the specific purpose of assisting MSD in determining an estimate of the current client liability for those on or recently on benefit plus future client liability costs over the next five years. No reliance should be placed on this report for any other purpose without confirming with us that such a purpose is appropriate. Taylor Fry specifically disclaims any responsibility or liability to any party which might claim to suffer any loss as a direct or indirect consequence of relying on this report for any purpose other than the specific purpose described in this paragraph.

Detailed judgements about the definitions, methodology, analyses, assumptions and estimates of current client liability and future client liability described in this actuarial report should be made only after considering the report in its entirety.

Taylor Fry personnel are available to explain or amplify any matter presented in this report.

20.2 Reliance on data

In preparing this report we have relied on historical data and other quantitative information provided by MSD without audit or independent verification. This data is described in Section17.2. We have sought to validate the data internally and externally as described in Section 17.3. These checks suggest that there are no material problems with the data provided. Nevertheless, data accuracy and completeness remains the responsibility of MSD and we do not take responsibility for inadequacies in the valuation arising from errors in the data.

Any material discrepancies in the data should be reported to us to enable us to consider whether this report should be amended.

20.3 Uncertainty

There is an inherent limitation on the accuracy of liability estimates in this report caused by the fundamental uncertainty of attempting to predict the future. In particular there is a large amount of uncertainty related to:

- Changes to the welfare system;
- Changes in the way clients use the welfare system; and
- Changes in the New Zealand macro-economic environment.

All these are highly likely to affect projections, particularly given the long time horizon used in the valuation. A more detailed discussion of key risks is given in Section 6.

Additionally, the liability estimates are inherently uncertain, for the following general reasons:

- Models used to estimate such liabilities represent a simplification of complex real world processes;
- Even if the models used were perfect representations of the nature of the underlying processes, past random fluctuations in the experience of the social welfare system mean that uncertainty arises from estimating the parameters of the models;
- Any shortcomings of and/or errors in the data available increase uncertainty regarding the estimated parameters of the models; and
- Even if the true underlying parameters could be determined precisely for a suite of perfect models, the amounts of the current client liability and future client liability would still be uncertain because of:
    - Random fluctuations in the future experience of the social welfare system; and
    - The possibility of future systemic, i.e. non-random, changes. Note these changes include those listed at the start of this sub-section.

In our opinion, we have used techniques and assumptions which are appropriate, and the conclusions presented in this report are reasonable, given the information currently available. However, it should be recognised that the ultimate costs for the current and future client liability cohorts can be expected to differ, probably materially, from our estimates of those costs.

Finally it is worth noting that this is only the second time that a formal actuarial valuation of the NZ Social Welfare liabilities has been carried out. The benefits and data are complex, and inevitably more uncertainty arises than if there was an existing valuation framework and projections requiring only incremental re-calibration. Over time, as more valuations are carried out, this aspect of uncertainty will reduce.

20.4 More specific limitations of the valuation

There are significant implementation challenges associated with the following issues:

- The specific definition of continuous duration;
- The use of simulation to estimate the liability;
- The allocation of expenses and loans to segments and individuals; and
- Future changes to the benefit system;

None of the items above are insurmountable – we raise them primarily so MSD are aware of some of the issues likely to arise in future Level II work.

20.4.1 Definition of continuous duration

Continuous duration is used for allocation to segments, and for some of the reporting of the valuation. We have calculated continuous duration based on MSD's rules (a 14 day gap off benefits means duration resets), however there are some details that may cause discrepancies with MSD's traditional calculations:

- MSD has traditionally ignored spells of partners of beneficiaries. That is, MSD treats the partner as off benefits. We have chosen to treat payments to partners as being on benefits.
- Our calculation of the 14 day rule applies to periods when not receiving DPB, IB, SB, UB, EB, OB, WA/WB, DPB-CSI and CDA. Additionally, many of these benefit types include some miscellaneous smaller payment codes as described in the scope appendix. This may be different to the payment codes used by MSD for the continuous duration calculation.

While we believe our allocations to segments and calculations of continuous duration is generally close to MSD, exact matching should not be expected.

20.4.2 The liability is simulation based

There will always be a little bit of "noise" induced from the simulation based approach to the projections (currently ~0.01% at an aggregate level, but it can be quite significant at a small cohort and individual level). This could conceivably be reduced in the future via extra simulations of subgroups of particular interest – we believe that the 200 simulations used currently is adequate for the purpose of the valuation.

20.4.3 Allocation of loans and expenses to segments and individuals

After discussion with MSD, we have only calculated loans and expenses at an aggregate level. While we have distributed these amounts proportionally in places (for example, Table 4.3), in general this allocation should be treated as approximate rather than exact. This is because the incidence of expenses and loans are not uniformly distributed across welfare recipients, but performing an accurate allocation was infeasible for the current valuation – it would be difficult to do this without a significant amount of work for both MSD and Taylor Fry. It is envisaged that consideration will be given to improving this aspect of the valuation over time.

20.4.4 Changes to the benefit system

Late 2012 and July 2013 brings significant change to the welfare system, particularly with respect to how people are classified. The segment definitions pre-empt this in the sense that the definition of the top tier segments aims to be consistent with the new benefit definitions; for example, the Jobseeker segment combines a number of benefit types that will be similarly combined in the welfare reforms.

We make a few comments concerning these upcoming changes:

- There are no theoretical issues in adapting the methodology to the new benefit types. We can simply recast the old benefit types into the new ones and use this as the starting point in modelling;
- However there will be practical issues:
  - The behaviour of clients will almost definitely change due to the reforms. For instance, Jobseeker Support who originally had lower work requirements (such as Widows), may have higher churn rates than their historical average. It will take some time before the new behaviours can be completely quantified and projected correctly;
  - It is still unclear to what extent the "old" definitions of benefit type will be recoverable. For instance, we expect there will still be a sickness indicator even though the Sickness Benefit will no longer exist. This is important, because these reasons that correlate to old benefit types will be highly predictive (as was seen in Section 2). As another example, we would still expect differences between sole parents with children over 14 and those on the unemployment benefit, even though they will both be Jobseeker Support under the reforms. Ideally these distinctions would still be able to be made.
  - Reconciling the liability estimates that span the old and new systems will be difficult. Some differences will be due to:
    - Reform related behaviour changes;
    - Changes in modelling structure;
    - Economic circumstances; and
    - Improvements in MSD management.

    Separating out all these effects correctly will be virtually impossible, but it is difficult to predict the extent of the issues at this stage.

Thus the upcoming reforms will have some impact on the valuation and monitoring framework. We expect that allowing for this should be manageable, but there are some potential pitfalls and extra care is required.