Socioeconomic disadvantage and onset of childhood chronic disabling conditions: a cohort study

Nick Spencer, 1 Lyndall Strazdins 2

ABSTRACT

Objective To study the temporal relationship between socioeconomic disadvantage and onset of chronic disabling conditions in childhood.

Method Using parent reported data from the Longitudinal Study of Australian Children, we compared children who developed a chronic disabling condition between the ages of 6/7 and 10/11 years with children without a chronic disabling condition at either age. Logistic regression models assessed association between onset of chronic disabling condition and household income quintiles at 6/7 years, adjusting for confounders. To study the consequences of chronic disabling condition onset for family finances, a linear regression model was fitted on change in household income adjusted for income at 6/7. We compared prevalence of family material hardship in the two groups between 6/7 and 10/11.

Results Of 4010 children present in both waves, complete data were available for 3629 of whom 233 (6.4%) developed a chronic disabling condition between 6/7 and 10/11. After adjustment for confounding, the children from the lowest income quintile were more than twice as likely to develop a chronic disabling condition as those from the highest income quintile. Onset of a chronic disabling condition was associated with a relatively smaller increase in household income over time, but no change in hardship prevalence.

Conclusions Family socioeconomic disadvantage when children are aged 6/7 is associated with their development of a chronic disabling condition over the next 4 years and with adverse effects on household income.

INTRODUCTION

Globally, an estimated 200 million children aged 0–17 experience a disability. 1 In high income countries, chronic disabling conditions (CDCs) affect up to 10% of children. 2 CDCs are a heterogenous group of conditions with diverse aetiologies and life-time courses combining genetic, biological and social-environmental factors. All conditions share some degree of functional disablement, leading to their grouping in the overall classification of childhood disability in the International Classification of Functioning—Children and Young People 3 and in definitions of disability used in the USA 4 and UK. 5 CDCs include mental health problems which are recognised as leading causes of disability. 6

Although the association between family socioeconomic disadvantage and childhood CDCs is well documented, most research is cross-sectional. 7–9 It is not yet established whether socioeconomic disadvantage is on the causal pathway to childhood CDCs or if socioeconomic disadvantage is a consequence of caring for a child with a CDC. Possibly, socioeconomic disadvantage is both a driver and a consequence of childhood CDC, leading to reciprocal, potentially compounding relationships. Longitudinal studies exploring the temporal relationship of social disadvantage with disability are rare. 10 The study by Blackburn et al 11 is an exception, finding increased odds of CDC onset in later childhood among children socioeconomically disadvantaged in early childhood. However, they did not examine socioeconomic disadvantage arising as a consequence of CDC.

Socioeconomic disadvantage can be measured using low household income, absolute or relative poverty, or with proxies for low income such as unemployment, occupational class, educational level or residence in disadvantaged areas. 12 More than 80% of empirical studies on the relationship of socioeconomic status (SES) with childhood disability 13 used household income, poverty and...
maternal education (or some combination) to measure family socioeconomic disadvantage. Household income, in contrast to poverty, allows a social gradient to be identified and is useful for examining change over time. By contrast, parental education is less subject to change, largely reflecting parents’ own childhood social circumstances.

The present study based on the Growing Up in Australia: Longitudinal Study of Australian Children (LSAC) aims to replicate and extend the findings of Blackburn et al. in a different country setting. We first test if socioeconomic disadvantage, assessed by household income, precedes childhood CDC. A second analysis considers if socioeconomic disadvantage also occurs as a consequence. We compare families where a child develops a CDC, considering associations between risk for developing CDC and household income at age 6/7, as well as the associations between CDC onset and family income and material hardship 4 years later.

METHODS

This study uses data from the LSAC, a representative cohort study of 10,000 children and families, funded and managed by the Australian Department of Social Services. A two-stage clustered design was employed with Medicare enrolment and activity databases held by the Health Insurance Commission as sampling frames.

The study commenced in 2004 with two cohorts—families with 4–5-year-old children (the K cohort) and families with 0–1-year-old infants (the B cohort). Interviews took place in the family home with the main respondent, usually the mother (98.6%). For this study, we used data from waves 2 and 4 of the LSAC K cohort when the children were 6/7 and 10/11 years of age, respectively. Initial response rate for the K Cohort was 59% (4983 children), of whom 83.3% responded at 10/11.

Study 1: association of prior socioeconomic disadvantage CDC onset

Dependent variable: CDCs

Child CDCs were reported conditions lasting or expected to last >6 months and associated with restriction of normal functioning. As well as the physical health conditions listed (see table 1), CDCs could include mental health conditions: attention deficit hyperactivity disorder (ADHD) diagnosed by a professional and/or Strengths and Difficulties Questionnaire (SDQ) scores >95th centile for the cohort age group (≥18 at 6/7 years; ≥17 at 10/11 years). We then derived a variable to represent CDC onset if a CDC was reported between age 6/7 and age 10/11 (children who had a CDC at 6/7 were excluded from the analysis). ‘No CDC’ was where no CDC was reported at either age.

Independent variable of interest

Household weekly income quintile (Australian dollar, AUD) at child age 6/7:

- Quintile 1 = AUD 2124.80 through to highest; Quintile 2 = AUD 1590.65–2124.79; Quintile 3 = AUD 1200.01–1590.64; Quintile 4 = AUD 765.01–1200.00; Quintile 5 = lowest to AUD 765.00.

Potential confounding variables

To replicate the findings of Blackburn et al., we selected similar potential confounding variables: child’s sex and age in months at 6/7; indigenous status; and lone parenthood at child age 6/7 with addition of maternal CDC at 6/7. Selected potential confounding variables have a known association with childhood CDC and were significantly associated at 10% level with CDC onset in bivariate analysis (table 2), a recognised statistical cut-off for inclusion in multivariate models.

Analysis

Sample weighting between ages 6/7 and 10/11 was used to reduce bias associated with attrition between waves. Logistic regression was undertaken in the SPSS V20 Complex Samples facility (IBM Inc). Models were fitted on the dependent variable with the independent variable of interest first followed by potential confounders in the same sequence as that used by Blackburn et al. with the addition of maternal CDC:

- Model 1—household income quintile at 6/7 years only
- Model 2—child’s sex and age added
- Model 3—indigenous status added
- Model 4—lone parenthood added
- Model 5—maternal CDC.

Table 1 Chronic disabling conditions (CDCs) reported for children in the CDC onset group

<table>
<thead>
<tr>
<th>Reported condition</th>
<th>Percentage reported*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths and Difficulties Questionnaire &gt;95th centile</td>
<td>44.1</td>
</tr>
<tr>
<td>Attention deficit hyperactivity disorder: medically diagnosed</td>
<td>6.9</td>
</tr>
<tr>
<td>Conditions lasting &gt;6 months and associated with functional restriction</td>
<td></td>
</tr>
<tr>
<td>Sight problems</td>
<td>8.8</td>
</tr>
<tr>
<td>Hearing problems</td>
<td>11.4</td>
</tr>
<tr>
<td>Fits, blackouts, etc</td>
<td>2.5</td>
</tr>
<tr>
<td>Difficulty learning</td>
<td>10.8</td>
</tr>
<tr>
<td>Limited use of arms and fingers</td>
<td>7.0</td>
</tr>
<tr>
<td>Difficulty gripping</td>
<td>5.5</td>
</tr>
<tr>
<td>Limited use of arms and feet</td>
<td>4.9</td>
</tr>
<tr>
<td>Other physical condition</td>
<td>28.2</td>
</tr>
<tr>
<td>Disfigurement</td>
<td>2.1</td>
</tr>
</tbody>
</table>

*Sum of percentages exceeds 100 as children may have more than one reported condition.

Table 2 Socio-demographic characteristics of children in the onset and no CDC groups

<table>
<thead>
<tr>
<th>Characteristics at age 6/7</th>
<th>CDC onset: number (%) n=233</th>
<th>No CDC: number (%) n=2966</th>
<th>X² and p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in months</td>
<td>82.35</td>
<td>81.98</td>
<td>F=3.40 p=0.065</td>
</tr>
<tr>
<td>% male</td>
<td>128 (54.9%)</td>
<td>1450 (48.9%)</td>
<td>3.18 p=0.075</td>
</tr>
<tr>
<td>Indigenous status</td>
<td>13 (5.6%)</td>
<td>94 (3.2%)</td>
<td>3.88 p=0.049</td>
</tr>
<tr>
<td>Lone parent</td>
<td>55 (23.6%)</td>
<td>416 (14%)</td>
<td>15.79 p&lt;0.001</td>
</tr>
<tr>
<td>Mother had CDC</td>
<td>24 (10.3%)</td>
<td>105 (3.5%)</td>
<td>25.51 p&lt;0.001</td>
</tr>
<tr>
<td>Household income quintile</td>
<td>X² for linear trend 28.64 p&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 (richest)</td>
<td>32 (13.7%)</td>
<td>626 (21.1%)</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>37 (15.9%)</td>
<td>637 (21.5%)</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>42 (18%)</td>
<td>584 (19.7%)</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>43 (18.5%)</td>
<td>597 (20.1%)</td>
<td></td>
</tr>
<tr>
<td>Q5 (poorest)</td>
<td>79 (33.9%)</td>
<td>522 (17.6%)</td>
<td></td>
</tr>
</tbody>
</table>

CDCs, chronic disabling conditions.
Sensitivity analyses tested the extent exclusion of mental health problems from the CDC measure and paternal CDC confounded our analyses (see online supplementary tables S1–S3).

**Study 2: change in household financial situation as a consequence of CDC onset**

To test if the extent household social disadvantage is also a sequela of caring for a child with CDC, we studied the change in household financial situation after CDC onset. We created a continuous variable, income change, derived by subtracting household income at 6/7 from income at 10/11, tested in a model with CDC onset as the independent variable, adjusted for income quintile at 6/7. We also compared scores on material hardship, a 7-item index ranging from 0 to 7, based on Yes=1, No=0 responses to the following questions:

- Difficulty raising $2000 in a week
- Couldn’t pay bills on time
- Couldn’t pay mortgage on time
- Gone without meals
- Been unable to heat or cool home
- Pawned or sold something
- Sought assistance from welfare/community organisation.

**Analysis**

Income change was entered into a linear regression model with CDC onset adjusted for income quintile at age 6/7. To test if income quintile at 6/7 modified the effect of CDC onset on income change, we entered an interactive term CDC*income quintile at age 6/7 into the model. We undertook sensitivity analyses adding time variant variables (change in lone parenthood and maternal CDC) to the linear regression model as potential confounders. Changing prevalence of material hardship was estimated by calculating the ratio of different levels of hardship in the CDC onset group compared with the no CDC group between 6/7 and 10/11.

**Ethics approval**

LSAC was approved by the Australian Institute of Family Studies Ethics Committee.

**RESULTS**

Of the 4010 children present in both waves, complete data were available on 3629 (90.5%) (figure 1). Income data were missing for 381 children (9.5%); 1.8% missing in the highest quintile compared with 2.2% in the lowest income quintile. To study the precursors and consequences of CDC onset between ages 6/7 and 10/11, we included only children without a CDC at 6/7. Of children with complete data with no reported CDC at 6/7, 233 (6.4%) developed a CDC by 10/11 (CDC onset group) and 2966 (81.7%) did not (no CDC group).

**Study 1**

Table 2 describes the socio-demographic characteristics of children in the two groups. CDC onset showed a significant linear trend as household income decreased. Children in lone parent households, those with a mother who had a CDC and indigenous children were also significantly more likely to develop a CDC.

Model 1 in the logistic regression (table 3) shows that although odds increased as income quintile decreased, the higher odds (3.01) for the lowest income quintile compared with odds of 1.42 in quintiles 3 and 4 suggest a threshold effect. Child’s age, sex and indigenous status did not attenuate the effect of income on the odds of CDC onset. Lone parenthood and maternal CDC at child age 6/7 slightly attenuated the effect of income. When adjusted for all confounders, children in the lowest income quintile at 6/7 had two-and-a-half times the odds of CDC onset compared with children in the highest income quintile. Children whose mother reported a CDC at 6/7 were three times more likely to be in the CDC onset group.

**Study 2**

Income increased in all quintiles over the 4-year period studied; however, after adjustment for income quintile at 6/7, the increase in the CDC onset group was AUD 165 less than the no CDC group (p=0.033) (table 4). As shown in online supplementary tables S4 and S5, the interaction term showed no significant modifying effect of income quintile at 6/7 on the estimate for income change by CDC group and sensitivity testing for the effect of change in lone parenthood and maternal CDC did not significantly affect the estimate.

The ratio of overall hardship and at different levels of hardship in the CDC onset group compared with the no CDC group did not change between 6/7 and 10/11 (table 5).

Sensitivity tests (see online supplementary tables S1–S3) revealed the effect of social disadvantage and was evident for parental CDC and both physical and mental health conditions in our measure. When ADHD and SDQ >95th centile were excluded from the dependent variable, the odds of CDC onset by income quintile 5 increased suggesting stronger association of physical compared with mental problems with SES.

**DISCUSSION**

To our knowledge, this is the first paper to report empirical results from a longitudinal study considering socioeconomic disadvantage as both a precursor and consequence of CDCs in childhood. This paper extends the method used by Blackburn et al. by further considering if caring for a child with CDC subsequently eroded family finances.

Our findings suggest that socioeconomic disadvantage in early childhood is associated with later CDC onset in a developed, affluent nation, Australia. Although consistent with UK results, developed nations vary in terms of health services and social inequality: important caveats to the generalisability of our results. Although not providing conclusive proof of causation (only possible in experimental research), our study is consistent with experimental evidence that increased income is associated with positive child development outcomes. In addition, there are biologically plausible pathways underlying our findings. Children in socioeconomically disadvantaged households may encounter social and environmental risks in the prenatal and early childhood periods leading to activity limiting conditions as they mature. Social adversity is associated with chronic stress increasing the likelihood of chronic ill health. Low household resources impair parental capacity for supportive, stimulating and consistent parenting leading to poorer mental health, intellectual development and behavioural problems. Reduced access, uptake or quality of services is a further possible pathway for socioeconomically disadvantaged children that may create vulnerability to CDCs.

Over the 4 years of our study, income increased across the whole sample; however, income change in CDC onset households was 165 AUD/week lower than no CDC households. Despite this relatively lower increase in income, there was no overall change in prevalence of material hardship between the groups. Such relatively weak evidence of an adverse financial impact may be explained by the short period studied. Further,
not all of the reported CDCs (see table 1) may have been of sufficient severity to have a significant impact on family finances.

Strengths and limitations
Longitudinal data on a representative child population allow a robust analysis of the temporal relationship between socioeconomic disadvantage and childhood CDC. However, longitudinal data cannot unequivocally establish causality, and our findings must be interpreted cautiously, especially the relatively weak evidence that childhood CDC could generate household socioeconomic disadvantage. Differential social attrition between the waves of the LSAC, which may have

Table 3  Logistic regression models fitted on children in onset and no CDC groups

<table>
<thead>
<tr>
<th>Variables at age 6/7</th>
<th>Model 1 OR (95% CI)</th>
<th>Model 2 OR (95% CI)</th>
<th>Model 3 OR (95% CI)</th>
<th>Model 4 OR (95% CI)</th>
<th>Model 5 OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household income quintile</td>
<td>Q1 (richest)</td>
<td>1.0 (ref)</td>
<td>1.00 (ref)</td>
<td>1.00 (ref)</td>
<td>1.0 (ref)</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>1.15 (0.71 to 1.86)</td>
<td>1.15 (0.71 to 1.88)</td>
<td>1.14 (0.70 to 1.86)</td>
<td>1.14 (0.70 to 1.86)</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>1.42 (0.86 to 2.34)</td>
<td>1.40 (0.85 to 2.31)</td>
<td>1.39 (0.84 to 2.30)</td>
<td>1.38 (0.83 to 2.28)</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>1.42 (0.85 to 2.37)</td>
<td>1.42 (0.85 to 2.38)</td>
<td>1.40 (0.83 to 2.36)</td>
<td>1.38 (0.82 to 2.32)</td>
</tr>
<tr>
<td></td>
<td>Q5 (poorest)</td>
<td>3.01 (1.86 to 4.86)</td>
<td>3.01 (1.86 to 4.88)</td>
<td>2.93 (1.82 to 4.73)</td>
<td>2.75 (1.59 to 4.75)</td>
</tr>
<tr>
<td>Child’s age (months)</td>
<td>–</td>
<td>1.04 (0.99 to 1.09)</td>
<td>1.04 (0.99 to 1.09)</td>
<td>1.04 (0.99 to 1.09)</td>
<td>1.04 (0.99 to 1.09)</td>
</tr>
<tr>
<td>Child’s sex</td>
<td>–</td>
<td>1.33 (0.97 to 1.83)</td>
<td>1.34 (0.97 to 1.84)</td>
<td>1.34 (0.97 to 1.84)</td>
<td>1.35 (0.98 to 1.86)</td>
</tr>
<tr>
<td>Indigenous status</td>
<td>–</td>
<td>1.43 (0.63 to 3.24)</td>
<td>1.43 (0.63 to 3.24)</td>
<td>1.41 (0.62 to 3.21)</td>
<td>1.37 (0.60 to 3.12)</td>
</tr>
<tr>
<td>Lone parenthood</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1.14 (0.73 to 1.79)</td>
<td>1.15 (0.73 to 1.81)</td>
</tr>
<tr>
<td>Mother had CDC</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

CDCs, chronic disabling conditions.
underestimated the impact of social disadvantage on the outcome, was partially addressed by using sample weights. Imputation rather than exclusion of missing household income data may have increased the precision of the estimates of the impact of CDC onset particularly for income quintiles 3 and 4; however, as income data were missing more frequently for lone parent households and those in the lowest income quintile, our approach may underestimate the effect of CDC onset. Although a gradient effect can be discerned, the lack of statistical significance raises the alternative possibility that there may exist thresholds with only the most severe level of socioeconomic disadvantage associated with higher odds of CDC onset.

Our CDC measure was based on parental reports of conditions that had lasted more than 6 months and were associated with restriction of function. We also included children with medically diagnosed ADHD and/or a total score on the SDQ greater than the 95th centile for the cohort sample to reflect mental health disorders (predictive of chronic and reduced functioning in childhood). Such a broad category of CDC is consistent with internationally accepted disability classifications and the international literature. It does not, however, tease out possible differences for families based on specific CDCs. It is possible that households with children who became ill during the study period may have been more likely to drop out; however, we have no data on this and are not able to predict the direction of possible bias. Further, the CDC measure was parent reported and should not be considered as precise as using clinician diagnoses. It is also possible that our study underestimates the association between CDC and SES as low SES families may be less likely to access services which would identify a CDC.

**CONCLUSIONS**

Our findings are consistent with those of Blackburn et al indicating that socioeconomic disadvantage in early childhood is associated with later CDC onset. In addition, we show that, even over a short 4-year period, family finances are adversely affected by CDC onset, with consequences for the child and the family. A well-established literature on health selection attests to the importance of good health for later life opportunities, especially securing high quality employment. Later waves of the LSAC may allow us to track the possible longer term influence of childhood CDC. In most high income countries, financial benefits of varying generosity are available to families coping with the added burden of caring for a child with CDC. Additional social policy consideration should be given to preventative measures that are both child and family focused.

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**REFERENCES**


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