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ORIGINAL ARTICLE

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Child protection and developmental trajectories of children who entered care as infants

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Abstract

Infants have the highest rate of admission into out-of-home care in Australia, with rising rates of entry to care occurring around the world. Our previous research identified children who entered care as infants as having high levels of developmental vulnerability. The objective of this study was to determine the child protection and developmental trajectories of children who entered care as infants and whether meeting developmental needs through service provision improves trajectories and outcomes for these children. This is a prospective cohort study using three waves (2011–2016) of survey data from the New South Wales Pathways of Care Longitudinal Study which includes standardised assessments (Age and Stages Questionnaire, Brief Infant Toddler Social Emotional Assessment and the Child Behaviour Checklist), as well as linked administrative child protection and health data. Our findings suggest that children who entered care as infants predominantly remained in the care system and had a high level of developmental vulnerability as infants. A large group had positive physical and cognitive developmental trajectories with service provision increasing over time; however, early service provision is needed. Another group was identified as having early social–emotional concerns and displaying worsening social–emotional trajectories. Intervention for this group is an important priority to reduce risk of ongoing poor mental health outcomes.

KEYWORDS
child maltreatment, child protection trajectories, developmental outcomes, developmental trajectories, out-of-home care, standardised assessments

Key Practitioner Messages

- Most children who enter care as infants will remain in the care system into their childhood.
- Children entering care as infants had a high level of developmental vulnerability. Even though developmental service provision increased over time, it is important to ensure this service provision is provided early in their development.
- A group of infants displayed worsening social–emotional trajectories. Intervention for this group is an important priority to reduce the risk of poor mental health outcomes.

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INTRODUCTION

Global increases in infant involvement in child protection services are being reported due to safety and wellbeing concerns (Pearson et al., 2020). In Australia, infants are the age group with the highest rate of substantiated notifications of maltreatment (15.8 per 1000 children) and out-of-home care (OOHC) placements at 7.5 per 1000 children (Australian Institute of Health and Welfare, 2020). Australian and New Zealand research has highlighted the over-representation of Aboriginal and Maori infants entering care, and concerns about the impact on family, community, and culture (Keddell, 2019; O'Donnell et al., 2019).

International evidence indicates that infants who enter the care system have high developmental and health needs. A study in the UK found that infants involved in care proceedings were more likely to have poor birth outcomes, including pre-term birth and low birth weight (Griffiths et al., 2020). Similarly, a US study found that infants entering foster care were almost three times more likely to have low birth weight and twice as likely to have a birth abnormality (Needell & Barth, 1998). Our previous research utilising data from the Pathways of Care Longitudinal Study (POCLS), identified that 36% of children who entered care as infants were born pre-term or had low birth weight, with 70% assessed as being developmentally vulnerable on standardised measures. Early childhood development is important for building competencies which underpin educational achievement, health and wellbeing (Moore et al., 2015).

While research has confirmed that children who entered care as infants are developmentally vulnerable, there is limited research on the longitudinal child protection and developmental trajectories of infant's who enter care. A US study investigated child protection trajectories and found that children with unstable child protection trajectories were more likely to have poorer physical and behavioural wellbeing than children in the stable groups, with physical wellbeing assessed by global health questions, and behavioural wellbeing assessed by the Youth Self-Report (YSR) and Child Behaviour Checklist (CBCL) (Villodas et al., 2016). Similarly, a Norwegian study of children placed in foster care between 0.03 and 18.6 months used the Infant-Toddler Social and Emotional Assessment and the CBCL to investigate social–emotional functioning over time (Jacobsen et al., 2020). Of the children in this study, 26% were reported by foster carers to be in the borderline/clinical range on the CBCL with foster mother's reports of externalising behaviour at 2 and 3 years of age predicting reports at 8 years of age.

Given the rising rates of infants entering OOHC around the world, longitudinal research is required to improve the understanding of child protection trajectories for children who enter care as infants, their developmental needs, and how outcomes can be optimised. Australia's first large-scale longitudinal study, POCLS, collects information on children who entered OOHC for the first time between May 2010 and October 2011 and received final orders (NSW Department of Communities and Justice, 2020c). From 2011 to date, five waves of data have been collected, with an approximate interval of 18 months between waves. This current study uses a unique combination of both survey data and standardised developmental assessments, conducted within the POCLS study, linked to administrative child protection and health data.

The aim of this study is to investigate for children who entered OOHC as infants:

i. their child protection trajectories;
ii. their developmental trajectories using standardised measures; and
iii. whether provision of developmental services is associated with improvements in trajectories/outcomes.

METHODS

Study design and data sources

This study is a prospective cohort study utilising survey data from the New South Wales (NSW) POCLS and linked administrative child protection and health data (unweighted). The POCLS data includes information on all children and young people aged 0–17 years who entered care for the first time between May 2010 and October 2011 across NSW, received final care and protection orders by 30 April 2013, and whose carer agreed to participate in at least one POCLS interview (NSW Department of Communities and Justice, 2020a; NSW Department of Communities and Justice, 2020c). This study used the POCLS carers' survey and linked administrative data from the NSW Perinatal Data Collection and the DCJ Child Protection and OOHC dataset (NSW Department of Communities and Justice data). The POCLS team used deterministic matching to link survey data to the DCJ Child Protection and OOHC dataset and probabilistic matching to link it to NSW Perinatal Data Collection. Only de-identified data was provided to researchers. Details of the POCLS study protocol and data source are available in Paxman et al. (2014) and POCLS Technical report number 2 (NSW Department of Communities and Justice, 2020c). STROBE cohort reporting guidelines were used (Von Elm et al., 2014).

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Study population

This study included children in the POCLS who entered care as infants (aged <1 year) and were followed for the first three waves of the POCLS (Australian Institute of Family Studies, 2015). Of the 474 children who entered care as infants and participated in the POCLS wave 1 interviews, a cohort of 370 children whose carer completed interviews for the first three waves were selected. The majority (80%) of these children were less than 2 years old at the wave 1 interview, 91% were aged under 4 years at wave 2, and 98% aged 3–5 years at wave 3.

Of the 104 children for whom records were not available for all three waves, over half (53%) were female and 40% were Aboriginal children, similar percentages to the rest of the cohort. Thirty-nine children had left care (37.5%), which included 11 Aboriginal and 28 non-Aboriginal children. Of this group, 44% were restored to their families and 33% placed in guardianship. The rest of these children (65) were still in care after wave 1, some participated in wave 2, but children had no records at wave 3.

Covariates

Child and demographic characteristics such as sex, ethnicity, maternal age at birth, gestational age, and birth weight were obtained from the NSW DCJ data and NSW Perinatal Data Collection. The Socio-Economic Index for Area (SEIFA-Index of Relative Socio-economic Advantage and Disadvantage) from the Australian Bureau of Statistics was used (Australian Bureau of Statistics, 2018) as a baseline measure of socio-economic status of the carer as this was the closest in time to wave 1 data and children's first entry to care.

Child protection information including number of distinct care placements (distinct placements exclude non-permanent placements, such as respite and emergency, of less than 7 days as well as a return to previous carer), predominant placement type in first period of care (placement type in which the child spent the longest time within the first period of care), number of periods of care, and type of predominant risk of significant harm report prior to entry (predominant type of abuse) include the type abuse that was recorded in more than 50% of the reports the child had prior to entry. The term mixed was used to refer to cases where the highest percentage is tied or the percentage is less than 50%), and age of entry was obtained from the DCJ datasets. Additionally, child disability was obtained from the DCJ Child Protection and OOHC data, recorded from the DCJ's client information system, current at the time of the data extract (30 June 2019). Child disability flag included disability on mental (Intellectual, developmental delay, autism, and attention deficit disorder) and body functions (speech, neurological, acquired brain injury, vision, hearing, and physical) identified by 30 June 2019.

Professional services related to developmental needs received by the study child since placement were obtained from the carers survey in each wave. Services considered were behavioural management services, early intervention, neurologist, occupational therapist, physiotherapist, counselling or psychologist, and speech pathology service. For each wave, all services received by children since their placement in care related to their developmental needs were aggregated in a single variable, coded 1 if any service was received and 0 otherwise. We also investigated whether Aboriginal children were accessing Aboriginal Medical Services.

Outcomes

Child protection and developmental trajectories were investigated over waves 1 to 3 of the POCLS for children who entered care as infants. Two summary indicators were created from the following screening tools, broadly identifying children at-risk of developmental delays and, conversely, those not at-risk.

i. The Ages and Stages Questionnaire (ASQ), completed by carers in waves 1–3, is a screening tool assessing children's physical and cognitive development. The ASQ collects information on children aged 9–66 months in five domains: personal–social skills, problem solving skills, communication skills, gross, and fine motor skills. ASQ scores were coded as 'typical' if the score was within 1 standard deviation (SD) below the mean; and 'at-risk' if greater than 1. Appendix A describes the prevalence for children in each domain.
ii. The second indicator used combined information from the Brief Infant Toddler Social Emotional Assessment (BITSEA—problem behaviours and competence scale) and the Child Behaviour Checklist (CBCL—total problems, internalising, and externalising behaviour problem scales), screening tools designed to assess children's socio-emotional development (NSW Department of Communities and Justice, 2020b). Both assessments are conducted with carers, the BITSEA for children aged 12–35 months (wave 1), and the CBCL for children aged 3–17 years (wave 2 and 3). Scores were coded as 'typical' if within 1 SD below the mean and 'at-risk' if greater than 1. Note the CBCL competence scale was only collected for children aged 6 years and over, making it not applicable for our analysis.

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Statistical analysis

Descriptive statistics are presented to profile the demographic, health, and child protection characteristics of children who entered OOHC as infants whose carer completed at least waves 1–3 of the POCLS survey. Counts, percentages, and inferential statistical analysis are presented for children found to be developmentally vulnerable on the physical-cognitive developmental assessment (ASQ) and the socio-emotional developmental assessment (BITSEA/CBCL).

Latent class growth analysis, more specifically a group-based trajectory modelling (GBTM), was conducted to investigate developmental trajectories (physical and cognitive development-ASQ and socio-emotional development-BITSEA/CBCL) across the first three waves of the POCLS, for children who entered care as infants. This model assumes that within the population under study, there are heterogenous latent groups defined by unobserved characteristics which might have a different impact on their outcomes (Nagin et al., 2018; Van Der Nest et al., 2020). This model identifies different clusters of trajectories within the population, capturing differences between classes' trends over time. The GBTM estimates the probability of group membership for each individual and assigns individuals to the group with highest probability. The *Stata 16·0* software was used to conduct the analysis, and the command *traj* was used for fitting to longitudinal data to conduct the GBTM (Jones & Nagin, 2013). The Bayesian information criterion (BIC), the sample-size adjusted BIC, and the Akaike information criterion (AIC) were used to select the model that best fit the data and the optimal number of latent groups or classes (Jones & Nagin, 2013; Van Der Nest et al., 2020). The GBTM missing records are considered as missing at random in the model, and missing records were accounted for by fitting the model using maximum likelihood estimation.

Two models were analysed separately looking at physical and cognitive development (ASQ) and socio-emotional development (BITSEA/CBCL) trajectories over the first three waves of POCLS. Logistic GBTM models were fitted to estimate the developmental trajectories for each outcome (ASQ and BITSEA/CBCL) coded as binary (typical versus at-risk). Covariates were considered as time stable if they did not change their value over the waves such as sex, Aboriginality, and maternal age at birth, or if they were considered as fixed for ease of interpretation of results such as socio-economic status, number of distinct placements (ever), predominate type of abuse prior to first period of care, and predominant placement type in first period of care. Time in care and professional services were included as time-varying covariates, taking different values over the POCLS waves. Trajectories for each group are presented graphically, and growth parameter estimates are displayed in Appendix B. Given Stata command *traj* characteristics, covariates were considered as continuous and/or re-categorised as binary (Appendix C). The Wald test investigated the differential effect between the coefficient estimates in the trajectories for professional services and time in care.

Ethical approvals

Ethical approval was obtained from the University of NSW Human Research Ethics Committee (approval number HC10335), Aboriginal Health and Medical Research Council of NSW Ethics Committee (approval number 766/10), and the NSW Population & Health Services Research Ethics Committee (Ref: HREC/14/CIPHS/74 Cancer Institute NSW: 2014/12/570).

RESULTS

This study identified 370 children who entered OOHC as infants (aged <1 year) whose carer participated in at least the first three waves of the POCLS (waves 1–3). Of these, more than half were males (52%), close to 40% were Aboriginal children, and 44% were living in highly socio-economic disadvantaged areas. At birth, 22% were identified as having low birthweight (<2500 g) and a fifth were preterm (<37 weeks) (Table 1).

Child protection trajectory

Over two-thirds of the children (69%) entered care for the first time during their first 3 months of life. The majority (97%) had only one continuous period of care and were in this period of care at waves 1 (97%), 2 (96%), and 3 (78%). Within their care experience, they had on average two distinct placements, with almost two-thirds predominantly in foster care and 27% in kinship care (Table 1). At wave 3, 299 children were still in OOHC and the remaining 71 had transitioned out of care (19%) with the majority going to guardianship, and a small number to adoption, or restoration.

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TABLE 1 Cohort characteristics.

	Overall		Non-Aboriginal		Aboriginal	
	N	%	*N*	%	*N*	%
N	370	100.00	225	60.81	145	39.19
Sex						
Females	179	48.38	104	46.22	75	51.72
Males	191	51.62	121	53.78	70	48.28
Birth weight						
<2500 g	82	22.16	49	21.78	33	22.76
> = 2500 g	260	70.27	160	71.11	100	68.97
Missing	28	7.57	16	7.11	12	8.28
Maternal age at birth						
<20 years	52	14.05	29	12.89	23	15.86
20–29 years	169	45.68	100	44.44	69	47.59
30–39 years	104	28.11	67	29.78	37	25.52
40 + years	17	4.59	<15	<10.00	<5	<5.00
missing	28	7.57	<20	<10.00	<15	<10.00
Gestational age						
< 37 weeks	78	21.08	47	20.89	31	21.38
> = 37 weeks	263	71.08	162	72.00	101	69.66
missing	29	7.84	16	7.11	13	8.97
Disability						
Yes	65	17.57	34	15.11	31	21.38
No	305	82.43	191	84.89	114	78.62
SES 2011						
1 (high disadvantage)	76	20.54	42	18.67	34	23.45
2	86	23.24	42	18.67	44	30.34
3	121	32.70	73	32.44	48	33.10
4	48	12.97	35	15.56	13	8.97
5 (low disadvantage)	37	10.00	32	14.22	5	3.45
missing	2	0.54	1	0.44	1	0.69
Age at first entry to care (weeks)						
newborn	17	4.59	11	4.89	6	4.14
1 to 3 weeks	142	38.38	84	37.33	58	40.00
4 to 12 weeks	98	26.49	66	29.33	32	22.07
13 to 25 weeks	47	12.70	33	14.67	14	9.66
26 to 38 weeks	25	6.76	5	2.22	20	13.79
39 weeks and over	41	11.08	26	11.56	15	10.34
Predominant report prior to first entry to care						
Physical	104	28.11	62	27.56	42	28.97
Neglect	75	20.27	49	21.78	26	17.93
Mixed	173	46.76	102	45.33	71	48.97
Sexual, psychological, and other	16	4.32	10	4.44	6	4.14
Missing	2	0.54	2	0.89	0	0.00
Predominant placement type-first period of care						
Foster care	238	64.32	147	65.33	91	62.76
Relative and Kinship	101	27.30	60	26.67	41	28.28
Others	31	8.38	18	8.00	13	8.97

(Continues)

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TABLE 1 (Continued)

	Overall		Non-Aboriginal		Aboriginal	
	N	%	*N*	%	*N*	%
Number of distinct placements ever						
Mean (SD)	2.17 (1.12)		2.13 (1.12)		2.23 (1.13)	
Time in care at wave (mean days–sd)						
Wave 1	483 (163)		473 (152)		499 (177)	
Wave 2	1036 (179)		1023 (177)		1059 (183)	
Wave 3	1565 (224)		1554 (222)		1583 (226)	

Abbreviations: SD, standard deviation; SES, socioeconomic status.

TABLE 2 Proportion of children 'at-risk' on ASQ, BITSEA/CBCL and receiving services by wave.

	Wave 1		Wave 2		Wave 3	
	N	%	*N*	%	*N*	%
N	370		370		370	
ASQ						
At-risk	239	64.59	170	45.95	133	35.95
Typical	127	34.32	198	53.51	207	55.95
BITSEA/CBCL						
At-risk	73	19.73	76	20.54	112	30.27
Typical	226	61.08	294	79.46	258	69.73
Receiving professional services for developmental needs*						
Yes	67	18.11	129	34.86	165	44.59
No	303	81.89	241	65.14	205	55.41

Note: Missing records from ASQ and BITSEA/CBCL are not presented here. Maximum likelihood estimates were used in the GBTM model to handle missing data.
*Behavioural management services, early intervention, occupational therapist, counselling or a psychologist, physiotherapist, and speech pathology service.
Abbreviations: ASQ, Ages and Stages Questionnaire; BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; GBTM, group-based trajectory modelling.

Children 'at-risk'

The ASQ standardised assessment identified at wave 1 that 65% of the study children were 'at-risk' of having a delay in their physical and cognitive development. This proportion decreased over time, to 46% at wave 2, and 36% at wave 3 (Table 2). Conversely, the socio-emotional development assessment (BITSEA/CBCL) showed the opposite trajectory, with 20% of children identified as 'at-risk' at wave 1, increasing to 30% of the cohort in wave 3.

Service provision

Even though the proportion of children identified as receiving professional services for developmental needs was only 18% at wave 1, it almost doubled at wave 2 (35%) and reached 45% at wave 3 (Table 1). For children identified as at-risk of developmental delay for both standardised measures this was also the case. At wave 1, 21% of children identified as at-risk on the ASQ and 31% of those at-risk on the BITSEA/CBCL were receiving professional services. At wave 3, 66% of children identified as at-risk of developmental delay for both indicators were receiving services (Appendix A, Table A2). Additionally, the proportion of children receiving professional services was higher for children identified as at-risk in every wave, compared to those identified as typical. While there is limited information on culturally appropriate service provision, we did find that across the waves, 35–39% of Aboriginal children attended Aboriginal Medical Services.

Trajectories

The first GBTM estimates the trajectories for the likelihood for children of being identified as at-risk of developmental delay by the ASQ across the three waves of the POCLS. The model identified two different latent trajectory groups (Figure 1).

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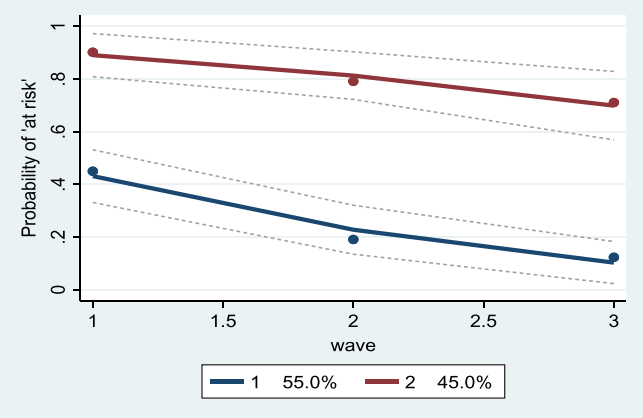

FIGURE 1 GBTM for ASQ (physical and cognitive\non-verbal) developmental trajectories. Probability of being 'at-risk' in the ASQ assessment across waves 1, 2 and 3 of POCLS. Latent groups. ASQ, ages and stages questionnaire; GBTM, group-based trajectory modelling; POCLS, pathways of care longitudinal study.

i. ASQ group 1 showed a lower probability of being at-risk of physical and cognitive developmental delay at wave 1, followed by a relatively sharp declining trajectory over waves 2 and 3. More than half of the children in the cohort (55%) were more likely to fall in this group.
ii. 45% of children were more likely to follow the ASQ group 2 trajectory. This group was characterised by higher probability of having a physical and cognitive developmental delay at wave 1, which also declined over time, however, at a smaller rate than those in group 1 (Appendix A, Table A1).

It should be noted that the different latent groups describe the trajectories of children over the POCLS three waves, clustering children that follow similar trajectories. ASQ group 1 and 2 clusters include children identified as typical and at risk of developmental delay in the ASQ and BITSEA/CBCL measures (Appendix A, Table A3). For both ASQ groups 1 and 2, the proportion of children identified as at-risk in the ASQ declines over time, however with greater decline for group 1. Conversely, for BITSEA/CBCL, the proportion of children at risk increases for both ASQ groups 1 and 2.

The model identified 192 children in ASQ group 1 and 178 children in ASQ group 2. Of those in ASQ group 1, 60% were females and 42% were Aboriginal, compared to ASQ group 2, which had 36% females and 36% Aboriginal children. Birth weight and gestational age were similar for both groups, with over 70% of children born at over 2500 g and over the 37 weeks of gestation. The proportion of children's age at first entry to care and the predominant report type was also similar between groups (Appendix A, Table A4).

As displayed in Table 3, sex, receipt of professional services, and time in care were the only factors showing significant association with children's physical and cognitive developmental trajectories. Girls were less likely to follow the ASQ group 2 trajectory than boys. Receiving professional services for developmental delay was positively associated with the probability of children being 'at-risk' for both groups. This could be interpreted as that children 'at-risk' are more likely to receive services than those not at-risk over POCLS waves. Wald test was conducted to assess if receiving professional services had a differential effect between latent group trajectories; however, no differences were found ($Ch^2 = 2{\cdot}54$; $p > ch2 = 0{\cdot}11$). Time in care had only an effect on group 1's trajectory, showing that among those at lower risk of developmental delay on the ASQ, more time in care was associated with a decreasing probability of being at-risk.

Socio-emotional (BITSEA/CBCL) developmental trajectories are presented in Figure 2 with two trajectory groups.

i. Group 1, representing 80% of children trajectories, showed a stable low probability of being 'at-risk' in the BITSEA/CBCL assessment over the three waves.
ii. Conversely, 20% of children were more likely to follow group 2's trajectory. This group had at baseline (wave 1) a high probability of being at-risk of socio-emotional developmental delay, and this risk increased across the waves (Appendix A, Table A3).

The model identified 297 children in the BITSEA/CBCL group 1 and 73 children in the group 2. Of the children in the BITSEA/CBCL group 1, 38% were Aboriginal children and 51% were females, compared to 45% of Aboriginal children and 38% of females in group 2. Interestingly, 31% of children in BITSEA/CBCL group 2 were from

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TABLE 3 GBTM. Factors associated to developmental delay ASQ and BITSEA/CBCL. Likelihood of group membership and the probability of being identified as 'at-risk'. Separate models.

Covariates (ref)	ASQ	BITSEA/CBCL
	Logit (SD)	Logit (SD)
Probability of group membership		
Reference group: Group 1		
Sex (females)	−1.52(0.31)*	−0.65(0.3)*
Aboriginality (Aboriginal)	−0.15(0.28)	0.32(0.29)
Maternal age at birth	0.13(0.18)	−0.04(0.2)
Age at entry to care in weeks	−0.06(0.1)	0.05(0.1)
Socio-economic disadvantage	0.03(0.11)	−0.2(0.13)
N of distinct placement	0.27(0.16)	0.26(0.12)*
Predominant type of abuse: Physical (all others)	0(0.31)	−0.03(0.32)
Predominant type of abuse: Neglect (all others)	−0.2(0.34)	−0.03(0.36)
Predominant type of abuse: Mixed (all others)	0.21(0.28)	0.00(0.29)
Predominant placement type: Foster (all others)	0.18(0.28)	0.77(0.35)*
Predominant placement type: Kinship (all others)	−0.44(0.3)	−0.75(0.37)*
Gestational age	0.02(0.33)	−0.36(0.33)
Birth weight	0.18(0.33)	−0.09(0.34)
Disability (Yes)	18.6(3552.91)	2.12(0.35)*
Probability of being at-risk (time varying covariate)		
Receiving professional services (not receiving services)		
Group 1	0.73(0.27)*	1.23(0.26)*
Group 2	2.20(0.90)*	0.61(0.81)
Time in care		
Group 1	−0.002(0.00)*	0.00(0.00)
Group 2	0.00 (0.00)	0.00(0.00)

Abbreviations: ASQ, Ages and Stages Questionnaire; BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; GBTM, group-based trajectory modelling; SD, standard deviation.

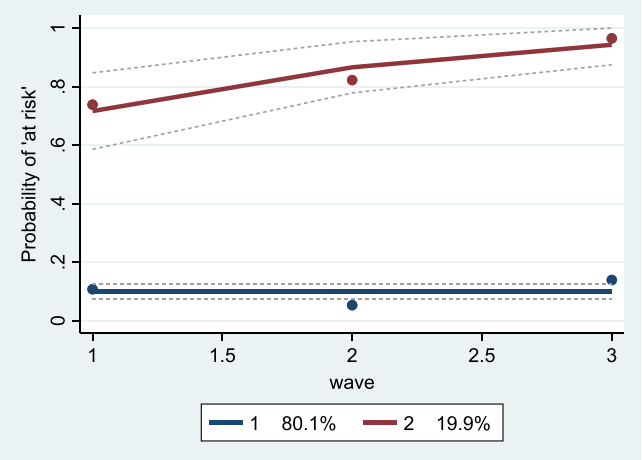

FIGURE 2 GBTM for BITSEA/CBCL (socio-emotional) developmental trajectories. Probability of being 'at-risk' in the BITSEA/CBCL assessment across waves 1, 2 and 3 of POCLS. Latent groups. Abbreviations: BITSEA, brief infant toddler social emotional assessment; CBCL, child behaviour checklist; GBTM, group-based trajectory modelling.

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the most socio-economically disadvantaged quintile compared to 18% of those in BITSEA/CBCL group 1 (Appendix A, Table A5).

As with the ASQ groups, girls were less likely to be in the high-risk trajectory group (BITSEA/CBCL group 2) compared to boys (Table 3). Higher number of distinct placements over their care experience and being predominantly in foster care was associated with an increased probability of being in the high-risk trajectory. Conversely, those predominantly placed in kinship care during the first period of care were less likely to be in the high-risk group. Children's disability was associated with increased probability of having a high-risk trajectory. Finally, professional services had a positive effect but only for group 1's trajectory. This could be interpreted as, within the group of children with a stable-low probability of being at-risk of developmental delay on the BITSEA/CBCL, the proportion of those at-risk receiving services increased over the POCLS waves compared to children in the typical range.

DISCUSSION

Our study found the majority of children who entered care as infants were still in care at wave 3 (80%), with 13% in kinship care and 78% in foster care. A small percentage (19%) left care, with the majority placed on guardianship orders and a small number adopted or restored to family by wave 3. Compared to a US study, we found almost double the proportion in kinship care, a greater proportion in foster care, and a smaller proportion who were adopted or reunified with birth parents (Villodas et al., 2016). In comparison to the Australian child protection data for all children in care, in our study, a higher proportion were in foster care (37%), and a lower percentage in kinship care (54%) (Australian Institute of Health and Welfare, 2021). This highlights the need for greater efforts on family reunification given the low number of children reunified and also an emphasis on placements with kin to maintain children's connection with family. Within the cohort, children had three placements on average, which is higher than current Australian statistics showing the majority of children in OOHC have one placement (Australian Institute of Health and Welfare, 2021).

Of the 370 children who completed the standardised assessments across the three waves of the study, there were varied findings for the physical and cognitive development trajectories and the socio-emotional trajectories. Our study confirms that children who enter care as infants have a high level of developmental concerns with 65% considered at-risk of physical and cognitive developmental delay. This is considerably higher than the general population, but expected given the higher prevalence of poor birth outcomes and potential exposure to adverse circumstances prior to children entering care (Lamsal, Dutton, & Zwicker, 2018). However, we did establish an encouraging finding that risk of physical and cognitive developmental concerns reduced over time with 36% considered at-risk by wave 3. Importantly over the three waves, service provision rose substantially from a low of 18% in wave 1 to 45% by wave 3 which coincided with a reduction in risk for developmental concerns.

In the analysis of ASQ trajectories over the three waves, two groups were identified. For group 1, there was a low risk of developmental concerns in wave 1 which then declined over the three waves and group 2 had a higher risk of developmental concerns in wave 1 with a decline in risk, although not as a pronounced. Only sex was found to distinguish the groups with girls more likely to be in the lower risk group, consistent with previous research showing males are at higher risk of developmental concerns (Lamsal, Dutton, & Zwicker, 2018). Given the high level of developmental concerns at wave 1 and the evidence that early intervention is advantageous to improving developmental trajectories, it is necessary to ensure that children in care are assessed and provided intervention services early to meet identified developmental concerns (Royal Australasian College of Physicians, 2013). Early intervention has also been endorsed by the NSW Department of Health with their First 2000 Days Framework highlighting the importance of the first 2000 days to improve long term outcomes. In this line, NSW DCJ and Health are also implementing the OOHC Health Pathway Program to ensure that all children and young people have health assessment, planning, and service provision to meet health needs. In our study, by wave 3 children identified as 'at-risk' of developmental delay had a higher proportion receiving services (66%) compared to the average.

Social–emotional trajectories differed to physical and cognitive development as there was an increase in risk from waves 1 to 3, resulting in 30% of the cohort being identified as at-risk for social–emotional development in wave 3. Of concern is that for group 2, those who were identified as at-risk for social–emotional development at wave 1 (20% of cohort) demonstrated worsening risk for social–emotional concerns over time. Given that children exposed to early neglect or maltreatment and adverse social circumstances are at higher risk of social–emotional concerns which may worsen during childhood, our findings are consistent with previous research (Jacobsen et al., 2020). For children in the first BITSEA/ASQ group who were at low risk of social–emotional concerns at wave 1, their trajectory was stable over time. There were several factors that distinguished these two BITSEA/CBCL groups' socio-emotional trajectories. Girls and those in kinship care were at lower risk of being in group 2 for worsening social–emotional concerns. Previous research has identified the protective effects of kinship care for children's mental health and wellbeing compared to foster care (Winokur, Holtan, & Batchelder, 2014).

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Previous research indicates that placement instability is associated with worse mental health outcomes; however, there is also the issue that children with social–emotional issues are more likely to have placement breakdown (Rubin et al., 2007). There is also strong evidence that children with disabilities are more likely to have mental health issues; our study also found that children with disabilities were at-risk for poor social–emotional trajectories highlighting this group as important for interventions (Baker et al., 2010; Emerson & Hatton, 2007). Similar to the findings in the ASQ, there was an increase over time in the proportion of children receiving services. However, service provision was only found to have an effect on the trajectory group who were at lower risk. This is unlike the ASQ findings where the highest risk group were more likely to be receiving services potentially indicating that for social–emotional risk there may be unmet need. There are clear practice implications from these finding with early intervention for social–emotional concerns required to reduce the risk of poor trajectories and poor mental health outcomes of children in care.

No differences were found in the estimates by Aboriginal status, so the results include data from both Aboriginal and non-Aboriginal children and families. Interpretation of the data should consider factors associated with the over-representation of Aboriginal children in child protection and OOHC including the legacy of past policies of forced removal and the intergenerational effects of previous forced separations from family and culture. The implications for policy and practice should highlight strengths and develop Aboriginal-led solutions to ensure improved outcomes for Aboriginal children and families.

LIMITATIONS

While this study utilised a unique longitudinal study linking survey and administrative data, there were some limitations. A small proportion of children in the POCLS did not participate in subsequent waves so we could not follow all assessment outcomes. As all children in the POCLS cohort entered care, there is a high level of developmental concerns and a lack of variability in factors; therefore, it was difficult to differentiate children who have typical versus at-risk trajectories. This may also have been a reason for the lack of observed differences between Aboriginal children and non-Aboriginal children. The ASQ covers five domains of development; however, given our sample size, a single indicator to describe and analyse the trajectories was used. Future research is recommended to investigate the pathways of children on individual developmental domains, maltreatment types, and the impact of specific services provided to address the related domain. It would also be useful in a large sample of Aboriginal children to investigate connection to culture, family and Aboriginal service provision, and the relationship to outcomes and trajectories.

CONCLUSIONS

This study found that the majority of children who enter care as infants will remain in care throughout their childhood. These children have a high level of developmental vulnerability as infants. A large proportion of children have positive physical and cognitive developmental trajectories with developmental service provision increasing over time; however, it is important to ensure this service provision is provided early in their development. Social–emotional development differed in that there was a group of infants who had early social–emotional concerns who displayed worsening social–emotional trajectories. Interventions for this group is an important priority to reduce the risk of poor mental health outcomes.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The authors do not have permission to share the datasets used in this study, which were provided by the NSW Department of Communities and Justice under strict confidentiality conditions.

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ETHICAL APPROVALS

Ethical approval was obtained from the University of NSW Human Research Ethics Committee (approval numbers HC10335 and HC16542), Aboriginal Health and Medical Research Council of NSW Ethics Committee (approval number 766/10), and the NSW Population and Health Services Research Ethics Committee (Ref: HREC/14/CIPHS/74 Cancer Institute NSW: 2014/12/570).

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APPENDIX A

TABLE A1 Proportion of children 'at-risk' on ASQ and BISEA/CBCL by POCLS waves, broken down by domain and screening tool.

		Wave 1		Wave 2		Wave 3	
		N	%	*N*	%	*N*	%
ASQ							
				Problem solving			
	At-risk	122	32.97	71	19.19	61	16.49
	Typical	244	65.95	296	80.00	279	75.41
	missing	4	1.08	3	0.81	30	8.11
				Communication			
	At-risk	100	27.03	67	18.11	58	15.68
	Typical	266	71.89	301	81.35	282	76.22
	missing	4	1.08	2	0.54	30	8.11
				Personal social			
	At-risk	110	29.73	56	15.14	56	15.14
	Typical	256	69.19	312	84.32	284	76.76
	missing	4	1.08	2	0.54	30	8.11
				Fine motor			
	At-risk	123	33.24	114	30.81	88	23.78
	Typical	243	65.68	254	68.65	252	68.11
	missing	4	1.08	2	0.54	30	8.11
				Gross motor			
	At-risk	98	26.49	54	14.59	42	11.35
	Typical	268	72.43	314	84.86	298	80.54
	missing	4	1.08	2	0.54	30	8.11
BITSEA							
				Problem scale			
	At-risk	46	12.43	-		-	
	Typical	247	66.76	-		-	
	missing	77	20.81	-		-	
				Competence scale			
	At-risk	44	11.89	-		-	
	Typical	237	64.05	-		-	
	missing	89	24.05	-		-	
CBCL							
				Problem scale			
	At-risk	<5	-	52	14.05	82	22.16
	Typical	<5	-	318	85.95	288	77.84
				Internalising			
	At-risk	<5	-	50	13.51	82	22.16
	Typical	<5	-	320	86.49	288	77.84
				Externalising			
	At-risk	<5	-	57	15.41	81	21.89
	Typical	<5	-	313	84.59	289	78.11

Abbreviations: ASQ, Ages and Stages Questionnaire; BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; POCLS, Pathways of Care Longitudinal Study.

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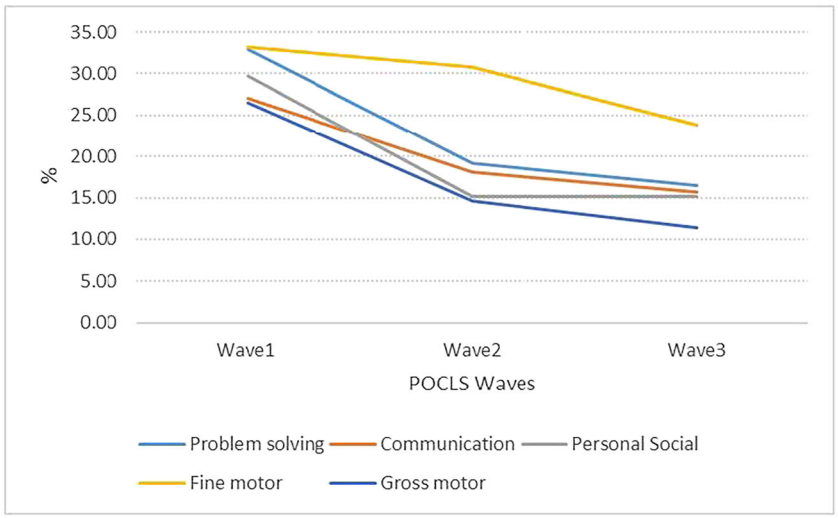

FIGURE A1: Proportion of children at-risk on each ASQ domain by POCLS waves. ASQ, ages and stages questionnaire; POCLS, pathways of care longitudinal study.Note that all ages and stages questionnaire (ASQ) domains are showing a decline in the proportion of children at-risk of developmental delay over the pathways of care longitudinal study (POCLS) first three waves. While most of the domains (problem solving, communication, person social, and gross motor) show a steep decrease in W2, which gets smaller in W3, fine motor is the only domain showing the opposite, small decrease in W2 followed by a steeper decrease in W3.

TABLE A2 Number and proportion of children receiving professional services by standardise measure indicator and POCLS wave.

			ASQ		BITSEA/CBCL	
			Typical	At-risk	Typical	At-risk
Wave 1	Total		127	239	226	73
Receiving professional services	Yes	*N*	16	51	37	23
		%	12.60	**21.34**	16.37	**31.51**
	No	*N*	111	188	189	50
		%	87.40	78.66	83.63	68.49
Wave 2	Total		198	170	294	76
Receiving professional services	Yes	*N*	46	83	78	51
		%	23.23	**48.82**	26.53	**67.11**
	No	*N*	152	87	216	25
		%	76.77	51.18	73.47	32.89
Wave 3	Total		207	133	258	112
Receiving professional services	Yes	*N*	65	88	90	75
		%	31.40	**66.17**	34.88	**66.96**
	No	*N*	142	45	168	37
		%	68.60	33.83	65.12	33.04

Abbreviations: ASQ, Ages and Stages Questionnaire; BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; POCLS, Pathways of Care Longitudinal Study.

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TABLE A3 Number and proportion of children in each trajectory latent groups (group ASQ 1 and 2; groups BITSEA/CBCL 1 and 2) by level of risk of developmental delay in each standard measure and POCLS wave.

	Group 1 ASQ				**Group 2 ASQ**			
	ASQ							
	Typical		**At-risk**		**Typical**		**At-risk**	
	N	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Wave 1	116	61.05	74	38.95	11	6.25	165	93.75
Wave 2	170	89.47	20	10.53	28	15.73	150	84.27
Wave 3	159	91.91	14	8.09	48	28.74	119	71.26
	BITSEA_CBCL							
	Typical		**At-risk**		**Typical**		**At-risk**	
	N	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Wave 1	132	84.62	24	15.38	94	65.73	49	34.27
Wave 2	171	89.06	21	10.94	123	69.10	55	30.90
Wave 3	153	79.69	39	20.31	105	58.99	73	41.01
	Group 1 BITSEA/CBCL				**Group 2 BITSEA/CBCL**			
	ASQ							
	Typical		**At-risk**		**Typical**		**At-risk**	
	N	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Wave 1	115	39.12	179	60.88	12	16.67	60	83.33
Wave 2	173	58.64	122	41.36	25	34.25	48	65.75
Wave 3	185	67.03	91	32.97	22	34.38	42	65.63
	BITSEA/CBCL							
	Typical		**At-risk**		**Typical**		**At-risk**	
	N	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Wave 1	209	87.45	30	12.55	17	28.33	43	71.67
Wave 2	282	94.95	15	5.05	12	16.44	61	83.56
Wave 3	258	86.87	39	13.13	0	-	73	100.00

Note: Missing records were not presented.
Abbreviations: ASQ, Ages and Stages Questionnaire; BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; POCLS, Pathways of Care Longitudinal Study.

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TABLE A4 ASQ trajectory group characteristics.

		Overall		Group 1 ASQ		Group 2 ASQ	
		N	%	*N*	%	*N*	%
Total[a]		370	100.00	192	51.89	178	48.11
Aboriginality							
	Non-Aboriginal	225	60.81	111	57.81	114	64.04
	Aboriginal	145	39.19	81	42.19	64	35.96
Sex							
	Females	179	48.38	115	59.90	64	35.96
	Males	191	51.62	77	40.10	114	64.04
Birth weight							
	<2500	82	22.16	46	23.96	36	20.22
	> = 2500	260	70.27	131	68.23	129	72.47
	missing	28	7.57	15	7.81	13	7.30
Maternal age at birth							
	<20	52	14.05	26	13.54	26	14.61
	20–29	169	45.68	92	47.92	77	43.26
	30–39	104	28.11	53	27.60	51	28.65
	40+	17	4.59	6	3.13	11	6.18
	missing	28	7.57	15	0.08	13	0.07
Gestational age							
	< 37 weeks	78	21.08	42	21.88	36	20.22
	> = 37 weeks	263	71.08	135	70.31	128	71.91
	missing	29	7.84	15	7.81	14	7.87
SES 2011							
	1 (high disadvantage)	76	20.54	41	21.35	35	19.66
	2	86	23.24	44	22.92	42	23.60
	3	121	32.70	65	33.85	56	31.46
	4	48	12.97	24	12.50	24	13.48
	5 (low disadvantage)	37	10.00	18	9.38	19	10.67
	missing	2	0.54	0	0.00	2	1.12
Age at first entry to care (weeks)							
	newborn	17	4.59	8	4.17	9	5.06
	1 to 3 weeks	142	38.38	69	35.94	73	41.01
	4 to 12 weeks	98	26.49	53	27.60	45	25.28
	13 to 25 weeks	47	12.70	24	12.50	23	12.92
	26 to 38 weeks	25	6.76	14	7.29	11	6.18
	39 weeks and over	41	11.08	24	12.50	17	9.55
Predominant report prior first entry to care							
	Physical	104	28.11	53	27.60	51	28.65
	Neglect	75	20.27	41	21.35	34	19.10
	Psychological	8	2.16	>5	>5.00	<5	<5.00
	Mixed	173	46.76	88	45.83	85	47.75
	Other	8	2.16	<5	<5.00	>5	>5.00
	Missing	>5	<5.00	>5	<5.00	>5	<5.00

[a]Note that the percentage of children estimated by the GBTM is a result of maximum likelihood estimation and so slightly differs from the real percentage of children in each group.

Abbreviations: ASQ, Ages and Stages Questionnaire; GBTM, group-based trajectory modelling; SES, socioeconomic status.

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TABLE A5 BITSEA/CBCL trajectory groups characteristics.

		Overall		Group 1 BITSEA/CBCL		Group 2 BITSEA/CBCL	
		N	%	*N*	%	*N*	%
Total [a]		370	100.00	297	80.27	73	19.73
Aboriginality							
	Non-Aboriginal	225	60.81	185	62.29	40	54.79
	Aboriginal	145	39.19	112	37.71	33	45.21
Sex							
	Females	179	48.38	151	50.84	28	38.36
	Males	191	51.62	146	49.16	45	61.64
Birth weight							
	<2500	82	22.16	64	21.55	18	24.66
	> = 2500	260	70.27	208	70.03	52	71.23
	missing	28	7.57	25	8.42	3	4.11
Maternal age at birth							
	<20	52	14.05	40	13.47	12	16.44
	20–29	169	45.68	134	45.12	35	47.95
	30–39	104	28.11	85	28.62	19	26.03
	40+	17	4.59	>10	<5.00	<10	<15.00
	missing	28	7.57	<30	<10.00	<10	<5.00
Gestational age							
	< 37 weeks	78	21.08	58	19.53	20	27.40
	> = 37 weeks	263	71.08	213	71.72	50	68.49
	missing	29	7.84	26	8.75	3	4.11
SES 2011							
	1 (high disadvantage)	76	20.54	53	17.85	23	31.51
	2	86	23.24	74	24.92	12	16.44
	3	121	32.70	96	32.32	25	34.25
	4	48	12.97	43	14.48	5	6.85
	5 (low disadvantage)	37	10.00	31	10.44	6	8.22
	missing	2	0.54	0	0.00	2	2.74
Age at first entry to care (weeks)							
	newborn	17	4.59	12	4.04	5	6.85
	1 to 3 weeks	142	38.38	114	38.38	28	38.36
	4 to 12 weeks	98	26.49	81	27.27	17	23.29
	13 to 25 weeks	47	12.70	40	13.47	7	9.59
	26 to 38 weeks	25	6.76	20	6.73	5	6.85
	39 weeks and over	41	11.08	30	10.10	11	15.07
Predominant report prior first entry to care							
	Physical	104	28.11	84	28.28	20	27.40
	Neglect	75	20.27	60	20.20	15	20.55
	Psychological	8	2.16	8	2.69	0	0.00
	Mixed	173	46.76	139	46.80	34	46.58
	Other	8	2.16	<5	<5.00	>5	>5.00
	Missing	>5	<5.00	>5	<5.00	>5	<5.00

[a]Note that the percentage of children estimated by the GBTM is a result of maximum likelihood estimation and so slightly differs from the real percentage of children in each group.

Abbreviations: BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; SES, socioeconomic status.

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APPENDIX B

TABLE B1 GBTM growth parameter estimates and goodness of fit measures, ASQ assessment.

Maximum likelihood estimates				
Model: Logistic (logit)				
Group		Parameter estimate (logit)	Standard error	*p*-value
1	Intercept	0.67	0.33	0.04
	Linear	−0.94	0.22	0.00
2	Intercept	2.73	0.61	0.00
	Linear	−0.63	0.22	0.00
Group membership				
1	**(%)**	54.96	7.22	0.00
2	**(%)**	45.04	7.22	0.00

BIC = -693.06 (N = 1074); SABIC = -690.39 (N = 370); AIC = -680.61; entropy = 0.54.
Abbreviations: AIC, Akaike information criterion; ASQ, Ages and Stages Questionnaire; BIC, Bayesian information criterion; GBTM, group-based trajectory modelling; SABIC, sample size–adjusted Bayesian information criterion.

TABLE B2: GBTM growth parameter estimates and goodness of fit measures, BITSEA/CBCL assessment.

Maximum likelihood estimates				
Model: Logistic (logit)				
Group		Parameter estimate (logit)	Standard error	*p*-value
1	Intercept	−2.20	0.15	0.00
2	Intercept	−0.01	0.55	0.98
	Linear	0.94	0.34	0.01
Group membership				
1	**(%)**	80.14	2.72	0.00
2	**(%)**	19.86	2.72	0.00

BIC = -539.47 (N = 1110); SABIC = -537.27 (N = 370); AIC = -529.44; entropy = 0.86.
Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion; BITSEA, Brief Infant Toddler Social Emotional Assessment; CBCL, Child Behaviour Checklist; GBTM, group-based trajectory modelling; SABIC, sample size–adjusted Bayesian information criterion.

APPENDIX C

Maternal age at birth, age at entry to care in weeks, socio-economic disadvantage, number of distinct placements ever, time in care, gestational age at birth, and birth weight were considered as continues variables. Predominant type of abuse was recategorized; separate binary variables for each type were created (e.g. physical abuse was coded as 1 and all other types of abuse as 0); only physical, neglect, and mixed types were included as they were the most prevalent. Similarly, predominant placement type was recategorized, separate binary variables for each type were created (e.g. foster care was coded as 1 and all other types of placement as 0), and only foster and kinship was included as they were the most prevalent placement. Finally, sex, Aboriginality, disability, and professional services received were used as a binary indicator as described in Tables 1 and 2.

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