

ROYAL AUSTRALIAN AND NEW ZEALAND  
COLLEGE OF PSYCHIATRISTS

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SCHOLARLY PROJECT

“Does preschool attendance have a beneficial effect on adult  
mental health?”

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## **Introduction**

Early childhood development interventions (ECDIs) have been highlighted in a number of worldwide recommendations as playing a crucial role in reducing inequality<sup>1,2</sup>. ECDIs is an umbrella term for interventions in early childhood designed to improve physical, social, behavioural, or cognitive development. This is a broad range of activities and in wealthier countries the focus is on the cognitive domain through the provision of educational services or parenting programs whilst developing countries often focus on improved health and nutrition. The explicit objective of the program to enhance development distinguishes ECDIs from programs predominantly focused on “child minding”<sup>3</sup>. There is a growing body of evidence for the positive social benefits achieved through ECDIs, including reduced adult crime and teenage pregnancy and increased educational achievement, employment opportunities, and income<sup>4,5</sup>. Given these outcomes and their known subsequent effects in promoting health outcomes<sup>6</sup>, and specifically mental health outcomes<sup>7</sup>, it is expected that ECDIs would play, at least indirectly, an important role in improving adult health outcomes. Despite this expectation there is a paucity of evidence demonstrating this relationship and even less evidence regarding specific mental health outcomes<sup>8,9</sup>.

There is certainly a much larger evidence base for the potential for ECDIs to improve child, as opposed to adult, health outcomes due to shorter time frames, simpler methodology, and less potential confounding factors<sup>10</sup>. Although one could presume continuity of effects from childhood to adulthood, specific evidence is crucial. The evidence for ECDIs improving adult health is primarily demonstrated in a small number of high-quality randomised controlled trials conducted in disadvantaged African-American populations in the United States of America (USA). Their findings were summarised in a recent systematic review by D’Onise et al (2010)<sup>8</sup>. The majority of these studies focus on cardiovascular risk and disease however a smaller

number included mental health outcomes. The Carolina Abecedarian Project (ABC) provided full-time centre-based ECDIs from infancy to age 5 for 108 participants, predominantly African-American and of a low socioeconomic status<sup>11</sup>. This particular study assessed 104 participants at age 21 and found improved symptoms of depression on the Brief Symptom Inventory (a self-reported psychological symptom scale)<sup>12</sup>. The Brookline Early Education Project (BEEP) demonstrated reduced symptoms of depression as measured by the Center for Epidemiologic Studies Depression Scale (CES-D)<sup>13</sup> amongst their urban cohort<sup>14</sup>. This was in a low-SES cohort of 120 people who received an ECDI from infancy to age 5 and were followed up at age 25. The Chicago Child-Parent Centre (CPC) program found no difference in experience of depressive symptoms when measured on a Likert scale of frequency<sup>15</sup>. This was a much larger study with 1539 participants from a low SES. Lastly two studies investigated the Head Start program, a nationwide preschool program in the USA. One study found no difference on depression as measured by the CES-D<sup>16</sup> whilst both found no change in self-esteem or mastery<sup>17</sup>. The systematic review concluded that although there was evidence for a reduced risk of poor mental health outcomes, the conclusions are mitigated by the small number of studies – often with methodological limitations<sup>8</sup>. This includes small sample sizes, non-experimental designs, and young ages at adult follow-up.

To identify further publications since the systematic review by D’Onise et al. (2010)<sup>8</sup> a search with similar terms (including but not limited to ‘child development’ (MeSH); ‘child, preschool’ (MeSH); and ‘health status’ (MeSH)) was conducted of the databases PubMed, Embase, the Educational Resources Information Center, PsycINFO, SCOPUS, and Google Scholar. There have been further studies conducted as part of the Perry Preschool Project (PPP) and the ABC<sup>18-21</sup>. They have demonstrated associations between ECDIs and both better health behaviours and less severe cardiovascular risk factors, such as blood pressure, but have not addressed the issue

of adult mental health. There have also been two observational cohort studies in South Korea<sup>22</sup> and the United Kingdom<sup>23</sup>. The former examined associations between ECDIs and self-rated adult health overall whilst the latter again investigated the associations with cardiovascular behavioural and biological risk factors. As such, the evidence for the impact of ECDIs on adult mental health remains under-investigated.

The hypothesised benefits of ECDIs on adult mental health may operate through both indirect and direct pathways. Indirect pathways are numerous<sup>9</sup> and include effects mediated by the many social benefits obtained through ECDIs such as greater educational achievement and socioeconomic status. In general, these social benefits are associated with a lower prevalence of mental disorders<sup>24, 25</sup>. As well as social indirect pathways there are also health-specific indirect pathways - for example participants in ECDIs have lower smoking prevalence and intensity, compared to non-participants<sup>20</sup>. Furthermore smoking has been shown to be an independent risk factor for mental illness<sup>26</sup>. The hypothesis most commonly suggested in recent literature to account for these positive associations via a direct pathway is through non-cognitive benefits such as increasing children's self-regulation. The Dunedin study has demonstrated the importance of self-regulation in predicting a number of adult outcomes including physical health<sup>27</sup>. However, the Dunedin study did not find an association between self-regulation and depression as assessed by clinical interview based on *Diagnostic and Statistical Manual of Mental Disorders*, 4<sup>th</sup> edition criteria. A recent study involving Head Start has demonstrated that ECDIs are capable of improving children's self-regulation, and this improvement is detectable a decade later<sup>28</sup>. Further research into the PPP and the ABC have also demonstrated that self-regulation or "externalising behaviours" and other personality factors play a significant role in mediating the beneficial effects of ECDIs<sup>20, 29</sup>. The present

study has specifically been designed to investigate direct pathways between attendance at ECDIs and adult mental health.

This study aims to assess the effects on adult mental health from attendance at Kindergarten Union (KU) preschools in South Australia using data from the North West Adelaide Health Study (NWAHS). As discussed above this study will address a significant evidence gap in current research but also investigate different populations – specifically a general population that is not necessarily disadvantaged and secondly a population outside of the USA. Ethics approval was granted as a sub-study of the NWAHS.

It is important to note this NWAHS cohort has previously been investigated for the effects of preschool on adult physical health<sup>30</sup> and social outcomes<sup>31</sup>. The former study identified an association between preschool and reduced risk of hypertension. The latter study identified a higher income in adulthood for those participants that had attended preschool.

## Methods

### *Conceptual Model of the Research*

Figure 1 is a directed acyclic graph which demonstrates the conceptual model of this research.

The aim of this research is to investigate the direct relationship between preschool attendance

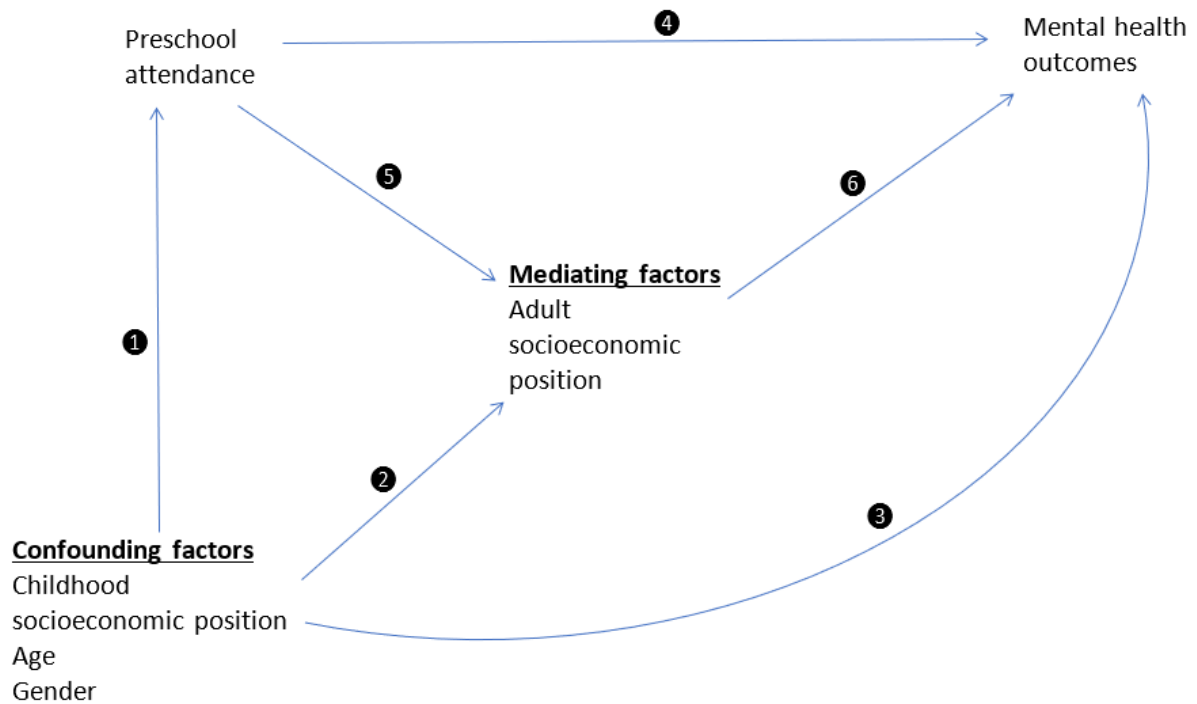


Figure 1. A directed acyclic graph exploring the relationship of potential confounding and mediating factors for the relationship between preschool attendance and adult mental health

and mental health outcomes (Figure 1 ④). The effects of this relationship will be isolated using a statistical model designed to account for mediating and confounding factors. Adult socioeconomic position is an important mediating factor. As discussed in the introduction preschool attendance has an impact on adult socioeconomic position (Figure 1 ⑤) which subsequently has an impact on mental health (Figure 1 ⑥). Childhood socioeconomic position, age, and gender are confounding factors due to their impact on the possibility of preschool attendance (Figure 1 ①) and independently their impact on adult mental health outcomes (Figure 1 ③).

### *Kindergarten Union preschools*

An important design of this study is the natural experiment presented to us through the proliferation of Kindergarten Union (KU) preschools throughout South Australia. The Kindergarten Union managed the vast majority of preschools in South Australia from 1906 to the mid-1970s and as such provided a uniform and high-quality, as understood by today's standards, ECDI to the resident population<sup>3</sup>. KU preschools were introduced with the specific goal of enhancing the social, emotional, physical, and cognitive development of children with an emphasis on educational services. Although initially developed for disadvantaged children they spread to provide services for most of the state. When first founded the educational curriculum was inspired by Froebel and Montessori methods; however, the KU came to adapt evidence from other branches of child education including the Nursery School Movement and Piaget. Along with specific educational services there were provisions targeted towards health including psychology and speech pathology, social goals, and parenting supports. Parents and siblings were actively encouraged to be involved. There were strict requirements for staff training and qualifications and the KU adopted national standards for the ratio of children to staff. As such it can be seen that individuals who attended childcare within South Australia were very likely to attend a high-quality ECDI which was not merely a "child minding" service.

### *North West Adelaide Health Study*

The NWAHS is a longitudinal representative cohort study of adults 18 years and older, randomly selected from the Northern and Western metropolitan regions of Adelaide using the Electronic White Pages. The selection process has been published in more depth by the NWAHS team<sup>32</sup>. Within each household, the person who had their birthday most recently and was aged 18 years or over was invited to participate. This was designed to reduce selection bias towards individuals more likely to be at home at the time of the phone call. Exclusion criteria



were applied by the recruiting staff during the initial phone contact and included not having the capacity to participate (i.e. intellectual disability or illness), living in a residential institution, and being unable to communicate in English. A sample of 4060 participants was recruited from 1999 to 2003 which represented 49.4% of those who were eligible to participate. Data were collected over three stages. Stage 1 from 1999-2003 used a questionnaire, computer-aided telephone interview (CATI) technology, and clinic attendance. The same methodology was used for stage 2 in 2004 and then a follow-up CATI was conducted for stage 3 in 2007.

### *Preschool Attendance*

Participants in the 2007 CATI follow-up study (n = 2996) were asked if they had attended preschool. Responses collected during previous stages were used to identify those who had grown up in South Australia.

### *Indicators of Childhood Socioeconomic Position*

Childhood socioeconomic position (SEP) was estimated by an index which combined three variables collected during the 2007 CATI. These variables were the father's main lifetime occupation, reported periods of at least 6 months of parental unemployment, and being brought up in a single parent household. If the father was not present the occupation was identified as the mother's or other primary care giver. This was then coded as manual or non-manual according to the Australian and New Zealand Standard Classification of Occupations<sup>33</sup>. Parental main lifetime occupation is a commonly used estimate of childhood socioeconomic position and there is evidence demonstrating its predictive validity<sup>34</sup>. These variables were then summed together to create the variable for childhood socioeconomic position on a score of 0 to 3 where 0 reflected a high SEP and 3 a low SEP. Due to the very low numbers of participants having a score of 3 this was collapsed in to the score of 2.

### *Indicators of Adult Socioeconomic Position*

Adult SEP was determined by two factors – education and income. These variables were obtained during self-report in stage 2. Education was constructed of four mutually exclusive categories - no further education beyond high school, trade/apprenticeship, certificate/diploma, bachelor's degree or higher. Annual household income was constructed of six mutually exclusive categories – 0-\$12,000, \$12,001 - \$20,000, \$20,001-\$40,000, \$40,001-\$60,000, \$60,001-\$80,000, more than \$80,000.

### *Mental Health Outcomes*

The Centre for Epidemiological Studies Depression Scale (CES-D) was completed during the 2007 stage 3 CATI. The CES-D is a 20 item self-report scale designed to measure the current level of depressive symptomatology in the general population<sup>13</sup>. Each item, asking about symptoms which occurred in the last week, scores from 0 to 3 such that total scores vary from 0 to 60 with higher scores indicating a higher severity of depressive symptomatology. The CES-D has become a popular research tool for screening for depression in general populations and medically unwell populations with a strong evidence base<sup>35</sup>. The optimal cut-off point for the CES-D remains somewhat unclear. The traditional cut-off for a likely depressive illness has previously been defined as a score of 16 or higher<sup>13</sup>. Some sources have stratified CES-D scores into an ordinal ranking of the severity of depression with severe depressive illnesses being identified as a CES-D score of 27 or greater<sup>36</sup>. A more recent meta-analysis has suggested that a cut-off score of 20 allows for a better trade-off between specificity and sensitivity<sup>35</sup>. Lastly it would be possible to treat CES-D as a continuous variable given that depressive illnesses are experienced along a spectrum. For the purposes of this study the CES-D score was rated as a dichotomous variable where a score of 15 or below was defined as not-depressed and a score of 16 or higher was defined as depressed. A self-reported previous diagnosis of depression or

anxiety by a doctor was also collected in the 2007 CATI. However during initial statistical analysis this was found to identify an almost identical population as those identified by the dichotomised CES-D variable and further statistical analysis of self-reported depression or anxiety was not undertaken.

### *Study Sample*

Inclusion criteria for the study were those who lived in South Australia as children and were born during the years 1937-1969. This age criteria ensured that the preschool attended was a Kindergarten Union preschool offering high-quality ECDIs as a number of non-KU preschools were opened during the mid-1970s. Application of these inclusion criteria reduced the sample size from 2996 (the number of participants in the 2007 CATI follow-up survey) to 875. Participants were then removed from the sample if there was missing data on childhood socioeconomic score (n = 53), adult socioeconomic position (n = 38), or outcome findings (n = 125). This left a final study sample of 659.

There was no significant difference between the included and excluded populations on gender, childhood socioeconomic position, or adult socioeconomic position. The CES-D scores between the included and excluded groups were similar with a mean difference of 0.59 (95% CI -0.23 – 1.42; p = 0.145).

## Results

A summary of comparisons between the preschool and non-preschool groups on all variables with appropriate statistical tests is displayed in Table 1. The group that did not attend preschool were more likely to be female and older, although both these differences were not statistically significant ( $p = 0.052$  and  $p = 0.258$  respectively). The group that did not attend preschool were statistically more likely to have a higher marker of childhood socioeconomic disadvantage ( $p < 0.001$ ). The group that did not attend preschool were also more likely to have lower incomes as an adult ( $p < 0.01$ ) although there was no statistically significant difference between the two groups on educational attainment ( $p = 0.33$ ). On univariate testing there was no statistically significant difference between the groups on the dichotomised CES-D score.

A summary of the results obtained using a binominal logistical regression model based on the conceptual design discussed above is presented in Table 2. This model was found to be significant using omnibus model testing ( $p < 0.001$ ) such that we can be confident it is able to explain a degree of the variance observed in the findings. This variance is quite low – estimated at 7.2% using Cox and Snell R Square.

The significant relationships observed in the model are for age and income. The odds ratio of age at 0.97 suggests that for every one-year increase in age there should be a reduction of the risk of depression by 3%. The income categories are compared to the reference category of those households earning over \$80,000 a year such that for example individuals earning between \$20,000 and \$40,000 are 4 times more likely to be depressed than individuals in a household earning more than \$80,000 a year. The lowest income category has a very high odds ratio which should be interpreted with caution – this is likely a result of the small number of participants in this category.

There was no evidence to suggest that attending preschool, when confounding and mediating factors have been considered, leads to a lower chance of depression in adult life ( $p = 0.25$ ).

I received external assistance with the statistical analysis demonstrated in table 2.

	<u>Preschool n = 518</u>	<u>No preschool n = 141</u>	<u>p value</u>
	<u>% of n or mean (SD)</u>	<u>% of n or mean (SD)</u>	
<u>Female</u>	47	57	0.06
<u>Age mean (years)</u>	49.80 (8.30)	54.30 (8.80)	0.26
<u>Childhood SEP</u>			<0.001
0	46	25	
1	48	71	
2	6	4	
<u>Income</u>			<0.01
Up to \$12,000	1	0	
\$12,001 - \$20,000	7	14	
\$20,001 - \$40,000	17	25	
\$40,001 - \$60,000	18	18	
\$60,001 - \$80,000	17	15	
More than \$80,000	40	28	
<u>Education</u>			0.33
Up to secondary	44	50	
Trade/apprenticeship	8	8	
Certificate/diploma	28	28	
Bachelor's degree or higher	20	14	
<u>CES-D</u>			0.26
Score <16	84	80	
Score ≥16	16	20	

**Table 1. Comparative summary between preschool and non-preschool groups**

	<u>Odds Ratio</u>	<u>95% C.I.</u>		<u>p value</u>
		<u>Lower</u>	<u>Upper</u>	
<u>Gender</u> <sup>a</sup>	1.43	0.74	2.80	0.28
<u>Age</u>	0.97	0.94	0.99	0.02
<u>Childhood SEP</u>				
0	Reference			0.26
1	0.58	0.23	1.50	0.24
2	0.83	0.34	2.0	0.68
<u>Income</u>				
Up to \$12,000	54.07	5.82	502.31	<0.001
\$12,001 - \$20,000	4.88	2.01	11.82	<0.001
\$20,001 - \$40,000	4.09	2.07	8.05	<0.001
\$40,001 - \$60,000	1.75	0.86	3.59	0.12
\$60,001 - \$80,000	2.64	1.34	5.19	<0.005
More than \$80,000	Reference			<0.001
<u>Education</u>				
Up to secondary	Reference			0.43
Trade/apprenticeship	1.06	0.48	2.34	0.88
Certificate/diploma	0.78	0.44	1.38	0.39
Bachelor's degree or higher	1.41	0.75	2.64	0.29
<u>Preschool</u> <sup>b</sup>	1.36	0.81	2.30	0.25

**Table 2. Binominal logistic regression on CES-D**

**a: male used as reference category b: attending used as reference category**

## Discussion

This study did not find evidence for a direct causal pathway between attending preschool and improved adult mental health outcomes. This result is comparable to the mixed results identified in the systematic review<sup>8</sup>. It is curious studies with much smaller sample sizes, such as the ABC<sup>11</sup> and BEEP<sup>14</sup>, were able to demonstrate an effect whilst larger studies such as this one and the CPC<sup>15</sup> were unable to do so. It may be that the interventions are less rigorous when applied to a larger population. Identifying an effect in this cohort was likely to be more difficult than in comparable studies, given the cohort was not necessarily from a low SES and the follow-up age was much older.

The model did display a significant relationship between annual household income and CES-D scores. It is unclear if this has captured the role of poverty as a risk factor for mental illness or whether people suffering from a mental illness are less able to obtain a significant income. This relationship should be interpreted with caution given it was not the stated aim of the study. The plausibility of this relationship is further strengthened by the gradient noted across the different income brackets. Excluding the \$40,000 - \$60,000 bracket, every improvement in income results in a reduction in the odds ratio. Although the direction of this relationship remains unclear a biological gradient fulfils one of Austin Bradford-Hill's criteria for causality<sup>37</sup>. This relationship is important to observe as although no direct causal pathway was identified in this study, the relationship between income and CES-D contributes to the evidence of an indirect pathway for preschool and adult mental health.

A retrospective cohort design has some inherent weaknesses and limitations which need to be considered in interpreting the results of this study. There is potential recall bias as participants were allocated to groups based on memory of life events. For some participants this was almost



60 years ago. However specific recall of preschool attendance by adults has been studied previously and found to be reliable<sup>3</sup>. As with long-term cohort studies attrition can potentially be an issue although the data was weighted to account for this. Another potential limitation of the study design is the unmeasured confounding factor of childhood socioeconomic position. Although an attempt was made to control for this by the creation of a childhood SEP score this is a complex confounding factor which may not be truly captured by the creation of a simple childhood SEP score. There may also be other unmeasured background characteristics related to the family environment such as parenting skills which are difficult to capture in a retrospective quantitative study design. The decision to use a cut-off of 16 for the CES-D may have resulted in an abnormally high prevalence of depressive symptoms. In the most recent National Health Survey carried out from 2014 to 2015, 8.9% of respondents reported a diagnosis of depression or feelings of depression in the last year<sup>38</sup>. This is much lower than the 16-20% in the non-preschool and preschool groups. It is unclear how this may have affected the results. There are however several strengths to this study including a large cohort and the natural experiment available to researchers in South Australia through the creation of the Kindergarten Union. It would typically be very difficult in a retrospective cohort design to ensure the uniformity and quality of a social intervention such as preschool.

A particular advantage of this study has been investigating new populations. The majority of research into the effects of preschool has been in socially disadvantaged African-American populations in the USA. This cohort is not entirely disadvantaged and is different in ethnicity and culture. There are likely to be some difficulties in generalising these results – particularly due to the age of the cohort and the changes in the social environment which have occurred since – for example expectations of the primary care giver to return to work.

Although this study was not able to establish a relationship there remains a plausible causative role for preschool attendance improving adult mental health through improved self-regulation. The impact of ECDIs remains an important issue particularly in today's political climate with frequent discussions around subsidy and payment of preschool workers. Ensuring an appropriate evidence base from which to advocate for policy is essential. Further research needs to be conducted – particularly more methodologically powerful studies such as prospectively designed research, ideally randomised trials, although this will always remain difficult over such a long timeframe.

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