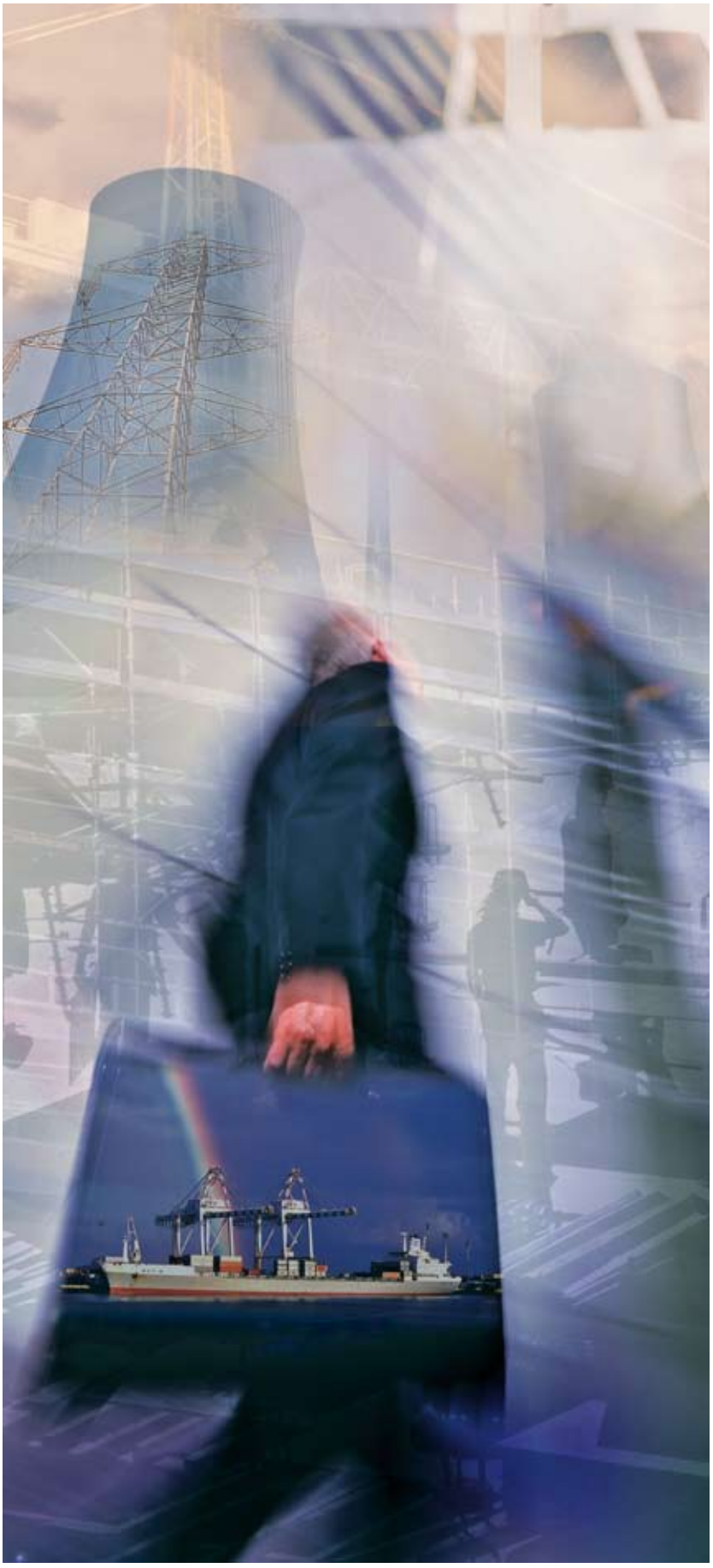

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Parental Income Support Receipt and Child Mortality: A Close Look with a Cohort of Australian Children

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Abstract

This research aims to improve our understanding of the relationship between parental income support receipt and child mortality using a unique administrative dataset, the TDS2, which contains almost a whole birth cohort of Australian children. Generally, parents of children who died under age 15 are more economically disadvantaged and are more likely to have a long duration on income support. However, no evidence was found that parental income support receipt is a significant risk factor for child mortality. Child mortality at a given time is associated with lower incidence of parental income support receipt immediately after that time, but associated with higher incidence in the long run, indicating overall negative impacts of child mortality on family financial situation. The research suggests that income support receipt has more complicated implications than simply as an indicator of economic disadvantage, and transitional income support receipt in particular may not be a good proxy for economic disadvantage.

JEL Classification: I1 I3

Key Words: child mortality, income support, economic disadvantage, Australia

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Description of the paper

This research undertakes a detailed analysis on the relationship between parental income support receipt and child mortality using a unique dataset extracted from Centrelink administrative records, the TDS2.

Parental Income Support Receipt and Child Mortality: A Close Look with a Cohort of Australian Children

1. Introduction

Child death is a rare event in Australia[1], but when it happens it has significant impacts on families. Mainly due to lack of appropriate data, child mortality is not well explored in Australia, especially at an individual level.

Yu (2008) has investigated the underlying influencing factors of child mortality at an individual level using a unique administrative dataset, the Second Transgenerational Data Set (TDS2). Consistent with other Australian studies (for example, ABS, 2007a; ABS and AIHW, 2005; AIHW, 2006; Draper *et al*., 2004; Turrell and Mathers, 2001), Yu (2008) found an association between increased risk of child mortality and parental disadvantage as indicated by low income, Indigenous status, teenage motherhood, and living in a disadvantaged neighbourhood, etc.

Among other indicators of parental disadvantage, long income support (IS) duration, as an indicator of economic disadvantage, was found to be generally associated with higher child mortality. However, different measures of IS receipt[2] lead to different estimations. In particular, contrary to the estimation of total IS duration, IS receipt at a point in time is found to be associated with a significantly lower child mortality risk.

Therefore, a methodological issue arises; that is, whether transitional IS receipt at a point in time or for a short period of time is a good proxy for economic disadvantage. Another

[1] According to ABS (2007b), in 2006 the age-specific death rates for males of 0-12 months, 1-4 years, and 5-14 years old were respectively 5.3, 0.2, and 0.1 deaths per 1,000 population; the rates for females of the three age groups were respectively 4.1, 0.2 and 0.1 deaths per 1,000 population.

[2] For instance, IS receipt at a point in time, IS duration while caring for a child, IS duration before the last date of care, IS duration since the first date of care, and IS duration in a fixed window (1987-2005) – as used in Yu (2008).

important issue, in terms of targeting policy intervention, is whether IS receipt is a risk factor for child mortality or a consequence of child mortality. Understanding the direction of the relationship has important implications for families and also family policy[3].

If parental IS receipt is a significant risk factor for child mortality, the preferred option for the parent would be to work and not rely on IS; the Government may need to help improve employment options available for parents. Particularly for those who cannot work the government may need to consider policies to eliminate or mitigate the potential side effects of IS receipt or consider alternative ways of supporting families with children. If parental IS receipt increases as a result of the death of a child, mechanisms designed to support high-risk families may require enhancement and parents whose child has died may require a higher level of assistance. Otherwise, the IS receipt may mainly serve as an indicator of economic disadvantage and policies may need to be targeted differently.

Rather than directly exploring the causal relationship between child mortality and parental IS receipt, this paper starts by questioning what will be the expected results if parental IS receipt is a significant risk factor for child mortality, and what will be the expected results if parental IS receipt is an outcome of child mortality. Then, by comparing the expected results with the observed ones, we may indirectly infer which statement regarding the relationship is likely to be true. Following Yu (2008), the current analysis continues to be based on TDS2 and a duration model is applied, allowing for time-varying variables.

This paper found that parental IS receipt was not a significant risk factor for child mortality. If this were not the case, prior and current parental IS receipt should be positively correlated with child mortality risk, but the estimation results show a different picture. Although the

[3] From an individual perspective, a low income parent faces two competing objectives: (1) increasing income and (2) taking care of her child. Options to increase income may include working, working longer and harder, and not relying on IS. To take care of her/his child, the parent may choose to stay longer at home, not work or work less, and rely on IS. From a public policy perspective, there are also two competing objectives: (1) helping parents in need – options may include, for instance, making benefits more generous and more accessible; (2) reducing welfare reliance – policy options may be just opposite.

mortality risk of boys was found to be positively correlated with prior parental IS receipt, this relationship was not significant; and the risk was significantly negatively correlated with concurrent parental IS receipt. The risk with girls was significantly negatively correlated with both prior and concurrent parental IS receipt.

If parental IS receipt is an immediate outcome of child mortality, child mortality at a point in time should be positively correlated with parental IS receipt immediately after that time. The estimated association, however, turned out to be the opposite – the mortality risk of both boys and girls at a point in time was significantly negatively correlated with parental IS receipt immediately after that time. On the contrary, in the long run, parental IS receipt tends to increase after the death of a child, as the correlation between child mortality and parental IS receipt later on was significantly positive for boys and also positive, although insignificant, for girls.

In addition, the results of the paper also raises a concern regarding the validity of simply using transitional IS receipt as a proxy for economic disadvantage at least in certain circumstances. IS receipt has much more complicated implications.

The remainder of the paper is structured as follows. Section 2 describes the background and conceptual framework for the research, Section 3 introduces the dataset and the sample, Section 4 reports the estimation results, Section 5 provides a discussion of the main findings, and the last section concludes.

2. Background and Conceptual Framework

It would be perfect if we could tell from a single research whether there is a causal relationship between parental IS receipt and child mortality. However, identifying the causality not only requires convincing and usually complex methodology, but also needs appropriate high quality data, which are not readily available in Australia. Therefore, to the

best of my knowledge, there is virtually no published Australian study on this issue. Even the association between child mortality and parental IS receipt is rarely, if ever, investigated in Australia.

Generally, in the literature, low socio-economic status (SES) is found to be associated with increased child mortality (for example, AIHW, 2006; Draper *et al*., 2004; Turrell *et al*., 2006), but no evidence shows that child mortality can be associated with the receipt of IS in itself. Several Australian studies, for instance, Butterworth *et al*. (2004) and Kalb (2000), have linked welfare receipt with mental health problems or stigma effects, which may indirectly contribute to lower quality of care for children and thus a higher child mortality risk[4]. However, another study (Lee and Oguzoglu, 2007) found that the stigma effect associated with IS receipt was not significant for young Australians. In addition, for parents on low income, IS provides extra income, or for a given level of family income IS receipt allows parents to stay at home longer with their children. Both higher income and longer time of care tend to lower child mortality risk[5]. Therefore, on balance, it is inconclusive whether IS receipt is a risk factor or a protection factor for child mortality.

Without doubt, child death is one of the most stressful life events, and the significant impacts of the event on parents and family are well documented, especially in the psychological literature[6]. The substantial economic costs associated with the death of a child, and the increased levels of depression, anxiety and stress which negatively affect health conditions,

[4] Welfare receipt is often associated with unemployment, which is usually found to be a risk factor for health and mortality in the literature, for instance, Dooley *et al*. (1996), Gerdtham and Johannesson (2003), Johansson and Sundquist (1997), and Mathers and Schofield (1998).

[5] For instance, using aggregate data from 16 European countries over the 1969 through 1994 period, Ruhm (2000) finds that rights to parental leave are associated with substantial decreases in deaths of infants and young children, and suggests parental time is an important input into the well-being of children. Baum (2003), on the other hand, finds that maternal employment in the first year of life has detrimental effects on child development, which are partially offset by positive effects of increased family income.

[6] See, for instance, Corden (2002), Dijkstra and Stroebe (1998), Dyregrov and Dyregrov (1999), Goodenough *et al*. (2004), Li *et al*. (2003) and Najman *et al*. (1993).

productivity and relationship stability of bereaved parents and family members[7], altogether worsen the family financial situation and are likely to increase the incidence of welfare receipt.

As such, the association between child mortality and increased parental IS receipt seems to be straightforward, but there is no study explicitly examining the direction of the relationship between IS receipt and child mortality.

This paper extends earlier work of Yu (2008) by investigating the correlations between child mortality at a given time and parental IS receipt around that time. Considering the complexity of the relationship and the limitations of the available data, it is probably too ambitious to determine causation. Nonetheless, the paper strives to improve our understanding of the relationship following a simple logic.

Theoretically, there are three possibilities regarding a causal relationship between any two factors A and B: A causes B; B causes A; or there is no causal relationship. The first two possibilities may co-exist. If a causal relationship between A and B exists, a positive correlation between the incidence of A and that of B would be expected to be observed; otherwise, once controlling for any other common factors affecting both A and B the correlation between the incidence of A and that of B should be insignificant. If the observed association is consistent with the expected one, we may not be sure that there exists a causal relationship, but if the observed association is in contradiction with the expected, we should be able to say with certain confidence that such a causal relationship does not exist. The

[7] A recent study by Stebbins and Batrouney (2007) conducted in-depth research on the topic of the social impacts and economic costs of the death of a child on the family during the first three years following the death. After interviewing 103 bereaved families, they estimated that the economic costs of child death include about $3,160 out-of-pocket medical and health-related expenses, $3,800 one-off costs associated with funeral expenses, and $59,500 lost income from employment. The social impacts for parents are also significant, including disharmony and arguments, less support and closeness between partners, and a dramatic decrease in both the frequency and importance of social activities.

paper applies such a method to investigate the three possibilities for the relationship between parental IS receipt and child mortality.

At any given time *t* a child is subject to a certain level of mortality risk (associated with own and environmental factors), and the primary carer of the child may choose (1) to spend more time taking care of the child and not work or work less, thus, relying on IS[8], or (2) to increase income by working or working longer, thereby spending less time with the child and not relying on IS. The parental choice and child mortality risk may affect each other, and both of them may also be affected by some common factors – for instance, single motherhood, disability and poor education of the parent, and poor neighbourhood. The main purpose of this paper is not to find out the effects of the third factors, but to identify whether child mortality is affected by parental IS receipt, or vice versa. Since the true relationship of the two factors may be masked by their correlations with the third factors, it is important to control for the third factors in the analysis.

Generally, if parental IS receipt is a risk factor for child mortality, a positive correlation should be observed between child mortality at time *t* and parental IS receipt at time *t*-1. If child mortality increases the incidence of parental IS receipt, a positive correlation should be observed between child mortality at time *t* and parental IS receipt at time *t*+1.

Otherwise, if there is no causal relationship between the two factors, after controlling for the common factors the correlations between child mortality at time *t* and parental IS receipt around (at and immediately before and after) time *t* should be insignificant.

A challenging issue is that some common factors may be unobserved or unobservable, which is particularly true for this research given the limitations of the available data. In this case, an assumption is made that for a relatively short period of time, the effects of the unobserved/unobservable third factors, for instance, low ability, on IS receipt do not change

[8] Income support in Australia is means tested, and people are allowed to combine benefits with low earnings from employment.

dramatically. With this assumption, if there is no causal relationship between parental IS receipt and child mortality, the correlations between child mortality at time *t* and parental IS receipt around time *t* – immediately before, at and immediately after time *t* – should not be significantly different. Nonetheless, the issue of unobserved heterogeneity should be kept in mind in the analysis.

To estimate the correlations between child mortality at time *t* and parental IS receipt around time *t*, two models can be estimated separately: one is using parental IS receipt (before or at time *t*) as an explanatory variable to estimate the hazard of death of a child; the other is using the death of a child as an explanatory variable to estimate the incidence of parental IS receipt.

However, for simplicity and consistency, this paper only applies a duration model to estimate the hazard of death of a child, but using different measures of parental IS receipt – receiving IS immediately before, at and immediately after time *t* – along with other variables as explanatory variables. Then the results of the models using these different measures are compared. As discussed above, if no causal relationship exists between IS receipt and child mortality, the estimation results of the models with these different IS measures should not be dramatically different.

3. Data

This section introduces the data used for the research, the Second Transgenerational Data Set (TDS2)[9] of the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA).

[9] For detailed background information on the data, refer to Breunig *et al*. (2007); for a detailed discussion of the advantages and limitations of the data, refer to Yu (2008).

The dataset was created from Centrelink[10] administrative records for the purpose of examining outcomes for children whose parents are disadvantaged. To facilitate this purpose, the TDS2 links the administrative records of a cohort of almost 130,000 Australian children born between 1 October 1987 and 31 March 1988 to the administrative records of their parents.

The TDS2 provides good coverage of the Australian birth cohort for the period, noting that the TDS2 data excludes a small number of children from high income families whose parents have never claimed IS or non-IS family payments, at least up until their 17th birthday, and some infants who died within the first few months of birth. Since TDS2 was extracted from Centrelink administrative records, information on IS was expected to be accurately recorded, and information of children, as a critical eligibility criterion for benefits, is also much more reliable than in most survey data.

However, infant deaths within the first couple months of birth are likely to be under recorded in TDS2, as discussed in detail in Yu (2008), as such, children who died within the first two months of birth are excluded from the sample[11]. In addition, children born overseas and those whose parent identifiers are missing are also excluded. Children in the birth cohort are referred to as the primary children in TDS2 and parents who provided the longest care are referred to as the primary parents[12].

Most of the children only appear in the TDS2 as a dependent of their parents, and thus do not have records in their own right. As a result, except for sex, date of birth and date of death, no other variables are available for the entire sample. Therefore, the study is mainly based on

[10] Centrelink is an Australian Government Statutory Agency, in charge of welfare payments. See http://www.centrelink.gov.au/ for details.

[11] For robust tests, children who died within the first three to six months are also excluded in preliminary analysis and the findings are generally consistent.

[12] One point to note is that a 'parent' recorded in TDS2 for benefit purposes is not necessarily the biological parent of a child (although in most cases this is true) and can be their grandparent, older sibling, relative, or any other person who acted as the primary guardian and also claimed benefits for the child.

the information of primary parents. In most cases in the sample, each primary child is associated with one primary parent, while a few parents are the primary parent of more than one primary child.

The research focuses on child deaths that happened between two months after birth and the 15th birthday of the primary children. This allows for at least two years of observation for parental IS receipt after the last recorded death and makes it possible to investigate the correlation between child mortality and parental IS receipt in a relatively long period of time after the death.

In total, there are 119,414 primary children in the sample, of whom 61,283 (51.3 per cent) are boys. There are 516 deaths recorded as having happened between two months after birth and their 15th birthday, of which 306 (59.3 per cent) were the death of boys.

The vast majority of primary parents are female (approximately 97 per cent), non-Indigenous (96.7 per cent), and born in Australia (80 per cent). Among the primary parents of children who died, the percentages of female, non-Indigenous and Australian born people are respectively 98.6, 94.2 and 84.7. Therefore, there are relatively larger proportions of female, Indigenous and Australian born people among the parents whose child had died than in the entire sample.

Table I provides a statistical summary of the primary parents by sex and death of a child. As shown in Table I, in comparison with the parents of children who survived to their 15th birthday, the parents of children who died are more likely to: have IS records, have longer IS duration (both family and individual ones), have lower family income, be a non-birth-parent[13], have more children, have a disability, be younger at the first date of care, have more changes in marital status and home address, and have more family and individual IS

[13] In this research, birth-parent is defined as a primary parent who started taking care of a primary child from the birth of the child.

spells as recorded in TDS2. Overall, these factors indicate that the parents of children who died are relatively more disadvantaged.

Table I about here

Figures 1-3 provide a comparison of IS receipt at the last date of each year between 1985 and 2004 between parents of boys who died and parents of boys who are alive, between parents of girls who died and parents of girls who are alive, and between parents of boys who are alive and parents of girls who are alive, respectively. Apparently, except that parents of boys who died are significantly more likely to receive IS, the other three categories of parents – parents of boys who are alive, parents of girls who died and parents of girls who are alive – are not significantly different in terms of IS incidence.

Figure 1 about here

Figure 2 about here

Figure 3 about here

Another point to note is that there is a clear increasing trend in the IS incidence over time, especially between 1985 and 1997[14]. This is due to changes in macro economic conditions and welfare policies of the Government (for example, economic recession and broadening of the eligibility criteria for parenting payments). This trend illustrates the importance of controlling for time and provides support for using a duration model in the econometric analysis.

4. Estimation Results

A standard Cox Proportional Hazards model is used to estimate the hazard of death of primary children from two months after birth to their 15th birthday. A day is used as the time

[14] This increasing pattern is consistent with the overall picture of IS receipt in Australia (see FaCSIA, 2006), although the sample in TDS2 is not directly comparable with the IS recipients reported in FaCSIA (2006).

unit for the duration of survival. The control variables include IS receipt, Indigenous status, country of birth, number of children cared for by the primary parent before the primary child[15], teenage motherhood, whether the primary parent is the birth-parent, parental disability, marital status, rural residence, Socio-Economic Indexes for Areas (SEIFA) disadvantage index and remoteness of living areas[16]. All these variables are from records of the primary parents. IS receipt variable, marital status, rural residence, SEIFA index and remoteness are all time varying. The model is estimated separately for boys and girls due to the significant gender differences found in preliminary analysis.

Table II reports the estimation results of eight duration models where eight different measures of IS receipt were used respectively[17]: (1) IS receipt 7-12 months ago (time t-2); (2) IS receipt in the last six months (time t-1); (3) current IS receipt (time t, that is, age of a child measured in days); (4) IS receipt in the following six months (time t+1); (5) IS receipt 7-12 months later (time t+2); (6) IS receipt so far (time $-\infty$ – time t); (7) IS receipt later (time t – April 2005); and (8) IS receipt ever in TDS2 (time $-\infty$ – April 2005). If there is no causal relationship between child mortality and parental IS receipt, the coefficients of these eight measures – at least the first five – should be similar, and generally would be expected to be positive – IS receipt mainly serves as an indicator of economic disadvantage. However, as shown below, the picture turns out to be very different.

Table II about here

For boys, as shown in the first column of Table II, parental IS receipt at time t-1 and that at time t-2 are both correlated with higher child mortality at time t but the coefficients are only

[15] For most primary children this number is equivalent to the number of older siblings or the birth order, but it may not be true for step and foster children.

[16] For a detailed description of these variables, refer to Yu (2008). For details of the SEIFA index and remoteness classification, refer to the website of the Australian Bureau of Statistics (ABS) at www.abs.gov.au.

[17] Full estimation results of the paper can be provided on request. In the estimation, time t is equivalent to the age of a child measured in days, time t-1 refers to the last period of time (for example, six months) immediately before time t, and time t-2 refers to the period of time before the last one.

marginally significant at 10 per cent level, whereas concurrent parent IS receipt is associated with significantly lower mortality risk (at 5 per cent level). For girls, as shown in the second column of Table II, parental IS receipts at time *t*, time *t*-1 and time *t*-2 are all correlated with significantly lower child mortality risks.

As such, the estimation results do not support the hypothesis that parental IS receipt is a significant risk factor for child mortality. If this hypothesis were true, parental IS receipt at time *t* and time *t*-1 would be significantly positively correlated with child mortality risk at time *t*, but the estimation shows this is not the case, especially for girls.

Parental IS receipt is not an immediate consequence of child death either, as the estimation results for both boys and girls show that parental IS receipt at time *t*+1 is significantly negatively correlated with child mortality at time *t*.

However, the results show that parental IS receipt is likely to increase in the long run after the death of a child, because the correlation between child mortality and the overall incidence of parental IS receipt after time *t* (till the end of the sampling window – April 2005) changes sign, becoming significantly positive for boys and also positive although not statistically significant for girls.

To test the robustness of the main findings, several exercises have been undertaken as follows. First, as discussed in Section 3 and also Yu (2008), deaths within the first few months after birth were likely to be under recorded in TDS2. If the under recording is non-random, the estimation may be biased. To tackle this issue, a method applied is to exclude all the recorded deaths within the first two months after birth. However, if deaths after the first two months were also non-randomly under recorded, the results will still be problematic. Therefore, one test is to exclude those deaths within the first six months after birth. The findings are generally robust (see Table II-1).

Table II-1 about here

Second, the mortality of children is subject to more factors outside the family as children age, and the importance of parental and family factors may fall accordingly. The reported results in Table II are based on analysis of deaths up to the 15th birthday. One robust test, which excluded those who died after age 12, shows similar results (see Table II-2).

Table II-2 about here

Third, the sample includes some middle to high income families who only received family payments but were never on IS; IS receipt may be less relevant or irrelevant for them. Another robust test shows that excluding those who had never received IS does not change the conclusions (see Table II-3).

Table II-3 about here

Fourth, a period of six months – before and after time *t* – is used for estimations reported in Table II. This period might be too long. Therefore, one robust test used one month or one fortnight instead of six months. The main findings remain robust (see Table II-4).

Table II-4 about here

In addition, some model specifications used continuous variables of parent age at the first date of care (also age^2, age^3 and age^4) and SEIFA index (also $SEIFA^2$) instead of category variables; the key findings were not significantly affected.

5. Discussion

Section 4 reported several robust findings, which will be discussed in detail in this section. To improve understanding and interpretation of the estimation results, an analysis of potential mechanisms through which parental IS receipt affects or is affected by child mortality is useful.

Firstly, how can child mortality be affected by parental IS receipt?

Generally, there are three potential mechanisms through which parental IS receipt may affect child mortality.

(1) IS serves as an indicator of low income and low income is associated with higher child mortality.

(2) For the same living and working arrangements, IS increases family income; or, putting it in a different way, for a given level of family income (including IS payments), receiving IS allows parents to spend more time looking after their children. Both higher income and more caring time serve as protection factors and tend to decrease child mortality (Baum, 2003; Ruhm, 2000).

(3) However, receiving IS may also have negative impacts on parents and children. For instance, IS receipt may have a stigma effect, lead to low self-esteem, increase levels of stress and depression[18], and may also be associated with unhealthy lifestyle behaviours, such as drinking, smoking, poor nutrition and physical inactivity[19], and these factors may lead to parents providing poorer quality care. Lower quality parental care tends to be associated with higher child mortality, which may indicate that IS receipt is a risk factor which tends to increase child mortality.

The causal effects of parental IS receipt on child mortality mainly refer to the second and the third mechanisms. After controlling for income and other factors, if the second mechanism dominates, parental IS receipt acts as a protection factor. If the third dominates, parental IS receipt may be viewed as a risk factor. Otherwise, parental IS receipt does not have any significant effect on child mortality.

[18] See Lee and Oguzoglu (2007) and Kalb (2000) for stigma effects of welfare receipt in Australia, and Bingley and Walker (1997), Edin and Lein (1997), Hoynes (1996), Moffitt (1983) and Rodgers-Dillon (1995) for other countries.

[19] McGinnis and Foege (1993) estimated that three lifestyle variables – tobacco, diet and activity, and alcohol consumption – explained around 38 per cent of premature mortality in the United States in 1990.

The estimation results suggest that IS receipt is not a significant risk factor for child mortality. The significantly negative association between mortality of girls and prior (and current) IS receipt of parents may indicate that the effects of longer caring time allowed by IS receipt dominate over those of poor care quality associated with IS receipt. The results also indicate that transitionary IS receipt (at a point in time or for a short period of time) may not be a good indicator of economic disadvantage.

Secondly, how can child mortality affect parental IS receipt?

The death of a child is likely to have significant impacts on parents and correspondingly other members of the immediate and extended family. Grief may negatively affect parental health and relationship stability, and may result in behaviour change and poorer family financial situation[20]. It is expected that these effects would generally predict a higher incidence of parental IS receipt after the death of a child.

However, in practice it is also possible that parental IS receipt may decrease after the death of a child. Some IS payments are conditional on having caring responsibility for a child, for instance, Parent Payment Single (PPS) and Carer Payment (CAR)[21]. As such, for some primary carers, an immediate consequence of the child's death may be the loss of IS eligibility, whilst others may transfer to IS payments which are not dependent on the presence of an eligible child and are usually less favourable, for example, Newstart Allowance (NSA).

As shown in Figure 4 and Figure 5, there are significant differences in the threshold of eligible income between PPS/CAR and NSA[22]. For example, if the income of a single PPS/CAR recipient falls between $777.67 and $1416.35 per fortnight, or the joint income of a partnered recipient falls between $1421.68 and $2328.50 per fortnight, they are likely to

[20] See references listed in Footnotes 6 and 7.
[21] For details of these and other payments, refer to the Centrelink website at www.centrelink.gov.au.
[22] The demonstration is based on the 2006 income test requirements (see Centrelink, 2006).

lose their IS eligibility after the death of their child because they will not be able to satisfy the income test for NSA. In addition, recipients of PPS/CAR and NSA are subject to different activity tests, with activity testing in the latter case generally requiring higher levels of participation.

Figure 4 about here

Figure 5 about here

It is likely that the estimated negative correlation of child mortality at time *t* with parental IS receipt at time *t*+1 (also with parental IS receipt at time *t*) may be driven by the effect of losing IS eligibility. Reasons for leaving IS payments are not always recorded in TDS2, but where recorded, the most frequent reasons for primary parents leaving their current IS payment after the death of a child include 'internal benefit transfer'[23], 'excess income', 'death of child', 'no dependent children', 'base rate of PGA'[24], and 'bereavement period ended'[25]. These reasons, except for 'internal benefit transfer', generally support the conjecture of losing IS eligibility as a result of the death of a child.

In contrast to the immediate decrease in IS receipt after the death of a child, the estimation results suggest that in the long run parental IS receipt is likely to increase. There are several possible explanations for these findings: (1) the death of a child has negative impacts on parental physical and mental health and relationships[26], and these effects take time to become apparent; (2) parents may decide to have another baby to 'replace' the one who died – replacement effect (Olsen, 1980; Cain and Cain, 1964) – which may increase their IS incidence; (3) they may change their behaviour after losing a child and withdraw from the

[23] Transferring from one IS payment to another IS payment.
[24] Base rate PGA is a non-income-support payment superseded by FTB Part B on 1 July 2000.
[25] Other reasons include 'fail to reply to correspondence', 'did not lodge form', 'departure overseas permanently', 'full-time employment', etc.
[26] For instance, prevalence of depression and stress and increased mortality of bereaved parents are reported in Goodenough *et al*. (2004) and Li *et al*. (2003). Najman *et al*. (1993) also show that after the death of an infant, marital relationships deteriorate and marital break-up rates increase.

labour force to spend more time with their remaining children; (4) IS receipt may indicate a lower ability to find and retain employment. In the fourth case, losing a child may temporarily lead to loss of IS eligibility, but this does not necessarily improve people's employment perspective and in fact may make it worse (Corden, 2002; Stebbins and Batrouney, 2007). Therefore, some time after the shock of losing a child, people return to IS via different paths.

The correlations between parental IS receipt and child mortality appear to be gendered.

Firstly, as shown in Table II, parental IS receipt in the last six months or 7-12 months is associated with approximately 30 per cent higher death hazard for boys (marginally significant at 10 per cent level), but associated with approximately 40 per cent lower death hazard for girls (significant at 5 per cent level). In addition, parental IS receipt so far (including time *t*) is associated with 9 per cent higher death hazard for boys (insignificant) but a 45 per cent lower death hazard for girls (significant at 1 per cent level). These results indicate that parental IS receipt is more likely to be a protection factor for girls than for boys. Secondly, the correlation between parental IS receipt after time *t* (from *t* to 2005) and child mortality risk at time *t* is significantly positive for boys, while it is insignificant although also positive for girls. It seems that the death of a boy may have a larger impact on parents than that of a girl in terms of IS receipt.

How can these differences between boys and girls be interpreted? Table III lists the leading causes of death for two age groups of Australian children in 1991[27] – less than one year old, and one to 14 years – and shows that the causes of death are also gendered. Boys have

[27] Data for earlier years are not available, and data for later years show a generally similar pattern.

relatively larger probabilities of dying for sudden external reasons (for example, accidents); while girls are more likely to die of diseases[28].

In the last decade, child mortality has been generally decreasing (ABS 2007b), along with child mortality due to external causes[29] (ABS 2004). However, the gendered pattern evident in cause of death data has not changed. According to a recent ABS report (ABS 2004), the mortality rate for children aged 0-14 years is 55.1 per 100,000 persons for boys, approximately 27.8 per cent higher than that for girls (43.1 per 100,000 persons). However, in the same age group mortality caused by external causes is 9.3 per 100,000 persons for boys, more than 63 per cent higher than figures reported for girls (5.7 per 100,000 persons)[30].

Table III about here

In comparison to deaths caused by diseases, deaths as a result of sudden external reasons may be more likely to happen in a disadvantaged family living in a poor neighbourhood where children are exposed to higher risks of accidents and injury (for example, traffic accidents), have poorer access to health services, and also may experience lower quality parenting (Blakemore 2007; Shore 1997). Longer caring time but poorer quality care associated with parental IS receipt is probably less effective in avoiding or reducing deaths caused by sudden external causes. Therefore, parental IS receipt is less protective to boys than to girls given that boys are more likely to engage in high risk behaviour (Blakemore, 2007).

[28] Recent Annual Report of the NSW (New South Wales) Child Death Review Team (2007) also shows that in New South Wales girls were more likely than boys to die of diseases and morbid conditions (80.0 per cent of females compared with 64.8 per cent of males), while boys were much more likely to die of external causes or ill-defined and unknown causes.

[29] However, over 1998-2002, age specific death rates of external causes of death increased at the age group of 15-19 years (ABS, 2004, p. 21).

[30] According to UNICEF (2001, cited in ABS, 2006), it is generally true regardless of the child's age and across all OECD countries that boys are not only more likely than girls to experience an injury, they are also more likely to die as a result of an injury.

Regarding the consequence of the death of a child, presumably an unexpected sudden death, which is more likely to be attributed to poor parental care, has bigger negative impacts on parents than a (somewhat expected) death resulting from a chronic illness[31]. Given that boys have a higher rate of dying due to accidents, overall, parents who have lost a boy tend to have a higher incidence of IS receipt compared with those who have lost a girl.

In addition, there is evidence in Australia and also other developed countries that women express a preference for female children and men express a preference for male children (see Gray *et al*., 2007 and references therein). As such it is proposed that the death of a boy may have a bigger impact on the father than that of a girl. As fathers are usually the main breadwinner in low income families, factors affecting fathers which lead to labour force withdrawal are more likely to affect family income and correspondingly increase incidence of IS receipt.

Nonetheless, these interpretations of the gendered pattern observed in the estimation results are far from conclusive and the issue deserves further exploration.

6. Conclusions

This paper undertakes a detailed investigation on the relationship between parental income support (IS) receipt and child mortality with a unique administrative data source, the TDS2. The TDS2 consists of nearly a whole birth cohort of Australian children, which, at the time of writing had a sampling window of more than 17 years.

Hypothetically, if parental IS receipt is a significant risk factor for child mortality, there should be a positive correlation between child mortality at a given time and parental IS

[31] Lang and Gottlieb (1993) showed that the suddenness of the infant's death is the best predictor of mother's grief, and mothers whose infant died suddenly rated their grief reactions higher than those whose infant's death was anticipated. At the same time, there is evidence which suggests that factors related to anticipated death may actually ameliorate the intense grief of losing a child (Wood and Milo, 2001).

receipt immediately before that time. However, the estimation results show a significant negative correlation for girls and an insignificant correlation for boys (at 5 per cent level). Furthermore, for both boys and girls, concurrent parental IS receipt is also significantly negatively correlated with child mortality. Therefore, there is no evidence showing that parental IS receipt is a significant risk factor for child mortality, particularly for girls. The estimation results suggest that protective factors associated with parents on IS being able to spend longer amounts of time caring for children may dominate over, or cancel out, the effects of risk factors associated with parents providing poorer quality care in a disadvantaged environment.

The results also do not support the proposition that parental IS receipt is an immediate consequence of child mortality, as parental IS receipt immediately after the death of a child is significantly negatively correlated with child mortality. Analysis of reasons given for leaving IS payments indicate that decreased IS receipt following the death of a child may be due to some parents losing their entitlement to IS payments immediately after the death of their child.

However, in the long run, the estimation results indicate that parental IS receipt is likely to increase after the death of a child, especially after the death of a boy. In contrast to the significantly negative correlation observed between child mortality and parental IS receipt immediately after the death of a child, a significantly positive correlation is found between mortality of boys and parental IS receipt from the time in question to the end of the sampling window – April 2005. For girls, the correlation is also positive, although not statistically significant.

Although the reasons for this association require further investigation, there are several plausible explanations for longer term increases in parental IS receipt following the death of a child. For some families, the stresses associated with the death of a child may adversely

affect parental mental or physical health and the ability to maintain labour force attachment. At the same time, it may also lead to relationship breakdown and a loss of partner financial support. For other families, parents may withdraw from the labour market due to the birth of a replacement child or to care for remaining children. It is also possible that parental characteristics which expose children to greater mortality risks may also be related to a lower ability to find and retain employment and parents who lose entitlement to caring related payments following the death of their child may return to IS support through different paths.

The gendered correlation between child mortality and IS receipt also requires further investigation. As the death of a boy is more likely to be caused by sudden external causes (for example, accidents) rather than long term illness or disease, it is likely that the death of a boy may have a bigger impact on parents and lead to a higher incidence of parental IS receipt afterwards. Longer caring time, but poorer quality care associated with parental IS receipt may also be less effective in reducing deaths caused by accidents and injuries, indicating that parental IS receipt may be less protective for boys than girls.

The positive association between child mortality and parent's future receipt of income support provides evidence for policy intervention designed to support parents who experience the death of a child. The results also highlight the importance of taking the increased vulnerability of boys to accidental death into account when targeting policy intervention.

Finally, from a methodological point of view, transitional IS receipt may not be a good proxy of economic disadvantage, and different measures of IS receipt around a significant event such as the death of a child may have very different implications and should be used and interpreted with caution.

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Table I Statistical Summary of Primary Parents

	Parents of all boys (n=60,977)	***Parents of boys who died*** (n=306)	***Parents of all girls*** (n=57,921)	***Parents of girls who died*** (n=210)
Females (per cent)	96.77	98.69	97.29	98.57
Indigenous (per cent)	3.27	5.56	3.35	6.19
Country of birth				
Australian (per cent)	79.77	83.99	80.05	85.71
Main English-speaking countries (per cent)	7.69	4.90	7.64	6.67
Other countries (per cent)	12.54	11.11	12.31	7.62
Ever received IS	0.57 (0.50)	0.74 (0.44)	0.57 (0.50)	0.69 (0.46)
Total family IS duration (days)	1,255 (1,548)	1,739 (1,650)	1,257 (1,549)	1,575 (1,606)
Total individual IS duration of primary parent (days)	834 (1,250)	1,202 (1,541)	831 (1,228)	932 (1,151)
Relative family income (as per cent of sample mean)	104.43 (62.72)	93.95 (69.09)	104.76 (71.75)	96.31 (47.81)
Birth-parents	0.75 (0.43)	0.51 (0.50)	0.76 (0.43)	0.47 (0.50)
Total no. of children for benefit purpose	3.12 (1.69)	4.06 (1.84)	3.12 (1.72)	4.02 (1.99)
No. of children before primary child	1.63 (0.97)	1.80 (0.99)	1.63 (0.98)	1.52 (0.81)
Disability	0.03 (0.18)	0.07 (0.26)	0.03 (0.18)	0.04 (0.19)
Age at first date of care	28.68 (6.21)	27.34 (5.69)	28.66 (6.19)	27.43 (6,31)
Count of marital events	3.12 (2.13)	3.75 (2.84)	3.12 (2.11)	3.59 (2.57)
Count of home postcode events	4.51 (3.17)	5.25 (3.95)	4.51 (3.21)	4.86 (3.46)
Count of family IS events	1.25 (1.54)	1.58 (1.54)	1.25 (1.55)	1.53 (1.53)
Count of individual IS events	2.12 (2.73)	3.28 (3.38)	2.12 (2.74)	2.69 (2.87)

Note: Standard deviations are in brackets.

Table II Estimated child mortality risk (2 months – 15th birthday) and parental IS receipt around the time

Parental IS receipt around time t	*Estimated child mortality risk at time t (per cent)* †	
	Boys	Girls
(1) IS receipt 7-12 months ago (time *t*-2)	+32 *	-40 **
(2) IS receipt in the last 6 months (time *t*-1)	+34 *	-47 **
(3) Currently on IS (at time *t*)	-31 **	-69 ***
(4) IS receipt in the following 6 months (time *t*+1)	-30 **	-59 ***
(5) IS receipt 7-12 months later (time *t*+2)	-33 **	-57 ***
(6) IS receipt so far (time -∞ – *t*)	+7	-45 ***
(7) IS receipt later (time *t* – 04/2005)	+42 **	+9
(8) IS receipt ever in TDS2 (time -∞ – 04/2005)	+33 *	+12

Notes: * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent. † In comparison to parents not on IS at a given time or period of time. Other control variables include Indigenous status, country of birth, number of siblings, teenage motherhood, birth-parent, disability, marital status, SEIFA index, remoteness and rural residence.

Table II-1 Estimated child mortality risk (6 months – 15th birthday) and parental IS receipt around the time

Parental IS receipt around time t	*Estimated child mortality risk at time t (per cent)* †	
	Boys	Girls
(1) IS receipt 7-12 months ago (time *t*-2)	+36 *	-35
(2) IS receipt in the last 6 months (time *t*-1)	+34 *	-42 **
(3) Currently on IS (at time *t*)	-25	-65 ***
(4) IS receipt in the following 6 months (time *t*+1)	-20	-52 ***
(5) IS receipt 7-12 months later (time *t*+2)	-27 *	-52 ***
(6) IS receipt so far (time -∞ – *t*)	+2	-44 **
(7) IS receipt later (time *t* – 04/2005)	+42 **	+10
(8) IS receipt ever in TDS2 (time -∞ – 04/2005)	+30	+15

Notes: * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent. † In comparison to parents not on IS at a given time or period of time. Other control variables include Indigenous status, country of birth, number of siblings, teenage motherhood, birth-parent, disability, marital status, SEIFA index, remoteness and rural residence.

Table II-2 Estimated child mortality risk (2 months – 12th birthday) and parental IS receipt around the time

Parental IS receipt around time t	*Estimated child mortality risk at time t (per cent)* †	
	Boys	Girls
(1) IS receipt 7-12 months ago (time *t*-2)	+28	-32
(2) IS receipt in the last 6 months (time *t*-1)	+33	-45 **
(3) Currently on IS (at time *t*)	-34 **	-61 ***
(4) IS receipt in the following 6 months (time *t*+1)	-30 **	-59 ***
(5) IS receipt 7-12 months later (time *t*+2)	-34 **	-58 ***
(6) IS receipt so far (time -∞ – *t*)	+4	-42 **
(7) IS receipt later (time *t* – 04/2005)	+41 **	+18
(8) IS receipt ever in TDS2 (time -∞ – 04/2005)	+30 *	+20

Notes: * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent. † In comparison to parents not on IS at a given time or period of time. Other control variables include Indigenous status, country of birth, number of siblings, teenage motherhood, birth-parent, disability, marital status, SEIFA index, remoteness and rural residence.

Table II-3 Estimated child mortality risk (2 months – 15th birthday) and parental IS receipt around the time, sub-sample of parents once on IS

Parental IS receipt around time t	*Estimated child mortality risk at time t (per cent)*†	
	Boys	Girls
(1) IS receipt 7-12 months ago (time *t*-2)	+28	-35
(2) IS receipt in the last 6 months (time *t*-1)	+30	-42 *
(3) Currently on IS (at time *t*)	-35 **	-65 ***
(4) IS receipt in the following 6 months (time *t*+1)	-35 ***	-58 ***
(5) IS receipt 7-12 months later (time *t*+2)	-38 ***	-56 ***
(6) IS receipt so far (time $-\infty$ – *t*)	-2	-39 *
(7) IS receipt later (time *t* – 04/2005)	+31	-28

Notes: * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent. † In comparison to parents not on IS at a given time or period of time. Other control variables include Indigenous status, country of birth, number of siblings, teenage motherhood, birth-parent, disability, marital status, SEIFA index, remoteness and rural residence.

Table II-4 Estimated child mortality risk (2 months – 15th birthday) and parental IS receipt around the time

Parental IS receipt around time t	*Estimated child mortality risk at time t (per cent)*†	
	Boys	Girls
(1) IS receipt in the last month (time *t*-1)	+21	-49 **
(2) IS receipt in the last fortnight (time *t*-1)	+21	-49 **
(3) Currently on IS (at time *t*)	-31 **	-69 ***
(4) IS receipt in the following fortnight (time *t*+1)	-27 *	-66 ***
(5) IS receipt in the following month (time *t*+1)	-29 **	-63 ***
(6) IS receipt later (time *t* – 04/2005)	+42 **	+9

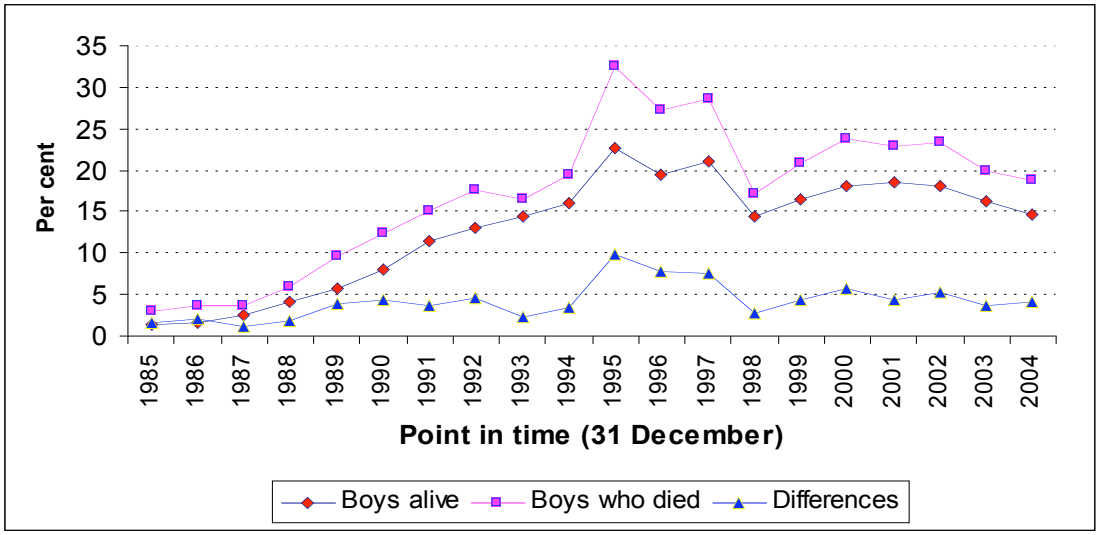
Notes: * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent. † In comparison to parents not on IS at a given time or period of time. Other control variables include Indigenous status, country of birth, number of siblings, teenage motherhood, birth-parent, disability, marital status, SEIFA index, remoteness and rural residence.

Table III Leading Causes of Death before Age 15 by Age and Sex, 1991

Cause of death	Males		Females	
	No.	per cent	No.	per cent
Deaths at ages under 1 year	1049	100	787	100
Certain conditions originating in the perinatal period	444	42.33	350	44.47
Congenital anomaly	265	25.26	210	26.68
Sudden death, cause unknown	228	21.73	130	16.52
Deaths at ages 1-14 years	462	100	327	100
Accidents, poisonings and violence	233	50.43	129	39.45
Motor vehicle traffic accidents	93	20.13	41	12.54
Accidents caused by submersion, suffocation and foreign bodies	66	14.29	33	10.09
Malignant neoplasms	58	12.55	55	16.82
Diseases of the nervous system and sense organs	47	10.17	34	10.40
Congenital anomalies	40	8.66	36	11.01

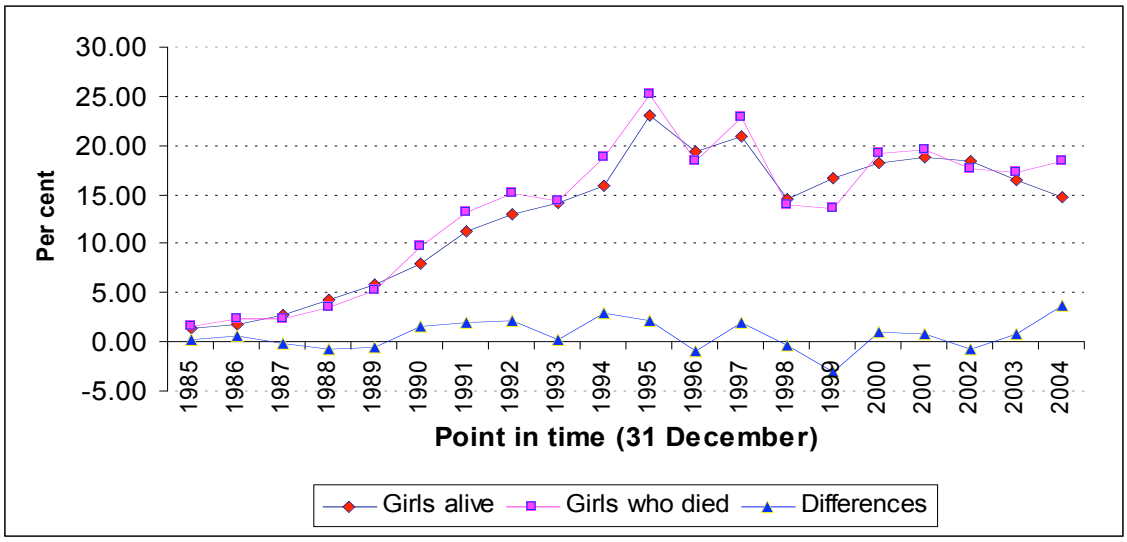
Source: ABS (1994), Tables 6-8, p. 27

Figure 1 Income Support Recipients: Parents of Boys Who Died vs. Parents of Boys Who Are Alive



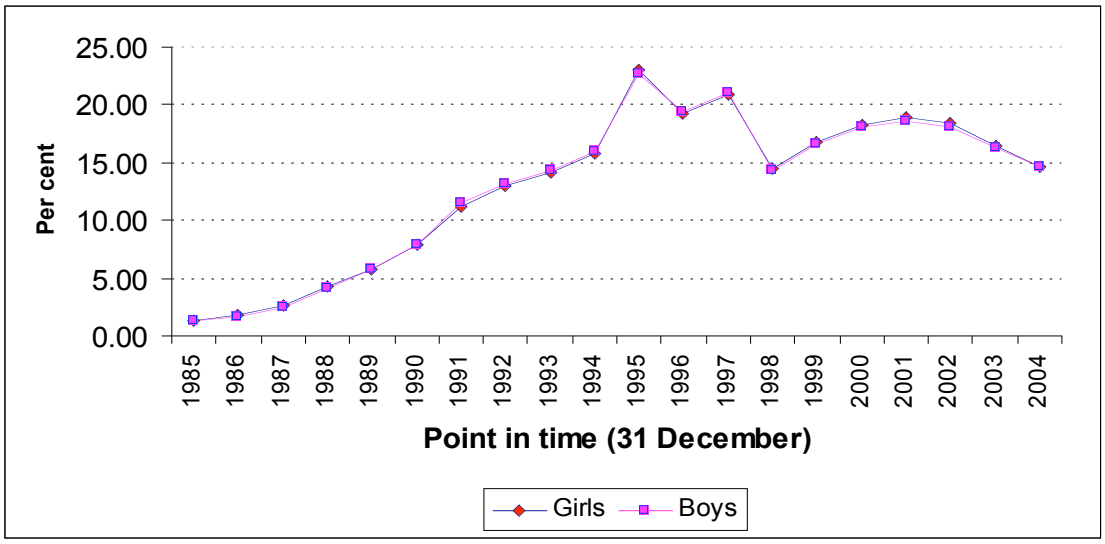
Source: Constructed from TDS2.

Figure 2 Income Support Recipients: Parents of Girls Who Died vs. Parents of Girls Who Are Alive



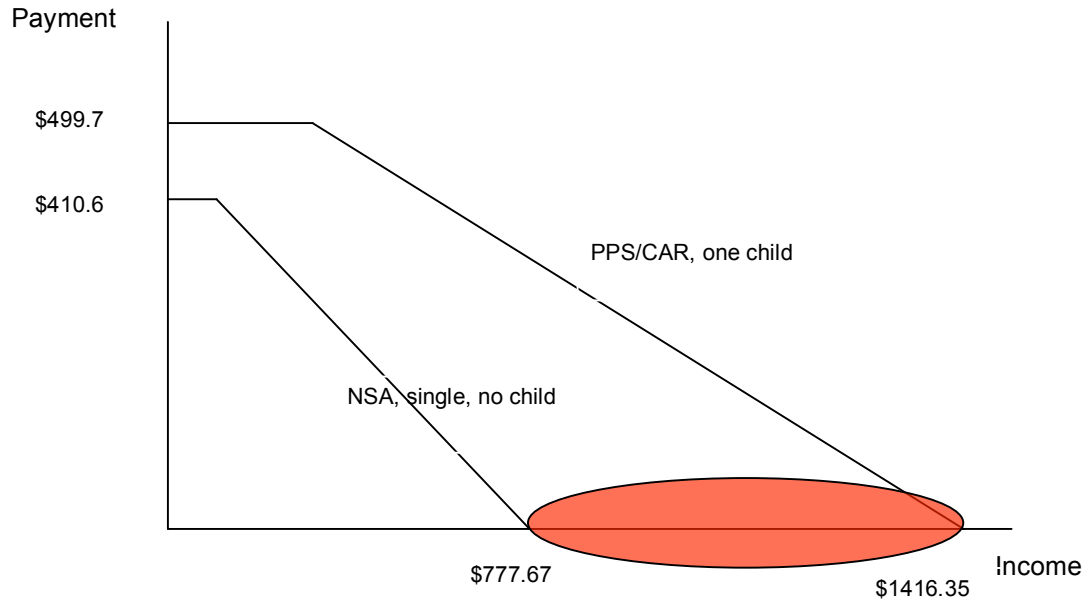
Source: Constructed from TDS2.

Figure 3 Income Support Recipients: Parents of Boys Who Are Alive vs. Parents of Girls Who Are Alive



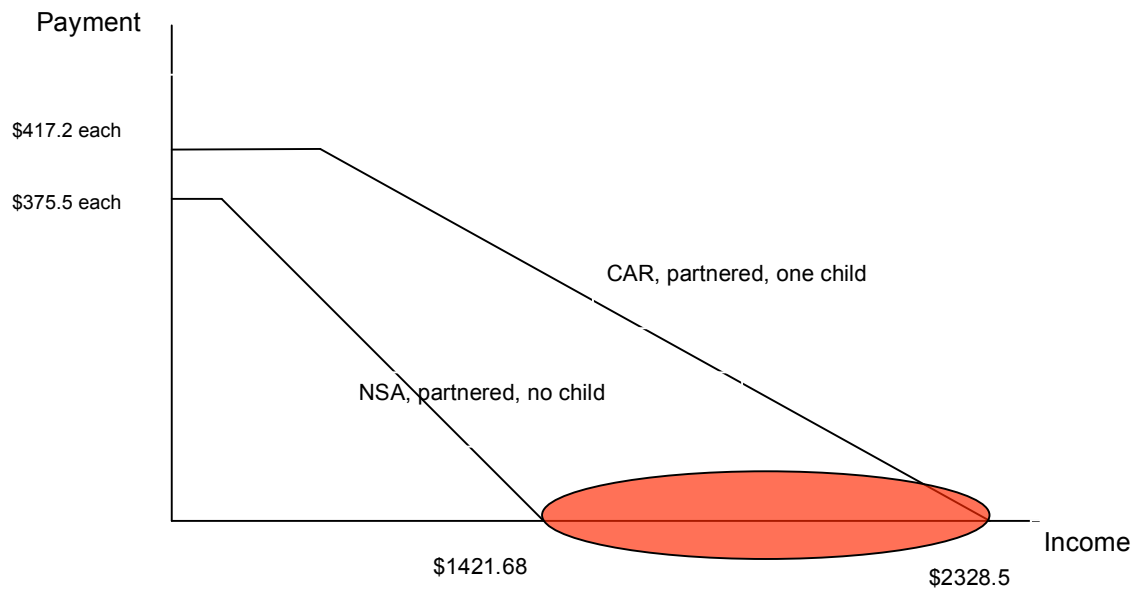
Source: Constructed from TDS2.

Figure 4 Child Death and Income Support Eligibility for Single Parents



Source: Constructed by the author based on the 2006 income test requirements (Centrelink 2006).

Figure 5 Child Death and Income Support Eligibility for Partnered Parents



Source: Constructed by the author based on the 2006 income test requirements (Centrelink 2006).