



# The First Five Years: What makes a difference?

## 3.4 Estimating the effect of child care on children's developmental outcomes

### Key findings

The results presented in the other factsheets simply described the different outcomes for different groups of children. This basic analysis was extended by statistical techniques that allow better estimates of the effect of child care on children's developmental outcomes. These techniques aim to take account of the other differences in children's circumstances that are visible in the data, and so focus on outcomes due to different child care use rather than any other underlying differences between groups.

- As average weekly charged hours increased, the risk of developmental vulnerability on one or more domains (DV1) initially fell and then rose. This same pattern was observed for total hours before adjustment, but risk ratios increased with total hours after controlling for the different circumstances of different groups.
- Child care was generally a protective factor for the communication skills and general knowledge, and language and cognitive skills (school-based) domains.
- Higher average and total hours of child care were associated with elevated risks of developmental vulnerabilities for the emotional maturity and social competence domains.
- The pattern of risk ratios for the physical health and wellbeing domain were more complex, with child care attendance a protective factor for some patterns of attendance and a risk factor for others. In general, risk ratios increased with increasing average hours and broadly fell with increasing total hours.
- Children's outcomes improved with increasing child care quality. Attending above standard child care reduced the child developmental vulnerability on one or more domains (DV1) and in each domain, compared to attending at standard child care. Not attending formal child care was a protective factor on some domains and a risk for others.

## Moving from description to inference

In sections 3.1 to 3.3, we presented descriptive analysis which showed variations in children's developmental vulnerability by child care attendance, quality of child care and hours of child care. While this descriptive analysis shows trends between developmental vulnerability and child care use, it cannot tell whether there is a causal relationship. To establish a causal effect between child care attendance and developmental vulnerability, additional analysis is needed to account for other factors contributing to developmental vulnerabilities (Hernan and Robins 2020).

The *observable* socio-economic factors and health factors described in section 2 influence child development. For example, children who attended child care may come from higher income households than those who did not. As such measuring the influence of child care attendance is in part measuring the effect of household income rather than just the effect of child care. Appropriate statistical analysis techniques can be used to adjust for observable confounding factors and better estimate the effect of child care.

There are also *unobservable* factors that affect child development, such as quality of home care, parenting behaviour, and genetic factors. We are unable to adjust for these factors in our analysis, and thus cannot conclude causal effects for child care on developmental vulnerabilities.

Nonetheless, in this section, we aim to estimate the effect of child care on AEDC domain developmental vulnerabilities adjusting for imbalance in confounding covariates (Tartaglia and Knapp (unpublished)). Two approaches were used for the analysis: G-computation and Inverse Propensity Weighting (IPW) (see the *Methodology* section for details). These methods adjust for available confounding factors that predict child care use and developmental vulnerability. *Unobserved* variables, for example parenting style and quality of home care, cannot be taken into account. As such, the results establish a better estimate of the effect of child care on developmental vulnerability, but require further research to be confirmed.

## Risk ratios

In this section, the risk ratio of a particular treatment (for example, using child care for a particular range of average weekly charged hours) is reported. The risk ratio is the ratio of the risk of being developmentally vulnerable for the treated group (those using child care in this way) compared to the risk of being developmentally vulnerable in the reference group (generally those not attending formal child care). A risk ratio of 1.2 for a particular treatment and domain means children with that treatment are 20 per cent more likely to be developmentally vulnerable in that domain than the reference group. A risk ratio of 0.9 means a child is 10 per cent less likely to be developmentally vulnerable. The risk ratio derived from associative analysis without adjusting for any confounding factors (for example, the results in section 3.1) is termed the unadjusted risk ratio. The adjusted risk ratio uses statistical techniques to adjust for underlying differences in characteristics between the groups.

The difference between the adjusted and unadjusted risk ratios is due to the confounding factors which are associated with both child care use and child development, such as parental education. Children who attend child care are more likely to experience socio-economic factors such as higher parental education and income, which are associated with lower rates of developmental



vulnerability. This means that adjusted risk ratios for child care use are typically higher than unadjusted risk ratios – the unadjusted ratios also pick up some of these underlying advantages, while the adjusted ratios aim to focus on just the effect of child care usage.

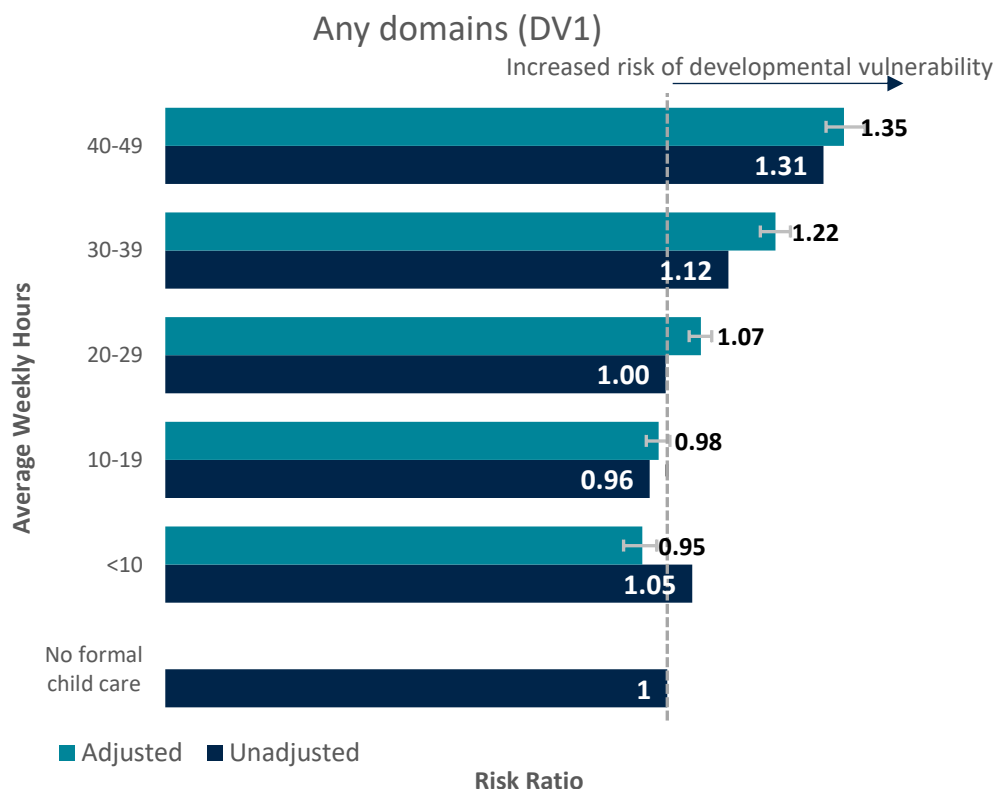
## Child care attendance and hours

In section 3.1 it was shown that attending child care is associated with a lower rate of developmental vulnerability on one or more domains. Further analysis, in section 3.3, which extends the binary child care attendance to different attendance patterns using average weekly and total hours, showed large variations in children’s developmental outcomes depending on patterns of attendance.

In this section, we use the statistical techniques (described in the *Methodology* paper) to estimate the effect of average weekly hours, total hours, and a combination of weekly intensity and overall hours in child care enrolment on children’s risk of developmental vulnerability on one or more domains (DV1) and in each domain.

In Figure 1 and 2, the adjusted risk ratios for attending child care for different average weekly hours and total hours are shown.

**Figure 1. Risk ratios for the effect of average weekly hours of enrolment in child care on developmental vulnerability on one or more domains compared to not attending formal child care.**



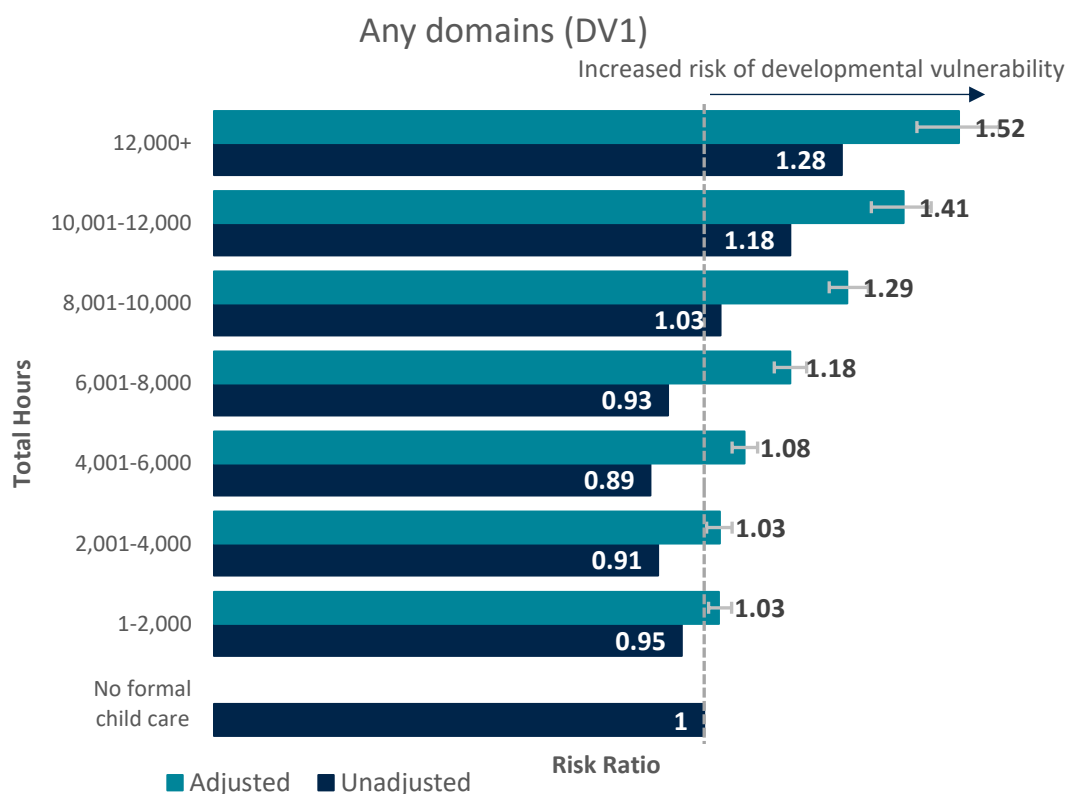
**Source:** Customised ‘First Five Years’ extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. DV1: Developmentally vulnerable on one or more domains. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown. For the <10 group, the unadjusted risk ratio is 1.05; after adjustment, the risk ratio reduced to 0.95.

Child care usage at less than 20 average weekly charged hours was a protective factor for developmental vulnerability on one or more domains. Before adjustment, the risk ratios of being developmentally vulnerable on one or more domains were 1.05 and 0.96 for the group with average hours of less than 10 and 20 respectively. The corresponding risk ratio changed to 0.95 and 0.98 after adjusting for covariates. Higher average weekly hours resulted in risk ratios above 1, indicating higher risks of developmental vulnerability compared to children who did not attend child care.

Total hours appeared to be a risk factor for DV1 across all levels (figure 2) after adjustment, though before adjustment the risk ratio was less than 1 for less than 8,000 total hours. As total hours are the sum of charged hours from birth to the year before school, there can be large variations in the attendance patterns within each group: for example, children who attended child care intensively when they were young and other children who attended child care only when they were older can be in the same group.

**Figure 2. Risk ratios for the effect of Total enrolment hours of child care on developmental vulnerability on one or more domains compared to not attending formal child care.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

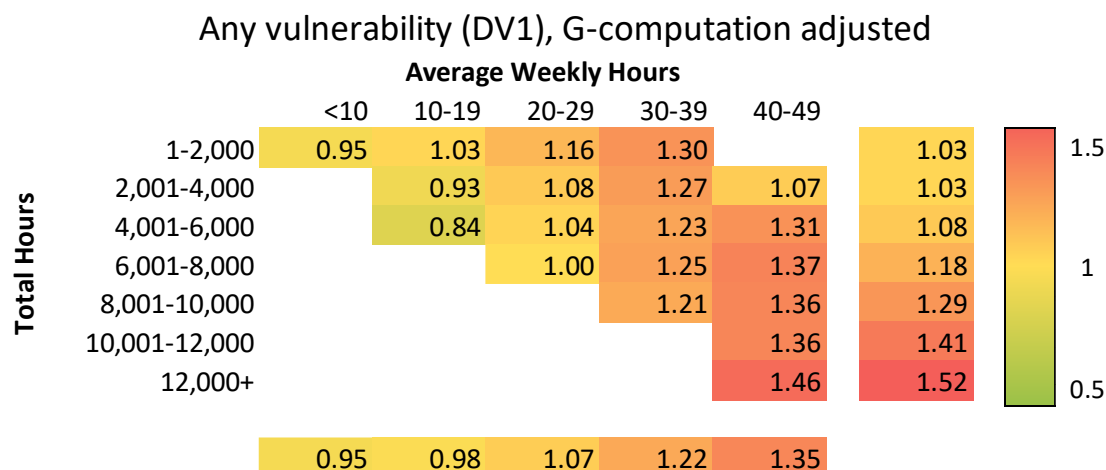
**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. DV1: Developmentally vulnerable on one or more domains. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown.

To account for both the intensity and total amount of child care usage, we showed adjusted risk ratios for combinations of average weekly and total lifetime child care hours (Table 1). The horizontal bar at the bottom of the table summarises the risk ratios for average weekly hours (as already shown in figure 1), while the vertical bar to the right does the same for total hours (just like together with the effect of total hours (as shown in figure 2).

The results were less precisely estimated when the number of children in a given combination of average weekly and total hours were small. For this reason, cells with fewer than 200 children, or risk ratios with a confidence interval equal to or exceeding one, have been removed (the number of children in each combination of average and total hours is shown in Figure 4b of section 3.3). The small number of children with 50 or more average weekly hours are also removed, because at most a single such cell per table passes these conditions.

Overall, the results show that consistent use of lower weekly hours of child care was associated with lower rates of developmental vulnerability. This held when considering the risk of developmental vulnerability across any of the domains or in each domain separately.

**Table 1. Adjusted risk ratios for the effect of combined child care average and total hours on developmental vulnerability in any AEDC domain compared to no formal child care attendance.**

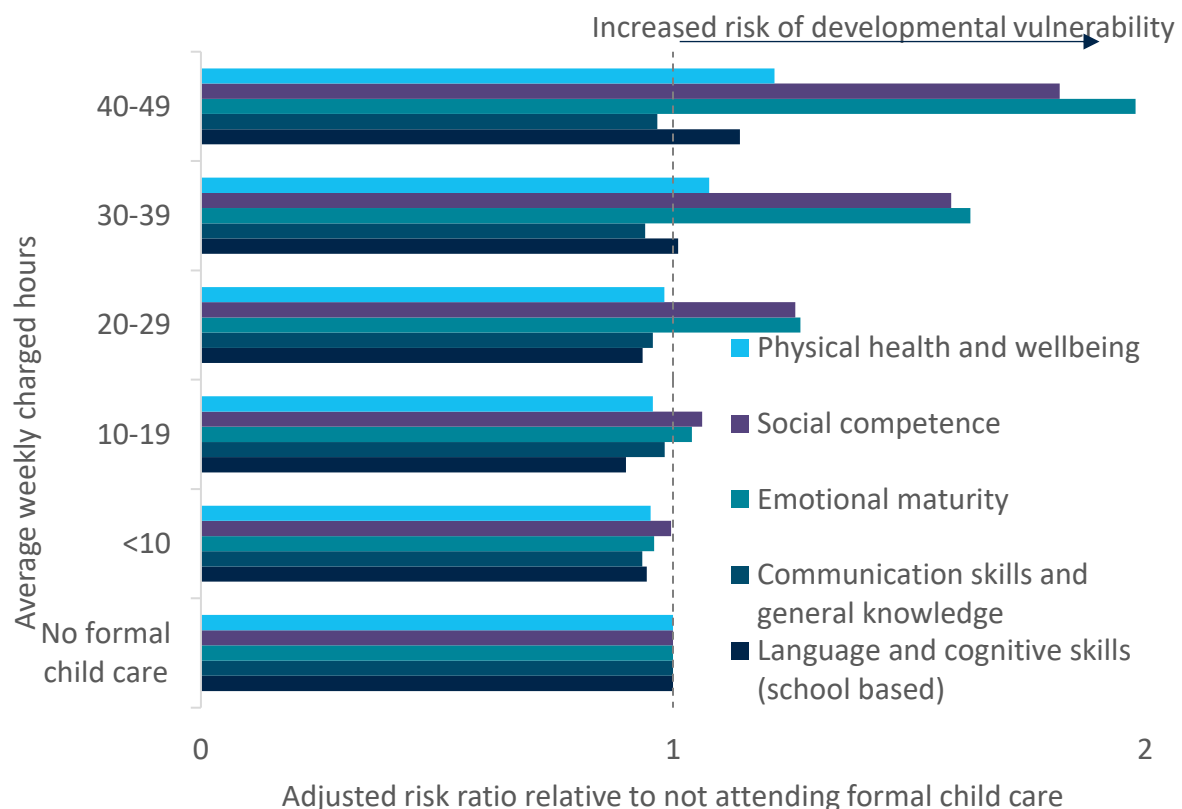


**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project, accessed 2023.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. DV1: Developmentally vulnerable on one or more domains. N =232,693. For simplicity, results from G-computation were the only results shown. Reference is the group not attending formal child care (risk ratio=1). Only the central estimations were shown. Cells with fewer than 200 children or risk ratios with a confidence interval equal to or exceeding one have been removed.

Figure 3 summarises on a single chart the risk ratios by average weekly charged hours for the separate AEDC domains.

**Figure 3. Adjusted risk ratios for the developmental vulnerability by average weekly charged hours and AEDC domain, compared to no formal child care attendance.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** Children may have separately attended preschool, which was not captured in the CCMS data.

There are clear differences in the patterns of risk ratios across the domains and average weekly hours. Risk ratios for the communication skills and general knowledge domain remain below 1 for all levels of average hours, indicating that child care is generally a protective factor for this domain. For the language and cognitive skills (school-based) domain, risk ratios initially fall as average weekly hours increase, suggesting that some child care hours result in a reduced risk of developmental vulnerability on this domain. Only for higher levels of average weekly hours for this domain do the risk ratios exceed 1, indicating an increased risk of developmental vulnerability. For the social competence and emotional maturity domains, risk ratios increase significantly as average weekly hours increase and reach high levels.

## Cognitive Domains

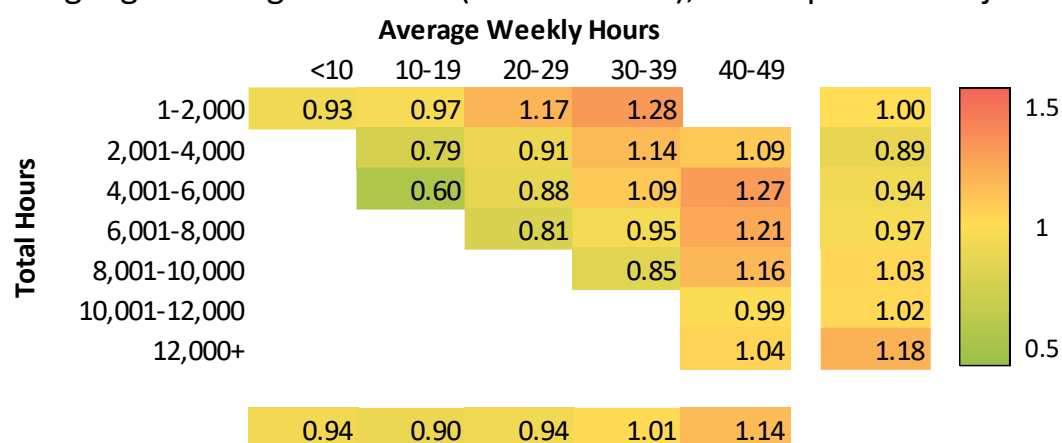
Focusing on the different AEDC domains, formal child care use generally served as a protective factor for cognitive domains (communication skills and general knowledge and language and cognitive skills (school-based)), as shown in section 3.1, before any adjustment. The protective effect remained when considering average weekly hours of attendance (figure 6 of section 3.3), for the group with less than 30 average weekly charged hours.

The adjusted risk ratios for the effect of child care on language and cognitive skills (school-based), and the communication skills and general knowledge, are shown in Table 2 and Table 3 respectively.

For less than 30 average weekly charged hours, and between 2,000 to 8,000 total hours, the risk ratio of being developmentally vulnerable in the language and cognitive skills (school-based) domain were less than 1. Adjusted risk ratios for the language and cognitive skills (school-based) domain (Table 2) generally fell with total hours and increased with average hours.

**Table 2. Adjusted risk ratios for the effect of combined child care average and total hours on developmental vulnerability in the Language and cognitive skills (school-based) AEDC domain compared to no formal child care attendance.**

Language and cognitive skills (school-based), G-computation adjusted



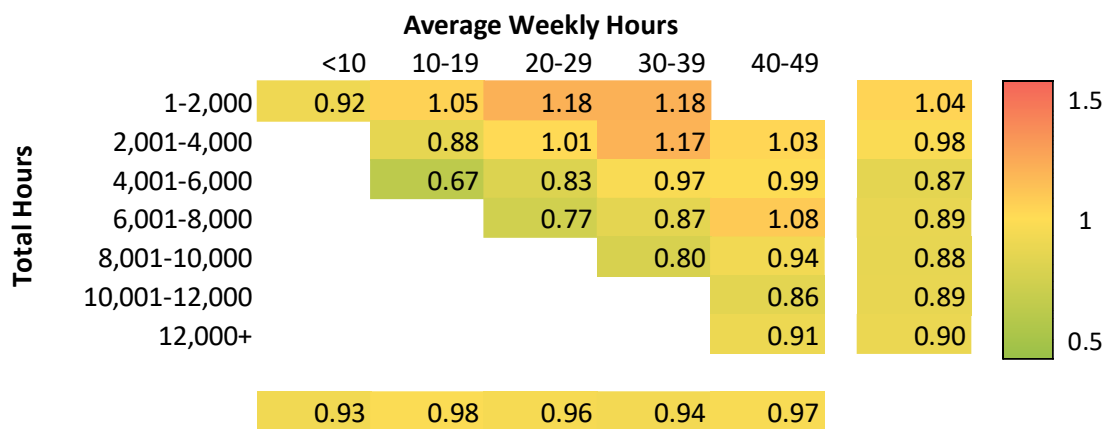
**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. N =232,693. For simplicity, results from G-computation were the only causal inference results shown. Further discussion available in methodology. Reference is the group not attending formal child care (risk ratio=1). Only the central estimations were shown. Cells with fewer than 200 children or risk ratios with a confidence interval equal to or exceeding one have been removed.

The communication skills and general knowledge domain exhibited the same general pattern as the language and cognitive skills (school-based) domain, with risk ratios generally falling with total hours and increasing with average hours. Child care attendance remained a protective factor even up to 50 average weekly charged hours. Risk ratios were only above 1, indicating higher risks of developmental vulnerability, for children with less than 4,000 total hours or 30 or more average weekly charged hours.

**Table 3. Adjusted risk ratios for the effect of combined child care average and total hours on developmental vulnerability in the Communication skills and general knowledge AEDC domain compared to no formal child care attendance.**

Communication skills and general knowledge, G-computation adjusted



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. N =232,693. For simplicity, results from G-computation were the only causal inference results shown. Further discussion available in methodology. Reference is the group not attending formal child care (risk ratio=1). Only the central estimations were shown. Cells with fewer than 200 children or risk ratios with a confidence interval equal to or exceeding one have been removed.

## Non-Cognitive Domains

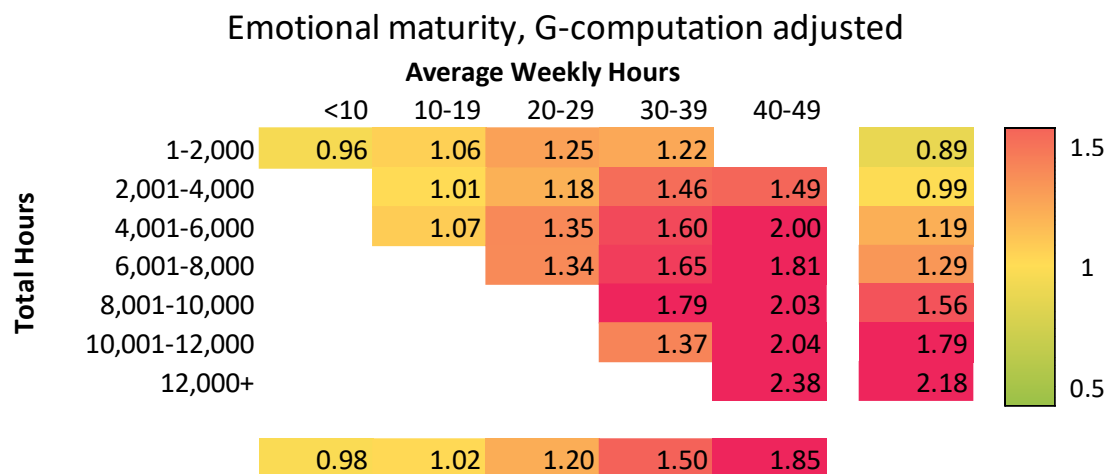
Non-cognitive domains showed a different pattern to the cognitive domains. Formal child care attendance appeared to be a risk factor for the emotional maturity and social competence domains before any adjustment, as shown in section 3.1. Higher average weekly hours were associated with significantly lower rates of being developmentally on track for these two domains (figure 6 of section 3.3).

The adjusted risk ratios for the effect of child care on the emotional maturity and social competence domains are shown in Table 4 and Table 5 respectively.

As with the descriptive analysis, the adjusted ratio shows that higher average weekly or total hours of child care use were associated with elevated risk ratios on the emotional maturity domain (Table 4). This effect was particularly pronounced for high average weekly hours.



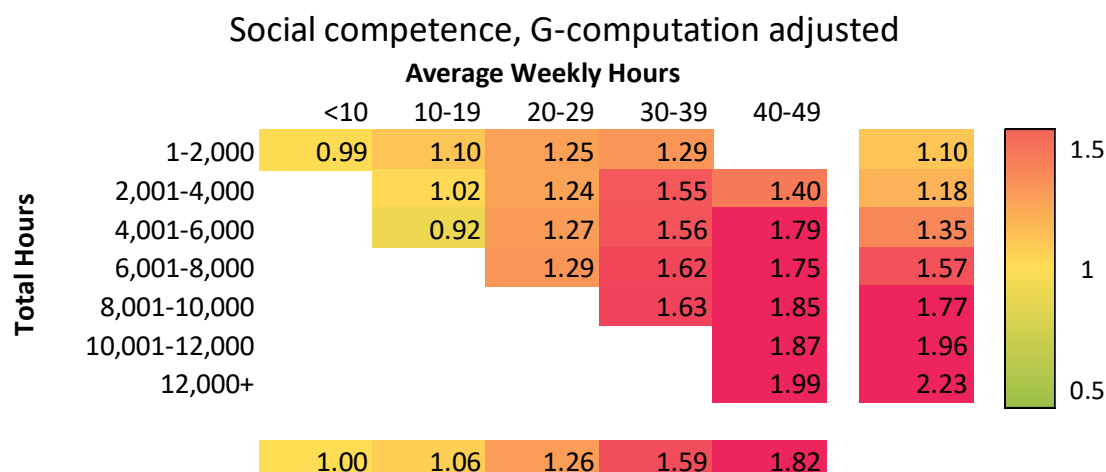
**Table 4. Adjusted risk ratios for the effect of combined child care average and total hours on developmental vulnerability in the Emotional maturity AEDC domain compared to no formal child care attendance.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. N =232,693. For simplicity, results from G-computation were the only causal inference results shown. Further discussion available in methodology. Reference is the group not attending formal child care (risk ratio=1). Only the central estimations were shown. Cells with fewer than 200 children or risk ratios with a confidence interval equal to or exceeding one have been removed.

**Table 5. Adjusted risk ratios for the effect of combined child care average and total hours on developmental vulnerability in the Social competence AEDC domain compared to no formal child care attendance.**

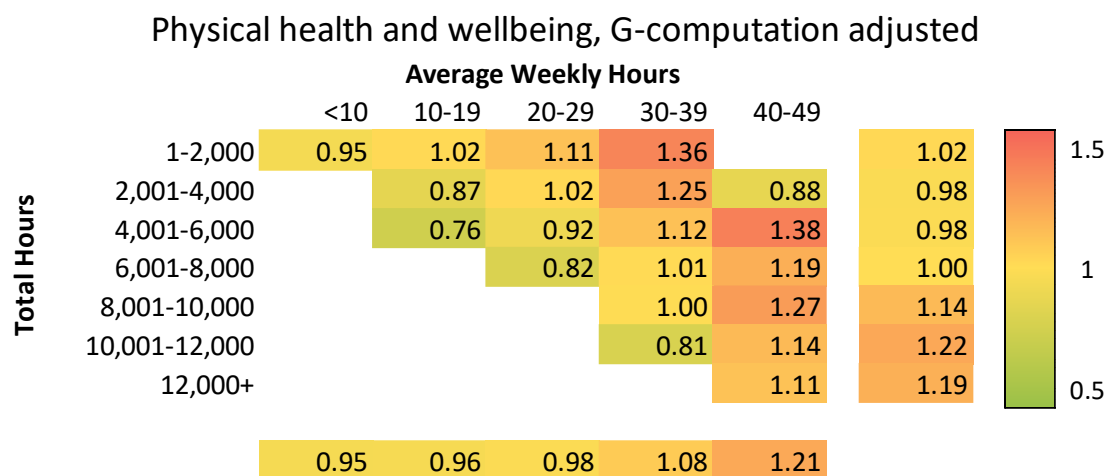


**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. N =232,693. For simplicity, results from G-computation were the only causal inference results shown. Further discussion available in methodology. Reference is the group not attending formal child care (risk ratio=1). Only the central estimations were shown. Cells with fewer than 200 children or risk ratios with a confidence interval equal to or exceeding one have been removed.

The social competence domain also showed elevated risk ratios with increasing weekly child care hours and increasing total hours (Table 5).

**Table 6. Adjusted risk ratios for the effect of combined child care average and total hours on developmental vulnerability in the Physical health and wellbeing AEDC domain compared to no formal child care attendance.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. N =232,693. For simplicity, results from G-computation were the only causal inference results shown. Further discussion available in methodology. Reference is the group not attending formal child care (risk ratio=1). Only the central estimations were shown. Cells with fewer than 200 children or risk ratios with a confidence interval equal to or exceeding one have been removed.

Risk ratios for the physical health and wellbeing domain were more complex, with formal child care a protective factor for some patterns of attendance and a risk factor for others. In general, risk ratios increased with increasing average hours and broadly fell with increasing total hours. Taking average weekly and total hours separately, child care was estimated to be a protective factor for this domain for less than 30 average charged weekly hours, or between 2,000 and 6,000 total hours.

## Child care quality

The descriptive results in section 3.2 compare rates of developmental vulnerability for children who attend child care at different quality ratings. Children who attend child care have lower rates of developmental vulnerability than children who do not, except for those attending child care with a not yet at standard quality rating. As has been shown from Australian national data, there are inequities to accessing high quality care associated with geographic and socio-economic disadvantage (Tang et al. 2024).

In this section, we use statistical techniques to estimate the effect of different child care quality (not yet at standard child care, above standard child care, and no formal child care, with at standard child care as a reference group), to better understand the relationship between child care quality on children's risk of developmental vulnerability.

We checked the distribution of child care hours for the different quality group to make sure that differences in outcomes were not being driven by differences in hours across the quality groups. The distributions of average weekly child care hours are similar for the three groups using formal child

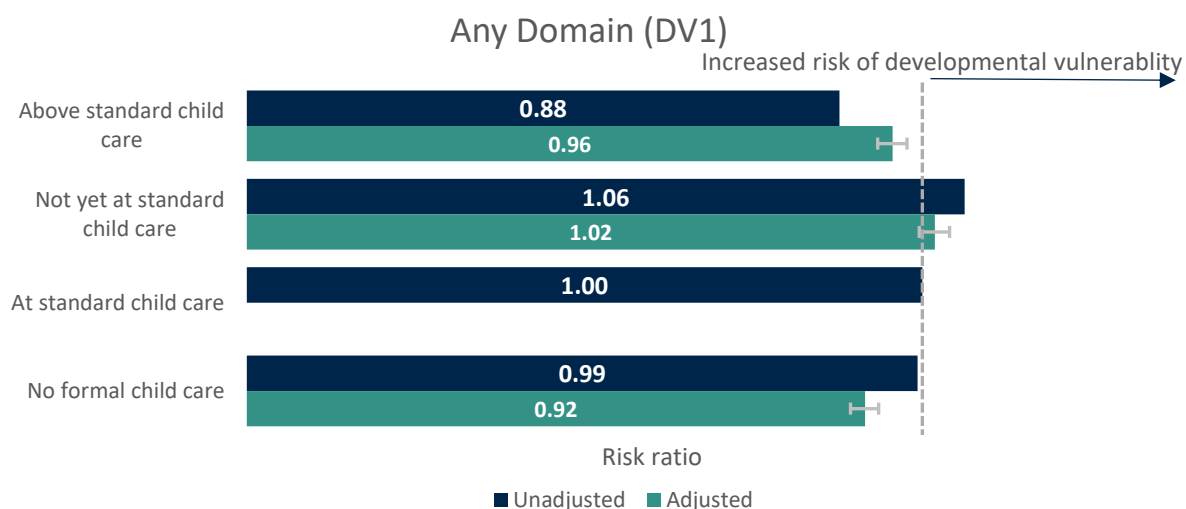
care. The group who did not use formal child care is also included, noting its diversity (and in particular, the different outcomes for those who did and did not attend preschool).

This section focusses on the effect of quality on outcomes. Other analysis that considered the combined effects of quality and hours suggests that these dimensions can be considered separately, rather than there being significant interaction effects.

Overall, the adjusted risk ratios for DV1 and each domain showed the higher the quality rating received by the child care provider, the better the outcome for the child. Attending above standard child care decreases the risk of being developmentally vulnerable in DV1 and in each domain when compared with attending at standard child care. This is consistent with finding from similar studies (focusing on different quality areas) in Australia (Rankin et al. 2024), where it is shown that children in services not yet at or at standard had higher rates of developmental vulnerability compared to those in services rated as above standard.

Figure 4 shows risk ratios for being developmentally vulnerable in one or more domains (DV1). Compared with attending at standard child care, attending above standard quality child care decreases the risk of being developmentally vulnerable (the adjusted risk ratio is 0.96 – that is, the risk of vulnerability is 4 per cent lower). Attending not yet at standard quality child care, on the other hand, increases the risk of being developmentally vulnerable by 2 per cent. The risk ratio for the group not attending formal child care is comparable with those attending At standard child care before adjustment, and shows an 8 percentage point lower risk of being developmentally vulnerable.

**Figure 4. Risk ratios for the effect of child care quality on developmental vulnerability on one or more domains compared to attending At standard child care.**



**Source:** Custom Multi-Agency Data Integration Project (MADIP) extract linked to Australian Early Development Census (AEDC) 2018 and Child Care Management System (CCMS).

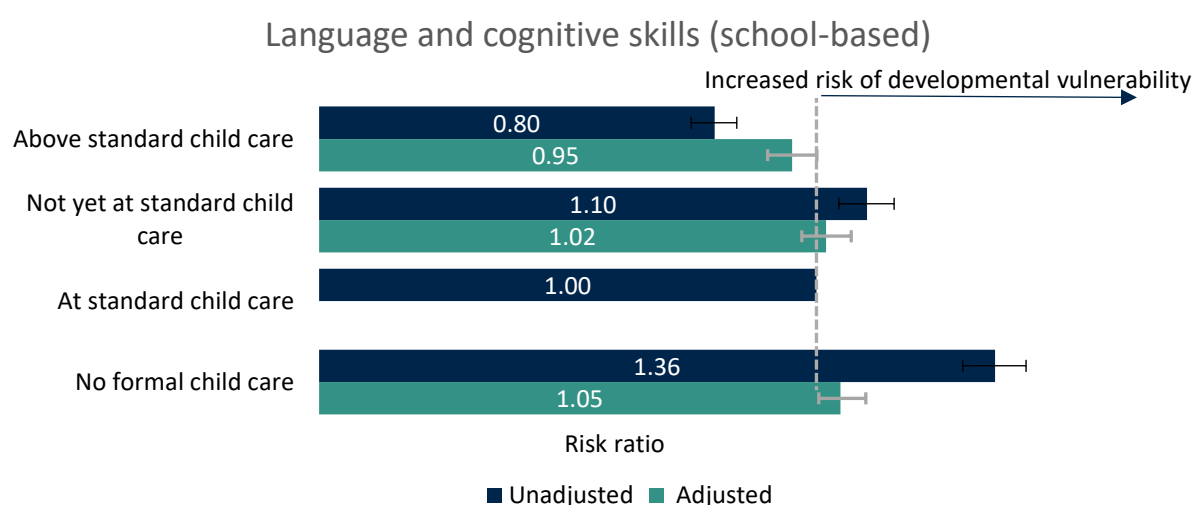
**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. Error bars are 95 per cent confidence interval. (N=53,795 not attending formal child care; 41,873 attending above standard quality; 53,368 attending at standard quality; 48,566 attending not yet at standard quality; 35,106 attended child care with unknown quality were removed from this analysis). For simplicity, results from G-computation were the only statistical inference results shown. Further discussion available in methodology. Children may have separately attended preschool, which was not captured in the CCMS data.

## Cognitive Domains

The pattern of results for different quality levels on cognitive domains showed that attendance across the quality ratings (compared with not attending formal child care) generally has a protective effect.

In the Language and cognitive skills (school-based) domain (Figure 5), attending Above standard child care lowered the risk of being developmentally vulnerable by 5 per cent. Both attending not yet at standard child care and no formal child care increased the risk of being developmentally vulnerable.

**Figure 5. Risk ratios for the effect of child care quality on developmental vulnerability in the Language and cognitive skills (school-based) domain, compared to attending *At standard child care*.**

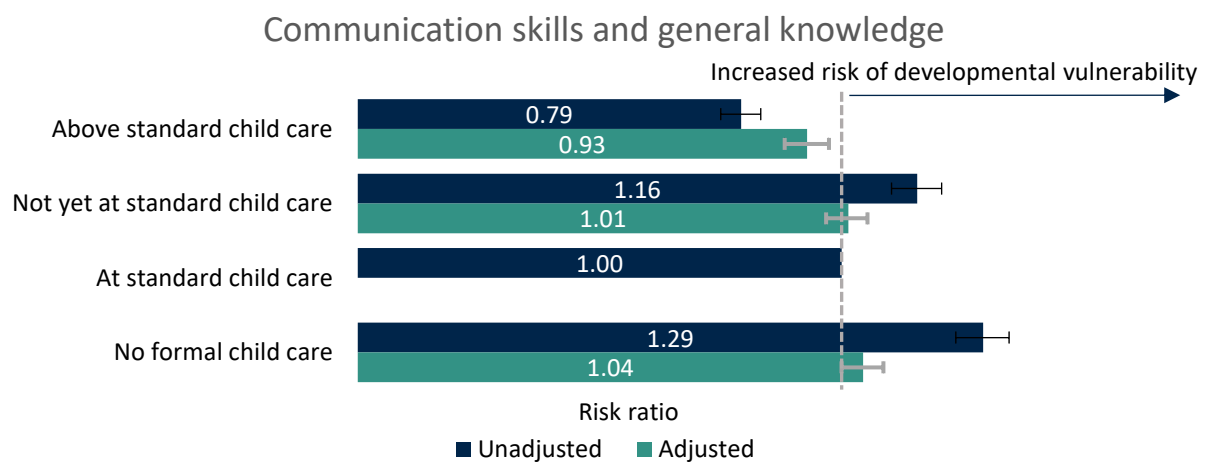


**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. Error bars are 95 per cent confidence intervals. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown. Further discussion available in methodology. Children may have separately attended preschool, which was not captured in the CCMS data.

Attending above standard quality child care was a protective factor for developmental vulnerabilities both before and after adjustment. Adjusting for the different characteristics of the groups lowers the apparent risk ratios of groups using not yet at standard or no formal child care, though the point estimates still show higher risks of being developmentally vulnerable than for children in at standard quality care.

**Figure 6. Risk ratios for the effect of child care quality on developmental vulnerability in the Communication skills and general knowledge domain, compared to attending *At standard child care*.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. Error bars are 95 per cent confidence intervals. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown. Further discussion available in methodology. Children may have separately attended preschool, which was not captured in the CCMS data.

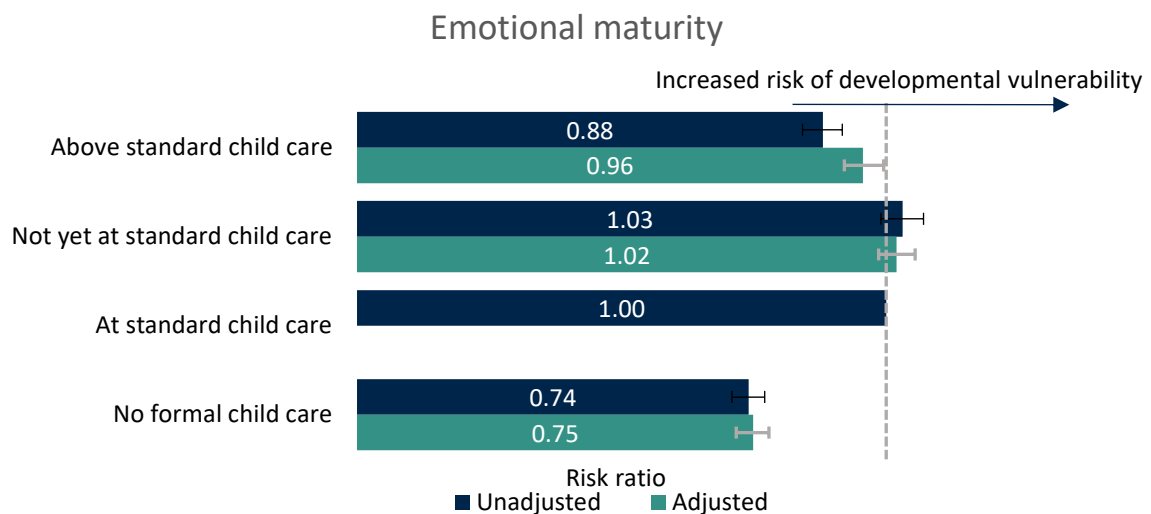
The same pattern was present for the communication skills and general knowledge domain. Above standard child care was estimated to be a statistically significant protective factor after adjustment, compared with those attending At standard child care.

## Non-Cognitive Domains

Results for social competence and emotional maturity domains were broadly similar, while the physical health and wellbeing domain displayed a different pattern.

Adjusting for the different characteristics of the different groups had a relatively smaller effect for the emotional maturity domain (figure 7). Above standard child care was estimated to have a lower risk of developmental vulnerability on the emotional maturity domain compared to at standard child care. The risk ratio for the group not attending formal child care was the lowest, both before and after adjustment.

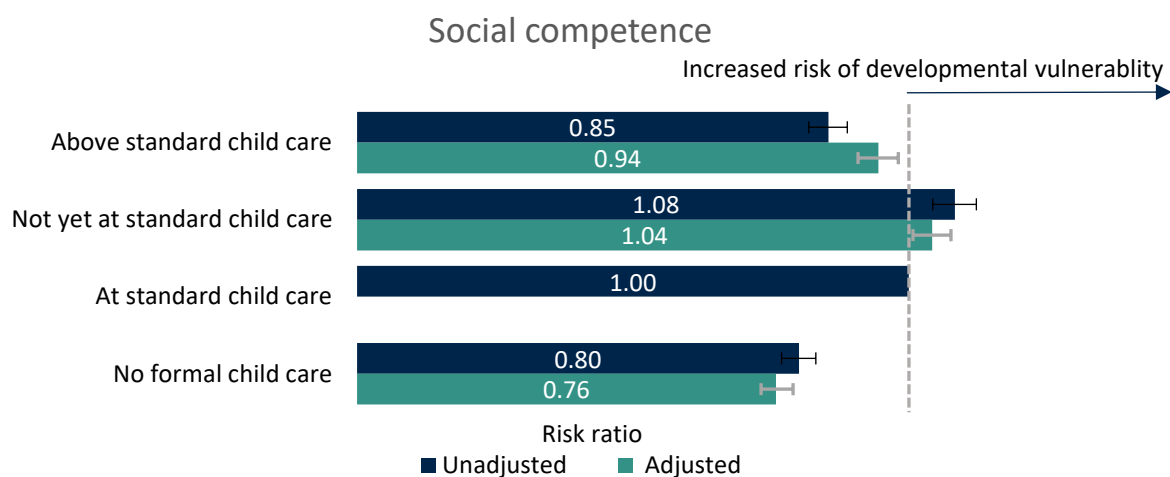
**Figure 7. Risk ratios for the effect of child care quality on developmental vulnerability in the Emotional maturity domain, compared to attending *At standard child care*.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. Error bars are 95 per cent confidence intervals. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown. Further discussion available in methodology. Children may have separately attended preschool, which was not captured in the CCMS data.

**Figure 8. Risk ratios for the effect of child care quality on developmental vulnerability in the Social competence domain, compared to attending *At standard child care*.**



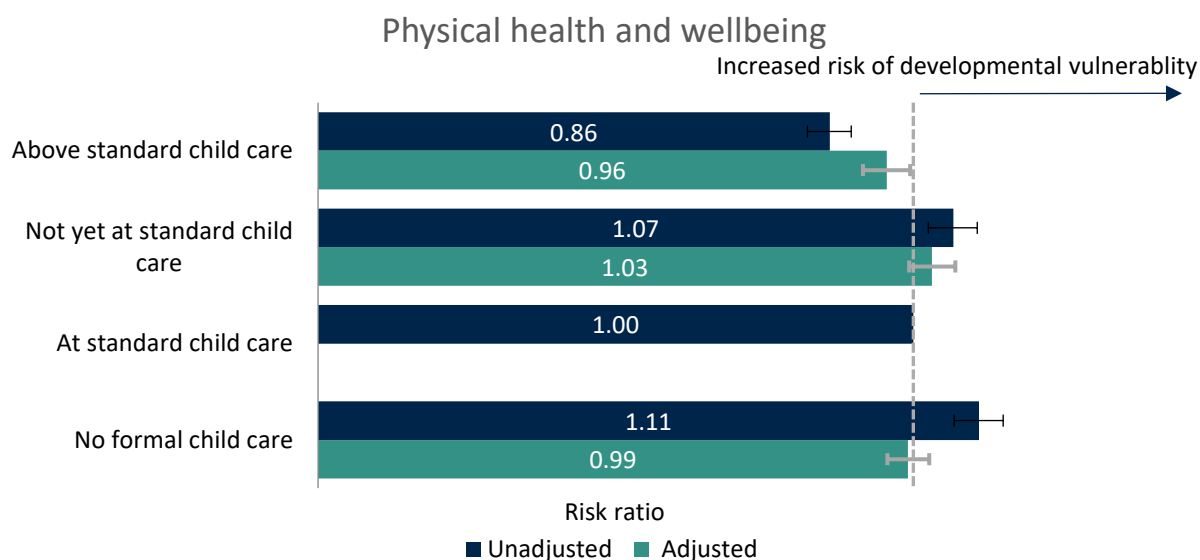
**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. Error bars are 95 per cent confidence intervals. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown. Further discussion available in methodology. Children may have separately attended preschool, which was not captured in the CCMS data.

Adjusting for the different characteristics of the groups accessing different quality child care produced a broadly similar pattern to the unadjusted results for the social competence domain

(Figure 8). Central estimates showed higher quality child care had lower risk ratios for developmental vulnerabilities on this domain, with a statistically significant difference between above and not yet at standard care. The group not attending formal child care had the lowest risk ratio, recognising the majority of these children attended preschool.

**Figure 9. Risk ratios for the effect of child care quality on developmental vulnerability in the Physical health and wellbeing domain, compared to attending *At standard child care*.**



**Source:** Customised 'First Five Years' extract from the Multi-Agency Data Integration Project.

**Notes:** This figure compares children from the 2018 cohort of the Australian Early Development Census. Error bars are 95 per cent confidence intervals. N =232,693. For simplicity, results from G-computation were the only statistical inference results shown. Further discussion available in methodology. Children may have separately attended preschool, which was not captured in the CCMS data.

For the physical health and wellbeing domain (figure 9), the differences in the risk ratio for different groups are smaller after adjusting for the different characteristics of the cohorts. Central estimates were lower for higher quality child care, ranging from being a slight protective factor through to a slight risk factor, though results were generally not statistically significant.

## References

Hernan M and Robins J (2020) 'Causal Inference: What If', *Boca Raton: Chapman & Hall/CRC*.

Rankin P, Staton S, Jones A, Potia AH, Houen S, Healey B and Thorpe K (2024) '[Linking quality and child development in early childhood education and care: Technical report](#)', *Australian Education Research Organisation (AERO)*.

Tang A, Rankin P, Staton S and Thorpe K (2024) 'Access to high-quality early care and education: Analysis of Australia's national integrated data', *Early Childhood Research Quarterly* 67:352, doi:/10.1016/j.ecresq.2024.02.001.

Tartaglia E and Knapp S (unpublished) 'Causal Inference in Education Data', *Australian Government Department of Education, Skills and Employment (DESE)*.

