The Effects of Persistent Poverty on Children's Physical, Socio-emotional, and Learning Outcomes

Jung-Sook Lee

Abstract This study investigated the effects of persistent poverty on children's development using the Longitudinal Study of Australian Children. The results showed that families in the *persistently poor* group were more likely to come from socially disadvantaged background that included young and unmarried mothers, less educated parents, Indigenous children, and children who speak other languages at home. Children in the *persistently poor* group showed significantly lower levels of socio-emotional and learning outcomes than children in the *never poor* group. The findings suggest that persistently poor families may need support to break the cycle of disadvantage. Actions to relieve poverty in early childhood and to reduce the effect of poverty are required to ensure adequate development of children in poverty in their early childhood.

Keywords Poverty · Child development · Early childhood · Longitudinal Study of Australian Children

1 Introduction

Every child matters for the wellbeing of Australian society because we, as a society, bear the consequences of his/her problems in the form of unemployment, physical and mental health, and crimes. Ensuring adequate development of children can be considered as a social investment to secure future wellbeing of individuals and society. However, the current wellbeing of children is equally important because children are not just human becomings but human beings (Qvortrup et al. 1994). Thus, it is essential to know whether children from disadvantaged backgrounds are growing up well in contemporary Australian society. The differences in wellbeing of children from different backgrounds can be considered as inequalities. If there is a

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gap between these children, we need to assess the magnitude of the gap and address the gap if necessary.

Some children are left behind from the early years of their lives. Child poverty is one of the biggest factors that hinder children's healthy development. According to a recent study conducted by Whiteford and Adema (2007), Australian child poverty rate is 11.6% in 2000s. In the study, child poverty rate ranged from 2.4% (Denmark) to 24.8% (Mexico) with the OECD average of 11.9%. Australia ranked 11th among 26 countries ordered from smallest to largest poverty rate. Although there have been controversies over the poverty line in Australia and the rate of poverty differs by measures used, this figure provides a general picture of child poverty in Australia.

The negative effects of poverty on children's development have been well documented (e.g., Brooks-Gunn and Duncan 1997; Evans 2004). Families in poverty struggle to meet basic needs for food, clothing, and shelter. Furthermore, multiple risks closely related to income poverty interfere with children's healthy development. For example, children in poverty face a wide array of suboptimal conditions such as low levels of parental monitoring and responsiveness, high levels of parental stress and neighbourhood disadvantages, low quality of the home learning environment, low quality housing, low quality schools, and low quality of ambient environment such as toxins, air, water, and noise (Evans 2004).

It has been also shown that poverty in early years, especially persistent poverty, has a stronger effect on children's development than does poverty in later years. For example, Duncan et al. (1998) reported that average family income between birth and age 5 had a stronger effect on the number of school years completed than did family income between ages 5 and 10 or between ages 11 and 15. According to Smith et al. (1997), children who were in persistent poverty during their first years had statistically significantly lower scores on various assessments than children who were never poor. Although the effects were smaller, they also found that living part of early childhood in poverty had significantly negative effects on most of outcomes examined.

The effects of poverty on children, however, differ by outcomes examined. Studies reported generally a stronger effect of poverty on cognitive development than on socio-emotional or physical development (Brooks-Gunn and Duncan 1997; Haveman and Wolfe 1995). For example, after reviewing numerous studies on child poverty in the United States, Brooks-Gunn and Duncan reported that, compared to children who were not in poverty, children in poverty had 2.0 times higher risk of grade repetition and dropping out of high school, 1.4 times higher risk of having a learning disability, 1.7 times higher risk of a low birth-weight birth, 1.7 times higher risk of child mortality, and 1.3 times higher risk of parent-reported emotional or behaviour problems.

Surprisingly, there is a paucity of recent studies about poverty in Australia, partly owing to the controversies over the poverty line. It is important to discuss the adequate measure of poverty; however, the debate should not prevent researchers from conducting studies examining the influence of poverty on people's lives nor stop practitioners and policy makers making efforts to enhance lives of people in poverty. Hence, there is a clear need to conduct studies examining the effect of income poverty in contemporary Australia. The current study examines effects of poverty on children's development using the data from the Longitudinal Study of

Australian Children (LSAC) (Australian Institute of Family Studies 2007). In the current study, it is hypothesised that persistent poverty negatively influences children's overall development. Given the controversies over the poverty line, the current study empirically tested the effects of persistent poverty using two different thresholds (i.e., proxies of 50% and 60% of median income). Detailed research questions of the current study are:

1. What are the characteristics of persistently poor families?
2. What are the effects of persistent poverty on children's outcomes (physical, socio-emotional, and learning)?

2 Methods

2.1 Data and Study Design

This study used the Longitudinal Study of Australian Children (LSAC): Growing Up in Australia (Australian Institute of Family Studies 2007). LSAC is the first comprehensive longitudinal study of Australian children using a nationally representative sample. LSAC explores various aspects of child development including physical and mental health, education, social, cognitive and emotional development from various sources. Over 10,000 children and their families were first interviewed in 2004 and are being interviewed biennially until 2018 (eight waves of data collection).

LSAC used a complex survey design that included stratum, clustering, and weights. The data were collected from 2,319 postcodes (primary sampling units) in 23 strata. Stratification was used to ensure that all geographic areas in Australia were represented in the survey; clustering was used to reduce the field costs and to have a large enough sample size in each postcode; weights were provided to adjust for unequal probability of selection and to reduce the possible bias due to non-response (Australian Institute of Family Studies 2009).

LSAC employed a dual cohort cross-sequential design (Australian Institute of Family Studies 2009). There are two cohorts: B-cohort and K-cohort. Children in the B-cohort were 0–1 years at Wave 1 and will be 14–15 years at Wave 8, whereas children in the K-cohort were 4–5 years at Wave 1 and will be 18–19 years at Wave 8. The design provides an opportunity to distinguish age effects from cohort effects while it extends the age spectrum of the study. Children in the B-cohort and K-cohort have overlapping age periods from 4 to 5 years to 14–15 years. By comparing results from two cohorts at the same age, researchers can identify whether certain findings are consistent regardless of cohort status. The current study used data from only Waves 1 and 2.

2.2 Sample

Children in the B-cohort were 0–1 years at Wave 1 and 2–3 years at Wave 2, whereas children in the K-cohort were 4–5 years at Wave 1 and 6–7 years at Wave 2. The original sample size was 5,107 at Wave 1 and 4,606 at Wave 2 for the B-cohort; 4,983 at Wave 1 and 4,464 at Wave 2 for the K-cohort. The rate of attrition between Wave 1 and 2 was about 10% and the weights were used to reduce possible bias due

to attrition. See the summary of data in Table 1. Due to missing values on outcome variables, the sample size somewhat differs by analysis (Refer to Tables 6, 7, and 8 for further details of sample size). Relatively smaller sample was used for the analyses of learning outcome for the B-cohort. A possible reason is discussed in the measures section below.

2.3 Measures

Dependent variables were physical, socio-emotional, and learning development domain at Wave 2 derived from various measures of LSAC data (Sanson et al. 2005). These domain scores were created using the three stage procedure of standardizing and combining. Domain scores are based on sub-domain scores and sub-domain scores are based on component measures. Table 2 summarises the sub-domains and component measures of the three domains. Due to the age difference, each cohort was administered a different battery of surveys.

For the B-cohort, physical domain is based on Health measured by Overall Health and Special Health Care Needs. Overall Health is from the Medical Outcomes Study Short Form Health Survey (SF-6, Ware et al. 1992), with a 5-point scale. Special Health Care Needs is derived from the yes/no ratings of child's medication needs and health care needs and it is from the Children with Special Health Care Needs Screener (Bethell et al. 2002).

For the K-cohort, physical domain comprises Health and Motor Skills. Health is measured by Overall Health, Special Health Care Needs, and Body-Mass Index (BMI). BMI is an age-adjusted direct assessment of the child's height and weight relationship. Motor Skills is an 8-item parent rated scale to measure a child's level of functioning in daily activities and is derived from the Physical Health Summary score from the Pediatric Quality of Life Inventory ($\alpha=0.88$) (Varni et al. 1999).

Socio-emotional domain is composed of three temperament measures for the B-cohort. These temperament measures are from an abbreviated form of the parent-rated Short Temperament Scale for Infants (STSI, Sanson et al. 1987). STSI Approach measures the infant's reactions to new situations and people ($\alpha=0.72$), STSI Irritability assesses the infant's responsiveness to soothing attempts and calmness versus volatility ($\alpha=0.57$), and STSI Cooperativeness captures the infant's amenability or adaptability ($\alpha=0.67$). All temperament measures have four items with a 6-point scale.

Table 1 Summary of the sample size and response rate

Wave	Year	B-cohort			K-cohort		
		Age	n	%	Age	n	%
1	2004	0–1	5,107	100	4–5	4,983	100
2	2006	2–3	4,606	90	6–7	4,464	90

LSAC is scheduled to be collected biennially until 2018 (8 waves of data collection). At Wave 8 in 2018, B-cohort children will be 14–15 years old and K-cohort children will be 18–19 years old

Table 2 Sub-domains of LSAC outcome measures

B-cohort	K-cohort
Physical domain	Physical domain
Overall Health	Overall Health
Special Health Care Needs	Special Health Care Needs
	Body-Mass Index
	PEDS QL Physical health
Socio-emotional domain	Socio-emotional domain
STSI Approach	SDQ Prosocial
STSI Irritability	SDQ Peer problems
STSI Cooperativeness	SDQ Emotional symptoms
	SDQ Hyperactivity
	SDQ Conduct
Learning domain	Learning domain
Communication and Symbolic Behaviour Scale	Peabody Picture Vocabulary Test
	Parent rating of reading skills
	Teacher rating of reading skills
	Teacher rating of writing skills
	Teacher rating of numeracy skills
	Who Am I

Sanson et al. (2005)

STSI stands for Short Temperament Scale for Infants, *PEDS QL* stands for Pediatric Quality of Life Inventory, *SDQ* stands for Strengths and Difficulties Questionnaire

For the K-cohort, socio-emotional domain consists of three sub-domains: Social Competence, Internalising, and Externalising. The sub-domains were derived from the parent-rated subscales of the Strengths and Difficulties Questionnaire UK version (SDQ, Goodman 1997). Social Competence was the mean of SDQ Prosocial and SDQ Peer problems. SDQ Prosocial measures the child's tendency to behave in considerate and helpful ways to others (α=0.66) and SDQ Peer problems measures the child's ability to build positive relationships with peers (α=0.50). Internalising is based on SDQ Emotional symptoms assessing the frequency of displaying negative emotional states (α=0.58). Externalising is the mean of SDQ Hyperactivity and SDQ Conduct. SDQ Hyperactivity measures the child's fidgetiness, concentration span and impulsiveness (α=0.74) whereas SDQ Conduct assesses the child's acting-out or problem behaviours during interactions with others (α=0.69).

The learning domain for the B-cohort is based on a 24-item parent-rated scale (α=0.89), the Communication and Symbolic Behavior Scale Developmental Profile—Infant/Toddler Checklist (CSBS-DP, Wetherby and Prizant 2001). The learning domain for the K-cohort is composed of Language, Literary, Numeracy, and Approach to learning. Language is measured by a 40-item shortened version of the Peabody Picture Vocabulary Test, Third Ed [PPVT-III] (Dunn and Dunn 1997). Literacy was assessed by parent-rated reading skills (three yes/no

items), teacher-rated reading skills (five yes/no items) and teacher-rated writing skills (six yes/no items). Numeracy was assessed by teacher rating of numeracy skills on five yes/no items. All teacher-rated items were drawn from National Longitudinal Survey of Children and Youth (NLSCY, Statistics Canada 2000). Approach to learning was based on the Who Am I? (WAI) Instrument (de Lemos and Doig 1999) and it is a direct child assessment to tap cognitive processes underlying early literacy and numeracy skills (internal consistency ranging from 0.51 to 0.67) (Plake et al. 2003).

Body-Mass Index, Peabody Picture Vocabulary Test, and Who Am I were direct measures. Teacher rating of reading, writing, and numeracy skills were completed by the child's teacher or carer. Other scales were all completed by the primary parent or guardian. The primary parent or guardian was the child's biological mother in most cases (98%). The domain scores were standardized composite measures with the means approximately 100 and standard deviations approximately 10. Higher scores indicate higher functioning. According to Sanson et al. (2005), when one or more z-scores of component measures were missing, a sub-domain score was still obtained by taking the average of all the available z-scores of component measures with some corrections for the missingness. The same principle was applied in creating a domain score based on sub-domain scores. This is likely to contribute to more missing values on learning outcome for the B-cohort because learning domain for the B-cohort was derived from only one sub-domain whereas all other domains were based on two or more sub-domains. Refer to Sanson et al. (2010, 2005) for further details of the child outcome index.

The independent variables are categories of poverty status across two waves: *persistently poor*, *out of poverty*, *fell into poverty*, and *never poor*. Families in the *persistently poor* group were poor at both waves; families in the *out of poverty* group were poor at Wave 1 but not poor in Wave 2; families in the *fell into poverty* group were not poor at Wave 1 but became poor at Wave 2; and families in the *never poor* group were not poor at both waves. Three dummy variables were created to indicate poverty status (*never poor* as a reference group).

The effects of persistent poverty were investigated using two different thresholds of poverty: poverty defined as being at the bottom 10% of the income ladder (poverty status 1) and at the bottom 20% of the income ladder (poverty status 2). LSAC data does not provide income from household members other than parents at Wave 1 or ages of household members other than study child and parents. Due to these limitations, equivalised parental income was calculated instead of equivalised disposable household income, a measure used by the Australian Bureau of Statistics (ABS).[1] To create equivalised parental income, parental weekly income was divided

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[1] According to the Australian Bureau of Statistics, equivalised household income is total household income adjusted by the application of an equivalence scale to facilitate comparison of income levels between households of differing size and composition, reflecting the requirement of a larger household to have a higher level of income to achieve the same standard of living as a smaller household. Retrieved on 29th April, 2011 from http://www.abs.gov.au/Ausstats/abs@.nsf/0/A390E2529EC00DFE CA25720A0076F6C6?opendocument

by the square root of the number of people in the household. This is an approximate measure that does not distinguish different income needs of households members (e.g., infants, adolescents, adults) (Bradbury 2007).

Due to the difference on income measure, it is not appropriate to use median income provided by ABS to set poverty thresholds in this study (i.e., 50% or 60% of median income). As an alternative, income percentile was used as a proxy. According to the statistics on household equivalised disposable income from 1994/1995 to 2007/2008 provided by the ABS, 50% of median income was comparable to 10th percentile income whereas 60% of median income was roughly similar to 20th percentile income (Refer to Appendix A for further details). Therefore, in this study, income at the bottom 10% of the income ladder was used as a proxy of 50% of median income whereas income at the bottom 20% of the income ladder was used as a proxy of 60% of median income.

For both cohorts, seven covariates were used in the current study that corresponded to individual and family characteristics at Wave 1. Individual background variables were child's age, child sex (female = 0 and male = 1), child's Indigenous status (0 = non-Indigenous and 1 = Indigenous), and child's main language at home (0 = English speaking and 1 = other languages). Family background variables were mother's age, mother's marital status, and parental education. Mother's marital status is the legal or registered marital status and does not differentiate whether mother is married to the child's biological father or not. It was categorised as married, never-married single, and other (divorced, separated, or widowed). Parental education was measured as the highest education of parents: Bachelor or higher degree, advanced degree, certificate, year 12, and no year 12.

2.4 Analysis

Because of the complex survey design used in LSAC data, the current study utilised statistical procedures specially developed for survey data: proc surveymeans, proc surveyfreq, and proc surveyreg of SAS 9.2 (SAS Institute Inc. 2008). The use of standard software programmes cannot guarantee that the complex design does not have a serious effect on estimation (Nathan 2005). The SAS procedures developed for analyses of data with a complex survey design incorporate the information of stratum, clustering, and weights. Refer to SAS manual (SAS Institute Inc. 2009) for further details of procedures.

To reduce possible bias due to missing values, I employed the multiple imputation procedure using proc mi and proc mianalyze of SAS 9.2 (SAS Institute Inc. 2008). In particular, income variables had between 12% and 24% of missing data. It is often the case that individuals with disadvantaged backgrounds (e.g., low income) are more likely to drop out of studies. Omitting cases with missing data can lead to biased statistical inference; however, data analysis using multiple imputation method allows for valid statistical inference (Fichman and Cummings 2003). Note, however, that outcome variables were not imputed.

To identify characteristics of families in persistent poverty, groups with different poverty status were compared on demographic variables. Chi-square tests[2] and regression analysis adjusted for the complex survey design were used to examine group differences on categorical and continuous variables, respectively.

To examine effects of persistent poverty on children's outcomes, I conducted multivariate analyses controlling for child's age, gender, Indigenous status, main language at home, mother's age, mother's marital status, and parental education. Three different strategies were used to examine the effects of poverty on children's outcomes (physical, socio-emotional, and learning outcomes). First, the income gradient effects were examined using a continuous measure of income. In this model, income was average equivalised parental income over two waves and it was transformed by taking the square-root to achieve an approximate normal distribution. To investigate the effects of persistent poverty, poverty status 1 (bottom 10%) and poverty status 2 (bottom 20%) were used in the second and third models, respectively. The separate regression models were examined for each cohort because outcome measures differ by cohort.

3 Results

3.1 Sample Characteristics

As shown in Table 3, the B-cohort and K-cohort are approximately 4 years apart: Average age at Wave 1 is 0.7 for the B-cohort and 4.8 for the K-cohort. The characteristics of two cohorts are very similar but slightly different. For both cohorts, slightly above half of children are male, the majority of children are non-Indigenous and speak English at home. The differences are, compared to the B-cohort, the K-cohort has a higher proportion of children who speak other languages at home, χ^2 (1, $N=9070$)$=10.49$, $p<0.01$ and non-Indigenous children, χ^2 (1, $N=9070$)$=7.83$, $p<0.01$. It is possible that the K-cohort has more immigrants because of the longer period between their birth and the survey. This might have provided more opportunities for children born overseas to be included in the study sample.

In general, family background is also similar but different. As expected, average age of mothers in the K-cohort is about 4 years higher than average age of mothers in the B-cohort. The K-cohort has a comparatively lower percentage of single mothers and a higher percentage of married mothers or mothers who were divorced, separated, or widowed, χ^2 (2, $N=9070$)$=142.55$, $p<0.01$. Also, the K-cohort has a relatively lower proportion of parents with a bachelor or higher degree and a higher proportion of parents without Year 12, χ^2 (4, $N=9040$)$=13.64$, $p<0.01$. The average equivalised weekly parental incomes for the B-cohort and K-cohort were about $650 and $660 at Wave 1 and $780 and $800 at Wave 2, respectively. In general, parental weekly incomes were about $10–20 higher for the K-cohort than for the B-cohort although the difference was not statistically significant.

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[2] The current study used a Rao-Scott chi-square test which is "a design-adjusted version of the Pearson chi-square test (SAS Institute Inc. 2009). For further details, see http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug_surveyfreq_a0000000221.htm

Table 3 Descriptive statistics of sample by cohort

	B-cohort (n=4,606)			K-cohort (n=4,464)		
	n	Mean/%	SE	*n*	Mean/%	SE
Physical domain	4606	100.00	0.15	4464	99.99	0.17
Socio-emotional domain	4488	100.05	0.17	4344	100.00	0.19
Learning domain	3531	100.02	0.19	4443	100.00	0.21
Child age	4606	0.74	0.00	4464	4.75	0.00
Child's sex						
Female	2247	48.79		2187	48.74	
Male	2359	51.21		2277	51.26	
Indigenous status						
Non-Indigenous	4426	94.88		4309	96.25	
Indigenous	180	5.12		153	3.75	
Language at home						
Non-English	456	12.20		517	14.75	
English	4150	87.80		3947	85.25	
Mother's age	4604	30.88	0.12	4434	34.59	0.11
Mother's marital status						
Married	3450	71.37		3488	75.63	
Single	946	23.31		567	14.25	
Other	210	5.31		409	10.12	
Parental education						
Bachelor or higher degree	1973	37.04		1767	34.51	
Advanced degree	484	10.18		453	10.07	
Certificate	1449	34.52		1415	34.20	
Year 12	354	7.04		362	7.76	
No Year 12	334	11.22		449	13.46	
Income at Wave 1	3491	650.91	13.60	3178	662.40	12.03
Income at Wave 2	3899	777.19	14.60	3581	798.17	14.43

Weighted descriptive statistics using sample weights. SE is standard error

3.2 Who are the Poor?

Both cohorts have quite similar proportions on poverty status. Table 4 shows that, using poverty status 1 (bottom 10% of the income ladder as a poverty threshold), about 4% of families were persistently poor through both waves, 12–13% of families experienced poverty at Wave 1 or Wave 2, and about 83% of families did not experience poverty at any wave. Using poverty status 2 (bottom 20% of the income ladder as a poverty threshold), about 11% of families were poor through both waves, 18–19% of families experienced poverty at some point, and about 70% of families were not poor at any wave.

Although there were differences on percentages, group comparisons on demographics showed similar patterns despite different thresholds used to define

Table 4 Percentages of children by poverty status and cohort

	B-cohort (n=4,606) Percent (%)	K-cohort (n=4,464) Percent (%)
Poverty status 1 (Bottom 10%)		
Persistently poor	4.0	4.2
Out of poverty	6.9	6.5
Fell into poverty	6.0	5.8
Never poor	83.2	83.5
Poverty status 2 (Bottom 20%)		
Persistently poor	11.3	11.6
Out of poverty	10.2	9.5
Fell into poverty	8.6	8.4
Never poor	69.8	70.6

Poverty status was created using equivalised parental income at Wave 1 and Wave 2. Missing values were imputed using the multiple imputation procedure in SAS 9.2. For poverty status 1, poverty was defined as being at the bottom 10% of the income ladder whereas, for poverty status 2, poverty was defined as being at the bottom 20% of the income ladder. Persistently poor group was poor at Wave 1 and 2; Out of poverty group was poor at Wave 1 but not poor at Wave 2; Fell into poverty group was not poor at Wave 1 but poor at Wave 2; and Never poor group was never poor at Wave 1 and 2. Total percentage may not be 100 due to rounding

poverty. As shown in Table 5, for both cohorts, the *persistently poor* group had a relatively higher proportion of Indigenous children and children who speak other languages at home. Although there was a slight difference by cohort, mothers who experienced poverty were relatively younger than mothers who did not experience poverty at any wave. For both cohorts, a large percentage of mothers in the *persistently poor* group were single whereas the majority of mothers in the *never poor* group were married.

The results further suggest that parents in poverty were relatively less educated. For both cohorts, about one third of parents in the *persistently poor* group did not finish Year 12 and about 11 to 17% of parents had a bachelors or higher degree. On the contrary, in the *never poor* group, less than 10% of parents did not finish Year 12, and 38 to 45% of parents had a bachelor or higher degree. Refer to Table 5 for further details.

3.3 The Effects of Persistent Poverty on Children

For both cohorts, persistent poverty had significantly negative effects on children's socio-emotional and learning outcomes using the bottom 20% as a threshold of poverty. The difference between two cohorts was that poverty at Wave 1 also had a significantly negative effect on K-cohort children's learning. Regardless of the threshold used, no significant effect of poverty was found for the physical domain for both cohorts.

For both cohorts, the income gradient effects were found for most outcomes examined. Average income across two waves was a significant predictor of children's

Table 5 Characteristics of children and their families by poverty status

	B-cohort (n=4,606)				K-cohort (n=4,464)			
	Persist	Out	Fell	Never	Persist	Out	Fell	Never
Poverty defined as being at the bottom 10% of the income ladder								
Indigenous status	***				***			
Non-Indigenous	85.3	90.2	88.2	96.2	90.5	92.3	93.5	97.0
Indigenous	14.7	9.8	11.8	3.8	9.5	7.7	6.5	3.0
Language at home	***				***			
Non-English	29.2	17.2	24.4	10.1	31.6	24.1	25.4	12.4
English	70.8	82.8	75.6	89.9	68.4	75.9	74.6	87.6
Mother's age†	***				***			
	29.9	29.1	29.7	31.2	33.4	33.4	33.4	34.8
Marital status	***				***			
Married	52.1	48.2	54.8	75.4	60.2	53.1	68.9	78.6
Single	40.7	40.2	37.9	20.0	26.1	26.9	22.5	12.1
Other	7.2	11.6	7.3	4.6	13.7	19.9	8.6	9.3
Parental education	***				***			
Degree	17.1	14.2	20.9	41.1	11.6	19.4	22.4	37.7
Advanced degree	3.4	10.0	8.9	10.6	8.9	8.0	8.2	10.4
Certificate	40.2	42.4	37.3	33.4	34.2	36.0	37.4	33.8
Year 12	8.8	10.1	7.9	6.6	9.2	10.1	13.0	7.1
No Year 12	30.5	23.3	25.0	8.3	36.1	26.5	18.9	10.9
Poverty defined as being at the bottom 20% of the income ladder								
Indigenous status	***				***			
Non-Indigenous	86.5	90.9	94.3	96.9	91.4	94.5	94.8	97.5
Indigenous	13.5	9.1	5.7	3.1	8.6	5.5	5.2	2.5
Language at home	***				***			
Non-English	24.5	12.9	19.2	9.2	30.2	20.0	18.9	11.0
English	75.5	87.1	80.8	90.8	69.8	80.0	81.1	89.0
Mother's age†	***				***			
	29.5	29.4	29.7	31.5	33.3	33.9	33.6	35.0
Marital status	***				***			
Married	53.1	55.4	63.2	77.7	63.1	64.3	69.3	80.0
Single	39.8	36.2	30.7	17.8	25.6	20.1	20.4	10.9
Other	7.1	8.4	6.1	4.5	11.3	15.6	10.3	9.2
Parental education	***				***			
Degree	14.5	19.3	20.6	45.3	13.5	23.6	23.3	40.8
Advanced degree	6.9	9.8	10.2	10.8	8.2	7.9	10.9	10.6
Certificate	42.0	42.2	46.3	30.7	36.7	39.9	37.2	32.7
Year 12	10.7	9.1	7.1	6.2	12.8	8.4	10.2	6.6
No Year 12	25.9	19.6	15.8	7.0	28.7	20.2	18.4	9.5

*** p<.001. Persist, Out, Fell, and Never stand for Persistent poverty, Out of poverty, Fell into poverty, and Never poor. Total percentage may not be 100 due to rounding. Numbers are percentages except ones for mother's age. The percentages are calculated from average frequencies from five imputed data sets. Chi-square test results of five imputed data sets are reported on Appendix 2. † SAS procedures of proc surveyreg and proc mianalyze were used to examine differences of mother's age by poverty status from five imputed data sets

socio-emotional and learning outcomes for both cohorts; however, income was a significant predictor of physical domain only for the K-cohort. Holding other variables constant, one unit increase on the square-root average equivalised parental income predicted 0.08 and 0.12 unit increases on socio-emotional and learning outcomes of B-cohort children. Other things being equal, one unit increase on the square-root average equivalised parental income predicted 0.07, 0.09, and 0.17 unit increases on physical, socio-emotional, and learning outcomes of K-cohort children, respectively. For both cohorts, the effect of average income was strongest for learning outcome. See Table 6.

For the B-cohort, there were significantly negative effects of persistent poverty on children's socio-emotional and learning outcomes when the bottom 20% of the income ladder was used as a threshold of poverty. Holding other variables constant, children in the *persistently poor* group had 1.96 lower scores on socio-emotional domain ($SE=0.73$, $p<0.05$) and 2.04 lower scores on learning domain ($SE=0.75$, $p<0.01$) than did children in the *never poor* group. However, using the bottom 10% as a threshold, poverty status did not significantly predict children's outcomes. Refer to Table 7.

The results of the K-cohort showed significantly negative effects of persistent poverty on socio-emotional and learning outcomes. Using the bottom 10% as a threshold of poverty, children in the *persistently poor* group showed significantly lower learning outcome ($\beta=-2.58$, $SE=0.97$, $p<0.01$). Using the bottom 20% as a threshold of poverty, children in the *persistently poor* group showed significantly lower levels of socio-emotional and learning development than did children in the *never poor* group. Holding other variables constant, children in the *persistently poor* group had 2.08 lower score on socio-emotional domain ($SE=0.70$, $p<0.01$) and 2.88 lower score on learning domain ($SE=0.59$, $p<0.001$). For the K-cohort, children who experienced poverty at Wave 1 also showed lower learning outcome ($\beta=-1.66$, $SE=0.56$, $p<0.01$) than did children who were never poor. See Table 8.

For both cohorts, in general, lower levels of socio-emotional and learning development were found among males,[3] Indigenous children, children with single parents, children who speak other language at home, and children with less educated parents.

4 Discussion

The current study examined effects of persistent poverty on children's physical, socio-emotional, and learning outcomes using the Longitudinal Study of Australian Children (Australian Institute of Family Studies 2007). Although the effects differed by cohort and the threshold used to define poverty, the results showed that persistent poverty generally had significantly negative effects on children's socio-emotional and learning outcomes.

As shown in the current study, families in the *persistently poor* group were more likely to come from socially disadvantaged background: Young and unmarried

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[3] Lower levels of socio-emotional outcome presented by males might be due to the fact that items in socio-emotional domain mainly measure conduct-related aspects in the current study.

Table 6 The effects of income on children's outcomes using average equivilased parental income across Wave 1 and Wave 2

	B-Cohort						K-Cohort					
	Physical (n=4,604)		Socio-emo (n=4,488)		Learning (n=3,531)		Physical (n=4,464)		Socio-emo (n=4,344)		Learning (n=4,443)	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Intercept	96.74***	1.49	93.78***	1.47	95.24***	1.55	93.91***	3.15	96.37***	3.24	91.99***	3.20
Child age	0.93	0.66	−0.34	0.69	1.19	0.82	0.52	0.64	−0.26	0.65	0.44	0.66
Male (Female)	−0.61*	0.30	−3.22***	0.28	−3.47***	0.33	−0.79**	0.28	−2.85***	0.28	−0.93**	0.30
Indigenous (Non-Indigenous)	−0.75	0.80	−2.56***	0.72	−4.47***	1.14	−0.73	0.68	−1.88	1.01	−4.84***	0.80
English at home (Other)	1.99***	0.56	4.47***	0.63	3.47***	0.63	1.73***	0.48	2.47***	0.50	1.73***	0.45
Average income	0.02	0.02	0.08***	0.02	0.12***	0.03	0.07*	0.02	0.09***	0.03	0.17***	0.02
Mother's age	0.04	0.03	0.05	0.03	−0.06	0.04	0.04	0.03	0.07*	0.03	0.04	0.03
Marital status (Married)												
Single	−1.42***	0.41	−1.02*	0.40	−0.21	0.48	−1.35**	0.51	−3.12***	0.49	−1.08*	0.50
Other	−0.53	0.74	−0.23	0.71	−1.86*	0.83	0.36	0.58	−2.13***	0.57	−1.71***	0.52
Parental education (Year 12)												
Bachelor or higher degree	−0.32	0.60	1.78**	0.62	2.91***	0.65	−0.09	0.66	1.49**	0.53	2.65***	0.56
Advanced degree	−0.08	0.63	1.45	0.76	1.82*	0.78	−0.07	0.81	0.46	0.65	−0.16	0.68
Certificate	0.04	0.58	0.70	0.62	1.44*	0.66	−0.29	0.66	−0.32	0.53	−1.86***	0.54
No Year 12	−0.96	0.87	−2.16**	0.80	−0.94	0.97	−1.53*	0.73	−1.80**	0.65	−3.63***	0.69

Average income was calculated using imputed income at Wave 1 and Wave 2 and then it was transformed by taking the square-root to achieve an approximate normal distribution. β stands for regression coefficients and SE is standard errors. Reference groups are in the parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 7 The effects of persistent poverty on B-cohort children's outcomes

| | Bottom 10% as a threshold | | | | | | Bottom 20% as a threshold | | | | | |
| | Physical (n=4,604) | | Socio-emo (n=4,488) | | Learning (n=3,531) | | Physical (n=4,604) | | Socio-emo (n=4,488) | | Learning (n=3,531) | |
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Intercept	97.35***	1.42	95.61***	1.36	97.40***	1.49	97.24***	1.43	95.95***	1.34	97.87***	1.48
Child age	0.91	0.66	−0.25	0.68	1.36	0.82	0.93	0.66	−0.34	0.68	1.24	0.82
Male (Female)	−0.61*	0.30	−3.23***	0.28	−3.47***	0.33	−0.61*	0.29	−3.25***	0.28	−3.48***	0.33
Indigenous (Non-Indigenous)	−0.71	0.81	−2.57***	0.72	−4.50***	1.13	−0.75	0.80	−2.45***	0.72	−4.33***	1.13
English at home (Other)	1.92***	0.56	4.54***	0.64	3.66***	0.64	1.99***	0.56	4.48***	0.63	3.61***	0.63
Poverty status (Never Poor)												
Persistently poor	−0.09	1.09	−1.70	1.24	−2.37	1.29	−0.29	0.64	−1.96*	0.73	−2.04**	0.75
Out of poverty	−0.70	0.96	−0.95	0.88	−0.84	1.01	−0.26	0.69	−0.91	0.62	−1.35	0.71
Fell into poverty	−1.43	0.78	−1.16	0.70	−0.40	0.90	−0.36	0.63	−0.14	0.55	0.24	0.69
Mother's age	0.04	0.03	0.06*	0.03	−0.05	0.04	0.04	0.03	0.06	0.03	−0.05	0.04
Marital status (Married)												
Single	−1.35***	0.41	−1.00*	0.40	−0.24	0.48	−1.40***	0.41	−0.95*	0.40	−0.18	0.48
Other	−0.45	0.74	−0.17	0.71	−1.84*	0.83	−0.52	0.74	−0.18	0.70	−1.83*	0.83
Parental education (Year 12)												
Bachelor or higher degree	−0.30	0.59	2.06***	0.63	3.36***	0.65	−0.29	0.59	1.92**	0.63	3.18***	0.65
Advanced degree	−0.07	0.63	1.47	0.75	1.89*	0.78	−0.08	0.64	1.39	0.75	1.76*	0.78
Certificate	0.03	0.59	0.64	0.62	1.40*	0.67	0.04	0.59	0.61	0.62	1.31*	0.67
No Year 12	−0.88	0.86	−2.14**	0.80	−0.89	0.98	−0.94	0.87	−2.16**	0.81	−0.97	0.98

β stands for regression coefficients and SE is standard errors. Reference groups are in the parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 8 The effects of persistent poverty on K-cohort children's outcomes

| | Bottom 10% as a threshold | | | | | | Bottom 20% as a threshold | | | | | |
| | Physical (n=4,464) | | Socio-emo (n=4,344) | | Learning (n=4,443) | | Physical (n=4,464) | | Socio-emo (n=4,344) | | Learning (n=4,443) | |
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Intercept	94.90***	3.09	98.01***	3.20	95.05***	3.23	95.02***	3.10	98.26***	3.20	95.27***	3.23
Child age	0.57	0.64	−0.19	0.65	0.52	0.67	0.59	0.65	−0.14	0.65	0.65	0.67
Male (Female)	−0.78**	0.28	−2.84***	0.28	−0.89**	0.30	−0.80**	0.28	−2.86***	0.28	−0.94**	0.30
Indigenous (Non-Indigenous)	−0.81	0.69	−1.90	1.00	−4.95***	0.79	−0.76	0.69	−1.84	0.99	−4.83***	0.79
English at home (Other)	1.89***	0.49	2.53***	0.51	1.93***	0.45	1.80**	0.49	2.37***	0.51	1.67***	0.45
Poverty status 2 (Never Poor)												
Persistently poor	−0.49	1.00	−2.49	1.38	−2.58**	0.97	−0.88	0.59	−2.08*	0.70	−2.88***	0.59
Out of poverty	0.14	0.74	−0.23	1.04	−1.58	0.83	0.14	0.60	−0.78	0.88	−1.66**	0.56
Fell into poverty	−0.44	0.86	−1.12	0.97	−0.88	0.72	−0.23	0.71	−0.65	0.76	−1.14	0.75
Mother's age	0.05	0.03	0.08*	0.03	0.06*	0.03	0.05	0.03	0.08*	0.03	0.05	0.03
Marital status (Married)												
Single	−1.43**	0.52	−3.13***	0.48	−1.09*	0.50	−1.37**	0.52	−3.04***	0.49	−0.99*	0.50
Other	0.36	0.58	−2.10***	0.57	−1.57**	0.51	0.37	0.58	−2.09***	0.57	−1.60**	0.51
Parental education (Year 12)												
Bachelor or higher degree	0.23	0.65	1.83***	0.53	3.34***	0.55	0.14	0.66	1.65**	0.54	3.06***	0.55
Advanced degree	0.02	0.81	0.53	0.65	0.00	0.67	−0.04	0.81	0.40	0.65	−0.20	0.68
Certificate	−0.29	0.66	−0.34	0.53	−1.89***	0.54	−0.33	0.66	−0.42	0.54	−2.00***	0.55
No Year 12	−1.59*	0.73	−1.80**	0.64	−3.65***	0.68	−1.57*	0.73	−1.81*	0.65	−3.65***	0.69

β stands for regression coefficients and SE is standard errors. Reference groups are in the parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

mothers, less educated parents, Indigenous children, and children who speak other languages at home. It is known that poverty is not equally distributed across different demographic groups (Corcoran and Chaudry 1997); it is rather concentrated among socially disadvantaged groups. Thus, it is likely that persistent poverty is a manifestation of multiple disadvantages that keep these families in poverty.

The results of the current study indicated the income gradient in children's outcomes: The more money parents have, the better their children develop. This finding explains one of mechanisms that maintain status quo in the society because children with better socio-emotional, physical, and learning development are likely to do better at school, have better jobs, and earn more money when they grow up. This leads to the intergenerational transmission of social and economic status. Due to the lasting negative effects of childhood poverty, researchers and policy makers often focus on individuals at the bottom of income ladder. It is clearly important to examine the effects of poverty (i.e., lack of income). However, this fining suggests that inequality in wellbeing of children is not just an issue for people in poverty but it is an issue for all.

The current study further investigated whether a family was consistently in poverty over 2 years or not and, subsequently, identified the effects of persistent poverty on children's outcomes. Children in the *persistently poor* group presented significantly lower socio-emotional and learning outcomes, using the bottom 20% as a threshold of poverty. This was the case for both cohorts. For K-cohort children, persistent poverty had a significantly negative effect on learning even when the bottom 10% was used as a threshold of poverty. The stronger effect of poverty on learning is consistent with previous literature (e.g., Brooks-Gunn and Duncan 1997; Haveman and Wolfe 1995). Literature suggests that poverty in early years particularly has a strong negative influence on children's learning (Duncan, et al. 1998; Smith, et al. 1997). Children's cognitive development in early years is critical because cognitive development in early years can be linked to academic success at school and other life chances later (e.g., employment). There is a cumulative aspect of learning in that current learning is often based on previous learning. The result showed that children from persistently poor families are falling behind regarding their cognitive development from early years of their lives (2–3 years old and 6–7 years old). Thus, without adequate interventions to compensate, it is likely that the delay of cognitive development in early childhood will further influence learning in later years, school success, and other life chances.

Although smaller in magnitude, persistent poverty had a significantly negative effect on socio-emotional outcome for both cohorts. Evans (2004) claimed that children's socio-emotional outcome is negatively influenced by many social and physical environment factors associated with poverty (e.g., unpredictable and chaotic households, instability at home and at school, residential crowding and noise). It is likely that families in poverty struggle to provide social and physical environment for healthy socio-emotional development of their children. It is also possible that the socio-emotional outcome of children partly reflects emotional and psychological state of parents in poverty because the outcome is based on the parent report in the current study.

No significant effect of persistent poverty was found on physical outcome of children. This finding is somewhat contradictory to the existing literature (e.g.,

Duncan and Brooks-Gunn 2000; Malat et al. 2005). One possible explanation is that the non-significant result is simply reflecting problems of the physical outcome measure. The physical outcome domain is negatively skewed and the strategy taken to create the domain score seems to be partly responsible for this. According to a technical report written by Sanson et al. (2005), the original score of the Body Mass Index was transformed because both underweight and overweight of children are considered as undesirable.[4] Simply to put, the original distribution of BMI was folded in half and the middle of the original distribution was placed at the right end. By doing so, the majority of children with average weight are now placed at the right end of the distribution, not in the centre of distribution, and the variation was reduced to a half of the original. It is likely that this procedure reduced the capacity to capture the influence of poverty on physical outcome.

As a whole, children in the *persistently poor* group presented significantly lower socio-emotional and learning outcomes than children in the *never poor* group although K-cohort children in the *out of poverty* group also showed a significantly lower learning outcome than children in the *never poor* group when the bottom 20% was used as a threshold of poverty. The development of children in poverty is influenced by the suboptimal living conditions that they experience including low quality food, housing, neighbourhood, and child care (Evans 2004). Literature also suggests that both the frequency and intensity of stressful life events and daily hassles are greater among children in poverty (Attar et al. 1994; Evans 2004; Evans and English 2002). This result may indicate an issue of duration of poverty. Considering the adverse life circumstances associated with poverty, it is understandable that children in persistent poverty who spent a longer period of time in poverty exhibit worst outcomes.

In identifying the effects of persistent poverty on children's outcomes, poverty status using the bottom 20% of the income ladder as a threshold had a stronger predictive power than poverty status using the bottom 10% of income. It is possible that the effects of persistent poverty were not adequately captured when children from families with income below 10th percentile were compared to children from families with income above that level. If income below 20th percentile is still suboptimal, children from families with income between 10th and 20th percentile may present similarly lower outcomes and including them to the comparison group would likely to reduce the effects of poverty. The results may mean that parental income below 20th percentile is still not enough to provide optimal environment for healthy development of children.

In the current study, bottom 10% and bottom 20% of the income ladder were used as proxies of 50% and 60% of median income, respectively. To measure a proportion of people living in or at risk of living in poverty, the European Union (EU) and the Organisation for Economic Cooperation and Development (OECD) use the percentages of the national median equivalised income. EU defines those 'at risk

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[4] The original score of the Body Mass Index was transformed to the *z*-score and the absolute value of the *z*-score was obtained by multiplying the scores below 0 by −1. Then, the scores were standardized and reversed to make higher scores represent a better outcome (i.e., average weight).

of poverty' as families with incomes below 60% of the median income of their own country. The OECD also measures poverty using 40%, 50% and 60% of median income. These relative poverty lines are widely used because it is easy to calculate, understand, and update (Zheng 2001). According to the results of the current study, children from families with income below 60% of median income may present lower levels of outcomes in many areas as do children from families with income below 50% of median income. Therefore, in developing policies against poverty, it may be more desirable to use 60% of median income as a threshold if we aim to reduce the negative effects of poverty on children and to prevent intergenerational transmission of poverty.

4.1 Limitations

Despite the efforts made to ensure the rigorousness of the current study, there are several limitations. Like all the other longitudinal studies, attrition is a concern for the current study. About 10% of families did not participate in the survey at Wave 2. LSAC datasets are provided with weights that adjust for unequal probability of selection and non-response. Hence, the current study used sample weights at Wave 2 which would greatly reduce the possible bias due to the attrition.

Other limitations are related to income and poverty measures. LSAC has a large proportion (12–24%) of missing data on income. To reduce the bias due to missing data, the current study used the multiple imputation procedure. In the current study, relative measures of poverty were used because no consistent measure of poverty is currently available in Australia. Families in the bottom 10% and 20% of the income ladder were identified as poor and these thresholds were proxies of 50% and 60% of median income. As a result of this strategy, the current study provides information about the effects of relative poverty.

The sole focus on income poverty is another limitation. Other factors may also be operating (e.g., Guo and Harris 2000; Yeung et al. 2002). These include food insecurity, economic hardship, educational investment, parenting, family interactions, and parental mental health. These factors are often closely related to and influenced by income poverty. Despite the limited scope, the current study showed the negative effects of poverty on children and this finding can serve as a starting point for complex studies. Future studies investigating the mediators or pathways would add valuable information for the development of interventions for children in poverty.

Lastly, different instruments were used to measure the same constructs due to the age difference of the B-cohort and K-cohort. Although the effects of persistent poverty on children's outcomes seemed to be larger for children in the K-cohort than for children in the B-cohort, dissimilar measures made it difficult to perform statistical tests on the difference. The larger coefficients for the K-cohort could stem from the cohort effect, age difference, or different measures used. Using the current data with two waves, different measures, and different age groups, it is not possible to determine the reason for the difference. LSAC data are scheduled to be collected until Wave 8 and the B-cohort will be 14–15 years old and the K-cohort will be 18–19 years old at the time. Future studies with later waves of LSAC data are warranted to confirm any of these possibilities.

4.2 Implications

The characteristics of poor families and the effects of poverty on children are well documented in the literature; however, there are few recent studies in Australia on this topic partly owing to the controversies over the poverty line. The current study attempted to bring our attention to child poverty in Australia again by providing recent empirical evidence. This is the major contribution of the current study.

Given the long term effects of early childhood development, it is necessary to make investments in the early years to reduce the gap among children from different backgrounds. The current study showed that children in the *persistently poor* group are more likely to have significantly lower levels of socio-emotional and learning outcomes and they are more likely to come from socially disadvantaged families in many ways. Equal opportunity to fulfil an individual's potential is a basis for an inclusive society. However, children from socially and economically disadvantaged families are falling behind from their early childhood. If we are to address these inequalities and to break the cycle of disadvantage, actions to relieve poverty in early childhood and to reduce the effects of poverty on children are required to ensure adequate development of the most vulnerable children (i.e., children from persistently poor families).

Although it is critical to understand the complexities of problems these families experience, it is also important for policy makers and practitioners in the field to have simple and clear criteria (e.g., income below a certain level) in deciding the eligibility of services and determining a target population for certain interventions. The current study examining the effects of persistent poverty on children using different thresholds provide some information for such criteria. For example, given the negative effects of persistent poverty on children's development found in the current study, if families earn income below 60% of median income for consecutive years, concentrate efforts need to be made to support these families and to ensure proper development of children from these families.

Further studies investigating longitudinal trajectories would provide clearer pictures about child development and the effects of poverty. The data from only two waves was used to create poverty status in the current study. Literature suggests that average income for a longer period is more predictive of children's outcomes (Blau 1999). Future studies using information for a longer period would provide a better understanding of the long-term effects of poverty on children. In particular, growth models using hierarchical model or structural equation model would provide a better picture of longitudinal trajectories of children's outcomes.

5 Conclusion

The current study provided empirical evidence on the negative effects of persistent poverty on Australian children. Children in the *persistently poor* group showed significantly lower levels of socio-emotional and learning outcomes than children in the *never poor* group. Children in the *persistently poor* group were more likely to come from socially disadvantaged families.

Appendix

Table 9 Comparison of 50% and 60% median incomes and 10th percentile and 20th percentile incomes

	1994/ 1995	1995/ 1996	1996/ 1997	1997/ 1998	1999/ 2000	2000/ 2001	2002/ 2003	2003/ 2004	2005/ 2006	2007/ 2008
Median weekly income	454	448	464	470	494	505	516	562	605	692
Percentages of median income										
50% of median income	227	224	232	235	247	253	258	281	303	346
60% of median income	272	269	278	282	296	303	310	337	363	415
Income at the top of percentiles										
10th percentile income	231	229	240	241	244	247	251	277	292	317
20th percentile income	275	273	285	287	294	300	307	338	364	410

Income is measured as equivalised disposable household weekly income in Australian dollar. The median income and income percentiles are provided by the Australian Bureau of Statistics whereas 50% and 60% of median incomes are calculated based on the median income. For further details, refer to Household income and income distribution, Australia, 2007–2008 (the Australian Bureau of Statistics): http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/32F9145C3C78ABD3CA257617001939E1/$File/65230_2007-08.pdf

Table 10 Chi-square results of group comparisons by poverty status

	Imputation Number	B-cohort (n=4,606)			K-cohort (n=4,464)		
		χ^2	df	p	χ^2	df	p
Poverty defined as being at the bottom 10% of the income ladder							
Indigenous status	1	59.52	3	<0.0001	39.45	3	<0.0001
	2	73.29	3	<0.0001	32.50	3	<0.0001
	3	58.62	3	<0.0001	37.84	3	<0.0001
	4	50.28	3	<0.0001	28.78	3	<0.0001
	5	62.14	3	<0.0001	44.39	3	<0.0001
Language at home	1	96.67	3	<0.0001	70.17	3	<0.0001
	2	50.50	3	<0.0001	94.47	3	<0.0001
	3	89.73	3	<0.0001	78.92	3	<0.0001
	4	122.73	3	<0.0001	85.26	3	<0.0001
	5	72.03	3	<0.0001	82.54	3	<0.0001
Marital status	1	139.33	6	<0.0001	131.66	6	<0.0001
	2	157.73	6	<0.0001	115.88	6	<0.0001
	3	128.07	6	<0.0001	144.16	6	<0.0001

Table 10 (continued)

	Imputation Number	B-cohort (*n*=4,606)			K-cohort (*n*=4,464)		
		χ^2	df	*p*	χ^2	df	*p*
	4	107.85	6	<0.0001	110.58	6	<0.0001
	5	176.54	6	<0.0001	136.55	6	<0.0001
Parental education	1	284.18	12	<0.0001	231.58	12	<0.0001
	2	254.84	12	<0.0001	155.36	12	<0.0001
	3	242.72	12	<0.0001	245.63	12	<0.0001
	4	222.89	12	<0.0001	218.33	12	<0.0001
	5	278.24	12	<0.0001	190.98	12	<0.0001
Poverty defined as being at the bottom 20% of the income ladder							
Indigenous status	1	94.29	3	<0.0001	43.20	3	<0.0001
	2	99.39	3	<0.0001	46.68	3	<0.0001
	3	82.21	3	<0.0001	53.57	3	<0.0001
	4	80.31	3	<0.0001	40.54	3	<0.0001
	5	92.46	3	<0.0001	55.91	3	<0.0001
Language at home	1	103.47	3	<0.0001	103.36	3	<0.0001
	2	68.39	3	<0.0001	118.78	3	<0.0001
	3	79.77	3	<0.0001	124.50	3	<0.0001
	4	100.19	3	<0.0001	119.05	3	<0.0001
	5	91.97	3	<0.0001	109.33	3	<0.0001
Marital status	1	176.36	6	<0.0001	112.50	6	<0.0001
	2	196.68	6	<0.0001	106.17	6	<0.0001
	3	170.54	6	<0.0001	122.51	6	<0.0001
	4	148.32	6	<0.0001	122.58	6	<0.0001
	5	184.04	6	<0.0001	131.13	6	<0.0001
Parental education	1	433.55	12	<0.0001	305.37	12	<0.0001
	2	404.63	12	<0.0001	300.79	12	<0.0001
	3	390.41	12	<0.0001	294.92	12	<0.0001
	4	295.56	12	<0.0001	296.32	12	<0.0001
	5	420.83	12	<0.0001	274.74	12	<0.0001

χ^2 is obtained from the Rao-Scott chi-square test, a design-adjusted version of the Pearson chi-square test (SAS Institute Inc. 2009)

References

Attar, B. K., Guerra, N. G., & Tolan, P. H. (1994). Neighboorhood disadvantage, stressful life events, and adjustment in urban elementary-school children. *Journal of Clinical Child Psychology, 23*, 391–400.

Australian Institute of Family Studies. (2007). *Longitudinal study of Australian children*. Melbourne: CD-ROM.

Australian Institute of Family Studies. (2009). *Longitudinal study of Australian children data user guide*. Melbourne.

Bethell, C. D., Read, D., Stein, R. E. K., Blumberg, S. J., Wells, N., & Newacheck, P. W. (2002). Identifying children with special health care needs: Development and evaluation of a Short Screening Instrument. *Ambulatory Pediatrics, 2*, 38–48.

Blau, D. (1999). The effect of income on child development. *The Review of Economics and Statistics, 81*, 261–276.

Bradbury, B. (2007). *Child outcomes and family socio-economic characteristics*. Sydney: Social Policy Research Centre, University of New South Wales.

Brooks-Gunn, J., & Duncan, G. J. (1997). The effects of poverty on children. *The Future of Children, 7*, 55–71.

Corcoran, M. E., & Chaudry, A. (1997). The dynamics of childhood poverty. *The Future of Children, 7*, 40–54.

de Lemos, M., & Doig, B. (1999). *Who am I: Mental measurements yearbook* (Vol. 15). Melbourne: Australian Council for Educational Research.

Duncan, G. J., & Brooks-Gunn, J. (2000). Family poverty, welfare reform, and child development. *Child Development, 71*, 188–196.

Duncan, G. J., Yeung, W. J., Brooks-Gunn, J., & Smith, J. R. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review, 63*, 406–423.

Dunn, L. M., & Dunn, D. (1997). *The peabody picture vocabulary test—form IIA, english edition* (3rd ed.). Circle Pines: American Guidance Service Inc.

Evans, G. W. (2004). The environment of childhood poverty. *American Psychologist, 59*, 77–92.

Evans, G. W., & English, K. (2002). The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. *Child Development, 73*, 1238–1248.

Fichman, M., & Cummings, J. N. (2003). Multiple imputation for missing data: Making the most of what you know. *Organizational Research Methods, 6*, 282–308.

Goodman, R. (1997). The Strengths and Difficulties Questionnaire: a research note. *Journal of Child Psychology and Psychiatry, 38*, 581–586.

Guo, G., & Harris, K. M. (2000). The mechanisms mediating the effects of poverty on children's intellectual development. *Demography, 37*, 431–447.

Haveman, R., & Wolfe, B. (1995). The determinants of children's attainments: A review of methods and findings. *Journal of Economic Literature, 33*, 1829–1878.

Malat, J., Oh, H. J., & Hamilton, M. A. (2005). Poverty experience, race, and child health. *Public Health Reports, 120*, 442–447.

Nathan, G. (2005). More advanced approaches to the analysis of survey data, Household Sample Surveys in Developing and Transition Countries Available from http://mdgs.un.org/unsd/hhsurveys/pdf/Chapter_20.pdf

Plake, B. S., Impara, J. C., & Spies, R. A. (2003). *The fifteenth mental measurements yearbook*. Lincoln: Buros Institute of Mental Measurements.

Qvortrup, J., Bardy, M., Sgritta, G., & Wintersberger, H. (Eds.). (1994). *Childhood matters: Social theory, practice and politics*. Aldershot: Avebury.

Sanson, A. V., Prior, M., Garino, E., & Oberklaid, F. (1987). The structure of infant temperament: Factor analysis of the revised infant temperament questionnaire. *Infant Behavior & Development, 10*, 97–104.

Sanson, A. V., Misson, S., & Outcome Index Working Group. (2005). Summarising children's wellbeing: the LSAC Outcome Index, LSAC Technical Paper No. 2: Australian Institute of Family Studies.

Sanson, A. V., Misson, S., Hawkins, M. T., Berthelsen, D., & the LSAC Research Consortium. (2010). The development and validation of Australian indices of child development—part I: Conceptualisation and development. *Child Indicators Research, 3*, 275–292.

SAS Institute Inc. (2008). SAS 9.2. Cary, NC: SAS Institute Inc.

SAS Institute Inc. (2009). SAS/STAT(R) 9.2 User's Guide, Second Edition Available from http://support.sas.com/cdlsearch?ct=80000

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor*. New York: Russell Sage.

Statistics Canada. (2000). *National Longitudinal Survey of Children and Youth (NLSCY) cycle 3 survey instruments: Parent questionnaire*. Ottowa: Statistics Canada.

Varni, J. W., Seid, M., & Rode, C. A. (1999). The PedsQL: Measurement model for the pediatric quality of life inventory. *Medical Care, 37*, 126–139.

Ware, J. E., Nelson, E. C., Sherbourne, C. D., & Stewart, A. L. (1992). Preliminary tests of a 6-item General Health Survey: A patient application. In A. L. Stewart & J. E. Ware (Eds.), *Measuring*

functioning and well-being: The medical outcomes study approach (pp. 291–308). Durham: Duke University Press.

Wetherby, A. M., & Prizant, M. (2001). *Communication and Symbolic Behavior Scales—infant/toddler checklist*. Baltimore: Paul H. Brookes.

Whiteford, P., & Adema, W. (2007). What works best in reducing child poverty: A benefit of work strategy? *OECD Social, Employment, and Migration Working Papers No. 51*: OCED Publishing.

Yeung, W. J., Linver, M. R., & Brooks-Gunn, J. (2002). How money matters for young children's development: Parental investment and family processes. *Child Development, 73*, 1861–1879.

Zheng, B. (2001). Statistical inference for poverty measures with relative poverty lines. *Journal of Econometrics, 101*, 337–356.