More than a snapshot in time: pathways of disadvantage over childhood

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Title: More than a snapshot in time: Pathways of disadvantage over childhood

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ABSTRACT

Background

Disadvantage rarely manifests as a single event, but rather is the enduring context in which a child’s development unfolds. We aimed to characterise patterns of stability and change in multiple aspects of disadvantage over the childhood period, in order to inform more precise and nuanced policy development.

Methods

Participants were from the Longitudinal Study of Australian Children birth cohort (n=5107). Four lenses of disadvantage (sociodemographic, geographic environments, health conditions, and risk factors), and a composite of these representing average exposure across all lenses, were assessed longitudinally from 0 to 9 years. Trajectory models identified groups of children with similar patterns of disadvantage over time, for each of these lenses, and for composite disadvantage. Concurrent validity of these trajectory groups were examined through associations with academic performance at 10-11 years.

Results

We found four distinct trajectories of children’s exposure to composite disadvantage, which showed high levels of stability over time. In regard to the individual lenses of disadvantage, three exhibited notable change over time (the sociodemographic lens was the exception). Over a third of children (36.3%) were exposed to the ‘most disadvantaged’ trajectory in at least one lens. Trajectories of disadvantage were associated with academic performance, providing evidence of concurrent validity.

Conclusions

Children’s overall level of composite disadvantage was stable over time, while geographic environments, health conditions, and risk factors changed over time for some children.
Measuring disadvantage as uni-dimensional, at a single time point, is likely to understate the true extent and persistence of disadvantage.

**Keywords:** health inequity, childhood, disadvantage, measurement, longitudinal, adversity

**Medical Subject Headings:** socioeconomic factors, child development, vulnerable populations, longitudinal studies
**Key messages**

1. Failure to take into account how disadvantage occurs over time could undermine the effectiveness of well-intended public health and public policy interventions to address child inequities.

2. This study characterised patterns of stability and change in children’s experiences of relative disadvantage over childhood.

3. Children’s overall level of disadvantage was stable over time, while trajectories within specific lenses of disadvantage (geographic environments, health conditions, and risk factors) changed over time as children developed (the sociodemographic lens was an exception).

4. Children can be exposed to different combinations of disadvantage over the childhood period: over a third (36.3%) of children were on the most disadvantaged trajectory in at least one lens (23.7% on one lens, 9.8% on two lenses, 2.5% on three lenses, and 0.3% on all four lenses).

5. These findings suggest the importance of sustained, multifactorial solutions in addressing childhood disadvantage.
INTRODUCTION

Relative disadvantage refers to position in a social hierarchy determined by, amongst other things, wealth, power, and prestige.¹ Exposure to disadvantage in childhood affects children’s health and development with far reaching consequences for future wellbeing and opportunity.² To address early inequities and their consequences, it is essential to capture the extent of disadvantage and how disadvantage unfolds over the course of the childhood period.³

It is increasingly recognised that concepts and measures of disadvantage in childhood need to take an ecological approach, capturing the environments in which child development occurs.⁴ ⁵ Recently, we developed and cross-sectionally tested a framework of child disadvantage⁶ (Figure 1), which comprises four interrelated social determinant ‘lenses’ reflecting the circumstances in which children live, learn and grow.⁶ By their nature, some of these aspects of disadvantage are fixed, whereas others are more modifiable. The sociodemographic lens captures characteristics (e.g., primary caregiver’s level of education) that define subpopulation groups at risk of poorer outcomes. The geographic environments lens captures the characteristics of the places where children live (e.g., proximity to services). The health conditions lens captures conditions unevenly distributed across social groups (e.g., caregiver depression). The risk factors lens captures attributes that are associated with an increased likelihood of poor child outcomes (e.g., caregiver smoking).

FIGURE 1 HERE

Also increasingly recognised is the importance of temporal dimensions to disadvantage, as disadvantage across these lenses does not usually manifest as a single event. Life course
perspectives view disadvantage as the context for children’s development, which is constantly unfolding over time.\textsuperscript{3,7-9} Research on severe deprivation shows that some children experience persistent poverty, while others have pathways defined by social mobility, or intermittent exposures.\textsuperscript{7,10-14} Children can also experience different pathways over time for particular aspects of relative disadvantage. For example, specific indicators within the health conditions\textsuperscript{15} and risk factors\textsuperscript{16} lenses appear to increase or decrease as children develop, while previous work suggests that trajectories within the sociodemographic lens are very stable over time.\textsuperscript{17}

The temporal nature of disadvantage could play an important role in explaining the consequences of childhood disadvantage for later health outcomes.\textsuperscript{3,9} Evidence suggests that disadvantage can have a cumulative toll on health.\textsuperscript{3,8,18} For example, the impact of poverty on child health and developmental outcomes has been shown to vary depending on the intensity of the exposure and when it occurs, including timing within more sensitive (and therefore potentially more heavily impacted) developmental periods.\textsuperscript{7,19,20} Understanding these patterns can contribute to the development of more precise policy responses to redress inequities in child development.

Indeed, despite the growing evidence on the multidimensionality and temporal nature of child disadvantage, many policy responses to address child disadvantage focus on single dimensions at a point in time. In countries such as the US and Australia, for instance, interventions aimed at increasing participation in preschool (to reduce developmental gaps prior to school) focus primarily on current income-based disadvantage (e.g., through public subsidy of fees). Such approaches fail to recognise that there may be enduring impacts on child development from previous exposure to disadvantage, or that disadvantage in other
aspects of their circumstances (e.g., geography\textsuperscript{22}) may create additional barriers to participation.

The current paper extends on previous work by bringing together two important emerging directions in the literature – the increasingly recognised need for a multidimensional and a temporal perspective on child disadvantage – into a single model. We aim to comprehensively describe the stability and change in children’s exposure to different aspects of relative disadvantage over the childhood period.\textsuperscript{23} We expect to find distinct trajectories of disadvantage from 0-1 to 8-9 years, across the four lenses of disadvantage, as well as at a composite (i.e., average) level. We further expect trajectories in the sociodemographic lens to show more stable and persistent patterns than the other three lenses. Finally, associations between disadvantage trajectories and academic performance (a known correlate of disadvantage\textsuperscript{24}) are examined to assess concurrent validity.

METHOD

Data Source

Data from the Longitudinal Study of Australian Children (LSAC) were used. LSAC is a prospective, population-based study of Australian children which commenced in May 2004.\textsuperscript{25} The LSAC design and sampling methodology is documented elsewhere.\textsuperscript{25,26} In short, a complex survey design was used, to select a sample that was broadly representative of all Australian children except those living in remote areas.\textsuperscript{26} Data were collected on children’s development as well as family and community characteristics, and multiple information sources were utilised, including parent interview, direct child assessments and observational measures, parent and teacher self-report questionnaires, and linkage to administrative datasets.
The current paper draws on data from the B-cohort, focusing on primarily parent-reported
data collected about their social environment and circumstances when children were aged 0-1
(Wave 1; n=5107), 2-3 (Wave 2; n=4606), 4-5 (Wave 3; n=4386), 6-7 (Wave 4; n=4242), and
8-9 years (Wave 5; n=4085). To examine concurrent validity, we draw on children’s results
from a direct assessment of academic skills at 10-11 years: the National Assessment Program –
Literacy and Numeracy (NAPLAN) conducted on all Australian students and subsequently
linked to the LSAC cohorts.27

Sample attrition of the 5,107 children recruited into the B-cohort has been gradual. The
retained sample by Wave 5 was 4085 (80% of original sample), comparing well to similar
cohort studies (e.g.,28). Non-response has been higher for some subpopulations, such as
families where mother’s had lower educational attainment, or those with less stable housing
tenure.29 Survey methods weighting was used to account for the probability of selecting each
child into the study and non-response.25 The LSAC methodology was approved by the
Australian Institute of Family Studies Human Research Ethics Review Board.

Measures

Disadvantage indicators from 0-1 to 8-9 years

We replicated Goldfeld et al.’s6 model of child disadvantage in each wave of data available
across the childhood period. Table 1 provides a summary of the variables used to indicate the
four lenses of sociodemographic, geographic environments, health conditions, and risk
factors, at 0-1, 2-3, 4-5, 6-7, and 8-9 years of age. Because the four lenses of disadvantage
overlap, some variables could align with more than one lens. For example, children with a
medical condition or disability were considered a population of children with special needs,
which therefore aligned with the sociodemographic lens, but their disability could
alternatively have been qualified in the health conditions lens. Caregiver disability, on the other hand, fitted more conventionally in the health conditions lens, rather than the sociodemographic lens. In ambiguous cases, indicators were categorised based on what most closely resembled the original theoretical model presented by Koh et al.,\textsuperscript{5} which was found to be a good fit for the data in Goldfeld et al.\textsuperscript{6} Five of the indicators used by Goldfeld et al.\textsuperscript{6} were not available across all waves, and were therefore excluded to ensure consistency of the way disadvantage was operationalised at each time point (see Table 1 for details). Assessment of each indicator across time was largely consistent, with small variations in wording (see \textsuperscript{30} for full details).

Factor scores reflecting each lens at each time point were generated using Confirmatory Factor Analysis (CFA). Each CFA model was fitted using maximum likelihood estimation, and the fit between the hypothesised model and observed data was evaluated using root mean squared error of approximation (RMSEA), comparative fit index (CFI), and standardised root mean squared residual (SRMR).\textsuperscript{31} The model was found to adequately fit the observed data at each wave (RMSEA values ranging from 0.046 to 0.042, CFI values ranging from 0.82 to 0.85 and SRMR values consistently below 0.05). The somewhat low CFI values could have been improved by modifying the model within each wave (e.g., removing partner status in Wave 1 when the majority of parents are partnered), but we instead prioritised replicating the model consistently at each time point. After fitting the models, factor scores for each lens were generated for each participant at each time point. These were also averaged to create a composite disadvantage score at each time point, to reflect children’s average circumstances across these lenses.

TABLE 1 HERE
Academic outcomes at 10-11 years

NAPLAN is an Australia-wide school-based direct assessment of academic skills conducted on all children in Grades 3, 5, 7 and 9.\textsuperscript{27} NAPLAN measures students’ skills in reading, writing, spelling, grammar and punctuation, and numeracy, which are mapped onto achievement scales with scores that range from 0 to 1000. Reading (M= 430.40, SD=91.98) and numeracy (M= 404.98, SD=74.95) scores were used as indicators of academic performance at 10-11 years of age.

Analysis

All analyses were performed using Stata 14.2.\textsuperscript{32} Identifying trajectory groups allows differences between groups of individuals in their patterns of exposure over time to be captured, rather than assuming a homogenous pattern (e.g., stable disadvantage across the childhood period) holds for all individuals.\textsuperscript{33} In the currently analysis, a semiparametric, group-based trajectory approach was used to identify groups of children who experienced similar patterns of disadvantage over time, according to both composite disadvantage and for each lens separately. Group-based trajectory modeling is a specialised application of the finite mixture model, which assumes that the population is composed of a mixture of distinct groups defined by their developmental trajectories.\textsuperscript{34,35}

Trajectory approaches involve some degree of uncertainty regarding the best number of trajectories to derive, and the allocation of cases to each trajectory.\textsuperscript{36} It is therefore important to have a strong theoretical framework underpinning the trajectory modelling and to validate the resulting solution, to ensure the resulting trajectories are meaningful.\textsuperscript{36} We based our study on a previously validated and empirically tested framework,\textsuperscript{6} and also examined the
concurrent validity of the arising trajectories through associations with academic achievement. In relation to disadvantage, trajectories should be interpreted as reflecting groups of children with similar patterns over time,\(^\text{37}\) rather than representing a fully homogenous group membership.

Modeling was performed using the STATA ‘traj’ plugin, an adaptation of the SAS plugin ‘PROC TRAJ’.\(^\text{34}\) A censored normal model was fitted to the data because the lens scores and composite disadvantage scores were continuous. The shape of the trajectories was defined by a polynomial function (i.e., linear, quadratic, or cubic) of age.\(^\text{35}\) For instance, a cubic association between disadvantage \(y_{it}^d\) and age is taken as:

\[
y_{it}^d = \beta_0^d + \beta_1^d Age_{it} + \beta_2^d Age_{it}^2 + \beta_3^d Age_{it}^3
\]

where \(Age_{it}\), \(Age_{it}^2\), and \(Age_{it}^3\) are individual \(i\)’s age, age squared, and age cubed at time \(t\).

Models with up to five trajectory groups were considered. The number and shape of disadvantage trajectories were determined based on the change in Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), average posterior probabilities and face validity.\(^\text{38}\) An average posterior probability of >0.7 was used as an indicator of good model fit.\(^\text{39}\)

Next, the concurrent validity of the disadvantage trajectories was tested. Linear regression models were used to examine associations between disadvantage trajectories and children’s reading and numeracy performance at 10-11 years. The sociodemographic lens includes the presence of a medical condition or disability, which could involve conditions that impact on academic outcomes. To account for this, we performed the analysis on the whole sample and on a sample that excluded children who had a medical condition or disability associated with
‘difficulty learning or understanding things’ (n=69, 1.34%). Results were similar across both approaches. Results excluding children with a learning disability are presented.

**Multiple imputation**

Multiple imputation by chained equations was performed to reduce selection bias due to missing data. Twenty imputed datasets were imputed under the missing at random assumption.\(^{40}\) The imputation model included all factor scores (8-9 years), age in years, reading and numeracy scores, and auxiliary variables (community socioeconomic status, argumentative relationship, learning difficulties, maternal education, maternal age, maternal Body Mass Index). Results using imputed data are shown.

**RESULTS**

**Disadvantage trajectories**

Using the factor scores at each wave, groups of children with similar patterns of disadvantage over time were identified. The best fitting models identified four distinct trajectories for composite disadvantage and for each lens. The average posterior probabilities for each trajectory group in composite disadvantage and in each lens were >0.7, indicating good precision of class assignment.\(^{41}\)

Trajectories of composite disadvantage showed a high level of stability (Figure 2). 10.9% of children had consistently high scores from 0-1 to 8-9 years, with this trajectory group labelled ‘most disadvantaged’. A similar proportion of children (11.1%) had consistently low scores over time, with this pathway labelled ‘most advantaged’. Children’s composite disadvantage scores were distributed in the expected way across the trajectory groups; those in the most
disadvantaged trajectory tended to have higher scores at each time point, while those in the
most advantaged trajectory tended to have lower scores at each time point (data not shown).

FIGURE 2 HERE

Trajectories within each of the four lenses showed more evidence of mobility over time
(Figure 3). For geographic environments, health conditions, and risk factors, some trajectories
increased or decreased over the childhood period. For example, in the geographic
environments lens, the trajectories showed a fanning pattern, where those who started in the
most advantaged trajectory tended to become even more advantaged over time. Conversely, in
the health conditions lens, a small group of children experienced a large increase (i.e.,
worsening) in disadvantage over time.

FIGURE 3 HERE

Around one in three children (36.3%) were in the most disadvantaged trajectory on at least
one lens. This included 23.7% who were in the most disadvantaged trajectory on one lens,
9.8% on two lenses, 2.5% on three lenses, and 0.3% on all four lenses. Note that in
calculating this, we combined the ‘increasing’ and ‘most disadvantaged’ trajectory for the
health conditions lens, given that their levels of disadvantage were similar by 8-9 years.

Concurrent validity of the disadvantage trajectories

Associations between the disadvantage trajectories and academic performance at 10-11 years
supported the concurrent validity of the lens and composite disadvantage trajectories (Table
2). Children in the most disadvantaged trajectory for composite disadvantage, and for each
individual lens, had lower reading (0.18 to 1.02 SD) and numeracy scores (0.18 to 1.27 SD) at 10-11 years than those in the most advantaged trajectories, as expected.

TABLE 2 HERE

DISCUSSION

We aimed to operationalise a multidimensional framework of disadvantage\(^6\) over time, and found distinct trajectories of child disadvantage from 0-1 to 8-9 years. At the overall composite level, disadvantage was stable: children who were most disadvantaged in infancy tended to continue to be disadvantaged throughout childhood. This aligns with the observation that while there may be some movement over time in facets of disadvantage, such as income,\(^{14,42,43}\) relative position in the social hierarchy can remain stable over long periods.\(^{43}\) The chronic exposure to disadvantage that some children experienced represents a very significant challenge, with potentially cumulative sequela for health, social-emotional, and occupational outcomes over the life course.\(^{44}\)

A somewhat different picture emerged when considering disadvantage at the lens level. Sociodemographic trajectories were fairly stable as in Sun et al.,\(^{17}\) who examined trajectories of household socioeconomic position (a composite of income, education and occupation). Trajectories in the other lenses changed over time for some groups of children, aligning with previous work on specific indicators,\(^{15,16,45}\) such as Matijasevich et al.,\(^{15}\) who found that pathways of maternal depression (which sits within the health conditions lens) appeared to increase or decrease for some children. This suggests that the benefits of various policy interventions may differ according to the aspect of disadvantage targeted by the intervention and the timing: sociodemographic factors may be more difficult to modify, but geographic
environments, health conditions, and risk factors may be more readily modifiable during the childhood period. It is also noteworthy that at the lens level around a third of families encountered some form of disadvantage over time, rather than disadvantage being concentrated in one small group of children.

Each trajectory was associated with academic performance at 10-11 years of age in the expected direction, consistent with findings such as that of Jackson et al., who found that trajectories of specific indicators of disadvantage (income, family structure, and maternal depression) predicted children’s academic performance at age five. This well-established association is likely due to a range of factors that are in turn associated with the lenses we describe, like less access to resources that promote learning in the home or to quality early childhood programs and schools, as well as shared causes.

Strengths and Limitations
The breadth and richness of data available enabled exploration of children’s exposure to multiple lenses of disadvantage over time in a way that has not previously been reported. Nevertheless, some indicators within each lens could not be captured due to a lack of available data consistently measured over the waves. As with any study of this duration there was substantial attrition, which was greatest for the most disadvantaged children. We have used survey weighting and multiple imputation to reduce the potential for non-representability of the general population.

The social determinants of health are often context dependent, and can differ across countries. While the broad conceptual framework for this research is likely to hold true across contexts, researchers may choose to categorise some indicators differently or include or
exclude particular indicators, as is most relevant to their context and aims. In addition, opportunities for social mobility may differ across countries and as such there may be different levels of stability or change in disadvantage lenses over time. Comparative analysis to determine whether similar patterns are observed over time across countries will be of value in future work.

**Implications and Future Directions**

This multi-factorial framework for operationalising exposure to disadvantage over time could be applied to other cohorts. It is unlikely that all potential indicators within each of the lenses listed by Goldfeld et al.\(^6\) will be perfectly captured at multiple time points in any one study. Rather, our framework can guide researchers to utilise the longitudinal data available to them within a coherent conceptual paradigm. Longitudinal measurement may be most critical when aiming to capture the heterogeneity of the experience of disadvantage at the lens level, and thereby better identify targeted opportunities and time points to intervene. In contrast, capturing composite disadvantage at one time point is reasonable given high levels of stability. Similarly, when making assessments for the distribution of services, measurement of composite disadvantage may be most relevant at baseline, but with continued monitoring of risks that may emerge at the lens level.

In describing patterns of stability and change, future research can now explore causes of the change and stability observed, including the potential for bi-directional influences over time.\(^12,14\) For example, disadvantage in the sociodemographic lens may contribute to increased disadvantage in the health conditions lens, which could further exacerbate sociodemographic disadvantage over time.
It also provides a foundation for future work to develop a more detailed understanding of the complex relationship between disadvantage and child development. Some lenses of disadvantage may be particularly relevant for some domains of child development, but this possibility is rarely explored.\textsuperscript{48} The current findings suggest that taking a longitudinal approach to examining how disadvantage lenses relate to outcomes is essential to avoid underestimating the effect of disadvantage, and is reinforced by others’ findings within specific lenses (e.g.,\textsuperscript{12}). Of key interest is how pathways across lenses might interact with one another over time to produce developmental outcomes, as this may suggest potential intervention targets at particular time points (e.g., in early childhood to prevent progression of an increasing health conditions pathway).

Evidence that disadvantage is multidimensional and temporal has implications for policies formulated to reduce child inequities. It is unrealistic to expect the benefits of once-off programs to last indefinitely, if children go on to be exposed to additional risks and changing circumstances over time.\textsuperscript{49} Rather than focusing on a ‘snapshot’ of children’s circumstances and opportunities to intervene at one point in time, policy responses will likely need to target multiple opportunities and platforms that reinforce one another over time and are responsive to change in children’s circumstances.\textsuperscript{50}

**Conclusions**

These findings reinforce that children’s exposure to disadvantage in all its complexity does not occur as a single event, but is the context in which children’s development unfolds over time. While composite level disadvantage is highly stable, more variability is seen over time within some specific lenses. Many children were exposed to a disadvantaged trajectory over childhood for at least one of the lenses of disadvantage considered. Identifying and describing
multiple aspects of child disadvantage over time can facilitate the development of more precise policy responses that consider not only what or who to target, but when.
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Competing interests

None declared.
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32. StataCorp. *Stata statistical software: Release 14*. College Station, TX: StataCorp LP; 2015.


LIST OF FIGURES

Figure 1. Framework of child disadvantage aligning to a social determinants and ecological perspective, reproduced from Goldfeld et al. Examples of relevant indicators within each lens (sociodemographic, geographic environments, health conditions, and risk factors) and level (child, family, and community) are shown. It is expected that disadvantage experienced through each of these lenses will overlap and interact to influence inequities in complex ways.

Figure 2. Trajectories of composite disadvantage from 0-1 to 8-9 years. Higher scores indicate higher levels of disadvantage. The bold line represents the sample mean score.

Figure 3. Trajectories of disadvantage within each lens from 0-1 to 8-9 years. Higher scores indicate higher levels of disadvantage. The bold line in each plot represents the mean score.
Framework of child disadvantage aligning to a social determinants and ecological perspective, reproduced from Goldfeld et al.4 Examples of relevant indicators within each lens (sociodemographic, geographic environments, health conditions, and risk factors) and level (child, family, and community) are shown. It is expected that disadvantage experienced through each of these lenses will overlap and interact to influence inequities in complex ways.26

34x38mm (300 x 300 DPI)
Trajectories of composite disadvantage from 0-1 to 8-9 years. Higher scores indicate higher levels of disadvantage. The bold line represents the sample mean score.
Trajectories of disadvantage within each lens from 0-1 to 8-9 years. Higher scores indicate higher levels of disadvantage. The bold line in each plot represents the mean score.
### Table 1. Indicators of disadvantage available assessed repeatedly from 0-1 to 8-9 years.

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<th>Indicator</th>
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<td>Health conditions</td>
<td>Main caregiver depression (C)</td>
<td>Kessler K6 screening tool for mood and anxiety disorders</td>
</tr>
<tr>
<td></td>
<td>Main caregiver medical condition</td>
<td>Primary caregiver has a condition or disability that has lasted for six months or more</td>
</tr>
<tr>
<td>Risk factors</td>
<td>Child body mass index (D)</td>
<td>Child’s Body Mass Index, calculated as: weight (kg)/height (m$^2$)</td>
</tr>
<tr>
<td></td>
<td>Main caregiver body mass index</td>
<td>Primary caregiver’s Body Mass Index, calculated as: weight (kg)/height (m$^2$)</td>
</tr>
<tr>
<td></td>
<td>Main caregiver smoking</td>
<td>Primary caregiver smokes cigarettes</td>
</tr>
<tr>
<td></td>
<td>Main caregiver binge drinking</td>
<td>Primary caregiver has five or more standard drinks on one occasion (if female) or seven or more standard drinks on one occasion (if male)</td>
</tr>
<tr>
<td></td>
<td>Child unmet need for services</td>
<td>Child has needed services in the last twelve months that they could not get</td>
</tr>
<tr>
<td>Main caregiver physical arguments with partner</td>
<td>Primary caregiver has arguments with their partner that end up with people pushing, hitting, kicking or shoving</td>
<td></td>
</tr>
<tr>
<td>Number of homes lived in</td>
<td>Number of homes child has lived in in the last two years</td>
<td></td>
</tr>
<tr>
<td>Main caregiver argumentative partner relationship (C)</td>
<td>How often primary caregiver and partner disagree about basic child-rearing issues, have awkward or stressful conversations, or have anger or hostility between them</td>
<td></td>
</tr>
<tr>
<td>Stressful life events within family (C)</td>
<td>Number of adverse events experienced by primary caregiver or their partner in the last year (e.g., suffered a serious illness, injury or assault)</td>
<td></td>
</tr>
<tr>
<td>Main caregiver unmet need for social support</td>
<td>How often primary caregiver feels that they need support or help but can’t get it from anyone</td>
<td></td>
</tr>
</tbody>
</table>

All variables are parent reported except where indicated: D=direct assessment; L=linked data. Variables are single items except where indicated by C (composite variable). Full details of each measure can be found in Australian Institute of Family Studies.\(^\text{14}\)

Note. Indicators included by Goldfeld et al\(^\text{6}\) but not available at all time points were: child tooth decay, child fat and sugar consumption, child home education, child physical inactivity, and main caregiver angry parenting.
Table 2. Disadvantage trajectory groups (0-1 to 8-9 years) and reading and numeracy skills at 10-11 years (imputed sample, n=5038).

<table>
<thead>
<tr>
<th>Trajectories</th>
<th>NAPLAN reading</th>
<th>NAPLAN numeracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β (95% CI)</td>
<td>Effect Size (SD)</td>
</tr>
<tr>
<td>Sociodemographic pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td>-32.01 -55.84, -8.18</td>
<td>0.34</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>-69.41 -93.34, -45.48</td>
<td>0.76</td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>-109.17 -134.19, -84.17</td>
<td>1.19</td>
</tr>
<tr>
<td>Geographic environments pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td>-31.55 -40.55, -22.54</td>
<td>0.34</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>-52.80 -60.85, -44.74</td>
<td>0.58</td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>-76.22 -87.12, -65.33</td>
<td>0.83</td>
</tr>
<tr>
<td>Health conditions pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>-18.39 -26.17, -10.61</td>
<td>0.20</td>
</tr>
<tr>
<td>Increasing disadvantage</td>
<td>-32.72 -50.94, -14.50</td>
<td>0.36</td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>-27.73 -42.50, -12.97</td>
<td>0.30</td>
</tr>
<tr>
<td>Risk factors pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>-17.39 -24.83, -9.94</td>
<td>0.19</td>
</tr>
<tr>
<td>Intermediate disadvantage</td>
<td>-24.21 -35.39, -13.03</td>
<td>0.26</td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>-25.23 -49.42, -1.02</td>
<td>0.28</td>
</tr>
<tr>
<td>Composite disadvantage pathway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td>-34.94 -44.27, -25.62</td>
<td>0.38</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>-72.05 -82.04, -62.05</td>
<td>0.79</td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>-97.21 -109.83, -84.59</td>
<td>1.06</td>
</tr>
</tbody>
</table>

Note. n=69 (2.8%) of children with a learning disability were excluded from this analysis.