School Mobility for Children in Out-of-Home Placement: Incidence, Educational Outcomes, and Tools for Mitigation

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Abstract

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Elevated school mobility (SM) for students in foster care (i.e. out-of-home placement (OHP)) is something that has been previously noted in non-peer-reviewed literature. At some level, this trend is precisely what would be expected. In the absence of a policy seeking to actively prevent SM for students in OHP, removing a student from one home and placing him in another would necessarily place him at increased risk of a school change. While such school changes would be expected to contribute to decreased educational achievement for any student, the combination of such changes in conjunction with the potential social and emotional barriers faced by a student in OHP appears to exacerbate the effects on academic performance for students in OHP compared with the effects of SM on students in the general population. Understanding the phenomenon of SM for students in OHP and policies that can be adopted to

combat SM is thus of importance to the fields of education and social work. In spite of the importance of SM for students in OHP, the peer-reviewed literature is nearly silent on this topic. This dissertation seeks to provide a comprehensive analysis of differences in school mobility as a function of OHP status and assess specific policy tools for minimizing SM.

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DEDICATION

This work is dedicated to my family. To my parents and siblings, no matter where life has taken me, I have always found you standing right by my side whenever I have needed you. To my children, while it may be years before any of you read this, you should know that my love for each of you is behind every word I have written here. And to my partner Nicole, you didn't start this journey with me, but you made it possible for me to finish. With you at my side, I know that anything is possible.

INTRODUCTION

Overview

There is a well-established relationship in the educational literature supporting a link between school mobility events (SM) (i.e. school transition for reasons other than grade promotion) and educational outcomes for children in the general population. In general, the literature provides consistent examples of negative associations between SM events and normative educational outcomes (e.g. passing scores on standardized tests, grade completion, etc.). There is, however, a paucity of research in which this relationship has been examined in the context of the child welfare system. For example, while anecdotal evidence exists to suggest that placement in foster care (i.e. out-of-home placement (OHP)) may increase the probability of a child experiencing an SM event, the literature lacks examples in which this assertion has been formally tested. The purpose of the current dissertation is to provide the field with a better understanding of the phenomenon of SM events in the context of OHP.

Review of Literature

The following section briefly summarizes the literature concerning SM events and their relationship to academic achievement. The review will begin with a summary of SM events writ large followed by a discussion of the educational context for students in OHP. Finally, the review will integrate this larger body of research into a discussion of the expected outcomes for students in OHP experiencing SM events in light of potential confounding variables identified in the larger literature. Since the subsequent chapters are intended to stand as independent publishable articles, some of the literature and reasoning in this chapter is duplicated in subsequent chapters.

The Phenomenon of Non-Normative School Transitions

The literature distinguishes between two primary types of SM events experienced by students; normative and non-normative. Normative school transitions refer to those changes that are expected and planned as a result of grade promotion (e.g. transitions from Junior High School to High School). Non-normative school transitions are identified in the literature as those transitions in which a child changes schools for reasons other than grade promotion (e.g. relocation) (Jason et al., 1992). The focus of the current study will be on non-normative SM events (hereafter, simply SM or SM events). While this study will make use of the Jason, et al. definition, it should be noted at the outset that the literature does not speak with one voice concerning operational definitions of school transitions - especially when levels of analysis move from the child to higher levels of aggregation (e.g. district, state, etc.) (see Ligon & Paredes, 1992 for a review of 62 definitions of SM).

Despite the lack of a common operational definition, there is general consensus in the literature that SM events are negatively associated with academic achievement including high school completion (e.g. Astone & McLanahan, 1994; Crowder & South, 2003) and academic performance in general (e.g. Rumberger & Larson, 1998). Some of this variance is certainly accounted for by pre-existing differences between transitioning children and their non-transitioning peers including socio-economic differences (e.g. Pettit & McLanahan, 2003) and intelligence (as measured by IQ scores) (e.g. Whalen & Fried, 1973). That said, the majority of available research would suggest an independent association between SM events and academic performance (see Courtney, Terao, & Bost (2004) for a discussion of this relationship in the context of SM events within the foster care system).

When compared to other parts of the world, all children in the United States are at increased risk of experiencing SM events. This is due simply to the fact that the United States

contains a far more mobile population than other countries in the world (e.g. Schachter, 2004). As residential changes are often accompanied by school changes, a child living in a more mobile society will be more likely to experience an SM event. This basic proposition is consistent with research examining reasons for SM events which indicate that over half of all SM events are at least partially related to a residential factor (as opposed to the transition resulting from factors such as school dissatisfaction e.g. Kerbow, Azcoitia, & Buell, 2003).

While overall mobility rates within the United States may certainly play a role in a child's risk of experiencing SM events, it is also important to note that mobility within the United States is not universal. Recent reports from the US Census Bureau suggest that variance in mobility exists as a function of various socioeconomic factors with individuals at lower ends of the socio-economic spectrum experiencing higher probabilities of mobility than those with relatively high socioeconomic status (Kaya, 2010). Studies focusing specifically on families with children tend to support this basic proposition. For instance, V. E. Lee & Burkam (2002) found that children from families with low socioeconomic status are nearly twice as likely to experience a residence change in their first five years of life compared with their peers residing in families with high socioeconomic status. Thus, factors related to a child's socioeconomic status may place them at increased risk of SM events independent of their OHP status.

The Educational Context of Children in OHP

In examining SM events in the specific case of students in OHP, consideration needs to be given to the larger educational context of OHP. As a starting point, it is important to note that students in OHP tend to perform poorly on most measures of academic achievement. As noted by Parrish et al. (2001), on average, students in OHP tend to have reading and math proficiencies that are below grade level and they are more likely to have been retained than their same-age peers.

Like many areas of child welfare research, the specific mechanisms driving OHP educational outcomes are unclear. One potential factor that would appear to have clear relevance is the level of poverty experienced by the child in the environment from which they were removed. There is an established association between poverty and educational outcomes within the general population with children living in impoverished neighborhoods tending to experience lower levels of academic achievement (e.g. Ludwig, Ladd, Duncan, Kling, & O'Regan, 2001). To the extent that children are being removed from families in which poverty is prevalent (see Marcenko, Lyons, & Courtney (2011) and Marcenko, et al. (2009)) for evidence of this tendency within Washington State), it is reasonable to infer that the effects of poverty may have a lasting effect on children once they enter OHP. Some evidence for this can be seen in Dumaret & Stewart (1985), a study contrasting educational outcomes for the children of low-income mothers in France raised in adoptive homes, foster homes, or the homes of their birth-mothers. After controlling for child-level variation which could have been a driving factor in placement type (e.g. intellectual disability, etc.), Dumaret found no differences in the educational outcomes for children raised at home as compared with those raised in foster care. However, this study lacked an appropriate high-income comparison group (i.e. all of the children in this study came from poor homes). More recently, Smithgall (2004) has examined the probability of grade retention for students in OHP in Chicago Public Schools finding that, on average, foster children were 2.4 times as likely to be "old for their grade" when compared to other students within the Chicago Public School District. When controlling for demographic variables such as poverty this likelihood reduced by 37%. Thus, while there appears to be some independent association between OHP and educational outcomes, this relationship appears to be substantially moderated by demographic variables such as poverty.

Another potential confounding variable in studies of OHP and educational outcomes is the possible association between maltreatment and educational outcomes independent of OHP. Although the results of the literature are mixed, researchers tend to find an association between child maltreatment and performance on an array of educational outcomes (e.g. grades, test scores, behavioral deficits) (see Leiter & Johnsen, 1994 for seminal work in this area). While the literature has examined the possibility that the type of maltreatment plays a role in the effect on maltreatment, the majority of research would appear to indicate no variance in academic achievement as a function of maltreatment type (e.g. Jaffee & Gallop, 2007; c.f. Jonson-Reid, Drake, Kim, Porterfield, & Han, 2004).

Four studies of educational outcomes in OHP appear to have made an effort to control for maltreatment. To date, Smithgall (2004) appears to have conducted the most thorough analysis of the effects of maltreatment. The author's results indicate that, compared to the general population of the Chicago Public School District, children who had a substantiated allegation of child abuse or neglect but who were not placed in out-of-home care had an increased likelihood of being "old for their grade". Similar results were observed for students who were currently in OHP. However, the odds-ratio was slightly lower for the group who was not placed (1.8 vs. 1.6). Earlier studies such as Runyan & Gould (1985) and Heath, Colton, & Aldgate (1994) also attempted to control for the effects of maltreatment in a similar manner to Smithgall. Using a much smaller sample of students than Smithgall, Runyan and Gould found no significant association between students in OHP and classroom grades (the implication being that OHP is a proxy for maltreatment) and the study by Heath, et al. resulted in cell sizes that were too small to allow for meaningful comparisons across the different types of placement interventions.

Taken as a whole, these studies would suggest some association between maltreatment and educational outcomes. That being said, concerns about construct validity could be raised in

all of the studies due to the fact that the authors all tend to proceed from an assumption that children in foster care have necessarily been maltreated. While children with a substantiated allegation of child maltreatment will tend to have a much higher probability of OHP than other children, this does not allow one to make the claim that all children in OHP have been maltreated. Large proportions of children placed in OHP enter without a founded allegation of child abuse or neglect (see Mienko (2012) for a review of this tendency in Washington State). In an apparent recognition of this distinction, Conger & Rebeck (2001) analyzed the educational outcomes of children in OHP in New York City utilizing a "reason for removal" variable which indicated whether or not a child had been placed into care as a result of child abuse or neglect, a "person in need of supervision" petition, or as a result of a voluntary placement agreement. The authors found (utilizing a cohort approach examining outcomes after placement) that children placed for child abuse or neglect (as compared to voluntary placement agreements) showed significant improvement in math scores.

In addition to the above, a variety of features associated with the child welfare system have been identified in the literature as potential contributors to poor academic performance amongst students in OHP. While claims are often made of negative treatment toward foster children by their peers and teachers (e.g. Jackson, 1994) and lack of support from foster parents (e.g. Dubowitz & Sawyer, 1994), perhaps the most salient cause identified in the literature is the simple lack of coordination between the schools and local child welfare agencies (e.g. Ayasse, 1995; Jackson, 1994). Generally speaking, personnel within school systems have little understanding of the child welfare system. This lack of understanding can lead to days or even weeks of delay in enrolling foster children into school after a removal.

While the above literature review should not be considered exhaustive, it provides an overview of the factors that need to be considered in examining the relationship between SM

events and academic achievement for students in OHP. Turning now to the topic of SM events for students in OHP, although the body of literature is small, there is evidence that students in OHP are at increased risk of SM events as compared to the general population (e.g. Smithgall, 2004). At a fundamental level, this trend is precisely what would be expected. In the absence of a policy seeking to actively prevent SM events for foster children, removing a child from one home and placing him in another would necessarily place him at increased risk of an SM event. While such school changes would be expected to contribute to decreased educational achievement for any child, the combination of such changes in conjunction with the potential social and emotional barriers faced by a child that has been placed in OHP appears to exacerbate the effects on academic performance for students in OHP compared with non-normative school changes experienced by the general population (Smucker, Kauffman, & Ball, 1996).

Working Causal Model

Thus, in attempting to examine the relationship between SM events and academic achievement for students in OHP, the literature would suggest that the relationship cannot be examined in isolation. The diagram presented in the figure above displays the proposed causal model linking the various concepts identified in the literature (possible moderating effects colored in red-brown). To start, the model demonstrates independent links between OHP and academic achievement, between poverty and academic achievement, and between poverty and SM events. Also distinguished are placements resulting from maltreatment vs. placements resulting from other issues (e.g. child behavior, etc.) in recognition of the fact that the literature identifies a link between maltreatment and academic achievement independent of OHP. These potential confounding relationships must be given consideration in any assessment of the association between SM events for students in OHP and academic achievement.

Regarding the specific experiences of students in OHP, the causal diagram presents the standard poverty model of child maltreatment where poverty (by contributing to stress) leads to child maltreatment (types of maltreatment are collapsed here for the sake of simplicity). It is recognized that poverty may play less of a role in the child welfare involvement of rural families where child specific factors (e.g. mental health) may create more of a risk for entry (Barth, Wildfire, & Green, 2006). However, poverty is also a risk factor for childhood mental health problems (McLeod & Shanahan, 1993). The diagram presented here acknowledges the fact that although poverty may play less of a role in influencing certain forms of entry than others, it remains an upstream risk factor for virtually all entry paths into the child welfare system. Here "other conditions" associated with a child's entry into OHP are also included as dependent on poverty (e.g. family conflict, child behavior, etc.).

Once a child is placed in OHP, they are categorically at risk of SM events due to the fact that residential mobility (i.e. placement in foster care) necessarily increases the likelihood of SM That said, this relationship is believed to be moderated by coordination between the school and the local child welfare agency. Here, coordination is proposed to moderate the relationship between OHP and SM events. Coordination could refer to a variety of activities such as the use of school social work staff to ensure that transportation is arranged across district lines in support of school stability (Eckenrode, Laird, & Brathwaite, 1995). Another potential moderating variable that has never been addressed in the literature is the supply of foster homes in a child's removal school district. Despite the presence of protective legislation such as McKinney-Vento, if there are no viable placement options in a child's school district, OHP will almost certainly increase a child's risk of SM events.

The final relationship in the causal diagram is one of the more complex relationships to be examined in this review of literature. The mechanisms associated with variability in academic

achievement as a function of SM events have both an ecological and individual basis. In terms of the ecological basis, as noted by Fabian & Dunlop (2007), it would appear that at least two of Brofenbrenner's (1979) numerous hypotheses about child development have relevance to the current discussion: Hypothesis 29 which states that a child's development in a new setting will be enhanced if the child's "...transition into that setting is not made alone" (p. 211). Hypothesis 42 would also appear to have relevance stating that development is enhanced to the extent that "...information, advice, and experience relevant to one setting are made available, on a continuing basis, to the other" (p. 217). In essence, these hypotheses predict that consistency, either in relationships (Hypothesis 29) or in social norms (Hypothesis 42) will promote the development of a child in a new setting. Thus, one might expect a child placed into a foster home with his siblings and maintained in his original school to be more likely to maintain his prior academic performance. On the other hand, a child placed in a different county without his siblings and not allowed to maintain in his former school may end up experiencing variation in his academic performance. It is not, however, a foregone conclusion that the child will experience lower levels of academic achievement in the latter case. The direction of the variation would be expected to vary as a function of the peer group developed by the child in the new setting. Proceeding from Harris' modular theory of social development, children entering a peer group in which academic performance is valued and promoted would be expected to exhibit higher levels of academic achievement whereas children entering a peer group in which academic performance was not valued would be expected to exhibit lower levels of academic achievement (Harris & Parker, 1998). That said, such differences could also take place following Hypothesis 42 in that wealthier school districts may be able to provide greater levels of information, advice, etc. to incoming students (Bronfenbrenner, 1979).

Specific Research Questions

While there are many questions raised from the model outlined above, the particular focus of the proposed dissertation will be an examination of how placement in foster care influences a child's risk of experiencing a non-normative transition, how non-normative transitions impact the educational outcomes of foster children, and how system-level policy tools can be used to limit the incidence of non-normative transitions for foster children. Toward this end, three specific research questions are proposed:

1. Predicting Non-Normative Transitions: How does OHP effect the probability of a student experiencing SM events?,
2. Predicting Educational Outcomes: How do SM events within the context of OHP effect a student's probability of normative educational outcomes?, and
3. Mitigating the Incidence of Non-Normative Transitions: How do macro and micro-level policy tools impact the incidence of SM events for students in OHP?

Question 1 is addressed in the analysis presented in Chapter 2. Question 2 is addressed in the Chapter 3 analysis. Question 3 is partially addressed in Chapter 1 as well as Chapter 4.

These questions will be specifically addressed using an integrated set of administrative data from two Washington State agencies: the Office of the Superintendent of Public Instruction (OSPI) and the Children's Administration within DSHS (CA). Data from OSPI includes student level administrative and assessment data will be obtained for all grades and content areas including information concerning graduation, dropout, and enrollment for the 2004-05 through 2010-11 academic years. Data from CA includes foster care placement records from "FamLink", the State Automated Child Welfare Information System (SACWIS) over the same time period. Due to variability in data quality in K-8 enrollment records, the analyses presented in the subsequent chapters will focus specifically on high-school students.

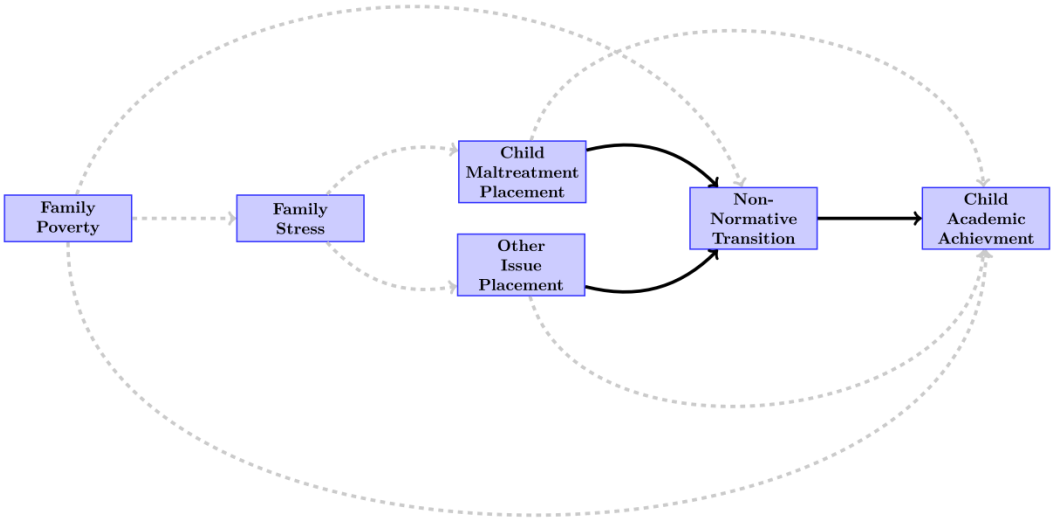

Figure 1.1: Hypothetical causal model based on existing literature.

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OUT-OF-HOME PLACEMENT AND HIGH SCHOOL MOBILITY: GENERAL ESTIMATES OF INCIDENCE AND THE EFFECTS OF THE FOSTERING CONNECTIONS AND INCREASING ADOPTIONS ACT

Elevated school mobility (SM) for students in foster care (i.e. out-of-home placement (OHP)) is something that has been previously noted in non-peer-reviewed literature (Burley & Halpern, 2001; Smithgall, 2004). At a fundamental level, this trend is precisely what would be expected. In the absence of a policy seeking to actively prevent SM for students in OHP, removing a student from one home and placing him in another would necessarily place him at increased risk of a school change. While such school changes would be expected to contribute to decreased educational achievement for any students, the combination of such changes in conjunction with the potential social and emotional barriers faced by a student that has been placed in OHP appears to exacerbate the effects on academic performance for students in OHP compared with SM in the general population (Smucker, Kauffman, & Ball, 1996). Understanding the phenomenon of SM for students in OHP and policies that can be adopted to combat this mobility is thus of importance to the fields of education and social work.

In spite of the importance of SM for students in OHP, the peer-reviewed literature is nearly silent on the topic. In fact, there is relatively little literature concerning the phenomenon of student mobility in the general student population. While recent articles have begun to examine the *effects* of mobility (e.g. on achievement) (Fantuzzo, LeBoeuf, Chen, Rouse, & Culhane, 2012; Voight, Shinn, & Nation, 2012), there remains a gap in the literature focused on mobility *per se*. The purpose of the current article is to provide an analysis of differences in SM as a function of OHP status. The article proceeds as follows. In the background section a review of previous work on SM for students in OHP is conducted along with a brief description of the history of FCIA. This discussion is followed by a description of the data from Washington State

used in this analysis followed by method and results sections. The manuscript concludes with a discussion of policy implications.

Background

Defining the Problem of School Mobility

The literature distinguishes between two primary types of transitions experienced by students; normative and non-normative. Normative transitions refer to those changes that are expected and planned as a result of grade promotion (e.g. transitions from junior high school to high school). Non-normative school transitions are identified in the literature as those transitions in which a student changes schools for reasons other than grade promotion (e.g. relocation) (Jason et al., 1992). The focus of the current study will be on non-normative transitions (i.e. SM events). While this study will generally make use of the Jason, et al. definition, it should be noted at the outset that the literature does not speak with one voice concerning operational definitions of school transitions-especially when levels of analysis move from the student to higher levels of aggregation (e.g. district, state, etc.) (see Ligon & Paredes, 1992 for a review of 62 definitions of "school mobility").

Despite the lack of a common operational definition, there is general consensus in the literature that SM as defined above is negatively associated with academic achievement including high school completion (Astone & McLanahan, 1994; Crowder & South, 2003) and academic performance in general (Rumberger & Larson, 1998). In general, these effects tend to be particularly high for students in OHP. Some of poor academic achievement for students in OHP is certainly accounted for by pre-existing differences between transitioning students and their non-transitioning peers including socio-economic differences (Pettit & McLanahan, 2003) and IQ scores (Whalen & Fried, 1973). That said, the majority of available research would

suggest an independent association between SM events and academic performance (see Courtney, Terao, & Bost, 2004 for a discussion of this relationship in the context of non-normative school changes within the child welfare system).

Causes of SM Events

When compared to other parts of the world, all children in the United States are at increased risk of experiencing SM. This is due in part to the fact that the United States contains a far more mobile population than other countries in the world (Schachter, 2004). As residential changes are often accompanied by school changes, a student living in a more mobile society will be more likely to experience SM events. This basic proposition is consistent with research examining reasons for school changes which indicate that over half of all SM events are at least partially related to a residential factor (as opposed to the transition resulting from factors such as school dissatisfaction, etc.) (Kerbow, Azcoitia, & Buell, 2003).

While overall mobility rates within the United States may certainly play a role in a student's risk of experiencing SM, it is also important to note that mobility within the United States is not universal. Recent reports from the US Census Bureau suggest that variance in mobility exists as a function of socioeconomic factors with individuals at lower ends of the socio-economic spectrum experiencing higher probabilities of mobility than those with relatively high socioeconomic status (Kaya, 2010). Studies focusing specifically on families with children tend to support this finding. For instance, Lee & Burkam (2002) find that children from families with low socioeconomic status are nearly twice as likely to experience a residence change in their first five years of life compared with their peers residing in families with high socioeconomic status. Thus, a student's socioeconomic status may place them at increased risk of SM independent of their OHP status.

Legislation Targeted at Reducing SM for Students in OHP

Specific federal policies directed at decreasing SM for students in OHP have been present for over a decade. In 2001, the No Child Left Behind Act (PL 107-110) (NCLB) amended Title VII-B of the McKinney-Vento Homeless Asssistance Act (PL 100-77). Among other things, the amendment expanded the definition of "homeless children and youths" to include children who were "awaiting foster care placement". This expanded definition made *some* students in OHP eligible to remain in the school that they had been attending prior to entering OHP (i.e. their school of origin) in spite of the fact that entering OHP may have moved them to a new school district or school catchment area. Under the NCLB amendments, however, states and local education agencies (LEA) were allowed to interpret "awaiting foster care placement" at their discretion. In response to confusion and inconsistent application of the NCLB OHP provisions, the FCIA was passed in 2008 to help clarify legislative intent regarding school enrollment for students in OHP. Under FCIA, LEAs and child welfare agencies were now required to coordinate with one another to "ensure" that students remain in their schools of origin.

The Current Analysis

The current study seeks to estimate the annual count of SM events for students in OHP and examine how this rate differs from the count of SM events for general population students. The study also seeks to estimate the effects of the most recent federal efforts (i.e. FCIA) on decreasing SM for students in OHP. Specifically, this study seeks to answer the following two research questions: 1. Is there a difference in SM for students in OHP as compared to students in the general population?, and 2. Has the passage of FCIA reduced SM for students in OHP?

To answer these questions, the study used administrative enrollment data from the Washington State Office of the Superintendent of Public Instruction (OSPI) and OHP episode records from the Children's Administration (CA) in the same state. This study utilizes a random-

effects difference-in-differences approach to compare the change in SM for students in OHP with the SM for non-OHP students.

Data

The data for this analysis were drawn from a longitudinal database of enrollment records from the Washington State Office of the Superintendent of Public Instruction (OSPI). These data were subsequently linked to child welfare records held by Washington's Children's Administration (CA). This analysis focused specifically on high-school students from the graduating classes of 2008 through 2011. These graduation classes are defined on the basis of the adjusted cohort graduation rate (ACGR) methodology. The ACGR is considered to be the preferred approach to high-school cohort definition when examining graduation (Seastrom, Hoffman, Chapman, & Stillwell, 2006). As this study is part of a larger research program (Mienko, 2016) that will ultimately focus on high-school completion, the ACGR cohort definition was also used here to facilitate comparison between the studies. An ACGR cohort includes all students who enter a particular graduating class in grade 9, plus students who transfer into the cohort, minus students who leave the cohort due to movement, or death (34 CFR § 200.19). The current analysis focused on three main variables, each of which is discussed below.

Annual Count of SM Events (Dependent Variable)

The analysis database was prepared in such a way that unit of analysis was an enrollment year for a given student (i.e. student-enrollment-year (SEY)). Thus, for each year that a student was a part of their ACGR, the number of SM events experienced by a student in that year was counted. As described above, this analysis was only focused on SM taking place for a reason *other than* grade promotion. Thus, any SM event which took place within a district to a more

senior school (e.g. a 9th grade student transitioning to the 10th grade at the district's senior high school) was not included in this count.

Indication of an OHP Episode

Student OHP records were linked using a probabilistic matching technique to the data from OSPI. Similar to the SM event count, within each SEY, the number of OHP episodes were counted. Each OHP episode was counted only once. If an OHP episode began in one SEY but did not complete until a subsequent year, it was only counted in the first year in which the episode was observed. This count is coded as a dummy variable indicating whether a given SEY coincided with a new OHP episode.

Eligibility for FCIA Services

In addition to calculating the SM event counts as described above, this study also sought to determine whether or not the FCIA had any impact in reducing SM event counts for students in OHP. As noted above, the FCIA expanded the obligation of states to ensure that students are able to stay in their schools of origin unless it is not in the best interests of the student. Thus, each SEY is also categorized by whether or not it took place before or after the passage of FCIA (i.e. before or after the start of the 2008-09 enrollment year).

Additional Variables of Interest

The OSPI data provide several different variables which may impact a student's annual SM event counts, including a student's special education status, minority status, sex, and whether or not a student is flagged as speaking English as a second language (ESL). As the limited available literature also suggests that economic disadvantage and housing instability may also play a role in a student's rate of SM, students are also categorized as to whether or not they have ever been eligible for free or reduced price lunches and whether or not they have ever experienced a period of homelessness. Other variables which may impact SM event counts

including the grade and academic year associated with a given SEY. While this study would have ideally controlled for SM prior to a student's enrollment in high school, the enrollment data used for this study are less reliable for grades K-8 data than for grades 9-12. While future analyses may explore the SM history of a student as a moderator to the findings here, the current study is limited to variables available with the high-school enrollment records for the state.

Method

As indicated above, the data used in this study involved multiple observations of the same student in different academic years. That is, the study utilize SEY observations, nested within FCIA conditions (prior to the 2008-09 school year and after), nested within students, nested within school districts (the school district in which the student entered the ACGR). For the current research questions, a mixed-effect Poisson regression model was developed using the statistical programming language, R (R Core Team, 2016). The study made specific use of the `lme4` package developed by Bates, Mächler, Bolker, & Walker (2015). Preliminary analysis indicated that the data are slightly *under*-dispersed which precluded the need for more complex models which include a dispersion parameter. This approach also provided for the simultaneous answer both of the identified research questions.

Making approximate us of Gelman-notation (Gelman & Hill, 2006) our analytic was identified using the indexes i, j, and k for SEY, student, and initial school district. The basic model is thus given as

$$y_{ijk} \sim \text{Pois}\left(\exp\left(\theta \cdot x_i + \alpha_j^{\text{student}} + \alpha_k^{\text{district}}\right)\right)$$

where

$$\theta \cdot x_i = \beta^0 + \beta^{\text{female}} \cdot \text{female}_i + \beta^{\text{frl}} \cdot \text{frl}_i + \beta^{\text{minority}} \cdot \text{minority}_i + \beta^{\text{esl}} \cdot \text{esl}_i + \beta^{\text{year}} \cdot \text{year}_i + \\ + \beta^{\text{homeless}} \cdot \text{homeless}_i + \beta^{\text{sped}} \cdot \text{sped}_i + \beta^{\text{grade}} \cdot \text{grade}_i + \beta^{\text{grade}} \cdot \text{grade}_i^2 + \\ + \beta^{\text{ohp}} \cdot \text{ohp}_i + \beta^{\text{fcia}} \cdot \text{fcia}_i + \beta^{\text{ohp.fcia}} \cdot \text{ohp.fcia}_i.$$

We additionally define random effects $\alpha_j^{\text{student}}$ and $\alpha_j^{\text{district}}$ as

$$\alpha_j^{\text{student}} \sim \mathcal{N}(\gamma^0, \sigma^2_{\text{student}})$$

and

$$\alpha_k^{\text{district}} \sim \mathcal{N}(\delta^0 + \delta^{\text{ohp}} \cdot \text{ohp}_k + \delta^{\text{fcia}} \cdot \text{fcia}_k + \delta^{\text{ohp.fcia}} \cdot \text{ohp.fcia}_k, \sigma^2_{\text{district}}).$$

As can be seen above, the model predicting the annual count of SM events (y_{ijk}) includes several covariates. Specifically, the analysis included student-level fixed effect dummy variables of sex (female), free and reduced lunch status (frl), minority status (minority), ESL status (esl), history of homelessness (homeless), and special education status (sped). Additional SEY-level fixed effects of the mean-centered academic year (year) and the grade associated with the SEY (grade) were also fit in this study. As shown below, descriptive analyses of the data suggested a quadratic relationship between grade and annual SM events. As such, grade was entered into the formula as a second-order polynomial.

The two primary variables of interest were also included in the model as SEY-level dummy variables along with an interaction term. The OHP variable was denoted as ohp, the FCIA variable was denoted as fcia, and the interaction term was denoted as ohp.fcia. The interaction term serves as a difference-in-difference (DID) estimator. DID estimators are a well-established econometric tool used to estimate casual effects when policies are implemented in such a way that they create a natural experiment. A classic applied example of this approach is given by Card & Krueger (1994) and Imbens & Wooldridge (2008) provides a current summary of this and similar econometric approaches.

As applied here, the DID approach was used to compare annual counts of SM events before and after FCIA. In other words, the study relied on time to identify the responsiveness of school districts to the SM provisions of FCIA. Since there may be underlying trends in SM over

this same time period and non-FCIA policy tools may have also been implemented over the same time, control groups were used to isolate the effects of FCIA from other factors.

Since only students in OHP are eligible for the SM provisions of FCIA, there is no need to worry about spill-over effects to other students. Thus, SEY observations coinciding with an OHP entry are the *only* SEY observations considered to be in the FCIA "treatment" group. SEY observations taking place without a coincident OHP entry are used as "controls". The difference between the change in the expected annual counts of SM events for OHP SEY observations and the change in the expected annual counts of SM events for non-OHP SEY observations can be interpreted as the "effect" of FCIA on the SM event counts. The ohp. fcia interaction term captures this difference. Since it is possible that the strength of the FCIA effect varies from district to district, ohp. fcia was also entered as a random slope to the model along with the associated main-effect variables.

The specified model was estimated by the Gauss-Hermite approximation to log-likelihood function of the model (see B. M. Bolker et al., 2009 for a description of Gauss-Hermite quadrature). The robustness of this model was tested against negative-binomial (NB) and zero-inflated Poisson (ZIP) alternatives as well as less complex nested alternatives to the current model. While all models are not presented here for the sake of brevity, the final mixed effect model presented was superior in terms of both Bayesian Information Criterion (BIC) (as specified by Kass & Raftery (1995)) and deviance. The model presented below in Table 2.1 is compared against its fixed-effect variant.

Results

Tables 2.1 and 2.2 display descriptive results of the data used in this study. One of the immediate patterns observed in the data is the reliable pattern of SM events across the grades as

shown in the first row of Table 2.1. Across all years of data, growth from grade 9 to 10 is observed followed by a decline from grade 10 to 11 and again from 11 to 12. Summing across all grades, we find a value of $0.18 + 0.18 + 0.14 + 0.08 = 0.58$ SM events per SEY. While it is unlikely that these values all represent truly independent values (a requirement of basic probability theory in order to simply sum the values (Grimmett & Welsh, 2014)), the values taken together suggest that a substantial proportion of students attending high school in Washington are likely to experience at least one SM event during a 4-year period of high school enrollment. Other rows in the table indicate that the variables are distributed uniformly across the grades. The exception to this is 11th grade SEY observations for students in OHP which, in terms of magnitude, is over 28% lower than the other grades.

Table 2.2 outlines the distribution of SM events by the same key variables. As can be seen in column 1, nearly 90% of SEY observations do not have an associated SEM event. Female sex and ESL-status are associated with decreased SM event counts. History of homelessness, special education history, and OHP entries all appear to be associated with increased SM event counts. Indeed, over 15% of OHP-associated SEY observations have SM events at the 98th percentile or above.

In Table 2.3, results are presented of the chosen mixed effect statistical model (as specified above). The results of this final model were based on 1,103,614 SEY observations, nested in 303,889 students, nested in 266 districts. For the purposes of comparison, the results of one of the nested comparison models is also displayed in Table 2.3; the fixed-effect complement to the mixed-effect (i.e. multilevel) model. As noted above, the final model was chosen on the basis of BIC with substantive decreases in BIC taking place at every additional complexity added to the model, except the expansion to the ZIP and NB models referenced above.

With respect to the main research questions, the results of the model indicate that, on average, academic enrollment years which coincide with an OHP entry tend to have SM events at $\exp(1.72) = 5.58$ times the rate of those years which do not coincide with an OHP entry ($p < 0.001$). The difference-in-differences estimator indicates that academic enrollment years taking place after the passage of FCIA have SM events at rates of $\exp(-0.24) = 0.79$ times the rate of those years taking place prior to FCIA ($p < 0.001$). In other words, FCIA appears to have reduced annual SM rates for students in OHP by 21%. These results are displayed visually in Figures 2.1 and 2.2. Figure 2.1 shows how FCIA appears to have impacted school mobility across all four years of enrollment. Figure 2.2 demonstrates the multi-level aspect of the model and the level of variation that exists across districts. District-level variability can also observed in Figure 2.3 which displays a rank-ordered series of the random DID effect by district. Although the majority of these effects are negative (and thus amplifying the FCIA effect), several of the effects are positive and may bring some districts closer to the mean.

Discussion

The findings presented here provide policy makers with general guidance concerning the expectations of school mobility - both in the general population and in the case of special sub-populations such as students in OHP. While the chosen model indicates that several special populations are at increased risk of experiencing an SM event (i.e. males, FRL-eligible students, minority students, students with homelessness history, and special-education students), students with an OHP entry are at increased risk for an SM event relative to these other groups. These findings are consistent with the available literature and persist even after controlling for the other variables in the chosen statistical model; including several random intercept and slope parameters. The relationship between grade and the count of SM events identified in the

descriptive analyses was also confirmed by the second-order polynomial term which was included in the chosen statistical model. This pattern is potentially consistent with a hesitancy for parents and caregivers to transition students to a new school later in their high-school career and should be explored further in future research.

The demographic findings related to homelessness and FRL (our measures of poverty) are consistent with previous findings in the literature which demonstrate that poor and homeless students are at increased risk of SM events (e.g. Buckner, Bassuk, & Weinreb, 2001). Based upon a review of the limited existing literature on this topic, the increased risk of SM events due to special education status is unique to this study. While this finding is likely an artifact of purposeful mobility (perhaps directed by the school district) in attempting to meet the educational needs of special education students, this apparently new finding should be explored further.

The study also identified apparent protective factors which served to decrease a student's risk of school SM events. Specifically, a student's ESL status had a small but statistically significant effect on the risk of SM events, decreasing annual mobility rates by $100 \cdot (1 - \exp(-2.73)) = 3\%$ for ESL students. As ESL status may be a proxy for migrant or immigrant students, it is possible that this effect is related to an overall level of stability in certain immigrant neighborhoods. Stability in Latino immigrant communities has been previously identified in non-educational literature (e.g. Boggess & Hipp, 2010). As noted by Breton (1964), these tight-knit "barrios" possess latent features of familiarity and family which make residential changes (and thus school changes) less likely. This is another pattern which future research should explore in more detail.

This study also demonstrates that the FCIA appears to have been successful in reducing the expected count of SM events for students in OHP in particular. This reduction is particularly

noteworthy given that FCIA was not an entirely new policy. Rather, FCIA was a clarification and possible expansion of SM provisions for students in OHP already embodied under NCLB. While there are a number of alternative explanations, the passage of FCIA would appear to be the most convincing explanation. Indeed, as shown in Figures 2.1 and 2.2, the expected count of SM events for non-OHP students slightly increased over the period of FCIA implementation. Thus, it appears unlikely that the FCIA effect is due to secular trends in SM events in the general population. Nonetheless, the results do indicate variance in the FCIA effects. As shown in Table 2.3, the variance term for the random interaction effect was higher than any of the other random slopes. Future research should examine district-specific policies which may impact the district-level variation in FCIA observed in this study.

Overall, the results of this study suggest that SM provisions of legislation such as the McKinney-Vento Homeless Assistance Act, FCIA, and NCLB are capable of achieving meaningful improvements in SM for students in OHP. In particular, FCIA appears to be responsible for creating a non-trivial decrease in the rate of SM events. Nonetheless, even with the FCIA effects, more work is needed to bring the mobility rate of students in OHP in line with their same-aged peers. While the best interests of some students in OHP may be served by having them change schools (e.g. due to relative placements, the unique placement needs of the student, etc.), the results of existing research suggest that, on average, a student's educational outcomes may be best served by allowing them to remain in their school of origin.

Table 2.1
Descriptive Statistics of Key Variables, By Grade

	Grade 9	Grade 10	Grade 11	Grade 12
Average SM Events Per Year	0.18	0.18	0.14	0.08
Female (%)	48.98	49.18	49.58	50.12
History of FRL Eligibility (%)	34.35	34.85	35.35	35.6
Non-White Student (%)	30.09	30	29.56	28.95
ESL Student (%)	11.45	11.27	11.12	10.99
History of Homelessness (%)	3.25	3.24	3.11	2.83
Special Education History (%)	12.75	12.53	12.09	11.44
New OHP Episode (%)	0.46	0.41	0.28	0.39

Table 2.2
Descriptive Statistics of Key Variables, By Average SM Event Percentile

	[0,90th)	[90th, 98th)	[98th, 99.9th)	[99.9th, 100th]
Average SM Events Per Year	0	1	2.29	6.03
Female (%)	49.76	48.24	43.16	24.78
History of FRL Eligibility (%)	34.23	40.82	43.94	49.73
Non-White Student (%)	28.55	38.19	41.41	37.18
ESL Student (%)	11.02	13.35	11.2	5.96
History of Homelessness (%)	2.43	7.49	12.72	19.45
Special Education History (%)	11.35	17.66	24.26	41.65
New OHP Episode (%)	0.13	1.67	4.91	10.75

Table 2.3
Fixed and Mixed Effects Predicting annual count of SM Events

	Fixed Effect	Mixed Effect
Constant	-2.290*** (0.005)	-2.645*** (0.035)
Female	-0.142*** (0.005)	-0.095*** (0.007)
History of FRL Eligibility	0.213*** (0.005)	0.164*** (0.008)
Non-White Student	0.385*** (0.006)	0.304*** (0.009)
ESL Student	-0.118*** (0.008)	-0.027* (0.013)
Enrollment Year (Centered)	-0.046*** (0.003)	-0.046*** (0.004)
History of Homelessness	0.939*** (0.009)	0.997*** (0.016)
Special Education History	0.506*** (0.006)	0.483*** (0.010)
Grade	-285.164*** (4.360)	-192.438*** (5.446)
Grade^2	-151.777*** (2.944)	-128.451*** (2.984)
New OHP Episode (OHP)	1.597*** (0.016)	1.719*** (0.042)
Post Fostering Connections (FCIA)	0.003 (0.009)	0.096*** (0.024)
FC BY FCIA	-0.272*** (0.034)	-0.238*** (0.065)
Var(~1|Student)		1.348
Var(~1|District)		0.269
Var(~FC|District)		0.145
Var(~FCIA|District)		0.089
Var(~FC BY FCIA|District)		0.190
BIC	950517.9	862095.4

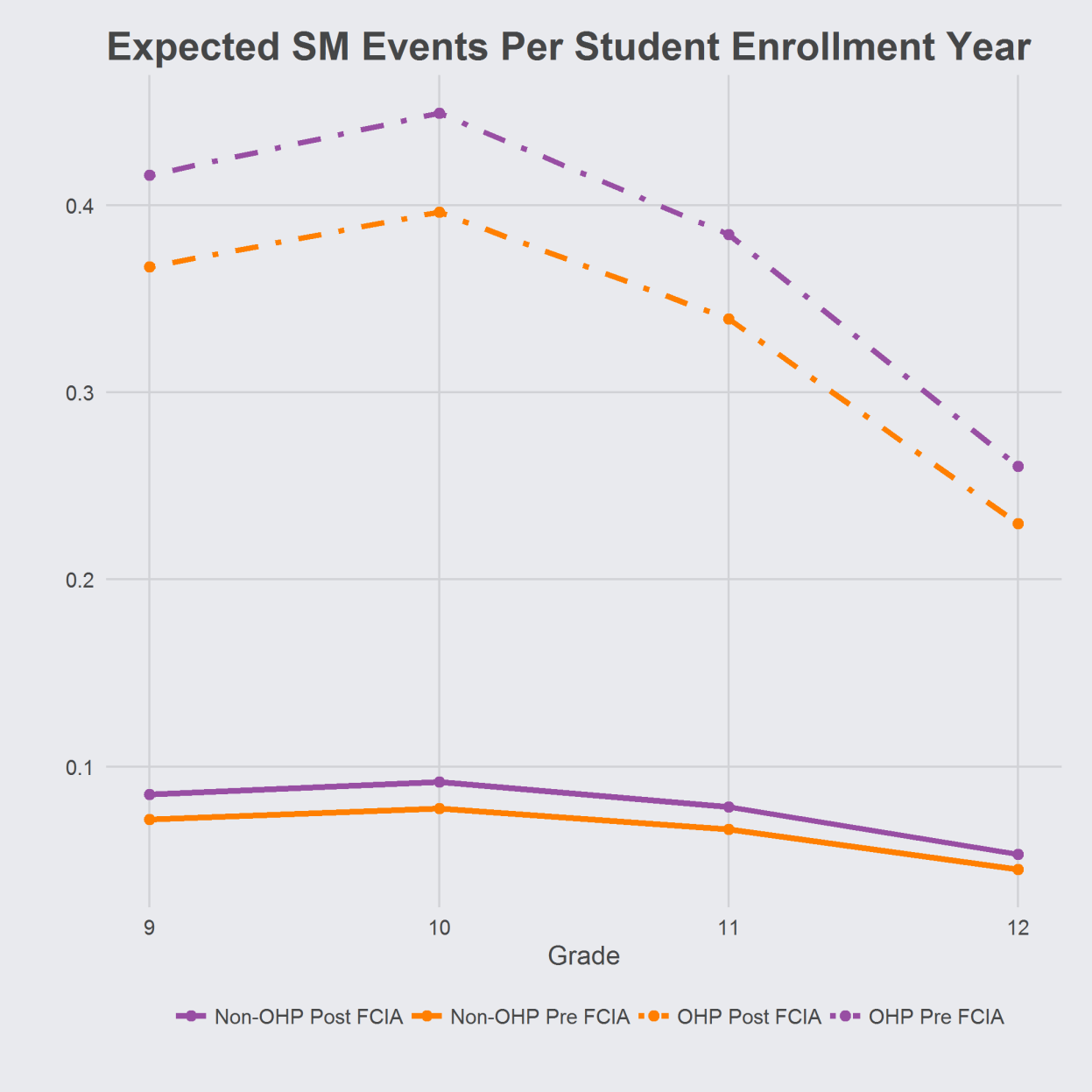

Figure 2.1: Expected SM events per year by grade and OHP status, pre and post FCIA

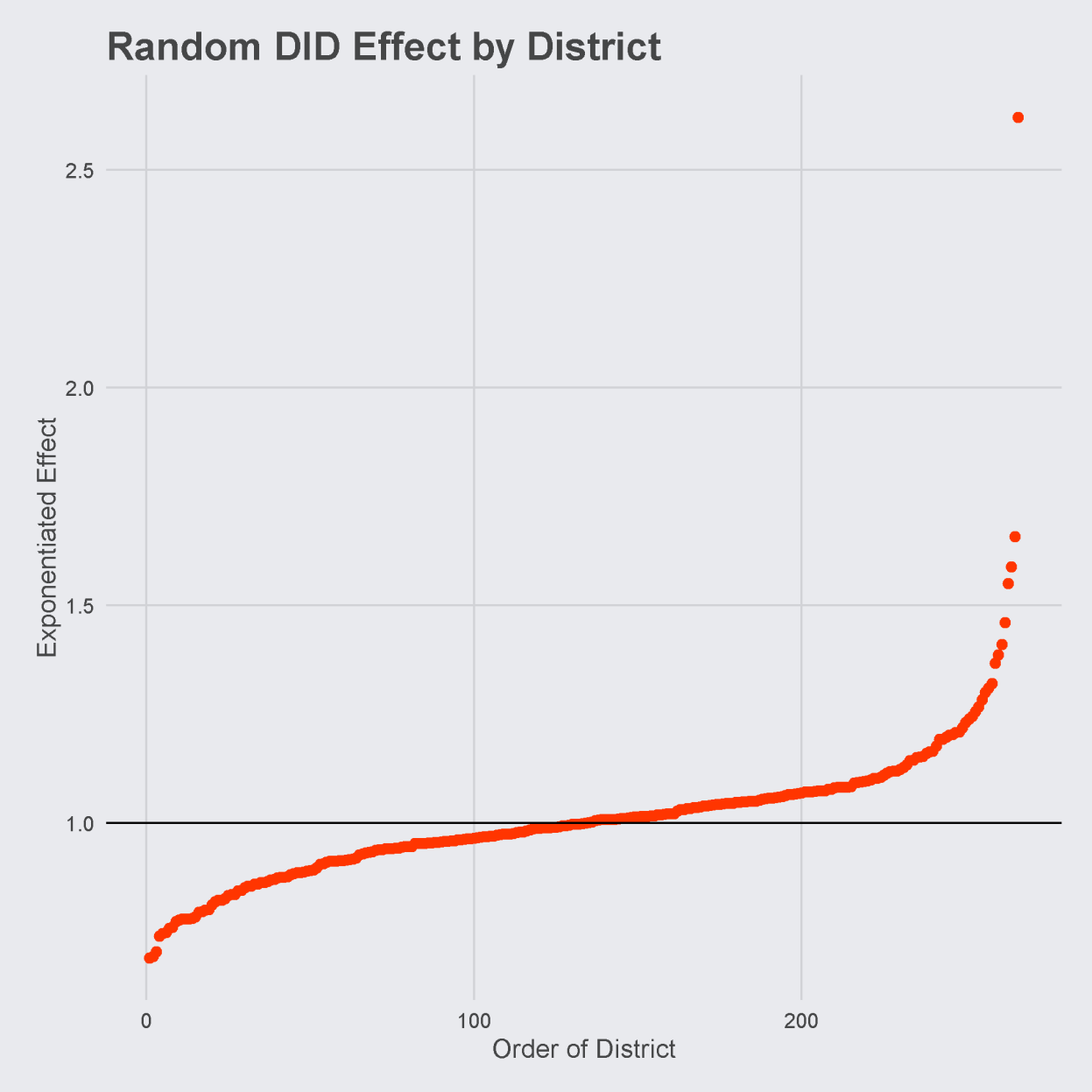

Figure 2.2: Dotplot of exponentiated random difference-in-difference effects for each Washington district.

Figure 2.3: Expected SM events per year by initial district and OHP status, pre and post FCIA

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EFFECTS OF OUT-OF-HOME PLACEMENT AND SCHOOL MOBILITY ON ON-TIME GRADUATION: A RETROSPECTIVE STUDY OF PROSPECTIVELY COLLECTED ADMINISTRATIVE RECORDS

Introduction

Current estimates from the Children's Bureau indicate that, as of the last day of FY 2014, over 400,000 children were in some form of out-of-home placement (OHP)(Bureau, 2015). Recent studies of these same data indicate that approximately 5.91% of US children will experience an episode of OHP during their childhood (Wildeman & Emanuel, 2014). These estimates suggest that OHP is a phenomenon that a substantial proportion of the pediatric population will experience before entering into adulthood. Understanding how this experience will impact measures of child wellbeing such as educational outcomes is of critical importance to policy-makers and practitioners.

In most of the peer-reviewed research, out-of-home placement (OHP) is strongly associated with poor educational outcomes (Fantuzzo & Perlman, 2007; Scherr, 2007; Stone, 2007). However, most studies of educational outcomes for children in OHP are not population-based which raises questions of external validity. While at least one population-based study examining the relationship between OHP and educational outcomes has found a persistent negative relationship when comparing OHP children to the general population (Blome, 1997), the results of larger (Berger, Cancian, Han, Noyes, & Rios-Salas, 2015) or more rigorous (Dumaret & Stewart, 1985) studies have found no effect for OHP. At least one study has shown a potential protective effect of OHP (Runyan & Gould, 1985).

These inconsistencies, in conjunction with the limited number of population-based studies indicates a need for future research in this area. Furthermore, the majority of existing

studies have tended to focus on the educational achievement of younger children (grades K through 8), leaving a gap in knowledge regarding the educational outcomes of older children. The present study focused on older youth, examining the relationship between OHP and on-time-graduation from high-school (OTG). Utilizing integrated, longitudinal, administrative data from the State of Washington, I specifically examined the effect of the annual rate of OHP episodes on the probability of graduation. Final analyses explored this relationship while controlling for the effects of key covariates which could offer an alternative explanation to observed relationships such as rates of school mobility (SM).

Like many areas of child welfare research, the specific mechanisms driving the educational outcomes of children in OHP are unclear. An obvious, yet relatively unstudied, factor in the educational outcomes of children in OHP is SM. There is general consensus in the educational literature that school transitions for reasons other than grade-promotion (i.e. SM events) are negatively associated with academic achievement, including OTG(Astone & McLanahan, 1994; Crowder & South, 2003). Some of this variance is certainly accounted for by pre-existing differences between transitioning children and their non-transitioning peers including socio-economic differences (Pettit & McLanahan, 2003) and cognitive abilities (Whalen & Fried, 1973). Nonetheless, the majority of available research would suggest an independent and negative association between SM and academic performance. While the relationship between SM and educational outcomes has never been examined in the context of OHP *per se*, it at least seems clear that children in OHP are at increased risk of SM (Mienko, 2016).

That children in OHP are at increased risk of SM is not surprising. Unless state and local governments have policies in place to prevent SM from taking place for children in OHP, the residential changes that are inherent in OHP will always increase the likelihood of SM for

children in OHP. In research being conducted in parallel to the current study, even in the context of such policies (e.g. the Fostering Connections and Increasing Adoptions Act), children in OHP still appear to be at increased risk of SM relative to the general population(Mienko, 2016). Not only are children in OHP at increased risk of SM, some researchers have even noted that the latent disadvantage (e.g. history of maltreatment, history of poverty) associated with OHP may actually serve to multiply the effects of SM on educational outcomes (Smucker, Kauffman, & Ball, 1996).

Another potential factor that would appear to have clear relevance to the current analysis is whether or not the child experienced poverty in the environment from which they were removed. There is an established association between poverty and educational outcomes within the general population with children living in impoverished neighborhoods tending to experience lower levels of academic achievement (Ludwig, Ladd, Duncan, Kling, & O'Regan, 2001). To the extent that children are being removed from families in which poverty is present (Barth, Wildfire, & Green, 2006), it is reasonable to infer that the effects of poverty may have a lasting effect on children once they enter OHP. In prior studies of the educational outcomes of children in OHP, poverty has been consistently found to have an independent effect on educational outcomes (Berger et al., 2015; Smithgall, 2004). Thus, while there appears to be some independent association between OHP and educational outcomes, this relationship appears to be substantially moderated by demographic variables such as poverty.

In addition to the factors identified above, a variety of features associated with the child welfare system have been identified in the literature as potential contributors to poor academic performance among children in OHP. While claims are often made of negative treatment toward children in OHP by their peers and teachers (Jackson, 1994) and lack of support from foster parents (Dubowitz & Sawyer, 1994), perhaps the most salient cause identified in the literature is

the simple lack of coordination between the schools and local child welfare agencies (Ayasse, 1995; Jackson, 1994). Generally speaking, personnel within school systems have little understanding of the child welfare system. This lack of understanding can lead to days or even weeks of delay in enrolling children in OHP into school after a removal. Thus, in any examination of the educational outcomes of children in OHP, it seems critical that efforts are made to address unobservable differences between different school settings.

In the context of this existing literature, I utilized integrated data from the child welfare and educational systems in the State of Washington to examine the relationship between a child's rate of OHP during high school and their probability of OTG. These data provide a complete event history of all OHP activity for children in Washington, as well as a complete event history for every school enrollment event for these same children. Consistent with the majority of multivariate population-based research in this area, I hypothesized that the effects of OHP on the probability of OTG will be non-significant or slightly positive (Berger et al., 2015; Dumaret & Stewart, 1985; Runyan & Gould, 1985). As SM is relatively unexplored in the educational literature related to OHP, I was also interested in understanding the relationship between SM and graduation rates - both for the general population and for children in OHP in particular. As suggested in the limited literature on this topic(Smucker et al., 1996), I hypothesized that the combination of OHP and SM would have a multiplicative effect and that the presence of SM and OHP would decrease the probability of OTG more than SM alone.

Methods

Study Design

Data population and sources.

All of the following analyses were conducted under approval from the Washington State Institutional Review Board. I specifically conduct a retrospective study of prospectively collected data from the Washington State Office of the Superintendent of Public Instruction (OSPI) and the Washington State Department of Social and Health Services (DSHS). Data were probabilistically linked by OSPI as a part of a routine data sharing program in existence between OSPI and DSHS. The resulting set of data contained information on a cohort of children enrolled in Washington schools from the 2004-2005 academic year through the 2010-2011 academic year. In this analysis, I focus on students who were expected to experience OTG in the years 2008 through 2011. In order to develop my graduation cohorts, I utilized the adjusted cohort graduation rate (ACGR) methodology. This is the methodology currently used to calculate OTG in Washington and the preferred approach by experts in educational data analysis (Seastrom, Hoffman, Chapman, & Stillwell, 2006). The ACGR approach is described in detail by Seastrom et al. (2006). Briefly, however, the calculation involves selecting a base cohort of all students who enter a 9th grade graduating class and tracking them forward for 4 years. From this base cohort, students who transfer into the school after 9th grade are added to the cohort. Students who leave the school due to residential changes or death are subtracted from the cohort.

Definition of main study variables.

The outcome of interest in this study was OTG (graduate). OTG graduation is defined on the basis of the exit-reason field listed in OSPI enrollment records. Students are considered to have graduated "on time" if they exited high-school within 4 years for one of the following reasons: i.) graduation with a regular high school diploma, ii.) graduation with an international

baccalaureate high school diploma, or iii.) graduation with an associate's degree. Exit reasons ii and iii are outcomes of advanced Washington high-school programs designed to prepare students for post-secondary education.

The main predictor of interest in this study was the average rate of placements experienced by a child from 9th through 12th grade (ohppy). This variable was calculated by counting the total number of OHP episodes from 9th grade through the child's last enrollment date and dividing by the total number of enrollment years. An OHP episode is defined as any period in which the state takes custody of a child and places them into some form of care outside of the home of the child's parent or legal guardian. Thus, the episode was defined in terms of the period of legal custody. A child may experience multiple placement settings (e.g. multiple foster parents) during the course of single OHP episode. For the purpose of this analysis, an enrollment year was considered to be any academic year in which a child was enrolled for at least one day of the year. Since prior research has outlined the importance of controlling for historical as well as currently OHP activity (Berger et al., 2015), I also calculated a second OHP variable as the count of OHP episodes prior to high school (priorfc).

The secondary predictor of interest in this study was an operational definition of SM. Consistent with prior literature (Mienko, 2016a), this study focuses specifically on school mobility (SM) events (i.e. those school changes which take place for reasons other than grade promotion). Similar to the definition of ohppy above, I operationalized SM as the average rate of SM events experienced by a child from 9th through 12th grade (smpy). This variable was calculated by counting the total number of SM events from 9th grade through the child's last enrollment date and dividing by the total number of enrollment years, with enrollment years defined as specified above. In the full model specified below, I also included an interaction term between smpy and ohppy, ohppy. smpy.

Definition of covariates.

I included several additional covariates in my analysis based on my review of the existing educational and literature concerning OHP. These covariates include a dummy-coded indicator of child sex (female), a dummy-coded indicator of any history of free and reduced lunch activity (frl), a dummy-coded indicator as to whether or not the child speaks English as a second-language (esl), a dummy-coded indicator as to whether or not a child received special education services during their high-school education (specialed), and the child's standardized scores on Washington's 10th grade reading and math tests (readscore and mathscore). Descriptive statistics of these covariates are provided in Table 3.1 below. To control for secular patterns in the data, I also included a mean-centered variable of the child's expected graduation year (classof). As described in more detail below, I also include a "random effect" variable for the last enrollment district for a child (district) do account for latent differences between school districts as referenced above.

Missing data.

As can be seen in Table 3.1, several students were missing test score information. Descriptive analysis of the data suggests that over half of these missing scores are due to children entering into a given cohort later in their high-school career. As list-wise deletion for large proportions of a sample can lead to severely biased estimates in statistical models, I utilized a multiple imputation process in order to generate predicted values of the missing data. These estimates were conducted using the mi package available in the statistical programming language, R(Gelman & Hill, 2011). This resulted in 16 imputed sets of data - each with n=304,321 students.

Data Analysis

To estimate the probability of OTG as a function of the variables referenced above, I estimated a mixed-effects binomial generalized linear model with a log-link (i.e. multilevel logistic regression). This mixed-effects approach was chosen due to accommodate the nesting inherent in any educational data analysis - at a minimum, students are nested in districts. I made specific use of the lme4 package to estimate the specified model (Bates, Mächler, Bolker, & Walker, 2015). Making approximate us of Gelman-notation (Gelman & Hill, 2006), my model was specified using the indexes i for student and j for final school district. My full model is thus given as

$$\Pr(\text{graduate} = 1) = \text{logit}^{-1}\left(\mathbf{BX}_i + \alpha_j[i]^{\text{district}}\right)$$

where

$$\begin{gathered}\mathbf{BX}_i = \beta^0 + \beta^{\text{ohppy}} \cdot \text{ohppy}_i + \beta^{\text{smpy}} \cdot \text{smpy}_i + \beta^{\text{ohppy.smpy}} \cdot \text{ohppy.smpy}_i + \\ +\beta^{\text{priorfc}} \cdot \text{priorfc}_i + \beta^{\text{female}} \cdot \text{female}_i + \\ +\beta^{\text{frl}} \cdot \text{frl}_i + \beta^{\text{minority}} \cdot \text{minority}_i + \\ +\beta^{\text{esl}} \cdot \text{esl}_i + \beta^{\text{classof}} \cdot \text{classof}_i^2 + \\ +\beta^{\text{homeless}} \cdot \text{homeless}_i + \beta^{\text{specialed}} \cdot \text{specialed}_i + \\ +\beta^{\text{mathscore}} \cdot \text{mathscore}_i + \beta^{\text{readscore}} \cdot \text{readscore}_i.\end{gathered}$$

I additionally defined a random effect $\alpha_j^{\text{district}}$ as

$$\alpha_j^{\text{district}} \sim \mathcal{N}(\gamma^0, \sigma^2_{\text{district}}).$$

As referenced above, the data used in this analysis were first subjected to a multiple imputation process resulting in 16 imputed data sets. Each model specified above and described below was estimated 16 times (an estimation for each imputed set of data). Results of each model were then averaged according to Rubin's rules (Rubin, 1987). The summary model statistics were accomplished, in part, using the Amelia package for R(Honaker, King, Blackwell, & others, 2011).

As can be seen, the model predicting the probability of OTG includes all of the covariates described above. The two main predictors of interest, ohppy and smpy, were also included in the model along with the interaction term, ohppy. smpy. The smpy term was included in order to examine the first hypothesis, the smpy and ohppy. smpy were added to contextualize any observed effects in light of the increased risk of SM faced by children in OHP to address the second hypothesis. The full model was evaluated in nested approximations of the full model. I first estimated bivariate models examining the effects of ohppy and smpy alone. I then examined the change in bivariate effects by the inclusion of the interaction term in a third model and the inclusion of the prior placement term (smpy) in a fourth model. The final model included all of the covariates specified above. Model fit was assessed in terms of the Bayesian Information Criterion (BIC) following Kass-style cutoff criteria (Kass & Raftery, 1995).

Results

Bivariate Regression Results

The results of bivariate regression analyses are displayed in Table 3.2. As can be seen, the unadjusted results indicate strong and significant relationships between smpy and graduate as well as ohppy and graduate. With regard to smpy, the odds of OTG decrease by a factor of $\exp(-2.47) = 0.08$ for each unit increase in smpy. This observation is beyond that which might be expected to occur by chance in the absence of a true effect ($P < .01$). The effect for ohppy is smaller, but still statistically significant. Specifically, the odds of OTG decrease by a factor of $\exp(-0.41) = 0.66$ for each unit increase in ohppy ($P < .01$). The results are converted to a probability scale and displayed graphically in Figures 3.1 and 3.2 below.

Multivariate Regression Results

The results of multivariate regression analyses are displayed in Table 3.3. As can be seen, although decreasing some, the effects of smpy remain relatively constant throughout the models. Specifically, the odds-ratio of smpy decreases from $\exp(-2.47) = 0.08$ in Model 1 to $\exp(-2.07) = 0.13$ in Model 5. The effects of ohppy, however, decrease substantially when the interaction term is added in Model 3; from $\exp(-0.41) = 0.66$ in Model 2 to $\exp(-.06) = 0.94$ in Model 3. When the historical OHP term is added to the model, the fcpy effect actually changes direction to $\exp(.05) = 1.05$ in Model 4 and $\exp(.08) = 1.05$ in Model 5. All results are statistically significant. The district variance term of 1.731 in the final model (in conjunction with the intercept term) indicates that, 95% of the time, the probability of OTG varies between $\exp(0.85 - 2 \cdot \sqrt{(}1.731))/(1 + \exp(0.85 - 2 \cdot \sqrt{(}1.731)) = 0.09$ and $\exp(0.85 + 2 \cdot \sqrt{(}1.731))/(1 + \exp(0.85 + 2 \cdot \sqrt{(}1.731))) = 0.14$ between school districts. This result remains relatively constant across all models. The interaction effect from Model 5 is displayed graphically in Figure 3.3 below. Based on an assessment of BIC, Model 5 is chosen as the preferred model in this analysis.

Discussion

Consistent with the expectations of prior research (Berger et al., 2015; Fantuzzo & Perlman, 2007; Scherr, 2007; Stone, 2007), the results of my bivariate regression models indicate that increases in the frequency of OHP episodes are associated with decreases in the probability of OTG. The results also support educational analyses of the general population (Astone & McLanahan, 1994; Crowder & South, 2003) which indicate that increases in SM events are also associated with decreases in the probability of OTG. The results of my multivariate analysis are also consistent with this general population research in that the strong effect of SM on OTG

remains after controlling for several potential confounding variables. The results of my chosen model with respect to OHP, however, contribute to an underdeveloped literature which suggests that, when compared to the general population and after controlling for key demographic variables, children in OHP do not experience educational outcomes differently than other children. In the current study, the significant interaction effect between OHP and SM actually appears to protect children from the effects of SM.

The multivariate nature of an interaction effect makes interpretation difficult. Figure 3.3 attempts to demonstrate the effect graphically by displaying the probability "surface" of Model 5 as a function of both SM and OHP. Contours are added to the plot in order to display the decreasing probability of OTG. Similar to Figure 3.2, this plot shows that the probability of OTG drops off quickly as SM increases. However, children with increased contact with the child welfare system are protected (at least somewhat) from this overall trend. Rather than exacerbating the problem of SM as suggested by previous researchers (Smucker et al., 1996), OHP appears to protect children from the general effects of SM - at least in terms of the probability of OTG. This finding is, perhaps, not surprising. Washington has compulsory education until age 18 (RCW 28A.225.010). When children are placed in the custody of the state, case managers are obligated to make sure that children in OHP abide by this law. While any legal custodian would also be required to comply with this statute, the increased scrutiny on a child's life associated with an open OHP case will likely increase the probability of compliance with this law as compared to children in the general population.

In addition to the effects of placement, statistically significant effects were also observed for the pre-high-school count of OHP episodes for a child. In terms of practice implications, although additional research is needed, this effect suggests that efforts to focus on the developmental and educational needs of young children in OHP would be well-placed. This

finding is consistent with some prior research (Berger et al., 2015). However, more research is needed regarding the dynamics of these placement histories (e.g. types of placement, lengths of stay) before strong policy recommendations can be made with respect to this finding.

Also noteworthy is the direction of the free-and-reduced lunch variable in Model 5. While this parameter is the smallest significant main-effect in the model, it does suggest that participation in the free-and-reduced lunch program improves a child's probability of OTG. This finding is also consistent with some prior research (Berger et al., 2015) and should be explored in more detail.

Conclusions

The probability of OTG for all children is significantly decreased as the result of non-normative SM. Although increased OHP episodes appear to have a mild protective effect against the effects of SM, the effect is not nearly strong enough to mitigate the strong effects of SM. Thus, while children who experience non-normative SM in the context of OHP will have some protection from the effects of SM, SM should still be avoided whenever possible - both for children in OHP and children in the general population. It is also important to understand that high-school students who experience some time in OHP will not necessarily remain in OHP for their entire high-school career. In terms of patient advice and advocacy, the analyses reported here suggest that one of the most important ways that the effects of current and historical OHP episodes can be mitigated is to minimize SM both inside and outside of OHP. Thus, practitioners should take care to help patients with any OHP background (current or historical) and their parents or guardians to understand the importance of high school completion and ensure that proper referrals are made to community resources to maximize the probability of OTG.

Table 3.1.
Descriptive Statistics of Key Variables

variable	n	mean	sd	min	max
OHP episodes per year (ohppy)	304321	0.008	0.116	0	8
standardized grade 10 math score (mathscore)	237252	400.2	39.401	200	575
school mobility events per year (smpy)	304321	0.171	0.415	0	11
pre-highschool ohp episodes (priorohp)	304321	0.03	0.236	0	27
standardized grade 10 reading score (readscore)	201864	429.4	31.779	225	541
child speaks English as a second language (esl)	304321	0.12	--	0	1
sex (female)	304321	0.49	--	0	1
history of free/reduced lunch status (frl)	304321	0.349	--	0	1
regular high-school graduation (graduate)	304321	0.735	--	0	1
history of homelessness (homeless)	304321	0.033	--	0	1
child is not white (minority)	304321	0.309	--	0	1
history of special education services (specialed)	304321	0.124	--	0	1

Table 3.2.
Summary of Bivariate Models

	$\mathbf{B_{Model\ 2}}$	$\mathbf{SE_{Model\ 2}}$	$\mathbf{P_{Model\ 2}}$	$\mathbf{B_{Model\ 1}}$	$\mathbf{SE_{Model\ 1}}$	$\mathbf{P_{Model\ 1}}$
β_0	0.75	0.08	<0.01	0.74	0.08	<0.01
β_{smpy}			<0.01	-2.47	0.02	<0.01
β_{fcpy}	-0.41	0.01	<0.01			<0.01

Table 3.3
Summary of Multivariate Models

	$\mathbf{B_{Model\ 5}}$	$\mathbf{SE_{Model\ 5}}$	$\mathbf{P_{Model\ 5}}$	$\mathbf{B_{Model\ 4}}$	$\mathbf{SE_{Model\ 4}}$	$\mathbf{P_{Model\ 4}}$	$\mathbf{B_{Model\ 3}}$	$\mathbf{SE_{Model\ 3}}$	$\mathbf{P_{Model\ 3}}$
β_0	0.85	0.09	<0.01	0.74	0.08	<0.01	0.73	0.08	<0.01
β_{smpy}	-2.07	0.02	<0.01	-2.46	0.02	<0.01	-2.47	0.02	<0.01
β_{fcpy}	0.08	0.02	<0.01	0.05	0.02	<0.01	-0.06	0.02	<0.01
$\beta_{priorohp}$	-0.12	0.01	<0.01	-0.19	0.01	<0.01			<0.01
β_{female}	0.4	0.01	<0.01			<0.01			<0.01
β_{frl}	0.04	0.01	<0.01			<0.01			<0.01
$\beta_{minority}$	0.02	0.01	0.11			<0.01			<0.01
β_{esl}	-0.12	0.02	<0.01			<0.01			<0.01
$\beta_{classof}$	0.63	0.01	<0.01			<0.01			<0.01
$\beta_{homeless}$	-0.26	0.03	<0.01			<0.01			<0.01
$\beta_{specialed}$	0.13	0.03	<0.01			<0.01			<0.01
$\beta_{mathscore}$	1.1	0.03	<0.01			<0.01			<0.01
$\beta_{readscore}$	0.75	0.04	<0.01			<0.01			<0.01
$\beta_{ohppy.smpy}$	0.03	0.01	<0.01			<0.01			<0.01
$\mathbf{var}_{\hat{district}}$			1.959			1.733			1.731
BÎC		242620			270631			270978	
N		304321			304321			304321	

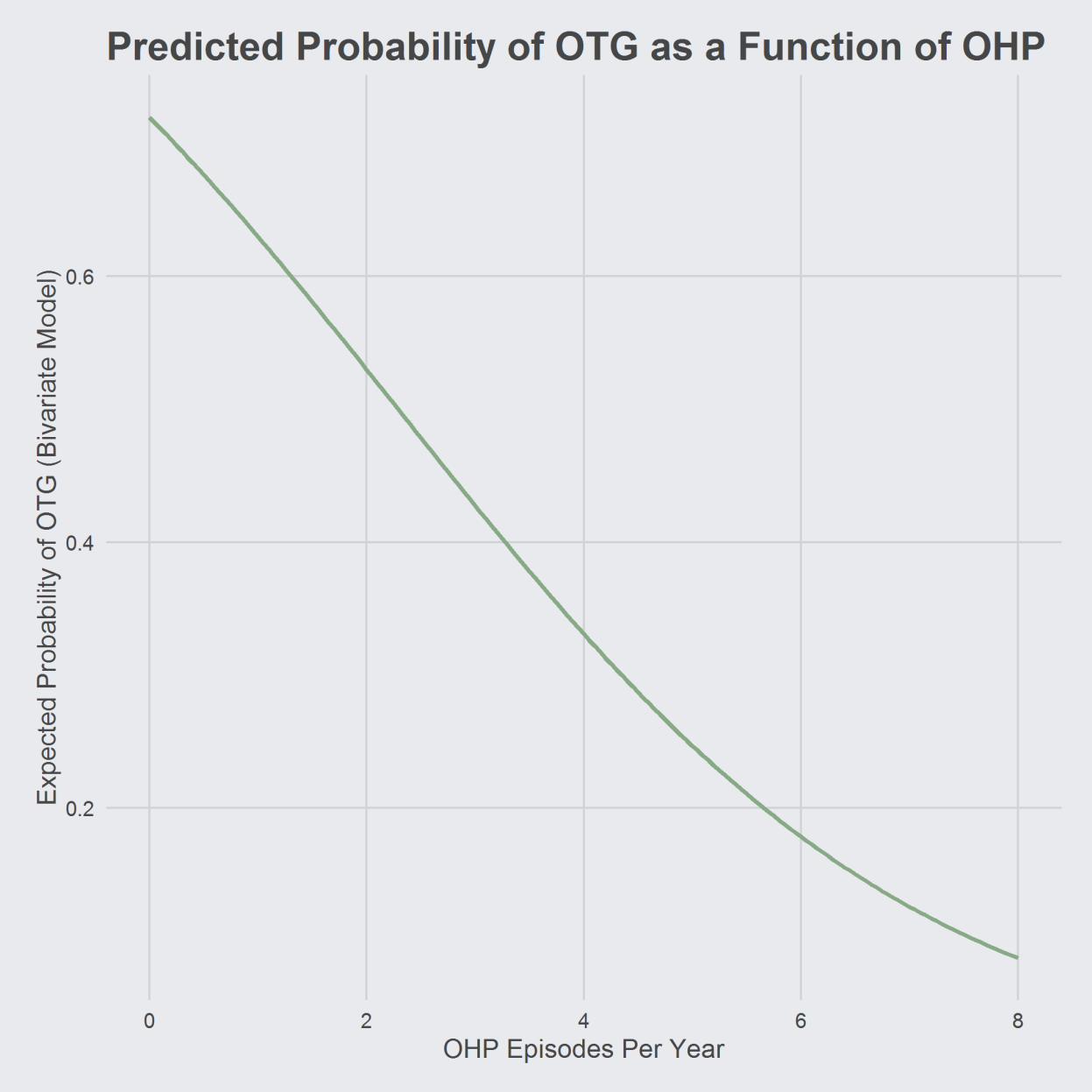

Figure 3.1: Predicted Probability of OTG by OHP. Chart was made using the ggplot2 and lme4 libraries for the statistical programming language, R. All other variables held constant at their mean values.

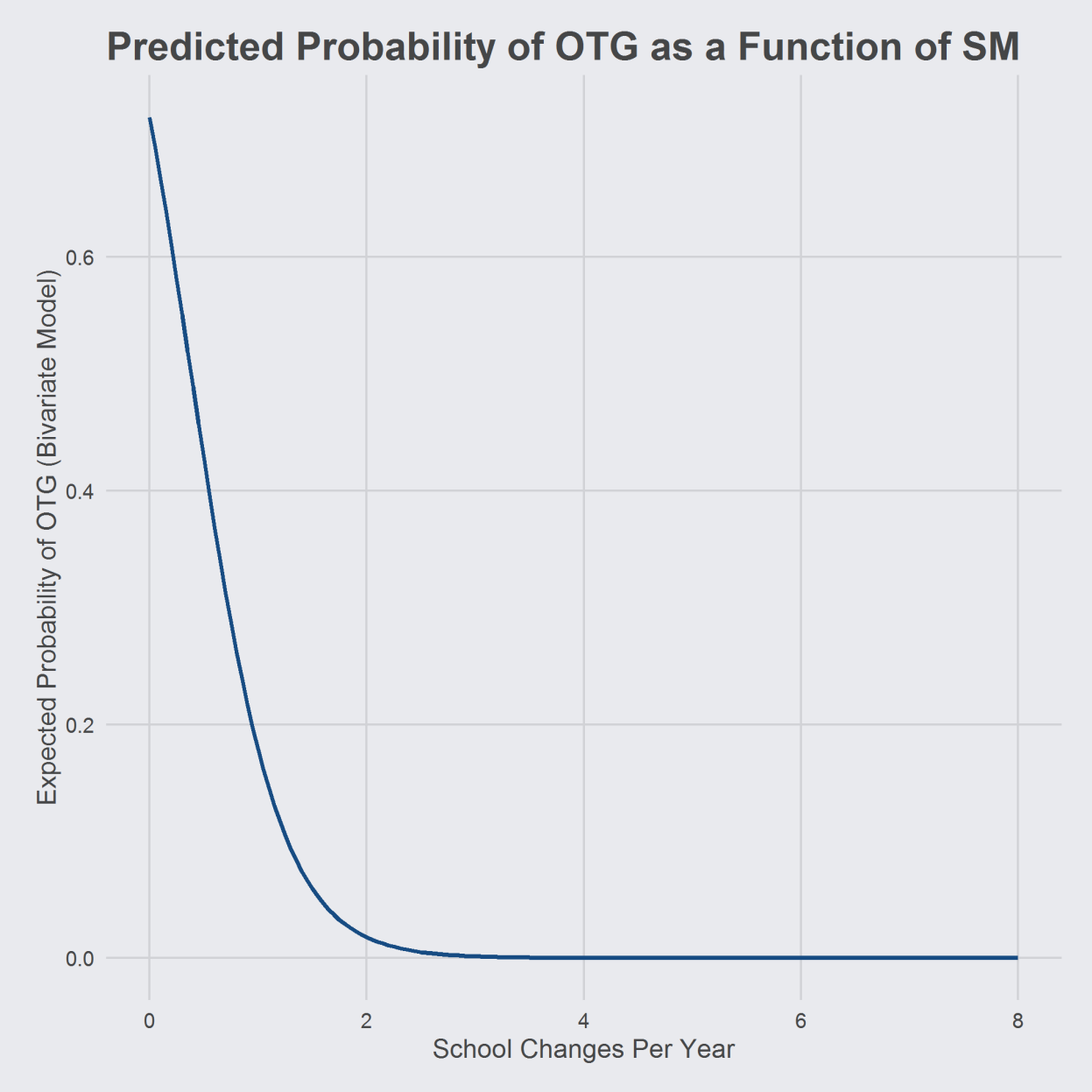

Figure 3.2: Predicted Probability of OTG by SM. Chart was made using the ggplot2 and lme4 libraries for the statistical programming language, R. All other variables held constant at their mean values.

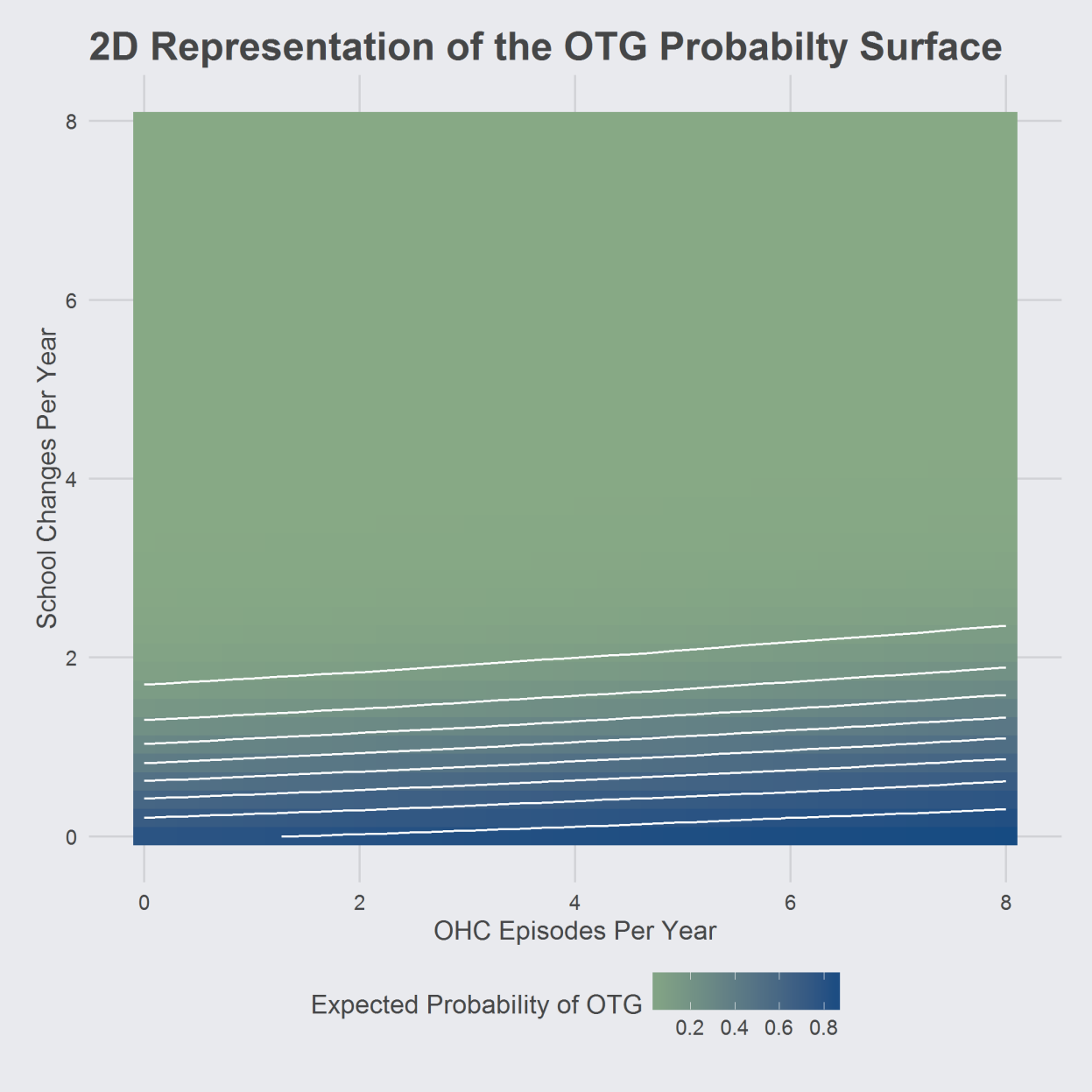

Figure 3.3: Tile plot displaying shading and contours of the Model 5 probability surface as a function of OHP and SM. Chart was made using the ggplot2 and lme4 libraries for the statistical programming language, R. All other variables held constant at their mean values.

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THE EFFECTS OF PLACEMENT DYNAMICS AND INDIVIDUAL FACTORS ON HIGH SCHOOL MOBILITY FOR STUDENTS IN OUT OF HOME PLACEMENTS

Current data from the federal government estimate that, as of September 30th, 2014, over 260,000 school-aged children were residing in out-of-home placement (OHP) (DHHS, 2015b). A growing body of research is developing which examines the educational outcomes of these children. Most recently, two population-based studies have found that, once controlling for key demographic variables, OHP does not appear to significantly impact educational outcomes (Berger, Cancian, Han, Noyes, & Rios-Salas, 2015). In some cases, OHP can even be seen to have a protective effect (Mienko, 2016a).

One of the variables under consideration in these studies is school mobility (SM) - changes in schools for reasons other than grade-promotion. Specifically, Mienko (2016a) found that the effects of SM on high-school graduation, while problematic for all students, were significantly moderated by OHP. This work built on a related population-based study (Mienko (2016b)) in which the author showed large differences in SM between students in OHP and students in the general population, while also demonstrating that SM can *per se* be mitigated by macro-level policy tools. Specifically, Mienko (2016b) showed that the passage of the Fostering Connections and Increasing Adoptions Act (FCIA) (PL 110-351), which expanded SM protections for students in OHP by requiring that local education agencies (LEAs) and child welfare agencies work together to ensure SM for students in OHP, appears to have had some success in reducing SM for high-school students in OHP.

In summary, the small existing literature concerning SM for students in OHP suggests 1. That children in OHP are at increased risk for SM (Mienko, 2016b), 2. That SM for students in OHP is susceptible to macro-level policy tools such as FCIA (Mienko, 2016b), and 3. That, in

terms of graduation outcomes, SM experienced in the context of OHP appears less problematic than SM experienced in the general population (Mienko, 2016a). It is important to note, however, that this last finding describes a moderation effect. In other words, while Mienko (2016a) has shown a protective effect of SM experienced in the context of OHP, this protection does not eliminate the negative effects of SM. Rather, the author showed a strong and negative association between SM and the probability of on-time graduation. This effect was observed independent of the protective effects of OHP.

Although assessing SM in the context of an appropriate reference population is important, the findings above point to a need to better understand how the specific characteristics of an OHP episode (placement setting, length of stay, etc.) may impact SM. From the perspective of a child welfare or school social worker, direct changes to such characteristics are much more within the scope of social work practice than the implementation of federal policy such as FCIA.

The current study examines the impact of OHP episode characteristics on SM while controlling for key demographic features of a given student. The article proceeds as follows. In the next section the article briefly reviews literature relevant to SM in OHP. The article then describes the methodology used in this analysis and the specific data from Washington State which were used. The manuscript concludes with a review of analysis results and a discussion of practice and policy implications.

Background

Residential Changes and SM

Perhaps the most obvious precursor to SM for students in OHP and students in the general population is residential mobility. Unless they remain in the catchment area of their prior school district, when US students make a residential change, they will typically be making a

school change as well. While the expansion of recent policy developments such as scholarship tax credits and other school choice programs may ultimately serve to limit SM subsequent to a residential change, such programs did not exist in Washington during the period in which data were collected for this study. This study thus proceeds from the assumption that residential changes are one of the strongest drivers of SM. This assumption is consistent with previous research on SM identifying residential factors in over half of school transitions for reasons other than grade promotion (Kerbow, Azcoitia, & Buell, 2003).

Students in OHP have, by definition, been removed from one home and placed in another. Thus, for students in OHP, an initial risk of SM seems likely. In addition to their initial transition to OHP, however, students in OHP are also likely to experience moves *within* a given OHP episode. Recent national estimates for the US suggest that children experience placement moves at a rate of 4.12 moves per 1,000 care days (DHHS, 2015a). Taken in conjunction with US Census data regarding residential mobility in the general population, these numbers suggest that students in OHP experience residential mobility as much as 7 times as households in the general population (Mateyka, 2015). While overall residential mobility would be an important factor to consider in the analysis of SM in any population, the relatively high mobility for students placed in OHP suggests that overall residential mobility (e.g. the overall count of placement settings) is a key characteristic to consider in the current analysis.

Characteristics of Residential Changes in OHP

In addition to overall measures of residential mobility, existing literature suggests that a child's placement *type* is also an important consideration. While the field currently lacks literature specifically examining the relationship between residential mobility and SM for students in OHP, there is a related literature examining OHP residential mobility and various measures of child and family wellbeing (Barth & Jonson-Reid, 2000; Rubin, O'Reilly, Luan, &

Localio, 2007). In general, this existing research indicates an independent effect of restrictive care settings (e.g. group care settings) on measures of wellbeing with more restrictive care settings tending to be associated with lower levels of wellbeing. These effects persist after controlling for overall measures of residential mobility in OHP. Other more descriptive analyses of residential mobility in OHP find qualitative differences in placement trajectories as a function of the type of placement setting thus reinforcing the need to consider the type of placement as much as raw measures of mobility (Webster, Barth, & Needell, 2000; Wulczyn, Kogan, & Harden, 2003).

Qualitative differences between school districts may also be relevant to the current analysis. Such differences could operate at the district level through variation in policies concerning foster child mobility. To the extent that individual characteristics also impact SM (see the following section), these differences could also operate at the child level through variation in the behavioral milieu of the child. This latter line of reasoning is consistent with literature finding an independent effect of school-level SES on academic outcomes (Caldas & Bankston, 1997; Harris, 1995).

Characteristics of Students in OHP

As noted by Zima et al. (2000) and other researchers, controlling for demographic variables is important in any analysis of residential mobility in OHP. The importance of demographic factors was also noted by Rock, Michelson, Thomson, & Day (2013) after the results of a systematic review of available placement dynamic literature at that time. Rock notes specifically that age appears to be the most important demographic to consider. While other demographic factors are often examined, the age of the child appears most consistently in the literature, and with the most reliable effects of any demographic factor. Since individual characteristics may also impact SM (e.g. due to behavioral problems), such characteristics are

also important to consider in the current analysis. In addition to covariates commonly used in child welfare literature such as age, race, sex, and reason for removal, the use of integrated data described below allows for the inclusion of less common covariates including the special education status of the child and the child's language preference.

The Current Analysis

The current study sought to estimate the hazard of SM for students in OHP and examine how this rate differed as a function of placement characteristics and individual characteristics. Specifically, this analysis was designed to answer the following research questions: 1. What types of placement characteristics impact the hazard of SM for students at different states in their OHP episode?, and 2. What individual characteristics impact the hazard of SM for students in an OHP episode? In order to answer these questions, this study made use of integrated data from the Office of the Superintendent of Public Instruction (OSPI) and OHP episode records from the Children's Administration (CA) in Washington State. This study employed a conditional proportional hazards modeling approach to examine the above research questions.

Data

The data for this analysis was extracted from records held by the Washington State OSPI and probabilistically linked to OHP records from CA. This analysis focused on students in the high-school graduating classes of 2008 through 2011 who were also in OHP. The graduating classes were defined on the basis of the adjusted cohort graduation rate (ACGR) methodology, which has been identified as the preferred approach to high-school cohort definitions (Seastrom, Hoffman, Chapman, & Stillwell, 2006). Although this study is not specifically focused on graduation outcomes, the ACGR is utilized here to facilitate comparison with papers from a larger research program using the same data. This study makes use of a subset of the cohort

utilized by Mienko (2016b). Specifically, the study selects any child with an OHP episode beginning after the child's entry into the ACGR cohort.

Methodology

Hazard of an SM Event (Dependent Variable)

The relationship between SM and the predictors of interest in the model was characterized by fitting proportional hazards models as implemented in the `coxph` package within the statistical programming language, R (Therneau & Grambsch, 2000). Specifically, a semi-parametric Cox proportional hazards model was utilized in which an individual's covariates changed over time (i.e. time-varying covariates) to assess whether previous exposure events (e.g. changes in OHP setting) changed a student's risk of experiencing an SM event. These models estimate the effects of covariates on risk of an SM event by comparing values of variables associated with individuals who experienced an SM event with other individuals with the same associated variables. In order to assess the risk of all SM events for an individual, a stratified Cox model was chosen in which each SM event observation period (i) was fit as a separate strata (k). Thus, the goal of this analysis is to predict (for each level of k) a hazard (λ_k) as a function of time (t). The predicted hazard function ($\lambda_k(t)$) is assumed to be proportional to a baseline hazard (λ_{k0}) which is left unspecified. Correlation between repeated measures of individual students was modeled by additionally fitting a clustered error term in the model (Hanley, Negassa, Forrester, & others, 2003). This approach is an approximation of a conditional frailty model which is well-described by Box-Steffensmeier & De Boef (2006).

The saturated model is specified as

$$\lambda_k(t) = \lambda_{k0}(t)\exp(\theta \cdot x_i)$$

where

$$\theta \cdot x_i = \beta^0 + \beta^{\text{setting}} \cdot \text{setting}_{it} + \beta^{\text{direction}} \cdot \text{direction}_i +$$
$$+\beta^{\text{count}} \cdot \text{count}_{it} + \beta^{\text{female}} \cdot \text{female}_i +$$
$$+\beta^{\text{minority}} \cdot \text{minority}_i + \beta^{\text{age}} \cdot \text{age}_i +$$
$$+\beta^{\text{esl}} \cdot \text{esl}_i + \beta^{\text{migrant}} \cdot \text{migrant}_i +$$
$$+\beta^{\text{homeless}} \cdot \text{homeless}_i + \beta^{\text{class}} \cdot \text{class}_i +$$
$$+\beta^{\text{rmvlrsn}} \cdot \text{rmvlrsn}_i + \beta^{\text{sped}} \cdot \text{sped}_i + \beta^{\text{grade}} \cdot \text{grade}_i.$$

Placement Characteristic Measures (Independent Variables)

Placement setting (setting) is included in this model as a categorical measure which contains information on the type of placement setting in which a student is located at a particular time. As this variable is time-varying, it is indicated above with the subscript it indicating it is the placement setting(s) for a particular SM risk period, i. Some students in the sample exited OHP while still enrolled in high school. During such periods, setting was coded as the type of OHP exit that a child experienced as a result of the OHP episode. If the student re-entered care, the new placement setting was updated with the new placement setting for the new OHP episode. Possible values for setting included ohp setting $-$ foster, ohp setting $-$ group, ohp setting $-$ relative, ohp setting $-$ other/absent from care (typically students who are "on-the-run"), in $-$ home dependency/reunification, guardianship, emancipation, and other exit from care (typically students who are transferred to another state, another jurisdiction, or another legal authority). These placement types were dummy-coded with ohp setting $-$ foster serving as the reference category. It should also be noted that adoption was a permanency outcome for 9 students in this analysis. None of these students experienced an SM event when setting $=$ adoption. In order to simplify estimation of the proposed statistical model in the context of this rare event, these students were excluded from the analysis.

The district level change in percentile ranking for average graduation rates during the observation period was also included as a placement characteristic variable (direction). The change was calculated by subtracting the district graduation rate percentile ranking for a student's

district at the start of high-school from the district percentile ranking at the end of high-school. A value of 0 indicated no change in district rank (or district). A negative value indicated a decrease in ranking. A positive value indicates an increase in ranking. This variable is included as a rough measure of direction and magnitude of change in SES for the child resulting from SM. A simple count of distinct placement settings was also included as a time-varying measure of placement characteristics count. To be clear, the count variable covers periods both in OHP and outside of OHP. This means it should not be compared with other measures of placement mobility within the child welfare literature.

Individual Characteristic Measures (Independent Variables)

As can be seen above, the model included several potential covariates as informed by the review of literature above. Specifically, fixed effect dummy variables of sex (female), minority status (minority), ESL status (esl), history of homelessness (homeless), special education status (sped), removal due to child behavioral problems (rmvlrsn), and migrant status (migrant) were included in the saturated model. Continuous individual characteristic measures also included the mean centered graduation year for the student (as calculated by the ACGR) (class), the age of the child at the start of their first high-school OHP episode (age), and the grade of the child at the start of their first OHP episode (grade).

Covariate Selection Approach

An approximation of the saturated model, as specified above, can be estimated using a stratified gap-time approach (Prentice, Williams, & Peterson, 1981) with "working variance" style standard errors (Hanley et al., 2003). In order to choose covariates from the saturated model as specified, the gap-time approximation was used to subject the covariates to Bayesian Model Averaging (BMA). The details of BMA are beyond the scope of this paper. The reader, however, is directed to Hoeting, Madigan, Raftery, & Volinsky (1999) for a discussion of the overall

approach. Briefly, BMA is a process through which a researcher identifies a set of potential covariates and a candidate statistical model (e.g. a Cox model such as the gap-time model). The analyst then estimates the statistical model for every possible combination of models. Each model receives a weighting based on the posterior probability of the model beginning with a prior probability which represents the researcher's beliefs prior to conducting the analysis. For the current problem, analysis began with a uniform prior in which no substantive *a priori* assumptions were made about the models. The BMA was implemented via the `BMA` package in R (Raftery, Hoeting, Volinsky, Painter, & Yeung, 2009).

Model Simulation Approach

In order to better understand the results of the chosen statistical model regarding placement settings and SM event strata, simulation analyses were conducted followed by a visual examination of the results. The simulation followed the framework outlined by King, Tomz, & Wittenberg (2000) as implemented in the `simPH` package in R (Gandrud, 2015). First difference simulations were specifically conducted using a variation of the Licht (2011) approach to post-estimation simulation of time-varying covariates. Predicted median survival times for each SM strata were conducted separately from the King et al. (2000) framework utilizing the predicted values and confidence intervals from the `survfitcoxph.fit()` function within the `coxph` package cited above.

Results

Descriptive Analysis

The selection technique and restrictions outlined aboveresulted in a sample of 1,395 students. Table 4.1 and Figure 4.1 both display descriptive results of the data used in this study. Figure 4.1 shows the distribution of raw counts of SM events in the study. As can be seen, the

counts are highly variable with a mean of 2.584 events and a standard deviation of 2.513. While there are some students who experience very high levels of SM, most students experience 2 or fewer placements (median of 2 and 25th percentile of 1). It is also noteworthy that the placement count value (count) is higher than the total count of SM events (mean placement count of 3.827 vs. mean SM event count of 2.901).

The most common placement setting during the observation period was foster care (68.5% of students had at least one stay in foster care during the observation period). Foster care was followed by in-home dependency/reunification (52.1%), relative care (35.1%), group care (29.0%), and emancipation (22.2%). Remaining placement settings were experienced (at least once during the observation period) by 10% or fewer of students during the observation period. The mean change in the district-level graduation rate for a given student was -0.037. Although this number is variable (standard deviation of 0.249), most students (55.2 percent) did not experience any change in district.

Based on recent census estimates which place the US white population at 77%, minority students are over-represented in the sample (41.8%) (Colby & Ortman, 2015). Females, who should occupy approximately half of the population, are also over-represented (59.1%). Approximately 33.1% of students have history of receiving special education services compared to approximately 13% in the general population (Snyder & Dillow, 2012). Students were placed due to their own behavioral problems in approximately 38.9% of the observations in this study. This percentage is below the findings of similar unpublished analyses which indicate that about half of all removals for children over the age of 11 involve some child behavioral issue (Bell-Associates, 2004). The descriptive data also indicate that students enter OHP relatively early in high school (mean grade of 9.983). However, the mean age at the same time is 15.53 (the typical

age of a 10th grade student) suggesting that students in this sample are somewhat old for their grade.

Inferential Analysis

Figure 4.1 presents the results of the statistical model chosen. As can be seen, the results of the BMA analysis recommended the exclusion of the placement count variable (count), the minority status variable (minority), the ESL status variable (esl), the migrant status variables (migrant), and the homelessness history variable (homeless). This model was the most preferred of the BMA analysis and had a posterior probability that was 10.8% higher than the next most probable model.

As can be seen in Figure 4.1, aside from some levels of placement setting variable, the age at placement variable (age) is the only variable which does not achieve statistical significant at $p < .05$. The strongest effect-size was observed for students in the "other/absent from care" status. Relative to students in a foster care placement, students who were in the custody of the state but absent from OHP for some reason had a 39.3% increase in the risk of experiencing an SM event (HR = 1.393 ($p = 0.038$)). The second-strongest effect was observed for student-based removal reasons (HR = 1.313 ($p < 0.001$)), followed by the effect for students who were placed in some sort of group setting. Relative to children in foster care, students in a group setting had a 29% higher risk of experiencing an SM event than students in regular foster care (HR = 1.29 ($p = 0.001$)). In terms of decreased risk, students who moved to a higher-performing district were at significantly decreased risk of experiencing a subsequent SM event (HR = 0.766 ($p = 0.001$)). Female students (HR = 0.788 ($p < 0.001$)) and students who entered into OHP at later grades (HR = 0.793 ($p < 0.001$)) were also at significantly decreased risk of SM events.

Figure 4.3 displays the results of the simulation analysis in order to better understand the variability in findings surrounding placement settings. The main point of the simulation and the

presentation in the figure is to provide a more nuanced display of the variation in findings regarding placement settings than what is possible using p-value thresholds alone. The results here show us, for example, that although "other/absent from care" and "group" settings have similar point-estimates, the change in risk resulting from being absent from care varies from almost 0% to almost 100% with the mass of the simulations spread somewhat evenly, while the change in risk from placement in group settings varies from 0% to 50% with the mass centered around the original point estimate. Similarly, although exits to emancipation do not result in a significant effect at $p < 0.05$, the vast majority of simulation results show that emancipation does increase risk of SM.

Figure 4.4 shows the variation in the predicted timing of various SM events. Although one might expect higher-order SM events to take longer to achieve, the results of the chosen statistical model suggest that the opposite is true and that higher-order events tend to occur earlier in the observation period. This suggests that children who experience high levels of SM events experience *all* of their movement earlier in a case than children who *only* experience lower levels of SM.

Discussion

The findings presented above have clear implications for how social workers and educators can work to try and avoid SM events for students in OHP. Although the findings indicate that there are several individual factors influencing SM which may be outside the scope of practice for a social worker or practitioner, the findings regarding placement settings are important and directly relevant to practice. While it may be unrealistic to expect practitioners to support placement decisions based solely on the risk of SM (risk of SM is one of several factors that a practitioner must weigh in making decisions regarding a student's placement setting

including immediate threats to a child's safety) the results here provide information on how educators and social workers can work to improve the residential experience of students in order to minimize disruption.

Perhaps the most significant finding regarding placement characteristics is that the BMA excluded the overall count of placements in favor of other variables in the model. While the full results of the BMA are not included in this paper, the variable was not only excluded from the chosen model, but all of the five most probable models in the analysis. Taken in conjunction with the fact that the placement setting variable was chosen in all of these models, the results of the BMA indicate that the available data are more closely aligned with a model based on qualitative differences between placement settings than the mere quantity of placement settings.

The specific findings regarding different types of placements are also important for the consideration of practitioners. The fact that children who were absent from care (typically children who are on-the-run) are at higher risk of SM than children in any other placement setting will not be surprising to most practitioners. Nonetheless, this finding reinforces the need for practitioners to carefully choose placements for children which minimize the risk of children "running" from the placement. While existing literature is not informative as to how placements should be chosen in order to minimizing the risk of a child running from the placement, recent efforts discussed by Moore, McDonald, & Cronbaugh-Auld (2016) which utilize predictive modeling and risk assessment to improve *overall* placement stability may be worth considering in efforts to reduce runs from care *per se*.

A less technical solution to mitigating risk of children going on the run while simultaneously decreasing risk of SM may be biasing placement decisions in favor of relative placements. Existing literature already establishes a strong relationship between placement with relatives and overall OHP stability, with increased stability observed in relative placements

(Webster et al., 2000). The results of the current study show that relative placements also decrease a child's risk of SM. Indeed, this study shows how relative placements decrease a child's risk of SM *more than any other placement type*. Thus, this study adds to the (mixed) evidence base relating relative placement to desired child welfare system outcomes.

Another important finding of this study is the risk of SM in foster care relative to other placement settings. Although placement with a relative and permanent placement in a guardianship tended to decrease risk of SM, all other placement settings increased risk of SM relative to foster care. This includes placements in a child's own home or permanent reunification which tend to increase a student's risk of SM by 15% relative to regular foster care placements. Practitioners may take this finding to mean that placement in foster care, does not *per se* increase the risk of SM for a student. Overall, these findings suggest that family-style OHP settings, whether relative placements or regular foster care placements, tend to yield the lowest risk for SM. The finding regarding increased risk of SM for children who are reunified or placed in their own homes should be a call to child welfare practitioners and educators to ensure that reunifying families have all of the support they need to maintain a stable residence after formal involvement with the child welfare system.

The finding of the change in graduation rate ranking is also noteworthy, but difficult to interpret without further analysis. To the extent that higher graduation rates are associated with district resources, this finding may suggest that better-resourced districts are more effectively able to maintain children in OHP in a district once they arrive there. It is also possible that individual characteristics of children which also drive risk of SM (e.g. discipline problems) are mitigated when children are transferred from a low-performing school to a high-performing school which could also lower the risk of future SM. This line of thinking would be consistent

with educational performance theory forwarded by Harris (1995) and Caldas & Bankston (1997). Further examination of these possibilities is an important area for future research.

As much as it is important to consider how practitioners should intervene, it is also important to consider when to intervene. The findings outlined in Figure 4.4 suggest that the simple answer to this question is "early". This is particularly true for practitioners wishing to prevent some of the extremely high rates of placement observed at the edge of the SM distribution in Figure 4.1. For example, while most students who experience an SM event don't do so until they have been in care for over 500 days since placement in OHP, the students who experience 5 SM events experience all of their events by 350 days. A case review of students at these extremes suggests that many of these children are "dual-system" youth who are simultaneously involved with the juvenile justice system *and* the child welfare system. From a practice perspective, it is important to note that extreme SM events for incarcerated youth may be difficult to avoid. From a policy perspective, however, there may be an opportunity for the educational, child welfare, and juvenile justice systems to work together to normalize the educational experiences of dual-system students and reduce some of the high rates SM observed here.

While policy changes may be required to address some of the risk factors identified in this study, the results discussed above suggest that practice decisions can have a significant impact on student risk of SM. These results, however, should be interpreted with some important caveats. Most obviously, the results of this study are limited to high-school students in OHP. Furthermore, these results may not generalize beyond Washington State. While more work is needed to replicate these findings and understand the underlying mechanism of the relationships observed in this study, the results do provide some clear ways in which child welfare professionals and educators can work together to help improve the stability of students in OHP.

Table 4.1
Descriptive Statistics of Key Variables

	n	mean	sd	min	max
count of EM events (EM)	1395	2.584	2.513	0	18
reference setting: foster	1395	0.685	0.465	0	1
non-ohp setting: in-home dependency/reunification	1395	0.521	0.5	0	1
non-ohp setting: guardianship	1395	0.047	0.212	0	1
non-ohp setting: emancipation	1395	0.222	0.415	0	1
ohp setting: group	1395	0.29	0.454	0	1
ohp setting: relative	1395	0.351	0.478	0	1
ohp setting: other/absent from care	1395	0.057	0.233	0	1
non-ohp setting: other exit from care	1395	0.105	0.307	0	1
ses direction of move (direction)	1395	-0.037	0.249	-0.922	0.864
count of placements (count)	1395	3.827	3.066	1	31
sex of student (female)	1395	0.591	0.492	0	1
student minority status (minority)	1395	0.418	0.493	0	1
student esl status (esl)	1395	0.061	0.239	0	1
any history of homelessness (homeless)	1395	0.336	0.473	0	1
any history of special education (sped)	1395	0.331	0.471	0	1
student behavior as removal reason (rmvlrsn)	1395	0.389	0.488	0	1
student migrant status (migrant)	1395	0.016	0.125	0	1
student graduating class (class)	1395	2010	1.092	2008	2011
student age at OHP start (age)	1395	15.53	1.069	11	17
student acgr cohort entry grade (grade)	1395	9.983	0.957	9	12

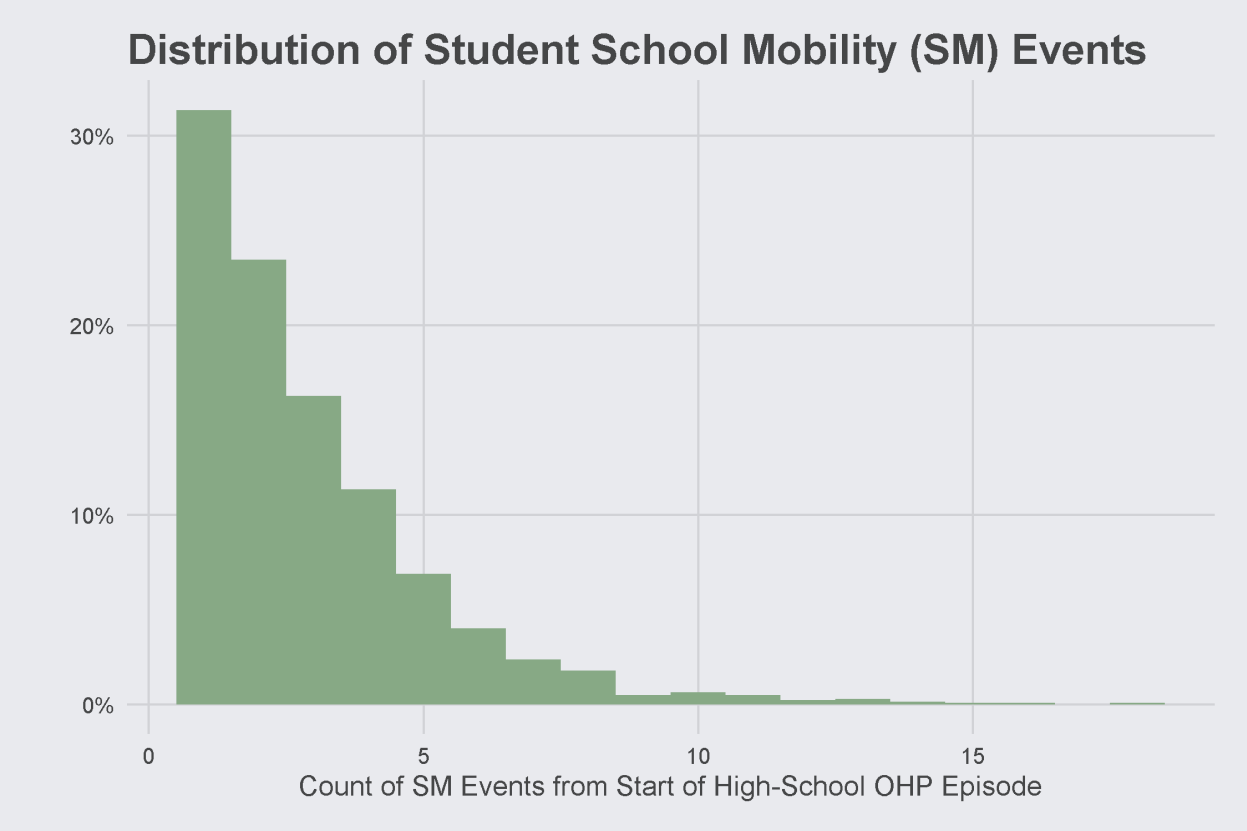

Figure 4.1: Percent distribution of total SM events for students with at least 1 SM event. As can be seen, the data are positively skewed. Although several children experience extremely high numbers of SM events (maximum of 18), most students experience 2 or fewer placements (median of 2 and 25th percentile of 1). Chart was made using the `ggplot2` library for the statistical programming language, R.

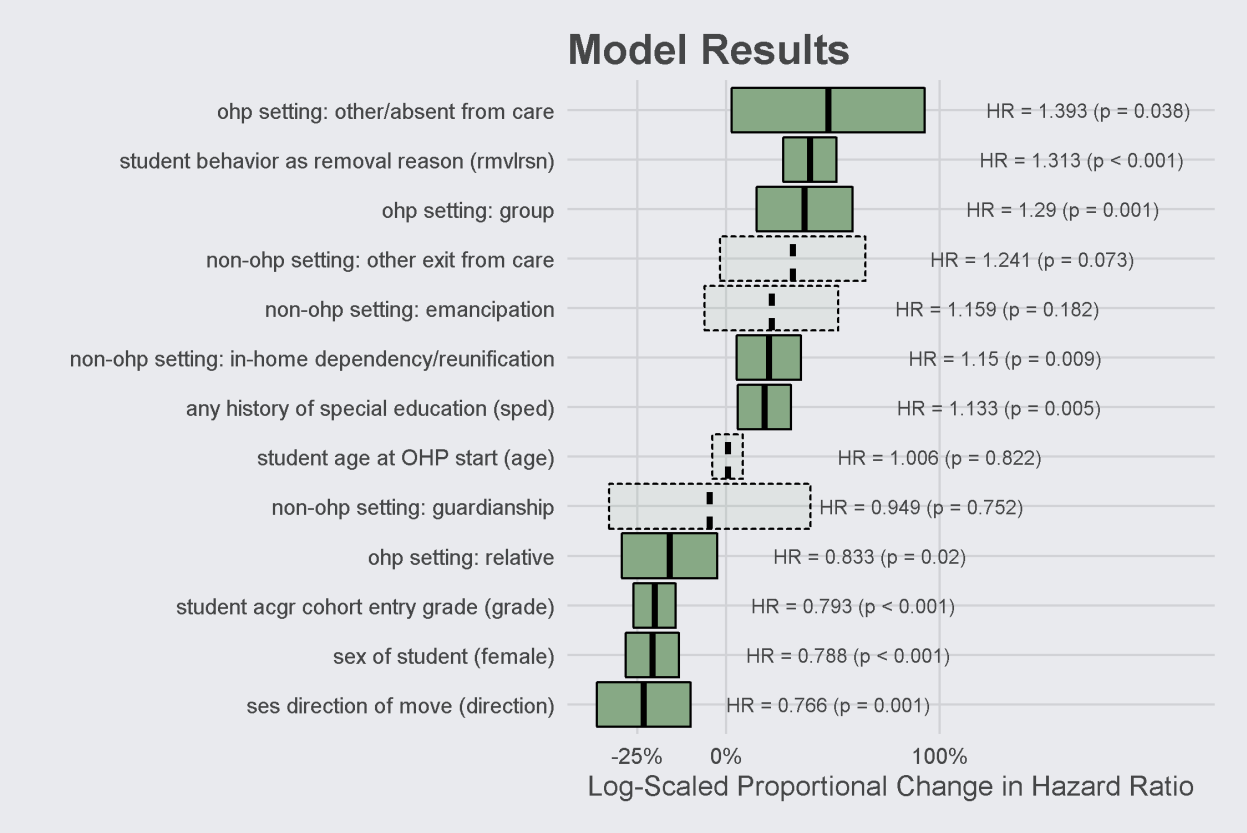

Figure 4.2: Crossbar plots of parameter estimates from the conditional proportional hazard model which was selected based on BMA. The edges of the crossbars show the upper and lower limits of a 95% confidence interval for each exponentiated parameter in the model. Numeric estimates of exponentiated parameters are all displayed next to the crossbars along with p-values. Crossbars for parameters with p-values of less than 0.05 are displayed with a transparent fill and a dashed line. All levels of the setting variable are estimated in reference to foster care. Chart was made using the `ggplot2` library for the statistical programming language, R.

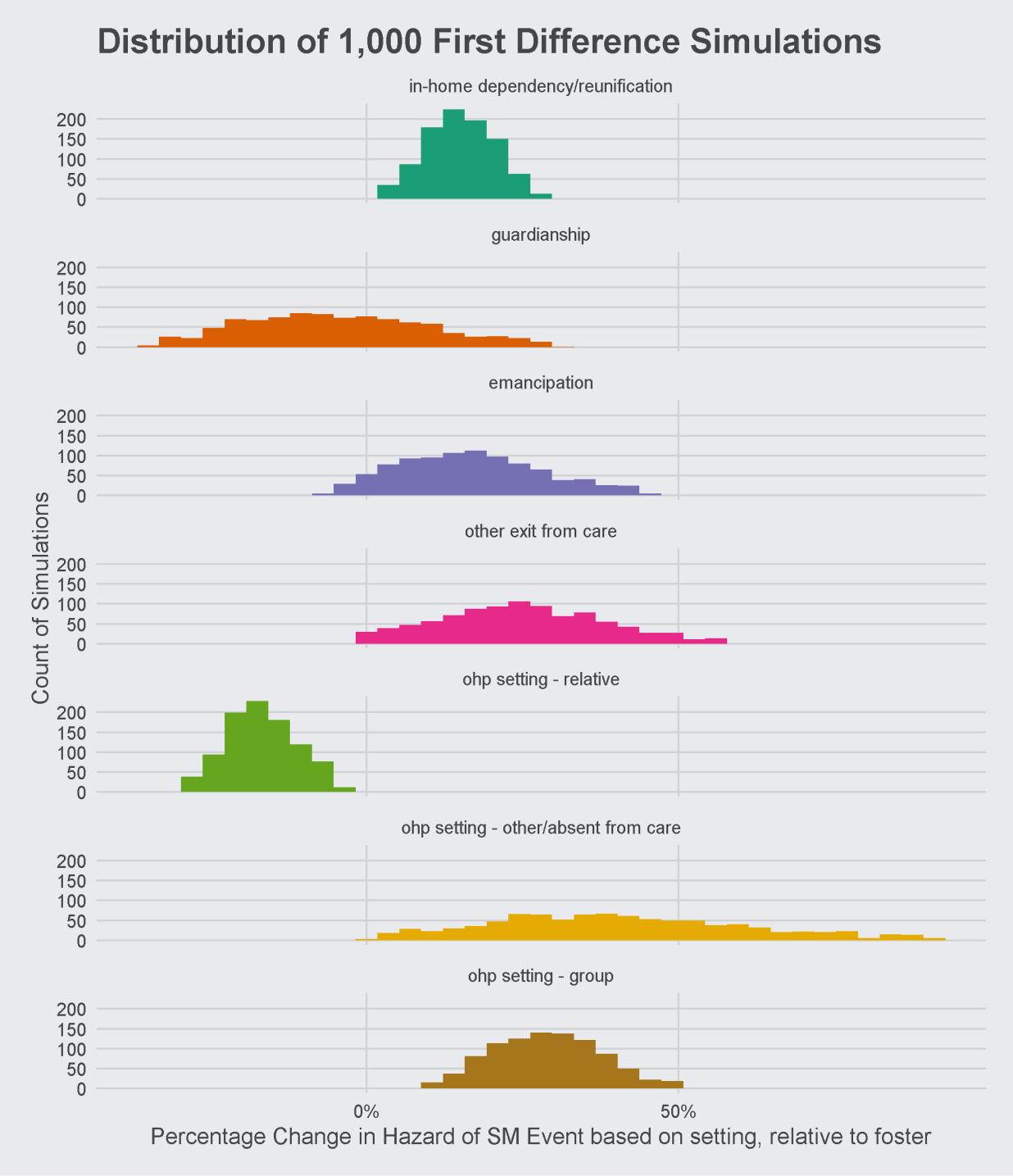

Figure 4.3: Distribution of placement setting simulations based on the chosen statistical model (see Figure 4.1). This graph is designed to help the reader interpret the variability in parameter estimates. Chart was made using the `ggplot2` library in R.

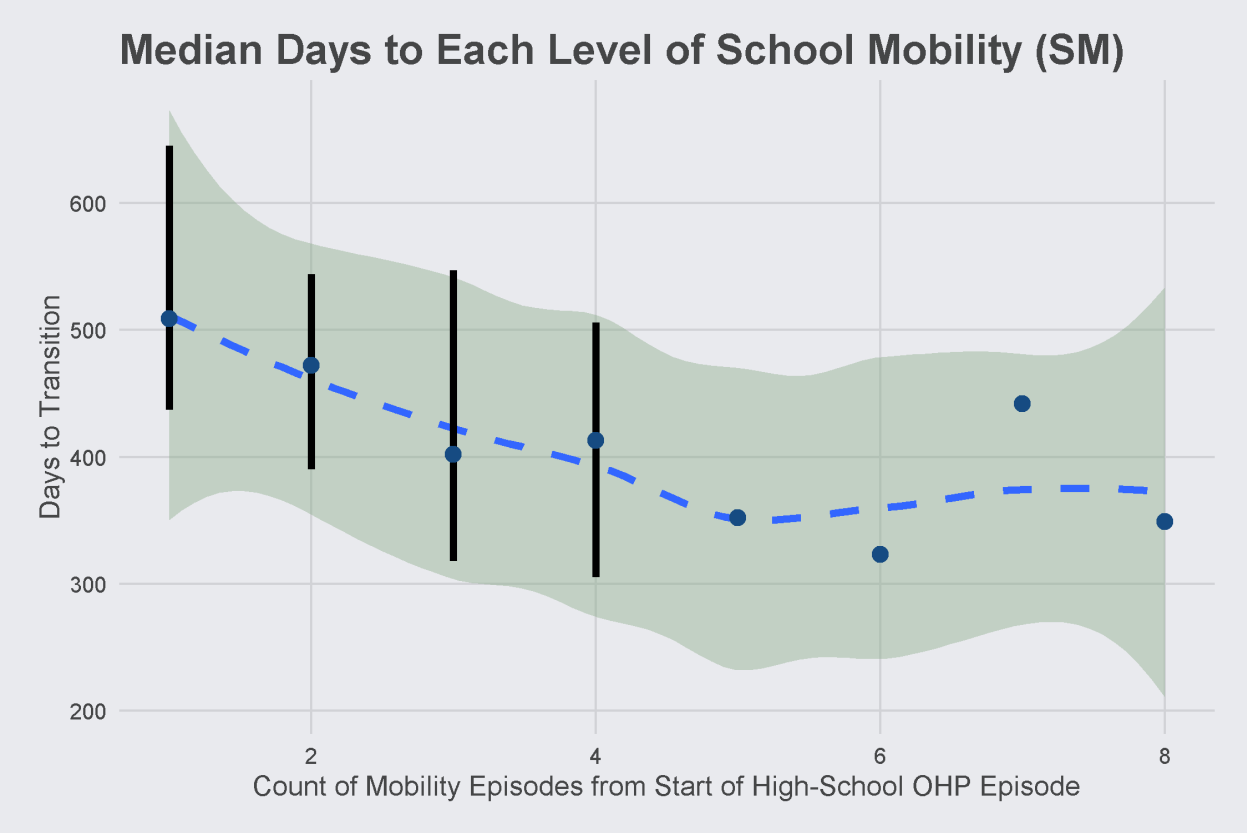

Figure 4.4: Predicted median days to each SM event. The black bars display the 95% confidence interval for each estimated median. Due to the rarity of SM events greater than 4, there is not enough data to calculate upper confidence limits. As such, the graph also displays a loess smooth (dashed blue line) along with a 95% confidence band around the loess estimates. This graph shows a downward trend in predicted days as a function of the level of the SM event. This suggests that children who experience high levels of SM events experience all of their movement earlier in a case than children who only experience lower levels of SM. Chart was made using the `ggplot2` library with predictions made from the `coxph` library in the statistical programming language, R.

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CONCLUSION

This dissertation was conducted in an effort to better understand the phenomenon of school mobility (SM) in the US. While the focus in the preceding analysis was high-school students in out-of-home placement (OHP), the analyses also contributed foundational information concerning the incidence of SM in the general population.

The preceding studies had three overarching goals: 1. To better understand the difference between the rate of SM events for students in OHP as compared to students in the general population, 2. To understand the role that SM events play in determining educational outcomes for students in OHP, and 3. To understand what can be done to impact rate of SM for children in OHP.

Differences in the Rate of SM - Students in OHP and students in the general population.

As shown in Chapter 2, the rate of SM for students in OHP is significantly higher than that of students in the general population. For every student enrollment year, students in the general population tend to experience SM events at a rate of 80 to 180 events per 1,000 SEYs. For SEYs which coincided with an OHP episode, the predicted number of events is between 446 to 1,004 events per 1,000 SEYs. While other factors also increased the likelihood of an SM event (e.g. homelessness), a coincident placement in OHP had a larger effect size than any other factor included in the chosen statistical model.

Differences in the Rate of On-Time Graduation - The Independent and Interacting roles of SM Events and OHP Events.

Although Chapter 2 helped answer questions related to the role that OHP episodes play in increasing the risk of SM, the analysis presented there did not provide the reader with any information as to *why* SM events should be a concern. Chapter 3 addresses this question by taking a population-based approach to examining the role of SM events in decreasing a student's probability of on-time-graduation (OTG) from high-school. The results from the analysis in Chapter 3 indicate that both OHP episodes *and* SM events decrease the probability that a child will experience OTG. However, the results of the chosen statistical model for the Chapter 3 study indicate a small, but significant protective effect of experiencing the SM event in OHP. While SM events always have a deleterious effect on the probability of OTG, if a student experiences the event in OHP, the effect appears to be moderated.

Reducing the Risk of SM for Students in OHP

Part of the analysis presented in Chapter 1 and all of the analysis from Chapter 4 attempted to provide readers with plausible recommendations about what can be done to reduce the risk of SM events for students in OHP. In Chapter 1, study data spanned the passage of the Fostering Connections and Increasing Adoptions Act (FCIA) (PL 110-351) which was partially focused on promoting SM for children in OHP. This position of FCIA relative to the time-frame of the data allowed for a quasi-experimental assessment of the FCIA in reducing SM for students in OHP. Although FCIA did not eliminate the difference in risk of SM for students in OHP compared with students in the general population, the results of the Chapter 1 analyses do indicate a significant decrease in the risk of SM for students who experienced an OHP episode after FCIA as compared with those who experienced an OHP episode prior to FCIA.

Chapter 4 attempted to identify more micro-level opportunities for reducing risk of SM. Specifically, Chapter 4 analyses focused on the impact of placement dynamics (e.g. number of placement settings, types of placements) on the risk of SM. One of the major findings of the Chapter 4 study is that *qualitative differences* between placement types appear to model risk of SM better than the *number of placement settings* experienced by a student in OHP. In terms of risk of SM, the study also identifies the types of placement settings exhibiting the lowest risk of SM. Most interestingly, "family-style" OHP settings (i.e. relative placements or regular foster care placements) were associated with a lower risk of SM than any other placement setting - including permanent reunification or in-home dependencies. The findings of this study also point to the need for intervention early in the life of a case - particularly for children at risk for very high levels of SM. Some of the largest risk factors for SM in this study appeared to be related to individual child behaviors (i.e. placement in care due to child issues, placement in group care, and "on-the-run" status).

Future Steps in Research

At their core, the preceding three analyses have yielded compelling findings and provide the field with some solid recommendations for the continued reduction of SM for children in OHP. Nonetheless, this dissertation does little to help scholars understand the underlying mechanisms which cause SM for students in OHP or the effects of SM on educational outcomes. While Chapter 4 begins to examine such mechanisms, the variables used in all of the preceding models are largely treated as "black boxes". This is the nature of demographic science involving administrative data. While these data have value for beginning conversations regarding social problems, efforts should always be made to follow these conversations with original data collection to assist the field in understanding *why* certain factors impact risk more than others.

Future Steps in Intervention

In spite of the need for further research on this issue, the combined results of Chapters 2 and 4 would provide policy makers with a strong rationale for expanding the existing provisions of FCIA regarding SM. The results of Chapter 2 indicate strong support for the success of the existing policy and the results of Chapter 4 (noting the higher risk of SM for reunified students relative to students in regular foster homes) suggest that students could benefit from such provisions beyond their OHP episodes. Taken as a whole, these studies would seem to provide strong support for a policy which expanded the SM provisions of FCIA to students throughout an OHP episode. The results of Chapter 4 would provide support to continuing provisions beyond the OHP episode.

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Publications

Kruzich, J.M., **Mienko, J.A.**, & Courtney, M.E. (2014). Individual and work group influences on turnover intention among public child welfare workers: The effects of work group psychological safety, Children and Youth Services Review, *42*, 20-27.

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Conference Presentations and Workshops

Mienko, J.A. (2016, January). School district foster home supply and foster child school mobility: An analysis of a potential macro-level policy tool. To be presented at the Society for Social Work and Research conference, Washington, D.C.

Mienko, J.A. & Kruzich, J. (2016, January). The role of organizational and work group characteristics on child welfare workers' turnover intentions. To be presented at the Society for Social Work and Research conference, Washington, D.C.

Mienko, J.A. & Piel, M.H. (2016, January). Homelessness in early adulthood for former foster youth: An examination of wave I follow-up data from the national youth in transition database (NYTD). To be presented at the Society for Social Work and Research conference, Washington, D.C.

Hayes, M.J., **Mienko, J.A.**, Feely, M., Panlilio, C.C., & Miyamoto, S.W. (2015, January). The diffusion of federal social policy mandates: The case of CAPTA, *1974*. Presented at the Society for Social Work and Research conference, New Orleans, LA.

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Smith, R.J., **Mienko, J.A.**, & Rothwell, D. (2015, January). Using R for analytic graphs: Learn how data visualization can improve interpretation in social work research. Workshop held at the Society for Social Work and Research conference, San Antonio, TX.

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Kruzich, J., **Mienko, J.A.**, & Courtney, M.E. (2011, August). Organizational, supervisory and team factors that enhance retention of public child welfare workers. Presented at the National Child Welfare Evaluation Summit, Washington, D.C.

Mienko, J. A. (2009, March). Using geographic information systems (GIS) in child welfare. Presented at the 13th Annual Child Welfare Training and Advancement Program Institute, Seattle, WA.

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Invited Reviews

Mienko, J. A. (2010). Rethinking child welfare administration. [Review of the book Fostering accountability: Using evidence to guide and improve child welfare policy, by M. F. Testa & J. Poertner]. Child and Youth Services Review, 33, 204-205.

Chapters

Lanier, P., Maguire Jack, K.L., **Mienko, J.A.**, & Panlilio, C.D.C. (2015). From causes to outcomes: Determining prevention can work. In D. Daro, A.C. Donnelly & L.A. Huang (Eds.), Advances in Child Abuse Prevention Knowledge: The Perspective of New Leadership. New York, NY: Springer Publishing Company.

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Professional Activities & Service

One Family One Team Evaluation Committee

Member **2015**

King County Homeless YYA Initiative Evaluation Team

Member **2013 – 2014**

Washington State Site Selection Advisory Committee for 2SHB 2106

Member **2009 – 2010**

Tacoma Community Analytical Models and Data Sharing Committee

Member **2009 – 2010**

MSCC Policy & Information Sharing Committee

Member **2009**

Community Review of Child Fatalities Team

Member **2008 – 2009**

Tacoma Family-To-Family Self Evaluation Committee

Chair **2008**

Programming Knowledge, by order of familiarity

R, T-SQL, MySQL, PostgreSQL, MPlus, Stata, SPSS, WinBUGS, LaTeX, Python, Julia, SAS, MLE, PHP, VBA

Projects Underway

Child Welfare System Involvement as Risk for Injuries: Collaborative research project with Washington State
Children's Administration and jointly funded by Casey Family Programs and Partners for Our Children.

An Ecological Examination of Child Maltreatment Outcomes in the United States: Collaborative research project with colleagues from Wayne State, Arizona State, and Northern Arizona Universities examining NCANDS data.

Interdisciplinary Evaluation of Child Custody Decision-Making among IPV Families: Joint project with the University of Washington School of Public Health funded by National Institute of Justice.

Responsible Fatherhood Opportunities for Reentry and Mobility: Joint project with the Washington Department of Corrections funded by the Administration for Children and Families.

Projects Under Development

Child Welfare System Responses to Prenatal Substance Exposure: Differential Management of Drug Withdrawal Symptoms for System-Involved Neonates and Infants.

A Comprehensive Analysis of the Foster Care Licensing Process in Washington State.