Does open enrollment policy improve academic performance among students involved with child protective service? Findings from Minnesota-linking information for kids

Saahoon Hong\textsuperscript{a,\ast}, Won Seok Choi\textsuperscript{b}, Kristine N. Piescher\textsuperscript{c}, Yanchen Zhang\textsuperscript{d}, Taeho Greg Rheee\textsuperscript{e,f,g}  

\textsuperscript{a}School of Social Work, Indiana University, Indianapolis, IN, USA  
\textsuperscript{b}Korean Educational Development Institute, Seoul, South Korea  
\textsuperscript{c}Center for Advanced Studies in Child Welfare, University of Minnesota, St. Paul, MN, USA  
\textsuperscript{d}Dept of School Psych & Ed Leadership (SPEL), College of Education, Idaho State University, Pocatello, ID, USA  
\textsuperscript{e}Department of Community Medicine and Health Care, School of Medicine, University of Connecticut, Farmington, CT, USA  
\textsuperscript{f}Department of Psychiatry, School of Medicine, Yale University, New Haven, CT, USA  
\textsuperscript{g}Yale Center for Outcomes Research and Evaluation, Yale-New Haven Hospital, New Haven, CT, USA

ARTICLE INFO

Keywords:  
Open enrollment  
Academic performance  
Child

ABSTRACT

The open enrollment (OE) policy was designated to provide educationally disadvantaged students with equal access to schools with enriched educational resources that enhance student learning. Comparative analysis and linear mixed modeling with propensity score matching were used to identify the extent to which students involved with child protection service (CPS) utilized an inter-district open enrollment option and to examine their academic achievement before and after switching schools. Results indicated that open enrollment provided students involved with CPS better academic resources from neighboring schools that have better academic outcomes. However, students involved with CPS did not have significant improvement on academic performance by utilization of open enrollment. The results suggest that while the intent of the policy led to use the OE option among students involved with CPS, additional support and non-school-based resources may be needed to improve academic achievements.

1. Introduction

Children involved in child protective services (CPS) represent a vulnerable population, as they are exposed to child maltreatment (e.g., child endangerment, physical abuse, sexual abuse, or neglect), often in conjunction with other risk factors such as poverty, homelessness, and parental mental health challenges (to name a few). In Minnesota, local child protection agencies received more than 75,000 reports of child maltreatment in 2016, which represents an 11.2% increase compared to 2015 (Minnesota Department of Health Services [DHS], 2017a). Furthermore, in 2016 alone, more than 15,000 children experienced more than 15,500 out-of-home care placement (e.g., group homes and foster care) episodes (Minnesota DHS, 2017b). The number also represents 10.2% increase in the overall number of children experiencing out-of-home care in 2015 (Minnesota DHS, 2017b).

Academic achievements are generally considered the net result of child vulnerabilities and competencies, combined with contextual risks and protective factors. In particular, child maltreatment, the primary source for involvement in CPS, is closely related to children’s performance in schools, and previous studies have demonstrated a strong association between child maltreatment and negative academic outcomes (Eckenrode, Laird, & Doris, 1993; Kurtz, Gaudin, Howing, & Wodarski, 1993; Leiter & Johnsen, 1994; Perez & Widom, 1994). Furthermore, the existing literature demonstrates that child maltreatment is associated with reduced attendance rates as well as increased student mobility (Eckenrode, Rowe, Laird, & Brathwaite, 1995; Leiter & Johnsen, 1994), leading to significantly lower levels of academic performance (Berger, Cancian, Han, Noyes, & Rios-Salas, 2015; Piescher, Colburn, LaLiberte, & Hong, 2014; Smithgall, Gladden, Howard, Goerge, & Courtney, 2004).

Targeted interventions and policies have been devised to narrow the gap between these educationally disadvantaged students, such as is often the case with students who come to the attention of CPS, and those without CPS involvement. To improve educational outcomes, one approach is to allow educationally disadvantaged students to attend schools outside of their residential neighborhoods, which may provide

\cite{https://doi.org/10.1016/j.childyouth.2019.104653}

Received 24 August 2019; Received in revised form 24 November 2019; Accepted 24 November 2019

Available online 30 November 2019

0190-7409/ © 2019 Elsevier Ltd. All rights reserved.
better academic resources. The approach is known as open enrollment (OE), and its aim is to provide equal access and opportunity to disadvantaged children to enroll in schools, which may better meet their educational needs for academic achievement (Smith, 1995).

Advocates of OE argue that the mobility of disadvantaged students, or students with CPS involvement, could facilitate desegregation of socio-economic disparities in school settings (Smith, 1995). The consequence is also that students with CPS involvement have better access to learning resources as well as diverse social networks to improve their academic achievement. It is also assumed that schools under the pressure of competitions would strive to improve their education programs to increase overall student achievement (Ozek, 2009; Welsch & Zimmer, 2012).

However, research on the OE utilization and effects of OE utilization were not conclusive because of mixed results. For example, it is argued that the OE policy does not function equitably by different racial or ethnic groups as higher numbers of non-Hispanic white students utilized OE than other groups of students (Institute on Metropolitan Opportunity, 2012; Orfield & Luce, 2013; Witte, Carlson, & Lavery, 2008). However, a different study (Hong & Choi, 2015) revealed that a higher number of black students utilized OE than other groups of students. Besides racial/ethnic differences in the utilization of OE, Bifulco and his colleague found positive effects of enrolling in inter-district magnet schools on students’ reading and math achievements in Connecticut (Bifulco, Cobb, & Bell, 2009). Ozek (2009), on the other hand, reported short-term detrimental effects of intra-district OE, and four other studies showed non-significant effects of OE utilization on academic achievements (Cullen, Jacob, & Levitt, 2005; Lee, Coladearci, & Donaldson, 1996; Lee, Maddaus, Coladearci, & Donaldson, 1999; Neal, 1997).

Earlier studies were limited as they often overlooked testing educational effects of OE utilization specifically among students with CPS involvement (Hong & Choi, 2015), a group known to experience multiple risk factors associated with academic achievement. Although the OE policy was created to increase access to well-resourced schools for all students, little is known whether children with CPS involvement benefit from this policy in Minnesota. Therefore, the current study takes advantages of integrated administrative data from multiple sources within the State Department of Education in Minnesota, and addresses the following research questions: (1) Are students with CPS involvement more likely to utilize OE when compared to students without CPS involvement? (2) What are the characteristics of students and schools participating in OE? And finally, (3) Does OE policy demonstrate positive effects on academic performance among students involved in CPS?

2. Methods

2.1. Data source and study sample

Data from the Minnesota Linking Information for Kids (Minn-LInK) project were used. The project utilizes statewide administrative data from multiple agencies, including the Department of Human Services in Minnesota, to address effects of policies, programs, and practice on bi-psycho-social well-being of children in Minnesota. In this study, names and birth dates of children receiving CPS were identified in the Minn-LInK project, and they were linked to their education records via Link Plus (Registry Plus, 2010). All identifiers were then removed from the data file after cross-system matching was completed (i.e. de-identification). The sample was drawn from a group of students who resided and enrolled in the Minneapolis school district in the beginning of the 2007–08 school year (N = 33,583). This sample was specifically chosen to replicate and extend a previous study on the utilization and outcomes of OE by students in the general population (Hong & Choi, 2015). The study procedures were approved by the Institutional Review Board from University of Minnesota, Twin Cities (#1011E93020).

2.2. Measures

2.2.1. Child protective service (CPS) involvement

CPS involvement was identified by records of which students were alleged victims of maltreatment during 2006–10. An alleged victim was defined as a child who is reported to be the direct victim of child maltreatment in a child protection case that is accepted by a local child protection agency. Using this information, we constructed a binary variable of CPS status (involved or not).

2.2.2. Open enrollment (OE)

OE enables a student to transfer to the public school of his/her choice without the expense of moving. Two forms of open-enrollment policies are utilized in Minnesota. Intra-district OE enables a student to transfer to another school within his/her home district. Inter-district OE allows a student transfer to a school outside his/her home district. In this study, inter-district OE was primarily examined as records could be distinctly identified for students who utilized this method.

2.2.3. School characteristics

A number of school-level variables were included: minority student ratio, economic hardship, limited English proficient ratio, special education, student–teacher ratio, proportion (%) of teachers less than five years of teaching experience, and proportion of teachers with a graduate degree.

- Minority student ratio. The ratio was calculated by the number of students in each ethnic group per total enrollment in a school.
- Economic hardship. Economic hardship was based on the reduced or free lunch program eligibility status. We created a categorical variable consisted of: (1) eligible for reduced lunch; (2) eligible for free lunch; and (3) ineligible.
- Limited English proficiency (LEP) ratio. LEP ratio was calculated by total full-time equivalent (FTE) in a foreign languages & cultures assignment per average daily membership (ADM) (Minnesota Department of Education [MDE], 2011).
- Special education. An Individualized Education Plan (IEP) is a written commitment of services and a management tool that grants students with disabilities access to special education and related services in a way appropriate to their unique learning needs (U.S. Congress, 1997). In Minn-LInK, the Special education status (yes or no) was used to identify whether a student receives special education services via an IEP.
- Student–teacher ratio. This ratio was calculated by ADM per total FTE of those with an instructional classroom assignment.

Reading and math scores. Key outcome variables of interest were reading and math scores from statewide standardized tests, Minnesota Comprehensive Assessments Series II (MCA-II). These standardized tests indicate achievement levels among individual students by following a scale score, ranging from 1 to 99. The scale score was used to identify a student’s achievement level on the MCA II as following: “Does Not Meet Standards,” “Partially Meets Standards,” “Meets Standards,” and “Exceeds Standards.” The last two levels are considered proficient. Proficiency levels are based on Vertical Scale Scores. For example, scores of 50 and above were considered proficient.

2.3. Analytical plans

The data analytic approaches to address research questions included a descriptive comparison analysis and a linear mixed model analysis. First, we investigated column proportions of the study sample by CPS involvement. Then, among students involved in OE, we investigated whether selected characteristics differed by CPS involvement. A Pearson’s chi-squared statistic was used to test such differences. Second, we ran a multivariable logistic regression analysis to determine factors
associated with participating in OE.

Third, we investigated mean differences in school resources between resident schools and transferred schools through open enrollment, and observed mean scores in math and reading by OE status among students with CPS involvement. Finally, the linear mixed model analysis was performed to examine the effect OE utilization with academic achievements in math and reading (Laird & Ware, 1982). To make OE and non-OE groups more comparable, optimal matching, a propensity score matching method (PSMM), was used (Rosenbaum & Rubin, 1983). The MatchIt package in R to create matched samples among students with CPS involvement was administered by using seven covariates, including race/ethnicity, gender, grade, special education receipt, free/reduced lunch eligibility, and 2007–2008 MCA II scores in reading and math. SPSS 23.0 (IBM Corp. Released, 2015) and R 3.02 (R Development Core Team, 2008) were used for all statistical analyses in this study.

3. Results

3.1. Demographic characteristics

Table 1 presents selected demographic characteristics of students in Minneapolis district by CPS involvement. Of 33,583 students, 3060 (9.1%) students were involved with CPS. Among students with CPS involvement, 88.6% were racially/ethnically minority students other than non-Hispanic whites, and 78.5% were eligible for either free or reduced lunch programs. Only 28.4% of students with CPS involvement were eligible for special education services. Students of color with CPS involvement, when compared to those without CPS involvement (< 0.001). Bivariate analyses showed that students participating in OE was pronounced in non-Hispanic white and Hispanic students with CPS involvement, when compared to those without CPS involvement (< 0.05). Rates of eligibility for free or reduced lunch programs and special education services were higher in students with CPS involvement than those with among OE enrollees (< 0.001).

3.2. Factors associated with open enrollment

Table 2 presents a multivariable logistic regression analysis of factors associated with OE. Students with a history of CPS involvement had 1.46 times greater odds of utilizing OE than those without such history (95% CI: 1.17, 1.82; p < 0.01). When compared to non-Hispanic white students, racial/ethnic minority students had at least two times greater odds of utilizing OE (p < 0.001 for all). Finally, being eligible for free or reduced lunch programs was associated with decreased odds of utilizing OE (p < 0.001 for all).

3.3. School characteristics between resident and transferred schools

Among the 103 students in CPS who changed their schools in the Minneapolis data, there were a total of 55 students whose original and new schools had available information on all of the indicators. Mean differences of school resources between resident schools and transferred schools through OE are summarized in Table 3. Regardless of involvement with CPS, students were more likely to switch schools via OE, where schools had fewer (1) students of color, (2) students with low income, (3) students with limited English proficiency, and (4) students receiving special education services (p < 0.001 for each). In terms of school resources, students who used OE were more likely to move schools with a higher proportion of less-experienced teachers (p < 0.001). In terms of academic achievement, students were more likely to switch schools through OE, which have higher scores on both math and reading standardized tests (p < 0.001 for all).

With regard to race/ethnicity, students in all racial/ethnic groups, except the Hispanic group, tended to move to schools that had fewer

---

**Table 1**

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>Open enrollment (n = 766)</th>
<th>Non-CPS involved (n = 30,523)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic white</td>
<td>351 11.4%</td>
<td>9116 29.9%</td>
<td>12.5% ***</td>
</tr>
<tr>
<td>Students of color</td>
<td>2709 88.6%</td>
<td>21,407 70.1%</td>
<td>18.5% ***</td>
</tr>
<tr>
<td>American Indian</td>
<td>363 11.9%</td>
<td>1144 3.7%</td>
<td>8.2% ***</td>
</tr>
<tr>
<td>Asian</td>
<td>72 2.4%</td>
<td>3040 10.0%</td>
<td>7.6% ***</td>
</tr>
<tr>
<td>Hispanic</td>
<td>244 8.0%</td>
<td>5366 17.6%</td>
<td>9.6% ***</td>
</tr>
<tr>
<td>Black</td>
<td>2030 66.3%</td>
<td>11,857 38.8%</td>
<td>28.5% ***</td>
</tr>
<tr>
<td>Economic hardship</td>
<td>2402 78.5%</td>
<td>16,872 44.7%</td>
<td>33.8% ***</td>
</tr>
<tr>
<td>Eligible for free or reduced lunch</td>
<td>49 2.0%</td>
<td>240 6.3%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Free lunch</td>
<td>2310 75.5%</td>
<td>15,071 49.4%</td>
<td>26.1%</td>
</tr>
<tr>
<td>Reduced lunch</td>
<td>92 3.0%</td>
<td>1801 5.9%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Not Eligible</td>
<td>658 21.5%</td>
<td>13,651 44.7%</td>
<td>23.2%</td>
</tr>
</tbody>
</table>

**Table 2**

Factors associated with participation in open enrollment (N = 33,583).

<table>
<thead>
<tr>
<th>(Reference group in a parenthesis)</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child protective service (No)</td>
<td>1.46 **</td>
<td>1.17–1.82</td>
</tr>
<tr>
<td>Race/ethnicity (non-Hispanic white)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>3.83 ***</td>
<td>2.60–5.64</td>
</tr>
<tr>
<td>Asian</td>
<td>2.59 **</td>
<td>1.85–3.63</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.37 **</td>
<td>1.75–3.21</td>
</tr>
<tr>
<td>Black</td>
<td>5.63 ***</td>
<td>4.52–7.02</td>
</tr>
<tr>
<td>Economic hardship (No)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible for reduced lunch program</td>
<td>0.32 ***</td>
<td>0.22–0.48</td>
</tr>
<tr>
<td>Eligible for free lunch program</td>
<td>0.28 **</td>
<td>0.24–0.32</td>
</tr>
<tr>
<td>Special education (No)</td>
<td>0.87</td>
<td>0.70–1.07</td>
</tr>
</tbody>
</table>

Note: *p < 0.05; **p < 0.01; ***p < 0.001. Nagelkerke R-squared statistic = 0.069.
students of color, low-income students, students with limited English proficiency, and students receiving special education services. These students, on average, also tended to move to schools with higher achievement levels (p < 0.05).

3.4. Effects of OE on academic performance

As shown in Fig. 1, differences were evident in the means of math and reading scores between OE and non-OE enrollees. In math, both OE and non-OE groups showed decreased scores over time from 2008 to 2010. In reading, while the non-OE enrollees had decreased scores between the 2008–2009 and 2009–2010 academic years, the OE enrollees showed a steady increase in their scores over time. When a linear mixed model analysis was performed (see Table 4), the OE did not have significant effects on students’ performance on math and reading among students with CPS involvement, although the coefficients of OE were both positive in math and reading achievements.

4. Discussion

The aims of this study were to understand the utilization of OE for students with and without CPS involvement, describe the characteristics of students participating in OE and the schools in which they were enrolled, and assess whether OE policy demonstrates positive effects on academic achievement among students involved in CPS.

As suggested by study findings, students with CPS involvement were more likely to take advantage of OE in urban settings than their peers without CPS involvement in general. The pattern was similar by race/ethnicity and economic hardship. This finding stands out differently from previous studies where minority student groups remained disadvantaged (Chapman & Antrop-Gonzalez, 2011; Orfield & Luce, 2013; Institute on Metropolitan Opportunity, 2012). Furthermore, the mixed results may imply the uniqueness and complications associated with students of CPS involvement as an over-looked at-risk population in literature.

Turning to school characteristics, inter-district transferred schools among students with CPS involvement were more likely to have better school resources and academic performance, but were less diverse in terms of race/ethnicity and economic status. Such findings are important for two reasons. First, it suggests that students with CPS involvement have used the OE policy as it was originally designed to (i.e., gaining access to better educational resources and learning environments). Second, it implies that guardians, who are often responsible to make educational decisions for students with CPS involvement, have adequate knowledge and capacity to navigate school choices using the OE policy.

However, no significant association between OE utilization and academic performance was found. One possible explanation is due in part to a relatively small sample size. In the linear mixed model, only 28 students were included, who had resided in Minneapolis, MN, who were third, fourth, or sixth graders in the 2007–2008 academic year, used the OE policy to transfer to inter-district schools, and attended the transferred schools for at least two years. These students’ academic performance was measured in three consecutive years. Despite the strong longitudinal nature of analyses, the relatively small sample size may have limited a statistical power to detect statistical significance. Besides such statistical concerns, another possible explanation would be confounding variables that were not included in the model. Because student learning is rather complicated and requires a dynamic process (e.g., psycho-social and environmental factors), OE alone may not explain the improvement in academic performance, and there may be other variables that can better predict student achievement.

There are several implications from this study. In a practical sense, child caregivers and family service professionals may want to consider OE as an option to meet the unique needs of students with CPS involvement. Furthermore, to better inform caregivers and professionals,
information regarding school resources and services outside typically documented categories should be provided and weighted into the decision-making process for these vulnerable students. More research should be conducted to examine effectiveness and cost-effectiveness of these special OE programs for students with CPS involvement to maximize the utilization of educational resources and meet the needs of students with CPS involvement.

The current study has some limitations. First, as stated earlier, a limited sample size and potential confounding may have resulted in non-significant findings in the multivariable, linear mixed model. Second, the setting is specific to the state of Minnesota, and therefore, the findings may not be generalizable in other states. Third, the state-wide measures of achievement that were utilized in this study may not possess adequate sensitivity to detect growth over time in this population. Other measures (such as GPA or other achievement tests) may be more sensitive to these changes, and if available, could be used to replicate the findings of the current study.

Despite these limitations, the strengths of this study included the use of state-wide administrative data and the longitudinal assessment of academic performance by OE utilization. Overall, the current study suggests a higher proportion of students with CPS involvement utilized OE to access better education resources than their peers without CPS involvement. The findings warrant further research related to students’ learning outcomes in students with CPS involvement.

CRediT authorship contribution statement

Saahoon Hong: Conceptualization, Data curation, Methodology.
Won Seok Choi: Methodology, Formal analysis. Kristine N. Piescher: Writing - review & editing. Yanchen Zhang: Writing - original draft. Taeho Greg Rhee: Writing - review & editing.

Acknowledgements and disclosures

Conflicts of interest
Each author reported no financial or other relationship relevant to this article.

Compliance with ethical standards
This article does not contain any studies with human participants or animals performed by the authors. All research procedures performed in this study are in accordance with the ethical standards of the Institutional Review Board at University of Minnesota, Twin Cities (#1011E93020).

Acronyms.

- CPS: Child protective service
- OE: Open enrollment

Table 4

Effects of open enrollment on math and reading scores among students with child protection service involvement.

<table>
<thead>
<tr>
<th></th>
<th>Math</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed effect</td>
<td>Estimate</td>
<td>95% CI</td>
</tr>
<tr>
<td>Year</td>
<td>−1.2</td>
<td>−15.68, 13.33</td>
</tr>
<tr>
<td>Open enrollment</td>
<td>0.2</td>
<td>−8.68, 9.14</td>
</tr>
<tr>
<td>Open enrollment # Year</td>
<td>−1.6</td>
<td>−5.93, 2.76</td>
</tr>
<tr>
<td>Intercept</td>
<td>39.6</td>
<td>** 32.37, 46.92</td>
</tr>
<tr>
<td>Random effect</td>
<td>Estimate</td>
<td>Standard error</td>
</tr>
<tr>
<td>AR1 rho</td>
<td>0.8</td>
<td>** 0.04</td>
</tr>
<tr>
<td>Year variance</td>
<td>51.8</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Note: *p < 0.05; **p < 0.01; ***p < 0.001. # indicates an interaction.
Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.childyouth.2019.104653.

References


