Washington State Institute for Public Policy
110 Fifth Avenue SE, Suite 214 • PO Box 40999 • Olympia, WA 98504 • 360.664-9800 • www.wsipp.wa.gov

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Evaluation of the Foster Care Hub Home Model: *Outcome Evaluation*

The hub home model is an approach to licensed foster care delivery wherein an experienced foster "hub home" provides activities and respite care for a group or "constellation" of foster homes. The Mockingbird Society has operated Washington's only hub home program, frequently referred to as the Mockingbird Family Model, on a small scale since 2004.

The 2016 Washington State Legislature directed the Washington State Institute for Public Policy (WSIPP) to evaluate the "impact and cost effectiveness" of the hub home model (HHM).[1] In this report we describe effects on child welfare outcomes, including placement stability, permanency, child safety, sibling connections, runaways, and caregiver retention. We also estimate the cost of the HHM relative to standard foster care.

In January 2018, we will update this report with benefit-cost results. Our analysis will incorporate effects on a broader range of outcomes, such as high school completion, arrests, and behavioral health.

Suggested citation: Goodvin, R. & Miller, M. (2017). *Evaluation of the foster care hub home model: Outcome evaluation (Document Number 17-12-3902).* Olympia: Washington State Institute for Public Policy.

Summary

The hub home model is an approach to licensed foster care delivery wherein an experienced foster "hub home" provides activities and respite care for a group or "constellation" of foster homes.

The program has operated on a small scale in Washington State since 2004.

The 2016 Washington State Legislature directed WSIPP to evaluate the hub home model (HHM). The study includes an outcome evaluation and a benefit-cost analysis to address the cost effectiveness of the HHM in comparison to traditional foster care delivery.

In this evaluation we compare youth who were placed in a HHM foster home at any time to a group of similar foster youth who were not served by the HHM.

Our results indicate that HHM youth are likely to have higher rates of placement stability but on average take longer to achieve permanency. For youth who achieved permanency, we found no significant difference in the rate of subsequent out-of-home placements for HHM and comparison youth. For youth who exited care, over the full analysis period there were no group differences in the rate of new CPS reports. The HHM had no effect on placement with siblings. HHM youth were more likely than comparison youth to run away from care.

WSIPP will publish results of a full benefit-cost analysis of the HHM in January 2018 using a more extensive set of outcome variables.

[1] Second Engrossed Substitute House Bill 2376, Chapter 36, Laws of 2016, 1st Special Session.

The report is organized as follows: Section I provides background on the hub home model and foster homes in Washington State. Section II outlines our methodology. Section III summarizes the key findings from our outcome evaluation, which includes analysis of youth outcomes and caregiver retention. Section IV provides a description of program costs and previews our forthcoming benefit-cost analysis. Section V summarizes key findings and identifies limitations. An Appendix provides supplemental analysis and technical detail.

Legislative Assignment

…the Washington state institute for public policy [shall] evaluate and report to the appropriate legislative committees on the impact and cost effectiveness of the hub home model, a model for foster care delivery. The institute shall use the most appropriate available methods to evaluate the model's impact on child safety, permanency, placement stability and, if possible, sibling connections, culturally relevant care, and caregiver retention. The report shall include an analysis of whether the model yields long-term cost savings in comparison with traditional foster care…The institute shall submit an interim report by January 15, 2017, and a final report by June 30, 2017.[#]

Second Engrossed Substitute House Bill 2376, Chapter 36, Laws of 2016, 1st Special Session.

[#] The WSIPP Board of Directors exercised its statutory authority to extend the due date of the final outcome analysis to December 31, 2017.

I. Background

The hub home model (HHM) is an approach to licensed foster care delivery where a group or "constellation" of six to ten foster homes in close proximity is supported by a shared "hub home." The hub home is an experienced foster home that provides families in their group with peer support, assistance navigating the child welfare system, social activities, and respite care.[2]

Specifically, hub home providers organize, coordinate, and host monthly social activities as well as monthly training and support meetings for the families in their constellation. They also hold two open licensed foster care beds to facilitate both planned and emergent respite care. Hub home providers are asked to actively maintain communication with their families and to serve as a resource for foster parents and youth.[3]

Goals of the HHM are to increase the stability of out-of-home placements for foster youth and to enhance foster caregiver recruitment and retention.[4]

All HHM providers are foster homes supervised by either the Department of Social and Health Services (DSHS) Children's Administration (CA) local offices or by private child placing agencies (e.g., Catholic Community Services, Pierce County Alliance, and Olive Crest).[5] Although staffing for HHM implementation varies between "host agencies" (i.e. the supervisory agency), each agency appoints at least one staff member to serve as the HHM program liaison. The program liaison is the primary point of contact between the host agency and the constellation families.[6]

The Mockingbird Society (TMS) has operated the HHM on a small scale in Washington since 2004, primarily in King, Pierce, Snohomish, Thurston, and Whatcom counties. Program records that are currently available indicate that a total of 16 constellations were in operation between 2004 and 2015, with the number of constellations ranging from one to nine in a given year. During this period, hubs supported a total of 165 foster homes, with the number of homes ranging from eight to 75 per year.

From late 2015 through 2016, TMS initiated a privately funded expansion in Pierce County foster homes supervised by child placing agencies. In 2016, seven new constellations opened in Pierce County, supporting 49 new foster homes. Even with the recent expansion, HHM foster homes

[2] Respite care is defined as "temporary, time limited relief for substitute parenting or caregiving of a child." It can be arranged in advance or on an emergency basis, and can include both hourly and daily (including overnight) care. https://www.dshs.wa.gov/ca/4500-specific-services/4510-respite-licensed-foster-parents-unlicensed-relative-caregivers-and-other-suitable-persons.

[3] Mockingbird Family Model Constellation Resource Guide, The Mockingbird Society, 2013.

[4] Mockingbird Family Model Host Agency Implementation Handbook, The Mockingbird Society, 2013. In Washington State, the number of licensed foster homes has declined over the past decade. See Exhibit 1.

[5] According to WAC 388-147, child placing agencies recruit families to become state licensed foster homes, certify that homes meet licensing requirements, and provide supervision of the homes.

[6] Mockingbird Family Model Host Agency Implementation Handbook. The Mockingbird Society, 2013.

currently represent only 2% of licensed foster homes in the state (see Exhibit 1).

The number of youth placed in HHM foster homes has grown since 2004. In each year between 2004 and 2016, the number of new HHM youth foster placements ranged from 11 to 166, with a total of 802 youth identified as having been placed in an HHM foster home. We also present the total number of foster youth served in HHM foster homes in a given year (see Exhibit 1).

The HHM foster care program has been funded in Washington since 2004 through a combination of public and private sources.[7] Funds have supported some TMS administrative costs related to HHM implementation and training. However, the primary use of funds has been for monthly payments to the hub homes to support the two open licensed beds, constellation activities, and insurance.[8]

Exhibit 1

Yearly Count of HHM Hubs, HHM Foster Homes, Total Licensed Foster Homes Operating in Washington, HHM Youth and Total Foster Youth

Year	HHM hubs	HHM foster homes	Licensed WA foster homes	New HHM foster home placements	Total youth in HHM foster homes	Youth in WA foster homes
2004	1	8	6,194	17	26	9,940
2005	2	17	5,920	11	29	10,314
2006	4	31	5,841	14	37	10,442
2007	4	33	5,965	12	44	10,630
2008	3	32	5,875	31	58	10,314
2009	6	50	5,739	54	99	9,954
2010	8	56	5,773	67	118	9,495
2011	7	43	5,570	68	113	9,096
2012	7	39	5,253	58	117	8,796
2013	6	28	5,133	54	115	9,123
2014	9	68	5,125	93	176	9,474
2015	9	75	4,945	157	258	9,463
2016	15	106	4,889	166	288	9,433

Notes:
HHM hub and foster home data provided by The Mockingbird Society. The 2004-2014 licensed foster home counts come from CA (2014). *Report to the legislature: Foster & adoptive home placement.* Olympia, WA. 2015 licensed foster home count, CA (2015). *Report to the legislature: Foster & adoptive home placement.* Olympia, WA. The 2016 licensed foster home count comes from D. Hancock, Division of Licensed Resources Administrator, Children's Administration (personal communication, January 10, 2017). Counts of youth in HHM foster homes and unduplicated yearly counts of youth in foster homes in Washington are from WSIPP analysis of FamLink placement events data. Licensed foster home data reflect end-of-year counts for state fiscal year (FY). During FY 2015 Children's Administration enacted data clean-up efforts to close duplicate providers who should have been closed during 2009-2015. As a result, counts for 2015 and 2016 are not directly comparable to those for earlier years.

[7] The 2016 state Operating budget allocated $253,000 in both FY 2016 and FY 2017 to fund the HHM. See Second Engrossed Substitute House Bill 2376, Chapter 36, Laws of 2016, 1st Special Session, p. 60.
[8] Degale Cooper, TMS Director of Family Programs, (personal communication, April 14, 2016).

II. Evaluation Methods

To evaluate the impact of the HHM, we must compare outcomes of youth in HHM placements to outcomes for a similar group of youth who were placed in foster homes that did not participate in a constellation.

Ideally, we would test the impact of the HHM using program and comparison groups created in a randomized controlled trial—the "gold standard" experimental approach to estimating treatment effects. Random assignment allows for direct comparison of outcomes between participants and non-participants because, in theory, the only difference between these groups would be random and not related to participant characteristics.[9]

When participation in the program is not random, program evaluations can exhibit "selection bias" which occurs when individuals choose, or are chosen, to participate in a program based on characteristics that may also impact their outcomes. In the case of HHM participation, although youth do not select foster home placements themselves, it is possible that placement administrators may—whether intentionally or not—systematically place youth exhibiting certain characteristics into HHM homes. For example, administrators may place youth perceived at high risk for placement instability into HHM homes. Foster caregivers choose whether to participate in an HHM constellation, and it is possible that caregivers with certain characteristics, or those who foster certain types of youth, may be more likely to participate. These underlying characteristics, rather than the program, may be responsible for group differences in outcomes.

Because WSIPP's evaluation of the HHM is retrospective, we are unable to use a randomized controlled trial design. Instead, we address potential selection bias by using an advanced statistical technique called propensity score matching. This technique allows us to closely match treated and comparison youth on a set of key observable factors related to outcomes. Propensity score matching allows us to approximate the comparability between groups that might have been achieved with random assignment.[10] However, we recognize that propensity score matching may not eliminate all differences in unobservable characteristics between the treatment and comparison groups that may affect outcomes.

In this report we use historical administrative data obtained from DSHS Children's Administration (CA) and the DSHS Integrated Client Database (ICDB) to evaluate the HHM.

Study Groups

A removal "episode" begins when a child is removed from a home and ends when the case is closed. Episodes may last for only a few days or for many years. Over the course of an episode, children may have multiple placement "events"—that is, placements in different homes or facilities. A removal

[9] Austin, P.C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research, 46*(3).

[10] Ibid.

episode may end with a case being closed in different ways. This includes reunification, adoption, or guardianship, as well as transfer of the case to another authority or youth reaching the age of majority at 18 years old.

The HHM "treatment" group includes all youth placed at least once between 2004 and 2016 in an HHM foster home. This time period maximizes the sample size for the evaluation, which improves the accuracy of impact estimates and also allows us to observe some participants after sufficient time has passed to capture impacts on outcomes in early adulthood. However, this approach also leads to wide variation in follow-up time across youth in the sample. For the 10% of youth served early in our study period we have a nine to ten year follow-up but for the 40% of youth most recently served we have only one to two years of follow-up data.[11] We identified a total of 802 youth who had at least one placement event, for any duration, in an HHM foster home. Some youth had multiple placements in an HHM foster home. We selected each youth's first HHM placement, and defined that as the "index event."

Because the HHM was only implemented in five counties, we limited comparison youth to those in foster care in each of the five counties during the years of HHM operation but who were never placed in an HHM foster home.[12] For the comparison group, the index event was the first placement event for a youth in that county during the period of HHM operation.

To summarize, HHM youth were foster youth who had experienced any placement event in an HHM foster home, regardless of the duration of that placement event. Comparison group youth were similar foster youth who had never been placed in an HHM foster home. The duration of removal episodes and index events varies widely. As a result, the index event may make up a small or large fraction of the removal episode and typically reflects only a small portion of any youth's experience in the child welfare system. For both the HHM and comparison groups, the index event may represent the first placement event in a removal episode or could be the second, third, or later event in an episode.

Matching Method

We used propensity score matching to select a matched comparison group from youth in foster care who were not placed in an HHM foster home. To ensure the best possible match, we completed two phases of propensity score matching, using an iterative process. In the first phase we used demographic information and child welfare history from CA data to identify a potential comparison pool. We started with this potential comparison pool for the second phase and added new information from the ICDB on youths' prior arrests and behavioral health to improve the match for our final comparison sample.[13]

[11] See Appendix Exhibit A7 for sample characteristics.
[12] More detailed methods for identifying the treatment and comparison groups are included in the Appendix, Section I.

[13] Matching was completed in two phases because it was not feasible to request ICDB arrest and behavioral health data for all youth in foster care placements from 2004-2016. By first identifying the HHM treatment group and a potential comparison pool, we were able to appropriately limit the number of youth to be matched to ICDB records. The additional information provided by ICDB records allowed us to refine our initial match.

We completed matching protocols within county to lessen the effect of geographical differences such as urbanicity and community resources. Our matching protocols also accounted for year of placement to reduce effects of historical trends in the child welfare system and outcomes over time.

Propensity score matching requires two steps. First, we estimate a propensity score (the predicted probability of placement in an HHM home) for each child. We use a statistical model that includes a variety of factors that may affect the probability of placement in an HHM home or the outcomes of interest. A complete list of variables for the first and second phases is in the Appendix. Second, we randomly sort the individuals and match each HHM individual to the nearest comparison group individual(s) with a similar propensity score.

For the first phase, we matched HHM youth to the nearest three individuals with a similar propensity score—our sample was 802 HHM youth and 2,356 comparison youth.[14] Using this as our potential comparison pool for the second phase, we then matched to the nearest single individual with a similar propensity score. We retained 790 HHM youth and 790 comparison youth for the final sample.[15]

[14] Our initial 3:1 match resulted in 50 duplicate comparison youth who had placement events in more than one county, reducing our potential comparison pool.

[15] In 41 cases (12 HHM and 29 comparison pool), the RDA process for linking to Phase 2 data resulted in multiple matches resolving into the same FamLink ID from our analysis sample. To ensure accuracy, we dropped these cases. This resulted in an HHM sample of 790 and potential comparison pool of 2,327.

Outcome Measures

We examined indicators of placement stability, permanency, and safety. We also examined placement with siblings, runaways, and caregiver retention. We define these outcomes below.

Placement Stability

Both federal regulations and the Braam settlement agreement[16] consider children to have placement stability if they have two or fewer placement events in an out-of-home placement setting for a single foster care episode (not including respite care, care hospitals, or institutional settings). States often do not meet this standard for children in care for 12 months or more.[17] Federal standards allow for states to report on the percent of children experiencing two or fewer placement events by duration of foster care episode (e.g., percent meeting the definition of placement stability for those in care for fewer than 12 months versus 12-24 months).

Many youth in our analysis sample had experienced multiple placements in the removal episode prior to the index event. Because WSIPP's charge was to evaluate the effects of HHM placements, our focus was necessarily on placement stability following the start of the HHM placement. As a result, we could not use the federal definition of placement stability where a count of

[16] For information on the Braam settlement agreement see: https://www.dshs.wa.gov/ca/acw/braam-settlement-agreement. For placement stability definition see Outcome 6, https://youthlaw.org/publication/official-oversight-of-the-washington-state-foster-care-system-nears-completion/.

[17] See Child Welfare Outcomes: 2009-2012, U.S. Department of Health and Human Services, Administration for Children and Families Administration on Children, Youth and Families, Children's Bureau U.S. Department of Health and Human Services, p. 26. https://www.acf.hhs.gov/sites/default/files/cb/cwo09_12.pdf.

placement events in the removal episode would include those that had occurred prior to the index event.

For this reason, our preferred indicator of placement stability was duration of the index event. We adopted the approach used by Rubin et al.[18] We identify those youth in out-of-home care for at least 12 months or at least 18 months (and who would not have turned 18 before August 1, 2017, the last day for which we had information). We counted 12 and 18 months starting from the beginning of the current removal episode, so for some youth this includes time preceding the index event placement. We then measure the proportion of youth whose index event lasted at least nine months. We focus on stability during the index event as that is most likely to be affected by the HHM.

Although we could not use the federal definition of placement stability, in a secondary analysis we used a modification of the federal reporting standards. We examined the percent of youth with two or fewer placements in the period following the start of the index event. We included the index placement event and looked at youth who remained in care for eight days to 12 months, 12 to 24 months, and more than 24 months from the index event start date.

Permanency—Exits to Permanency

According to Washington law,[19] permanency is defined as any one of the following:

- *Return of the child to the home of the child's parent, guardian, or legal custodian (reunification);*
- *Adoption, including a tribal customary adoption as defined in RCW 13.38.040;*
- *Guardianship;*
- *Permanent legal custody; long-term relative or foster care, if the child is between ages sixteen and eighteen, with a written agreement between the parties and the care provider;*
- *Successful completion of a responsible living skills program; or*
- *Independent living, if appropriate and if the child is age sixteen or older.*

The available data do not provide information on the last three outcomes. Therefore, we define permanency as reunification, guardianship, or adoption.

We analyzed the percent of youth achieving permanency within one year and within two years of the index event. For each analysis (within one year and within two years), we limit the sample so that all children would reach those time events by August 1, 2017, the last day for which we had information on the end of events. As a secondary approach, we also examined time (number of days) to permanency, which allowed us to use the entire matched sample and accounts for varying time "at risk."

For some youth the administrative data did not indicate a reason for case closure. For others, children were transferred from DSHS to other authorities (such as tribes). Date of discharge from state custody was sometimes missing from our data. In the case of missing discharge date, we assumed that the case closed on the youth's 19th birthday.

[18] Rubin, D.M., O'Reilly, A.L., Luan, X., & Localio, A.R. (2007). The impact of placement stability on behavioral well-being for children in foster care. *Pediatrics, 119*(2), 336-344.
[19] RCW 13.34.134.

Permanency—New Out-of-Home Placements

Children who leave foster care for permanent placements may, sometimes, be returned to care. For youth who achieved permanency, we examined subsequent out-of-home placements within one year and within two years of the date of permanency. This analysis extends our examination of permanency to address whether youth who exit to permanency remain in those placements. In these analyses (within one year and within two years), we limit the sample so that all children would reach those time events by August 1, 2017, the last day for which we had information on new out-of-home placements.

As a secondary approach, we also examined time (number of days) from permanency to a new out-of-home placement, which allowed us to use all those who achieved permanency, and accounts for varying time "at risk."

We recognize that examining new out-of-home placements only for youth who achieved permanency cannot tell us about the direct causal impact of HHM participation on future placement events. This approach ties new placements to an experience occurring after the index event (i.e., the treatment) has ended. We cannot say that HHM participation caused any observed differences in new out-of-home placements. Our analysis can only speak to patterns of future removals after achieving permanence.

Safety

Although some children do experience maltreatment while in foster care, this is a rare occurrence.[20] Given the low frequency of maltreatment in care, and the small number of children in our HHM sample, we would not expect the number of maltreatment cases observed to be reliably different from zero.[21] Because we cannot meaningfully comment on children's safety while in state custody, we focus instead on safety after exiting the child welfare system, when the youth again become "at risk" for new reports to CPS. For youth who exited the child welfare system before their 18th birthday, we examined subsequent reports to CPS within one year and within two years of exit.[22] In these analyses (within one year and within two years), we limit the sample so that all children would reach those time events by August 1, 2017, the last day for which we had information on new reports.

As a secondary approach, we also examined time (number of days) from exit to a new report, which allowed us to use all those who exited the child welfare system, and accounts for varying time "at risk."

As with the measure for new out-of-home placements, we acknowledge that examining new reports only for youth who exited the child welfare system may introduce bias. Additionally, this approach ties new reports to an experience occurring

[20] In Washington, over the period 2009 to 2012, fewer than 0.4% of children in foster care were maltreated while in care. See Child Welfare Outcomes: 2009-2012, U.S. Department of Health and Human Services, Administration for Children and Families Administration on Children, Youth and Families, Children's Bureau U.S. Department of Health and Human Services.

[21] The CA data that WSIPP requested do not permit us to identify reports to CPS where the alleged subject is a foster caregiver, as these reports are tracked in a separate system by the Division of Licensed Resources (DLR).

[22] Most youth (54%) included in this analysis were those who exited the child welfare system by achieving permanency through reunification, adoption, or guardianship. We also included cases transferred to another authority, and a small percentage of youth for whom the reason for case closure was unknown. We excluded the 35% of youth who were still in care, a small percentages of youth who had turned 18 by their case closure date, and youth who were deceased.

after the index event (i.e., the treatment) has ended. However, analysis of the full sample, regardless of exit status, is problematic because we would not be able to observe new reports for youth still in care. For these reasons, we cannot say that HHM participation caused any observed differences in children's safety after exiting state custody. Our analysis can only speak to patterns of future child safety after the foster home experience.

Placement with Siblings

We first identified all youth in our analysis sample with a sibling in foster care at any time during the index event. Placement with siblings was defined as having at least one sibling placed in the same foster home for any period of time during the index event. Additionally, in a secondary analysis of HHM youth only, we defined placement with siblings as having at least one sibling placed in the same constellation for any period of time during the index event.

Runaway from Care

Some children run away from foster care. We focused on runaway episodes during the index event as those are most likely to be influenced by the HHM. Youth were defined as having a runaway event when the index placement event ended with the youth running away from the placement.[23]

Foster Caregiver Retention

Foster home license renewals are on a three-year cycle, and retention is high until year three, when many foster homes do not renew their license.[24] We analyzed the percent of foster caregivers who were still licensed after one year, two years, and three years from the first record of a license issue date. For each analysis (within one, two, and three years) we limit the sample based on license issue date so that all caregivers in the analysis would have the defined follow-up period by August 17, 2017, the last day for which we had information on license closures. For example, a caregiver first licensed on August 1, 2015 would have only two years of follow-up data. As a result, they would be included in the one-year and two-year retention analysis but not the three-year retention analysis. As a secondary approach, we also examined time (number of days) remaining licensed, which allowed us to retain a larger sample of caregivers, and also accounts for varying time "at risk" for license closure.

Our analysis of caregiver retention was limited by data availability in two ways. First, CA records for foster home licenses issued prior to February 1, 2009 are not reliably available in the CA management information system, FamLink.[25] As a result, for foster homes first licensed prior to February 1, 2009, WSIPP has no access to information about foster homes' initial license date and no valid way to assess length of retention. Additionally, for homes where the first record of a license issue date is between 2009 and 2011, there is no way to determine whether this is indeed the first license issued or a renewal for a license first issued prior to February 1, 2009.

Second, our follow-up period includes information on active foster home licenses

[23] In our sample, no child under age 11 at the beginning of the event ran from care. For that reason, children under 11 were omitted from the analysis.

[24] Children's Administration (2015).

[25] Foster home license records that WSIPP received from CA include few licenses issued prior to February 2009. Children's Administration transitioned in February 2009 from its previous information system, CAMIS, to a new management information system, FamLink, and most licenses with issue dates prior to 2009 were not retained in the new system.

only through August 2017, resulting in an extremely limited follow-up period for homes that were newly licensed. For example, for homes first licensed in August 2016, we have only one year of follow-up.

Given these data limitations, we completed analysis of caregiver retention for providers whose first record of a license in our data was between 2012 and 2016.[26]

Analysis Method

For outcomes defined as yes/no (such as whether a removal episode ended in permanency, or whether siblings were placed in the same foster home), we used specialized logistic regression[27] controlling for the same characteristics used in the propensity score model as well as the county where youth were served.

Additionally, because the sample in this retrospective evaluation varies in age and in dates of participation, there is a wide range in individuals' time "at risk" for some outcomes. For example, a 10-year-old with an index placement in 2006 has a ten-year follow-up period, through age 20. However a 10-year-old with an index placement in 2015 has only a one-year follow-up period, through age 11. To address this issue, for most outcomes we also used survival analysis as a secondary approach. Survival analysis allows us to compare groups on the length of time from an event date to the occurrence of an outcome. This approach accounts for variation in time at risk and allows us to use the entire sample for which we have relevant data. For survival analysis of youth outcomes we controlled for the same characteristics used in the propensity score model. In analyses for youth outcomes and for caregiver retention we controlled for clustering within county.

[26] We selected 2012 because the three-year license cycle increases our confidence that these providers did not have an initial license issued prior to 2009, and that we were therefore capturing the date when they first became licensed. There were 101 HHM homes and 5,479 potential comparison homes where the first record of a license was in 2012 or later.

[27] We use the SAS program, Surveylogistic, specifying that cases were clustered by county.

III. Evaluation Findings

In this section we present results for analyses assessing the impact of HHM foster home placement on child welfare outcomes. To add context to our findings for youth outcomes in the child welfare system, we examined outcomes for all foster youth in the five counties where the HHM has operated. In Exhibit 2 we present descriptive information (unadjusted percent) for this broader population of youth in foster care alongside our regression-adjusted results for HHM youth and matched comparison group youth.

Exhibit 2

Percent of HHM Youth, Comparison Youth, and All Foster Youth in HHM Counties, with Youth Study Outcomes

	HHM youth		Comparison youth		All foster youth in HHM counties[a]	
Outcome variable	**N**	**%[b]**	**N**	**%[b]**	**N**	**%**
Index events lasting at least nine months (of those in care for 12+ months)	634	39%	556	26%	8,401	35%
Index events lasting at least nine months (of those in care for 18+ months)	545	43%	448	29%	7,061	38%
Permanency within one year of index event	728	15%	706	23%	11,955	27%
Permanency within two years of index event	563	36%	517	49%	10,274	50%
New out-of-home placements within one year of permanency	327	10%	360	5%	7,451	6%
New out-of-home placements within two years of permanency	260	12%	291	9%	6,254	9%
New reports to CPS within one year of exit from child welfare system	341	19%	380	13%	7,836	14%
New reports to CPS within two years of exit from child welfare system	265	25%	303	22%	6,549	22%
Placement with siblings	343	55%	338	57%	3,890	59%
Runaway from care	248	14%	254	5%	3,914	12%

Notes:

[a] Figures for all foster youth in HHM counties were derived from the protocol used to set up the comparison pool for our first matching phase. That is, we restricted the sample to youth in HHM counties during the period of HHM operation. We then selected the first event for each youth as the index event. Figures are unadjusted percent of youth.

[b] Figures reported for HHM and comparison youth are adjusted based on regression analyses.

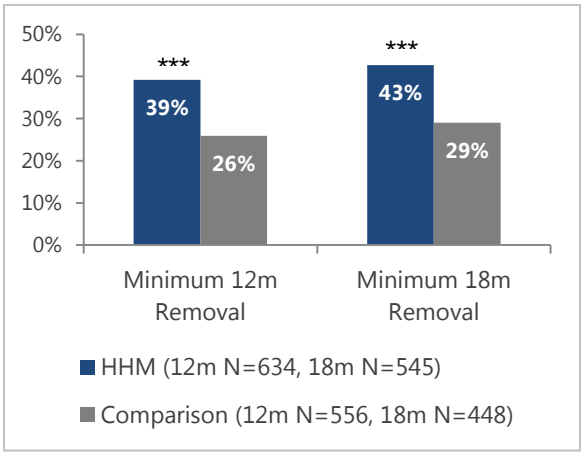
Placement Stability

Youth in the HHM group had longer index placements (278.36 days, SD = 415.73), on average, than comparison youth (170.68 days, SD = 294.85).[28]

For youth with removal episodes lasting at least 12 months, or at least 18 months, we examined the likelihood that the index placement lasted a minimum of nine months.[29] As seen in Exhibit 3, using either the 12- or 18-month removal episode criteria, HHM youth were more likely to have an index placement lasting at least nine months.

Exhibit 3

Regression-Adjusted Percent of Index Events Lasting Nine Months or Longer

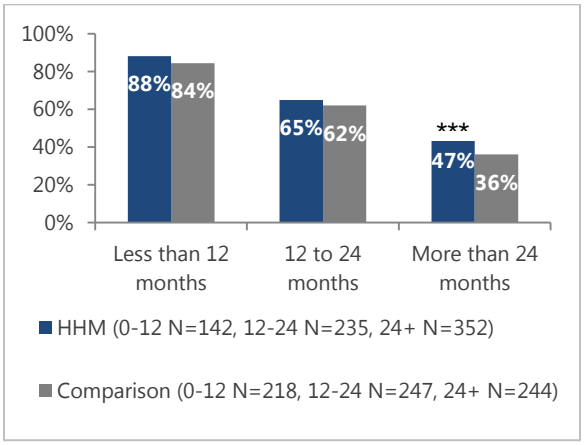


Note:
*** p <0 .001.[30]

As an alternative approach, we compared the likelihood that HHM and comparison youth would have two or fewer placements following the start of the index event. We included the index event and evaluated this comparison for youth in care for eight days to 12 months, 12 to 24 months, and longer than 24 months after the start of the index placement. As shown in Exhibit 4, for youth in care less than 12 months and 12 to 24 months after the index event started, there was no significant difference in the likelihood of having two or fewer placements. Consistent with our main analyses, for youth in care longer than 24 months from the start of the index placement, HHM youth were significantly more likely than comparison youth to have two or fewer placements.

Exhibit 4

Regression-Adjusted Percent of Youth with Two or Fewer Placements, Counting from the Start of the Index Event



Note:
*** p < 0.001.

[28] The index event was ongoing for 108 youth (63 in the HHM group and 45 in the comparison group). Excluding those youth whose index placement was ongoing, average length of the index placement was 240.31 days (SD = 397.42) for HHM youth and 146.31 days (SD = 262.32) for comparison youth.

[29] There were no significant differences in matching characteristics between the HHM and comparison group for subsamples with placements lasting a minimum of 12 months and of 18 months.

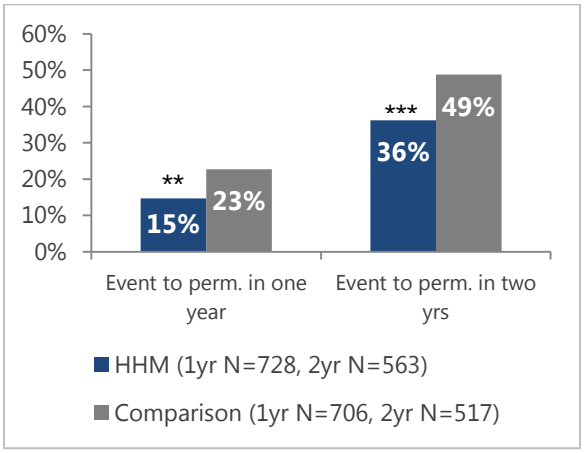
[30] Statisticians often rely on a metric, the p-value, to determine whether an effect is significant. The p-value is a measure of the likelihood that the difference could occur by chance—values range from 0 (highly significant) to 1 (no significant difference). By convention, p-values less than 0.05 (a 5% likelihood that the difference could occur by chance) are considered statistically significant.

Permanency—Exits to Permanency

We compared the likelihood of the removal episode ending in permanency for HHM and comparison youth. We found that HHM youth were significantly less likely to exit to permanency than were comparison youth. As displayed in Exhibit 5, this finding held for exits to permanency by one year and by two years from the index event start date. We also compared time to permanency using survival analysis. This approach yielded findings consistent with our main analyses (see Appendix).

Exhibit 5

Regression-Adjusted Percent of Youth Exiting to Permanency within One and Two Years Following Index Event

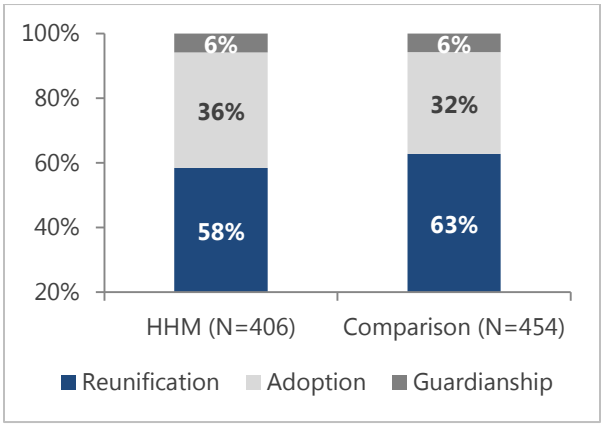


Note:
** p < 0.01 and *** p < 0.001.

In Exhibit 6, for HHM and comparison youth in our sample who achieved permanency at any time during our follow-up period, we present the percent of youth exiting to the three types of permanency. The overall difference in rates of permanency is mostly driven by a higher rate of reunification for comparison youth.

Exhibit 6

Unadjusted Percent of Youth Exiting Care to Reunification, Adoption, and Guardianship



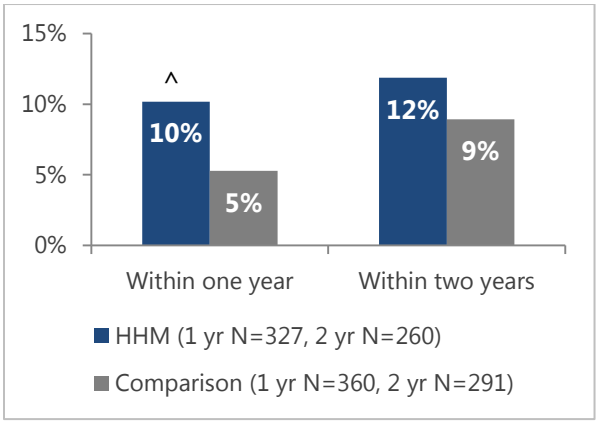
Permanency—New Out-of-Home Placement

We analyzed the likelihood of a new out-of-home placement following achievement of permanency as an indicator of whether youth who achieve permanency remain in those settings. As shown in Exhibit 7, youth in the HHM group were somewhat more likely to return to foster care within one year of achieving permanency but no more likely to return to foster care within two years of permanency.

Consistent with these findings, results of survival analysis (see Appendix) indicates no association between the HHM and time to a new out-of-home placement. Because new out-of-home placements are tied to having achieved permanency, an experience occurring after the index event, this analysis can speak only to the pattern of new out-of-home placements.

Exhibit 7

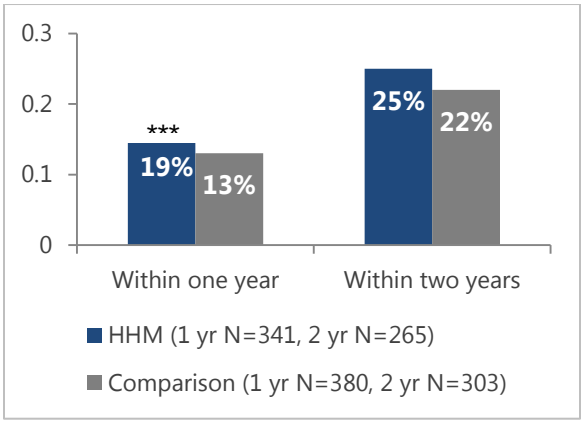
Regression-Adjusted Percent of Youth with a New Out-of-Home Placement



Note:
^ p < 0.10.

Exhibit 8

Regression-Adjusted Percent of Youth with at Least One New Report



Note:
*** p < 0.001.

New Reports to CPS

For youth who had exited the child welfare system before turning 18, we analyzed the likelihood of a subsequent report to CPS as an indicator of youth safety. As shown in Exhibit 8, youth in the HHM group were significantly more likely to have a new report within one year of exiting the child welfare system. However, they were no more likely to have a new report within two years of exiting.

Consistent with the two year findings, results of survival analysis (see Appendix) show no association between HHM group and time to a new report. Having a new report is tied to having exited the child welfare system, an experience occurring after the index event. Our analysis can thus only speak to the pattern of children' safety following foster care.

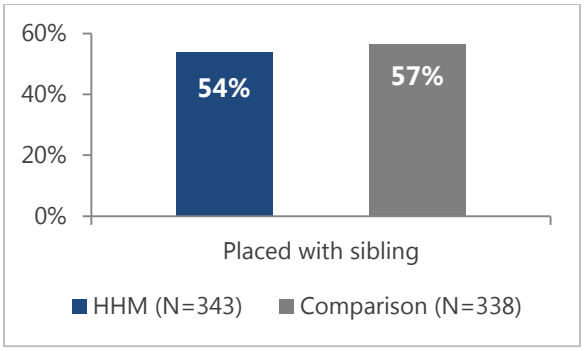
Placement with Siblings

We compared the likelihood of placement with a sibling for those youth in our sample who had at least one sibling in foster care during a period overlapping the index event. About 43% of youth in both groups had at least one sibling in foster care. As shown in Exhibit 9, there was no difference in the HHM and comparison groups in the likelihood of being placed in the same foster home with a sibling.

For HHM youth, we also looked at siblings placed in the same *constellation* at any time during the index event, and found a very small number of siblings in the same constellation who were not also in the same foster home. We found that of the 343 HHM youth with a sibling in foster care at the same time, fewer than 5% were in another foster home in the same constellation.

Exhibit 9

Regression-Adjusted Percent of Youth with a Sibling Placed in the Same Foster Home

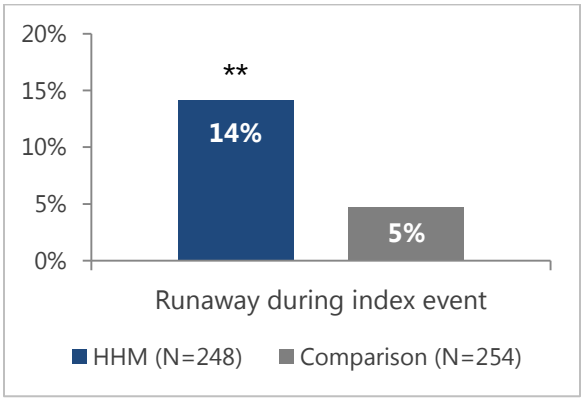


Runaways from Care

There were no runaways in our sample for youth younger than age 11, so we limited this analysis to youth ages 11 and older at the beginning of their index event. For HHM and comparison group youth we compared the likelihood that the index event ended with running away from care. As shown in Exhibit 10, HHM youth were more likely to have run away from the index placement.

Exhibit 10

Regression-Adjusted Percent of Youth (11 and older) Ending the Index Placement with a Runaway from Care



Note:
** p < 0.01.

Caregiver Retention

WSIPP's assignment included a direction to evaluate the HHM's impact on caregiver retention if possible. Several data limitations restricted our analyses for this outcome. First, foster caregivers who participate in the HHM may differ from non-HHM foster caregivers in ways that could impact retention. As a result, we cannot necessarily conclude that a difference in retention between HHM foster homes and other foster homes is caused by participation in the HHM. [31]

As previously noted, analysis of caregiver retention was limited by data availability in two additional ways. Records for foster home licenses issued prior to February 1, 2009 were not available. Further, when the first record of a license is between 2009 and 2011, there is no way to determine whether that record reflects the first license, or a renewal for a license first issued prior to February 1, 2009. As a result, we were unable to assess length of retention for homes licensed, or potentially licensed, earlier than 2009. Second, our follow-up period includes information on active foster home licenses only through August 2017, limiting the follow-up period for recently licensed homes.

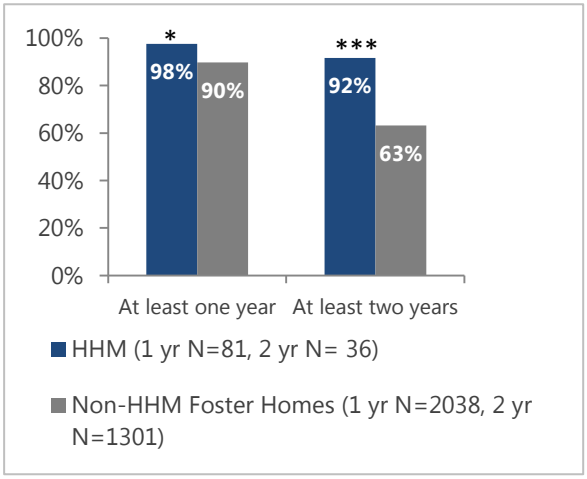
[31] The limited information available on foster caregivers precluded use of propensity score matching to address this potential selection bias.

Given these data limitations, we completed analysis of caregiver retention for providers whose first record of a license in our data was between 2012-2016.[32] Our comparison group was limited to foster homes in four counties where the HHM has operated.[33]

We examined the likelihood that HHM and other foster homes would remain licensed for one, two, and three years from the date when their first license on record was issued. As shown in Exhibit 11, HHM homes were significantly more likely to remain licensed for both one and two years past their license start date. HHM homes were moderately more likely to remain licensed at three years past licensing. However, for the three year analysis the HHM sample size is so small that we cannot draw meaningful conclusions using this analytic strategy.[34] We also completed survival analysis on the number of days remaining licensed from the first record of a license issue date. This analysis indicated that HHM homes remained licensed for a longer duration than other foster homes in the same counties (see Appendix).

Exhibit 11

Regression-Adjusted Percent of Foster Homes Remaining Licensed for at Least One and Two Years from Date of First License on Record



Notes:
* p < 0.05 and *** p < 0.001.
This analysis is limited to foster homes where the first record of a license being issued was between 2012-2016.
WSIPP had access to records of license closures through August 2017. Samples for 1-, 2-, and 3-year retention were limited to homes licensed before August 2016, August 2015, and August 2014, respectively, so that the requisite follow-up period was available for each analysis. This resulted in small sample sizes for HHM homes. The HHM sample size for three-year retention was too small to draw meaningful conclusions and is therefore not presented here.

[32] We selected 2012 because the three-year license cycle increases our confidence that these providers did not have an initial license issued prior to 2009 and that we were therefore capturing the date when they first became licensed. There were 101 HHM homes and 5,479 potential comparison homes where the first record of a license was in 2012 or later.

[33] Limiting our sample to homes first licensed in 2012 or later eliminated the HHM homes from Thurston County. Accordingly, we selected only comparison homes from those in the other four counties where the HHM has operated. After limiting our sample by county, there were 101 HHM homes and 2,407 comparison homes.

[34] WSIPP had access to records of license closures through August 2017. Samples for 1-, 2-, and 3-year retention were limited to homes licensed before August 2016, August 2015, and August 2014, respectively, so that the requisite follow-up period was available for each analysis. This results in extremely small sample sizes for the HHM group. For 3-year retention only ten HHM homes met these parameters.

IV. Cost Analysis

In addition to the impact of the HHM program on participants' outcomes, the legislature directed WSIPP to analyze the program's cost-effectiveness.

We will assess the potential economic consequences of the HHM using WSIPP's standard benefit-cost approach. Findings from this analysis will be released in a supplemental report. In our standard benefit-cost approach, we compare the costs of administering the program to the predicted monetary benefits to society associated with outcomes measured in our evaluation.

For example, a program that produces a decrease in the probability of additional removals and foster care placements or an increase in the probability of high school graduation, can lead to monetary benefits for program participants, taxpayers, and other people in society through reduced use of child welfare system services, increased employment, and greater tax revenue. An increase in the rate of high school graduation can also lead to reductions in the probability of crime, reductions in the use of publicly provided health care, and more. These benefits can then be compared to the cost to implement a program in order to estimate an overall return on investment.

In the current report, we focus on the cost side of the equation: our cost estimates for the HHM above and beyond the cost for standard foster care.

Cost Estimates

Here, we estimate the total per-participant cost to provide the HHM, over and above the cost of traditional foster care.

WSIPP's program cost estimates typically include only the ongoing costs to maintain a program. The primary cost of maintaining the HHM, over and above the cost of traditional foster care, is the $2,400 monthly payment made to each hub home, described in Section I.[35] To arrive at a per-participant cost, we first calculated a per-child per-day cost by summing the total cost of the hub home payments and dividing that figure by the total number of days youth spent in HHM placements. We then multiplied this per-child per-day cost by the average length of stay in HHM foster care placements.

Our goal was to estimate the cost required to support hub home operations at a sustained level, reflecting both the number of youth likely to be served when the program is fully operating and the length of time youth spend in HHM placements. We recognize that per-participant costs will be higher when the HHM supports fewer youth and thus calculating the cost during a start-up period may overestimate program cost.[36] To address

[35] Hub homes administered by CA receive the entire $2,400 Hub home payment and do not bill the state for respite care provided to constellation members. Hub homes administered by child placing agencies receive a monthly payment of approximately $1,920, with the remaining 20% retained by the child placing agency for administrative costs. These hub homes do bill the state for respite care provided to constellation members.

[36] In addition, funding for the HHM has not been stable across years of operation.

this, we included only the most recent three years (2014-2016) in our cost analysis.

We assumed that each hub home received a payment of $2,400 during each month of operation from 2014-2016.[37] We calculated the total dollar amount of payments made across 17 hub homes over this period as $696,000. Not all of these constellations were operating during the full 36 months, and we count only the months that the constellation was active. There were 624 HHM placements that were active during 2014-2016.[38] The total number of days that youth spent in these HHM placement events was 121,595, resulting in a per-child per-day cost of $5.72. For length of stay, we used the average across all HHM events because including only recent events artificially shortens the follow-up period for length of stay. The average length of stay in HHM homes (across all HHM placements) was 319.09 days (0.87 years).[39] These calculations resulted in an average cost per youth of $1,826.45.

Although we include only the hub home payment costs in our analysis, we note that there are additional costs associated with HHM startup, as well as costs associated with turn-over in hub home providers. TMS has not historically charged in-state host agencies for training and consultation but currently estimates a cost of $66,750 for two years of initial training, consultation, and fidelity assessment for out-of-state host agencies.[40] Determining a per-participant annual cost for this training would depend on the number of constellations supported and youth served by the host agency over time. Additionally, recruiting and training new hub home provider and constellation families requires time from an implementation team at each host agency. A 2015 TMS survey of HHM program liaisons in CA offices indicated that implementing a new constellation required, on average, 36 hours over 4.5 months.[41] If a hub home provider withdraws from the program, additional time for the program liaison and implementation team would be required to recruit and train a new provider for this position.[42]

[37] Hub homes supervised by CPAs do not receive the entire payment but the difference goes to the CPA for program administration.

[38] This includes events starting prior to January 1, 2014 but remaining active past that date. Our counts of the total number of days that youth were in HHM placements during 2014-2016 starts on January 1, 2014.

[39] For comparison, average length of stay was 189.14 days (0.52 years) for events active only during 2014-2016.

[40] TMS Table of Deliverables and Cost (Worksheet), MFM Two-Year Budget. Provided by Degale Cooper, TMS Director of Family Programs, October 12, 2017.

[41] Degale Cooper, TMS Director of Family Programs, (personal communication, October 13, 2017).

[42] Of the 24 Hub Homes active between 2004 and 2016, 14 were still operating in this role as of December 2016. WSIPP's calculations based on participation dates provided by TMS indicate that these homes' average length of participation at that time was 1.71 years (SD = 1.90 years). Of the ten Hub Homes not still operating in December 2016, average length of participation was 4.58 years (SD = 3 years).

V. Summary

Findings

Our results indicate that HHM youth are likely to have higher rates of placement stability. On average, youth in HHM placements take longer to achieve permanency. Of youth who achieve permanency, there are no significant differences in the rate of new out-of-home placements for HHM and comparison youth. Overall, for youth who exited the child welfare system, there was no relationship between HHM placements and new reports to CPS. The HHM had no effect on placement with siblings. Youth in HHM placements were more likely to end their index placement by running away from care.

Analysis of foster caregiver retention was limited by data availability and quality. However, our results suggest that HHM caregivers are likely to remain licensed for a longer duration than their non-HHM counterparts.

Limitations

The main limitation of this study is the inability to randomly assign participants—both caregivers and youth—to the HHM or to standard foster care. This experimental approach would have allowed us to rule out the possibility that foster caregivers who elect to participate in the HHM differ in important ways from those who do not participate. Random assignment of youth would allow us to compare outcomes for HHM youth to youth from the same offices at the same time. Random assignment would have increased our confidence that group differences observed were due to the HHM and not to other unobserved characteristics.

A second limitation is the small sample size available for this study. A small sample reduces the power to detect significant effects, and reduces our overall confidence in determining whether the HHM program had effects on study outcomes.

A third limitation is the restricted time for follow-up for a large part of our sample. Nine new constellations were initiated in 2015-2016, and approximately 40% of HHM youth entered into their index event in 2015 or 2016. Data available at the time of our analyses included less than two years of follow up on these youth.

Finally, data availability issues specific to foster home license records limited the potential sample for this analysis, as well as our ability to draw a cause and effect link between HHM participation and caregiver retention.

Appendices

Evaluation of the Foster Care Hub Home Model: *Outcome Evaluation*

Appendices

A. I. Data and Identification of the Study Group

Data

We requested data in two phases. In Phase 1, Children's Administration (CA) at the Department of Social and Health Services (DSHS) provided a file with license information on all foster parents with an active foster home license from 2004 through 2016. The Research and Data Analysis Division (RDA) at DSHS provided data files from the CA case files, including all cases between January 1, 2004 and January 1, 2017. We received separate files for intakes, removals, placement events, case services, child services, and Child Health and Education Tracking (CHET) screens. Personal information, including unique CA identification numbers for child, case, and removal were removed and replaced with bogus identifiers that allowed us to link children across records. We used these data to identify the hub home model (HHM) treatment group and a potential comparison pool—our initial analytic sample—as detailed in the following sections.

In Phase 2, after identifying the initial analytic sample, we submitted IDs for this sample to RDA for matching to records in the Integrated Client Database (ICDB). In some cases, RDA was not able to unambiguously identify children. For that reason 41 cases (12 of whom were HHM youth) were removed from our sample.[43] After matching, RDA stripped files of identifiers and provided WSIPP with the files detailed below, including a new analytic sample bogus research ID. Timing of index event and length of follow-up period varies by participant. Additionally, in some cases[44] we requested data on pre-index event characteristics to improve the match between the HHM treatment and comparison groups. As a result, specific details of our ICDB table requests varied by topic.

- Criminal arrest data were provided as a monthly array from July 1, 1997 through January 1, 2017.
- Mental health and substance use disorder treatment need flags were provided for the two-year period prior to each individual index event start date.

[43] Our initial 3:1 match resulted in 50 duplicate comparison youth who had placement events in more than one county, reducing our potential comparison pool.

[44] We used information on arrests, mental health treatment need, and substance use disorder treatment need prior to the index event placement start date to improve the propensity score match.

- Mental health and substance use disorder treatment were provided by treatment modality as a monthly array from each individual index start date through March 31, 2016.[45]
- Data on births to youth was provided for January 1, 2004 through January 1, 2017.
- Data on youths' receipt of Temporary Assistance for Needy Families (TANF), basic food, and homelessness was provided as monthly arrays for January 1, 2004 through January 1, 2017.

Finally, RDA provided the Education Research and Data Center (ERDC) with identifiers for the analytic sample. ERDC provided WSIPP with data on high school completion in the analytic sample from June 2004 through June 2016.

Identification of the Treatment Group

DSHS Children's Administration does not collect information on foster caregiver or youth participation in an HHM constellation. As a result, it required several steps to identify youth who participated in the HHM.

We started with The Mockingbird Society's (TMS) foster caregiver records, which included all available names and participation dates for hub and constellation foster caregivers between 2004 and 2016. We then identified these foster caregivers in records, provided by CA, of all foster caregivers with a license active between 2004 and 2016. Of the 254 HHM providers identified by TMS, we were able to identify 247 providers in CA license records, or 97.2%. This includes 24 hub home providers and 224 constellation foster homes, with one family participating in the HHM first as a hub and then as a constellation home.

To identify our youth treatment group we started with CA FamLink records of all placement events from 2004 through 2016. Within this file we flagged all youth with any placement event in an HHM foster home where the event overlapped with the dates of that foster home's participation in a constellation. Where a youth had multiple placements events in an HHM foster home, we selected the first placement event. We then used the start date of the first HHM event as the index placement date for youth in the treatment group. This process returned 802 youth in at least one HHM foster placement from 2004 through 2016.

This sample excludes some youth who were in HHM constellations hosted by Ryther Center for Children & Youth. Although Ryther hosted three constellations between 2005 and 2013, records for constellation family participation dates were not available for two of those constellations. As a result, we could not confidently identify youth who were placed in those constellation homes during HHM participation. The Mockingbird Society also identified a constellation in Yakima, WA from 2007 to 2011. However, no constellation family names or participation dates were available, so there was no way to identify youth placed in these homes.

Comparison Pool

Because the HHM was implemented in five counties over differing periods of time, we created a sample for each county. The comparison pool was comprised of youth in non-HHM foster care in the same counties and in the same time period during which there was at least one HHM constellation in the county. In two of the five counties, we further restricted the pool based on characteristics of HHM constellations (i.e. some counties had no constellations with child placing agencies) and the HHM youth in our sample. For example, in two counties, none of the HHM youth were over 15 years, so in those counties, youth over 15 were dropped from the comparison pool. One county had no HHM youth classified as Asian/Pacific Islander. Once youth were identified, we chose the first foster home placement event in the sampling period for that county.

[45] Due to data system changes these data were available only through March 2016.

A. II. Matching Procedures

In an ideal research design, both caregivers and youth would be randomly assigned to either the HHM or traditional foster care model. With a successfully implemented random assignment, any observed differences in outcomes could be attributed to the effect of the HHM. Unfortunately, as is the case in many real world settings, random assignment was not possible for this evaluation.

Instead, we used observational data and relied on a quasi-experimental research design. To infer causality from this quasi-experimental study, selection bias must be minimized. To do so, we implemented a variety of research design methods and statistical techniques that provided the ability to test the sensitivity of our findings. In this section of the Appendix, we describe the study groups and statistical methods we used to arrive at estimates of the effects of the HHM.

Propensity Score Matching

Propensity score matching allows us to match HHM youth with similar youth to obtain balance on observed covariates. This method has many benefits over standard regression analysis, which is often used to control for differences between treated and comparison groups.

First, the match is based on characteristics before the treatment occurs. That is, the outcome plays no part in matching the treated and comparison groups. This emulates an experimental design by separating the research design stage—where we test various matching procedures to obtain a sufficiently matched sample—from the analysis stage—where we estimate the effect of the treatment using our matched sample. Second, matching can limit the importance of functional form in regression analysis.[46] Finally, by conducting a logistic regression on the matched sample using the covariates from the matching model, we further reduce any residual bias that may remain after matching and account for any correlation between matched pairs.

For each of the five counties, we completed two phases of propensity score matching to ensure the best match possible based on available data. In the first phase, we used CA data (demographics and child welfare history) for 3:1 nearest neighbor matching without replacement. This 3:1 match allowed us to reduce the potential comparison pool to only the three most similar comparison group individuals. We then obtained additional Phase 2 data (pre-index event arrest and behavioral health history) for this initial analytic sample. In the second phase of propensity score matching, we used this additional information to complete 1:1 nearest neighbor matching without replacement. Using 1:1 matching can reduce bias between the treated and comparison groups by only matching treated individuals with the most similar comparison group individual, and was therefore our preferred matching procedure for the outcome analyses in this report.

Exhibits A1 through A5 report the results from the coefficients from the first stage model estimating the likelihood of HHM participation for each county where the HHM has operated. We completed matching protocols within county to lessen the effect of geographical differences such as rural/urban and community resources. There are some differences between counties in the specific covariates used because of differences in demographic makeup and in the years HHM constellations have been active in each county.

[46] Ho, D.E., Imai, K., King, G., & Stuart, E.A. (2007). Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political analysis, 15*(3), 199-236.

We report coefficients for both the first and second phases of propensity score matching in each table. In the first phase we control for youth age and race, whether the youths' foster home was supervised by a child placing agency, the total number of placement events in the removal prior to the index placement, removals to date, and whether the foster parent received "exceptional" payments for the child.[47] We entered covariates to account for year of placement (in two-year increments). In the second phase we introduce controls for any prior arrests, any prior runaways, and mental health and substance use disorder treatment needs in the two years prior to the index placement.

The table also provides the Area Under the Receiver Operating Characteristic Curve (AUC) for each model. AUC is a measure of how well the model predicts the outcome—in this case, whether a family would be assigned to FAR. Values of AUC can range from 0.05 to 1, with 1 indicating perfect prediction. AUCs of 0.7 or greater are considered good predictive models.

[47] Payments to foster parents are tiered, based on the estimated time and effort required to care for the child. Payments range from basic (level 1) through level 4. We consider children whose care is paid at levels 3 and 4—or where the payments indicated treatment care—to be exceptional payments.

Exhibit A1

Phase 1 and Phase 2 Logit Models Estimating the Likelihood of HHM Participation, King Co.

	Phase 1 match			Phase 2 match		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
Phase 1 covariates						
Age (reference group 5 to 10 years old)						
under 12 months	-0.97	***	0.19	0.15		0.23
1-2 years old	-1.02	***	0.19	0.15		0.25
3-4 years old	-0.78	**	0.22	0.44	^	0.24
11-14 years old	0.14		0.20	0.04		0.15
over 15 years old	-0.38	*	0.14	0.12		0.21
Male[a]				0.20	^	0.12
Race (reference group is White/undetermined)						
Black	0.32	*	0.18	0.09		0.14
Asian/Pacific Islander	0.27		0.13	0.18		0.24
Native American	-0.03		0.22	-0.09		0.19
Hispanic	0.14		0.17	0.21		0.20
Child placing agency	-0.99	***	0.18	-0.09		0.16
Exceptional rate payment[a]	0.66	***	0.14			
No. of removal episodes to date	0.23	**	0.12	0.02		0.07
No. of prior reports	0.04	**	0.07	0.03		0.02
No. of prior placement events in removal	0.03	***	0.02	0.04	**	0.01
Year of index placement (reference group is 2009-2011)						
2003-2005	-0.56	**	0.01	0.16		0.27
2006-2008				-0.24		0.28
2012-2014	0.21		0.16	0.07		0.16
2015-2017	0.98	***	0.15	0.05		0.16
Phase 2 covariates						
Any prior arrests				-0.71	**	0.27
Any prior runaways				-0.83	*	0.33
Prior mental health treatment need				0.33	*	0.14
Prior SUD treatment need				0.04		0.19
N	6,665			1,705		
AUC	0.762			0.594		

Notes:

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

[a] Gender was omitted from Phase 1. Exceptional rate payments was omitted from Phase 2 and replaced with other indicators of child behavioral health: prior arrests, prior runaways, prior mental health treatment need, and prior substance use disorder treatment need.

Exhibit A2

Phase 1 and Phase 2 Logit Models Estimating the Likelihood of HHM Participation, Pierce Co.

	Phase 1 match			Phase 2 match		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
Phase 1 covariates						
Age (reference group 5 to 10 years old)						
under 12 months	0.37		0.28	0.16		0.33
1-2 years old	-0.12		0.31	0.32		0.37
3-4 years old	0.10		0.30	0.29		0.33
11-14 years old	0.46	^	0.26	0.04		0.29
over 15 years old	0.33		0.32	0.08		0.37
Male[a]				-0.73	***	0.20
Race (reference group is White/undetermined)						
Black	-0.22		0.22	-0.04		0.24
Asian/Pacific Islander	0.84	*	0.34	0.46		0.36
Native American	-0.23		0.27	-0.16		0.31
Hispanic	-0.49		0.32	0.30		0.36
Child placing agency[b]						
Exceptional rate payment[a]	-0.32		0.37			
No. of removal episodes to date	0.03		0.20	0.09		0.22
No. of prior reports	-0.01		0.04	0.01		0.04
No. of prior placement events in removal	0.03		0.02	0.05		0.03
Year of index placement (reference group is 2016)						
Before 2016	-2.20	***	0.20	0.04		0.24
Phase 2 covariates						
Any prior arrests				-1.22	^	0.70
Any prior runaways				-1.39		1.02
Prior mental health treatment need				0.47	^	0.25
Prior SUD treatment need				0.13		0.38
N	1,817			620		
AUC	0.789			0.635		

Notes:

^ $p < 0.10$, * $p < 0.05$, and *** $p < 0.001$.

[a] Gender was omitted from Phase 1. Exceptional rate payments was omitted from Phase 2 and replaced with other indicators of child behavioral health: prior arrests, prior runaways, prior mental health treatment need, and prior substance use disorder treatment need.

[b] Child placing agency was omitted from both Phase 1 and Phase 2 because all HHM homes were managed by a child placing agency. Children in non-CPA foster homes were omitted from the comparison pool.

Exhibit A3

Phase 1 and Phase 2 Logit Models Estimating the Likelihood of HHM Participation, Snohomish Co.

	Phase 1 match			Phase 2 match	
Covariate	**Coefficient**		**SE**	**Coefficient**	**SE**
Phase 1 covariates					
Age (reference group 5 to 10 years old)					
under 12 months	0.35		0.28	0.02	0.35
1-2 years old	-0.52		0.35	-0.17	0.40
3-4 years old	-0.01		0.31	0.21	0.37
11-14 years old	-0.20		0.36	0.21	0.42
over 15 years old	-1.51	*	0.63	-0.35	0.84
Male[a]				-0.16	0.22
Race (reference group is White/undetermined)					
Black	-0.73	*	0.36	0.20	0.50
Asian/Pacific Islander	0.00		0.48	0.37	0.57
Native American	0.10		0.25	0.08	0.29
Hispanic	-0.24		0.31	-0.33	0.35
Child placing agency[c]					
Exceptional rate payment[b]	-0.14		0.28	0.09	0.33
No. of removal episodes to date	0.36		0.22	0.34	0.32
No. of prior reports	-0.10	^	0.05	0.03	0.06
No. of prior placement events in removal	0.05	^	0.03	0.07	0.06
Year of index placement (reference group is 2012-2014)					
2009-2011	-0.08		0.21	-0.02	0.24
2015-2017	-1.02	***	0.30	-0.06	0.36
Phase 2 covariates					
Prior mental health treatment need				-0.14	0.33
Prior SUD treatment need				0.15	0.36
N	2,496			461	
AUC	0.686			0.603	

Notes:

^ $p < 0.10$, * $p < 0.05$, and *** $p < 0.001$.

[a] Gender was omitted from Phase 1.

[b] Exceptional rate payments was included in Phase 2 instead of prior arrests and prior runaways because of the extremely low frequency of these events in our Snohomish Co. sample.

[c] Child placing agency was omitted from both Phase 1 and Phase 2 because no HHM homes were managed by a child placing agency. Children in CPA foster homes were omitted from the comparison pool.

Exhibit A4

Phase 1 and Phase 2 Logit Models Estimating the Likelihood of HHM Participation, Whatcom Co.

	Phase 1 match			Phase 2 match	
Covariate	**Coefficient**		**SE**	**Coefficient**	**SE**
Phase 1 covariates					
Age (reference group 5 to 10 years old)					
under 12 months	-1.59	*	0.67	-0.85	1.00
1-2 years old	-0.81		0.63	0.02	0.91
3-4 years old	-2.02	^	1.08	0.43	1.64
11-14 years old	-0.95		0.70	1.41	1.37
over 15 years old[d]					
Male[a]				-0.76	0.61
Race (reference group is White/undetermined)					
Black	0.17		0.72	-0.37	0.90
Asian/Pacific Islander[d]					
Native American	-0.01		0.53	-0.36	0.75
Hispanic	0.48		0.62	-0.87	0.89
Child placing agency[c]					
Exceptional rate payment[b]	0.30		0.55	0.63	0.71
No. of removal episodes to date	0.47		0.44	0.19	0.79
No. of prior reports	-0.30	*	0.12	-0.23	0.23
No. of prior placement events in removal	0.09		0.09	0.05	0.15
Year of index placement (reference group is after 2015)					
Before 2014	-1.90	***	0.55	-0.63	0.76
2014-2015	-0.84		0.52	-0.47	0.66
Phase 2 covariates					
Prior mental health treatment need				-0.38	0.74
Prior SUD treatment need				0.29	1.09
N	852			92	
AUC	0.778			0.690	

Notes:

^ $p < 0.10$, * $p < 0.05$, and *** $p < 0.001$.

[a] Gender was omitted from Phase 1.

[b] Exceptional rate payments was included in Phase 2 instead of prior arrests and prior runaways because of the extremely low frequency of these events in our Whatcom Co. sample.

[c] Child placing agency was omitted from both Phase 1 and Phase 2 because no HHM homes were managed by a child placing agency. Children in CPA foster homes were omitted from the comparison pool.

[d] 15 years old and Asian/Pacific Islander were omitted from both Phase 1 and Phase 2 because no children in HHM homes were over 15 at the start of their placement event and none were identified as Asian/Pacific Islander. Children over 15 and Asian/Pacific Islander children were omitted from the comparison pool.

Exhibit A5

Phase 1 and Phase 2 Logit Models Estimating the Likelihood of HHM Participation, Thurston Co.

	Phase 1 match			Phase 2 match	
Covariate	**Coefficient**		**SE**	**Coefficient**	**SE**
Phase 1 covariates					
Age (reference group 5 to 10 years old)					
under 12 months	-0.20		0.43	0.56	0.52
1-2 years old	-0.10		0.41	0.03	0.45
3-4 years old	0.37		0.38	0.05	0.41
11-14 years old	-2.50	**	0.86	-0.09	1.09
over 15 years old[d]					
Male[a]				0.15	0.31
Race (reference group is White/undetermined)					
Black	0.36		0.38	0.32	0.32
Asian/Pacific Islander[d]					
Native American	-0.26		0.51	0.25	0.25
Hispanic	-0.59		0.51	-0.12	0.56
Child placing agency[c]					
Exceptional rate payment[b]	0.37		0.33	0.06	0.36
No. of removal episodes to date	-0.25		0.43	0.40	0.54
No. of prior reports	0.10		0.07	0.05	0.09
No. of prior placement events in removal	0.22	*	0.11	0.05	0.12
Year of index placement (reference group is after 2010)					
Before 2009	-1.52	**	0.48	0.13	0.58
2009-2010	0.50		0.31	0.15	0.36
Phase 2 covariates					
Prior mental health treatment need				0.13	0.37
Prior SUD treatment need				-1.79	1.09
N	703			239	
AUC	0.761			0.595	

Notes:

* $p < 0.05$ and ** $p < 0.01$.

[a] Gender was omitted from Phase 1.

[b] Exceptional rate payments was included in Phase 2 instead of prior arrests and prior runaways because of the extremely low frequency of these events in our Thurston Co. sample.

[c] Child placing agency was omitted from both Phase 1 and Phase 2 because no HHM homes were managed by a child placing agency. Children in CPA foster homes were omitted from the comparison pool.

[d] 15 years old and Asian/Pacific Islander were omitted from both Phase 1 and Phase 2 because no children in HHM homes were over 15 at the start of their placement event and none were identified as Asian/Pacific Islander. Children over 15 and Asian/Pacific Islander children were omitted from the comparison pool.

Exhibit A6 shows characteristics of youth in the HHM and comparison groups before and after the Phase 1 match. Prior to the Phase 1 match, HHM youth differed from potential comparison group youth on nearly all observed characteristics in our model. Of particular note, HHM youth were more likely to have exceptional rate payments and had higher numbers of prior removals, placement events in the removal episode, and prior reports. After the Phase 1 match, small differences remained only for number of prior placement events in the removal episode and number of prior reports, with the HHM youth sample having higher numbers of both.

Exhibit A6

Study Group Characteristics Before and After Phase 1 Match

Variable	Before Phase 1 matching			After Phase 1 matching		
	HHM youth (n = 802)	Comparison youth (n = 11,731)	p	HHM youth (n = 802)	Comparison youth (n = 2,406)	p
Percent infant (0-1)	16%	22%	***	16%	17%	
Percent age 1-2	9%	16%	***	9%	10%	
Percent age 3-4	10%	13%	^	10%	9%	
Percent age 5-10	34%	27%	***	34%	34%	
Percent age 11-14	20%	13%	***	20%	18%	
Percent over 15	11%	9%	***	11%	12%	
Percent male	50%	51%	^	50%	51%	
Percent White/undetermined	40%	44%	^	40%	42%	
Percent Black	29%	24%	*	29%	28%	
Percent Asian/Pacific Islander	6%	5%	^	6%	5%	
Percent Native American	14%	15%		14%	14%	
Percent Hispanic	11%	12%		11%	11%	
Percent child placing agency	28%	31%	^	28%	28%	
Percent with exceptional rate payment	24%	15%	***	24%	22%	
No. of removal episodes to date	1.32	1.21	***	1.32	1.28	
No. of prior events in episode	3.75	2.63	***	3.75	3.38	^
No. of prior reports	3.32	2.69	***	3.32	3.05	*
Percent before 2009	11%	20%	***	11%	11%	
Percent 2009-2011	24%	26%		24%	25%	
Percent 2012-2014	26%	30%	*	26%	25%	
Percent 2015-2017	40%	25%	***	40%	40%	

Note:
^ $p < 0.10$, * $p < 0.05$, and *** $p < 0.001$.

Exhibit A7 shows characteristics before and after the Phase 2 match. The samples for both HHM and comparison youth are somewhat smaller than the Phase 1 match because some of the children could not be unambiguously identified in RDA's ICDB. Using the new reduced sample, the HHM and potential comparison youth showed few significant pre-match differences. Youth in the HHM group were somewhat more likely to have exceptional rate payments and had a higher number of prior removals and prior placement events in the current removal episode. There were significant differences in two of the new matching variables, with comparison group youth having more likely to have prior arrests and the HHM group having been identified more often as having mental health treatment needs in the two years prior to their index placement. Following the Phase 2 match, no significant differences remained.

Exhibit A7

Study Group Characteristics Before and After Phase 2 Match

	Before Phase 2 matching			After Phase 2 matching		
Variable	**HHM youth (n = 790)**	**Comparison youth (n = 2,327)**	**p**	**HHM youth (n = 790)**	**Comparison youth (n = 790)**	**p**
Percent infant (0-1)	15%	18%		15%	18%	
Percent age 1-2	9%	10%		9%	9%	
Percent age 3-4	11%	9%		11%	11%	
Percent age 5-10	34%	34%		33%	30%	
Percent age 11-14	20%	18%		20%	21%	
Percent over 15	12%	12%		12%	12%	
Percent male	50%	51%		50%	51%	
Percent White/undetermined	42%	41%		42%	41%	
Percent Black	28%	28%		28%	28%	
Percent Asian/Pacific Islander	6%	5%		6%	7%	
Percent Native American	14%	14%		14%	13%	
Percent Hispanic	11%	10%		11%	10%	
Percent child placing agency	28%	28%		28%	26%	
Percent with exceptional rate payment	24%	21%	^	24%	22%	
No. of removal episodes to date	1.32	1.28		1.32	1.27	
No. of prior events in episode	3.76	3.27	*	3.76	3.64	
No. of prior reports	3.31	3.00	*	3.31	3.18	
Percent 2003-2005	3%	3%		3%	3%	
Percent 2006-2008	7%	8%		7%	7%	
Percent 2009-2011	24%	25%		24%	25%	
Percent 2012-2014	26%	22%		22%	22%	
Percent 2015-2017	39%	40%		40%	40%	
Any prior arrests	5%	7%	*	5%	5%	
Any prior runaways	4%	5%		4%	4%	
Prior mental health treatment need	48%	43%	*	48%	47%	
Prior SUD treatment need	11%	11%		11%	10%	

Note:
^ $p < 0.10$ and * $p < 0.05$.

We used various diagnostics to determine the extent to which the propensity score matching improved balance between the treated and comparison groups. A common measure of balance is the standardized difference (or bias) calculated as the difference in the mean/proportion for the treated and comparison groups, divided by the pooled standard deviation for each covariate prior to matching. This measure is preferred to traditional t-tests as the standardized difference is not influenced by the study's sample size. Additionally, t-tests are used for making inferences about a population based on a sample; balance, on the other hand, is an in-sample property. Standardized bias values greater than 0.10 usually indicate moderate imbalance while greater than 0.25 indicates severe imbalance.[48] Exhibits A8 and A9 display the Phase 1 and Phase 2 percent standardized bias for each covariate in the propensity score model before and after matching as well as the p-value as a reference. After matching, we found no imbalance on any characteristic using Austin's criteria.[49] Finally we use logistic regression, controlling for the same variables used in the propensity score match. This last step is used to "clean up" residual covariate imbalance between groups.[50]

[48] Austin, P.C. (2009). Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. *Statistics in Medicine, 28*(25), 3,083-3,107 and Stuart, E.A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science: A Review Journal of the Institute of Mathematical Statistics*, *25*(1), 1–21.
[49] Austin (2009).
[50] Stuart (2010).

Exhibit A8

Study Group Characteristics Before and After Phase 1 Match

Variable	Means and proportions after Phase 1 matching		p-value	Absolute standardized difference (d)	
	HHM youth (n = 802)	Comparison youth (n = 2,358)		Before matching	After matching
Percent infant (0-1)	16%	17%	0.277	0.11#	0.03
Percent age 1-2	9%	10%	0.566	0.17#	0.02
Percent age 3-4	10%	9%	0.301	0.06	0.04
Percent age 5-10	34%	34%	0.755	0.09	0.01
Percent age 11-14	20%	18%	0.225	0.13#	0.03
Percent over 15	11%	12%	0.902	0.06	0.00
Percent male	50%	51%	0.465	0.01	0.02
Percent White/undetermined	40%	42%	0.420	0.03	0.02
Percent Black	29%	28%	0.571	0.06	0.01
Percent Asian/Pacific Islander	6%	5%	0.374	0.07	0.04
Percent Native American	14%	14%	0.751	0.03	0.01
Percent Hispanic	11%	11%	0.975	0.03	0.00
Percent Child Placing Agency	28%	28%	0.957	0.04	0.00
Percent with exceptional rate payment	24%	22%	0.159	0.16#	0.04
No. of removal episodes to date	3.32	3.05	0.152	0.20#	0.08
No. of prior placement events in removal	3.75	3.38	0.084	0.22#	0.06
No. of prior reports	1.32	1.28	0.046	0.27^	0.06
Before 2009	11%	11%	0.968	0.19*	0.02
Percent 2009-2011	24%	25%	0.449	0.03	0.01
Percent 2012-2014	26%	25%	0.606	0.06	0.00
Percent 2015-2017	40%	40%	0.822	0.19#	0.01

Notes:

# Indicates moderate imbalance, |d| > 0.1.

^ Indicates severe imbalance, |d| > 0.25.

Exhibit A9

Study Group Characteristics Before and After Phase 2 Match

Variable	Means and proportions after Phase 2 matching			Absolute standardized difference (d)	
	HHM youth (n = 790)	Comparison youth (n = 790)	p-value	Before matching	After matching
Percent infant (0-1)	15%	18%	0.219	0.04	0.04
Percent age 1-2	9%	9%	0.862	0.03	0.01
Percent age 3-4	11%	11%	0.873	0.04	0.01
Percent age 5-10	33%	30%	0.135	0.01	0.04
Percent age 11-14	20%	21%	0.707	0.04	0.01
Percent over 15	12%	12%	1.000	0.00	0.00
Percent male	50%	51%	0.812	0.01	0.01
Percent White/undetermined	42%	41%	0.575	0.01	0.02
Percent Black	28%	28%	0.546	0.01	0.01
Percent Asian/Pacific Islander	6%	7%	0.656	0.04	0.03
Percent Native American	14%	13%	0.619	0.01	0.02
Percent Hispanic	11%	10%	0.619	0.00	0.02
Percent Child Placing Agency	28%	26%	0.640	0.01	0.02
Percent with exceptional rate payment	24%	22%	0.171	0.04	0.04
No. of removal episodes to date	1.32	1.27	0.200	0.06	0.06
No. of prior placement events in removal	3.76	3.64	0.686	0.09	0.02
No. of prior reports	3.31	3.18	0.439	0.10	0.04
Percent 2003-2005	3%	3%	1.000	0.02	0.00
Percent 2006-2008	7%	7%	0.921	0.03	0.01
Percent 2009-2011	24%	25%	0.438	0.02	0.03
Percent 2012-2014	22%	25%	0.212	0.01	0.04
Percent 2015-2017	40%	40%	0.916	0.01	0.00
Any prior arrests	5%	5%	0.812	0.11#	0.01
Any prior runaways	4%	4%	1.000	0.08	0.00
Prior mental health treatment need	48%	47%	0.650	0.06	0.01
Prior SUD treatment need	11%	10%	0.506	0.01	0.03

Notes:

# Indicates moderate imbalance, |d| > 0.1.

A. III. Methods to Estimate HHM Effects

Dichotomous (Yes/No) Outcomes

For outcomes of interest defined as dichotomous (placement stability, permanency, new reports to CPS, new out-of-home placements, placement with siblings, runaways, and caregiver retention), we conducted logistic regression analysis controlling for the clustering of youth within counties.

Continuous (Length of Time) Outcomes

For outcomes of interest defined as continuous (time to permanency, time to new report, time to new out-of-home placement, and time to foster care license closure) we conducted survival analysis controlling for the clustering of youth or caregivers within counties.

Logistic Regression Analysis on Full (Unmatched) Sample from the Five HHM Counties

We began our outcome analysis using traditional multivariate logistic regression analysis on the full (i.e. unmatched) sample. Regression analysis allowed us to control for observed covariates in estimating the treatment effect. However, regression analysis has several limitations. First, regression analysis can only control for observed factors. Second, if treated and comparison group covariate distributions do not overlap, then any causal inferences for regions with few treated or control group members must be based on extrapolation, leading to less precise estimates. Third, to approximate an experimental design, the research design stage of an evaluation should be separate from the outcome analysis stage. With standard regression analysis, the outcome of interest is necessarily part of the regression model and determining model fit requires repeatedly estimating the treatment effect.[51] This can lead to model selection based on the observed treatment effect and also suffers from the multiple comparisons problem, where the likelihood of finding a statistically significant result increases with the number of statistical tests performed. Finally, regression analysis requires making assumptions about functional form, which can increase bias if the wrong functional form is used.

While regression analysis has several limitations, it can outperform matching methods if important unobserved covariates are omitted from the analysis. In this case, regression analysis will produce a less biased estimate than propensity score matching. For this reason, we first estimated the relationship between HHM participation and the dichotomous youth outcomes using standard logistic regression, controlling for clustering in counties. Exhibit A10 reports regression-adjusted rates for the unmatched sample and allows comparison with results from the matched sample for each outcome. After regression analyses, conclusions regarding the comparative effects of HHM were similar in the unmatched and matched samples.

[51] Rubin, D.B. (2007). The design versus the analysis of observational studies for causal effects: Parallels with the design of randomized trials. *Statistics in medicine, 26*(1), 20-36.

Exhibit A10

Effects of HHM on Outcomes for Foster Children, With and Without Matching

Matching method	Permanency within 2 years				Placement stability/in care for 18 months				Reports to CPS within 2 years of exit			
	HHM	Comp[#]	Percentage point difference[$]	SE[t]	HHM	Comp[#]	Percentage point difference[$]	SE[t]	HHM	Comp[#]	Percentage point difference[$]	SE[t]
Raw percentages												
(1) Unmatched	27.24%	42.97%	-15.73%***	0.02	41.59%	35.90%	5.69**	0.02	23.42%	21.96%	1.46%	0.03
(2) Matched	35.52%	48.74%	-13.18%***	0.02	47.62%	29.02%	18.60%***	0.03	23.02%	22.44%	0.58%	0.04
Regression adjusted percentages												
(3) Unmatched	30.30%	42.97%	-12.67**	0.02	47.62%	35.90%	11.72%**	0.02	22.77%	21.96%	0.81%	0.03
(4) Matched	36.21%	48.74%	-12.53%***	0.02	42.66%	29.02%	13.64%***	0.03	25.14%	22.44%	2.70%	0.04

Matching method	Return to care within 2 years of permanency				Placement with siblings (children with a sibling in out-of-home care)				Run away from index event (children ages 11 and older)			
	HHM	Comp[#]	Percentage point difference[$]	SE[t]	HHM	Comp[#]	Percentage point difference[$]	SE[t]	HHM	Comp[#]	Percentage point difference[$]	SE[t]
Raw percentages												
(1) Unmatched	10.61%	9.42%	1.19%	0.02	53.18%	61.98%	-8.8%**	0.03	11.24%	9.15%	2.09%	0.02
(2) Matched	10.77%	8.93%	1.84%	0.03	51.90%	56.51%	-4.61%	0.04	11.29%	4.72%	6.57%**	0.02
Regression adjusted percentages												
(3) Unmatched	10.34%	9.42%	0.92%	0.02	58.70%	61.98%	-3.28%	0.03	13.96%	9.15%	4.81%*	0.02
(4) Matched	11.86%	8.93%	2.93%	0.03	54.26%	56.51%	-2.25%	0.04	14.11%	4.72%	9.39%***	0.02

Notes:

[#] Comparison families.

* p < 0.05, ** p < 0.01, and *** p < 0.001.

[t] Standard errors are expressed as percent. Standard errors are calculated using the formula:

$$SE = \sqrt{\frac{p_{1(1-p_1)}}{N_1} + \frac{p_{2(1-p_2)}}{N_2}}$$

[$] Raw percentages represent the differences in mean percentages for HHM and comparison youth without regression adjustment. Matching on covariates was still used to obtain matched percentage.

Sample sizes varied by outcome. The entire matched sample was subset according to the details in Exhibit A11.

Exhibit A11

Outcomes and Sub-setting Criteria for Entire Matched Sample

Outcome	Sub-setting criteria	Sample sizes	
		HHM	Comparison
Permanency within two years	Children in care long enough to reach two years		
Unmatched		569	9,429
Matched		563	517
Placement stability/in care for 18 months	Children whose episodes lasted at least 18 months		
Unmatched		553	7,179
Matched		545	448
Reports to CPS within two years of exit	Children who exited to care early enough to allow for two years at risk		
Unmatched		269	6,280
Matched		265	303
Return to care within two years of permanency	Children who exited to permanency early enough to allow for two years at risk		
Unmatched		275	6,135
Matched		260	291
Placement with siblings	Children with at least one sibling in out-of-home care at the same time		
Unmatched		346	4,164
Matched		343	338
Run away from index event	Children at least 11 years old at beginning of the event		
Unmatched		249	2,635
Matched		248	258

Outcome Analysis: Logistic Regression on Matched Sample

Our preferred analysis uses logistic regression on the matched sample to estimate the effect of the HHM on stability, achievement of permanency, new out-of-home placements, new reports to CPS, placement with siblings, runaways, and caregiver retention. Our outcome model uses most of the same covariates included in the Phase 2 matching model. Covariates used in the various models were not all the same. In some cases, small cell sizes resulted in multi-collinearity or quasi-complete separation. A group of variables provided various measures of a youth's behaviors and conditions. These included exceptional foster care payments, history of arrest and runaway and the DSHS-identified need for mental health and substance abuse treatment. In some cases these were so highly correlated, that we eliminated exceptional payments from the analysis. When we controlled for the years in which events began, in some subsets there were so few children that we substituted "before 2009" for the years 2003-2005 and 2006-2008.

Outcome Analysis: Survival Analysis on Matched Sample

As a secondary analysis we used a statistical procedure referred to as survival analysis. Rather than considering a simple "yes/no," this approach analyzes time to an event. In medicine, this approach is used to compare effects of treatments on time to patient death or recurrence of symptoms. Survival analysis allows us to include the entire relevant sample instead of creating a sub-group with sufficient time at risk. We use a variation called Cox regression that allows us to control for the same covariates we include the logistic regression for the same outcomes.

A. IV. Results of Outcome Analyses Estimating HHM Effects

Results of the logistic regression analysis of placement stability using our preferred definition—index event lasted at least nine months, for youth in care for at least 12 months and at least 18 months—are reported in Exhibit A12. Results of logistic regression analysis for our secondary definition of placement stability—two or fewer placement events after the index event start date, for youth in care for eight days to 12 months, 12 to 24 months, and greater than 24 months—are reported in Exhibit A12. This approach counts the index event as the first placement.

Exhibit A12

Logistic Regression Estimating Effects of the HHM on Stability (Index Event Lasted at Least nine Months) For Youth in Care for at Least 12 Months and at Least 18 Months

	Children in care for 12 months			Children in care for 18 months		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
HHM	0.61	***	0.12	0.60	***	0.08
Age (reference group 5 to 10 years old)						
under 12 months	1.12	***	0.30	1.24	***	0.35
1-2 years old	0.28	***	0.08	0.30	***	0.13
3-4 years old	0.30		0.32	0.44	*	0.29
11-14 years old	0.05		0.08	0.03		0.07
over 15 years old	0.12		0.28	0.20		0.19
Male	0.10		0.15	0.08		0.15
Race (reference group is White/undetermined)						
Black	0.02	*	0.11	0.03		0.14
Asian/Pacific Islander	0.36	***	0.14	0.93	***	0.04
Native American	0.62	**	0.19	0.38	*	0.19
Hispanic	0.30		0.25	0.29		0.24
Child placing agency	-0.03	***	0.09	0.20		0.16
Exceptional rate payment	0.14	***	0.20	0.08		0.20
No. of removal episodes to date	0.05	*	0.02	0.05	*	0.02
No. of prior placement events in removal	-0.05	*	0.02	-0.06	***	0.01
Year of index placement (reference group is 2009-2011)						
Before 2009	0.75	***	0.11	0.68		0.07
2012-2014	0.01		0.11	0.04		0.07
2015-2017	-0.81	**	0.26	-0.54	***	0.18
Any prior runaways	-0.27		0.30	-0.18		0.32
Prior mental health treatment need	-0.02		0.10	-0.13		0.14
Prior SUD treatment need	-0.14		0.19	-0.04		0.09
N	1,190			993		
AUC	0.710			0.707		

Notes:
* p < 0.05, ** p < 0.01, and *** p < 0.001.

Exhibit A13

Logistic Regression Estimating Effects of the HHM on Stability (Two or Fewer Placement Events)
For Youth in Care Less than 12 Months, 12 to 24 Months,
and More than 24 Months from the Index Event Start Date

	Less than 12 months			12 to 24 months			More than 24 months		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
HHM	0.32		0.53	0.13		0.32	0.47	***	0.1
Age (reference group 5 to 10 years old)									
under 12 months	-0.93	^	0.55	-1.25	***	0.32	-0.96	*	0.39
1-2 years old	0.34		0.47	-0.09		0.39	-0.66	***	0.15
3-4 years old	0.77		0.62	0.14		0.31	-0.7	**	0.26
11-14 years old	0.22		0.25	0.66	^	0.35	0.13		0.3
over 15 years old	1.4	***	0.16	0.62	**	0.21	0.12		0.26
Male	0.26		0.48	0.29		0.23	-0.06		0.21
Race (reference group White/undetermined)									
Black	0.57	^	0.3	-0.56	*	0.25	0.06		0.16
Asian/Pacific Islander	0.21		0.39	-0.34		0.27	0.35	**	0.13
Native American	0.05		0.15	-0.09		0.32	0.11		0.24
Hispanic	0.03		0.27	-0.69	^	0.39	0.09		0.45
Months from removal to index event	-0.02	^	0.01	-0.02	*	0.01	-0.01	**	0
Child placing agency	-0.75	***	0.16	-0.49	^	0.29	-0.38		0.53
No. of removal episodes to date	0.14	^	0.08	-0.03		0.12	-0.02		0.04
No. of prior placement events in removal	0.09		0.07	0.14	***	0.04	0.11	***	0.02
Event year	0.07	*	0.03	0.07	*	0.03	-0.06		0.06
Any prior arrests	0.07		0.18	1.09	^	0.57	0.55	***	0.14
Any prior runaways	-1.66		1.15	-0.41		0.87	0.76	^	0.39
Prior mental health treatment need	0.77	*	0.3	0.07		0.3	0.91	***	0.2
Prior SUD treatment need	-0.09		0.33	-0.07		0.2	0.2857		0.28
N	360			482			596		
AUC	0.754			0.73			0.752		

Notes:
^ p<0.1 * p < 0.05, ** p < 0.01, and *** p < 0.001.

Results of the logistic regression analyses of an exit to permanency within one year and within two years of the index placement event start date are reported in Exhibit A14. Exhibit A15 provides survival analysis results for permanency.

Exhibit A14

Logistic Regression Estimating Effects of the HHM on Permanency

	Permanency within one year of event			Permanency within two years of event		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
HHM	-0.53	**	0.18	-0.52	**	0.10
Age (reference group 5 to 10 years old)						
under 12 months	-0.86	***	0.19	-0.35	***	0.11
1-2 years old	-0.12		0.29	0.10		0.11
3-4 years old	-0.13		0.09	0.13		0.19
11-14 years old	0.16		0.19	-0.28		0.27
over 15 years old	0.17	***	0.05	-0.40	***	0.32
Male	0.09		0.14	0.14		0.12
Race (reference group is White/undetermined)						
Black	0.05		0.20	-0.52		0.21
Asian/Pacific Islander	0.42	***	0.09	-0.24	***	0.16
Native American	-0.43		0.49	-0.49		0.17
Hispanic	-0.05		0.31	-0.52	^	0.08
Child placing agency	-0.20	^	0.10	0.06	**	0.17
No. of removal episodes to date	-0.25	**	0.09	-0.19		0.07
No. of prior placement events in removal	-0.19	***	0.04	-0.13		0.03
Month in episode prior to event	0.01		0.01	0.01		0.00
Year of index placement (reference group is 2009-2011)						
2003-2005	-1.39	***	0.15	-1.36	***	0.06
2006-2008	-0.99	***	0.11	-0.42	***	0.08
2012-2014	-0.62	***	0.19	-0.55	***	0.16
2015-2017	-0.52	***	0.11	-0.64	***	0.14
Any prior arrest	-0.06		0.37	0.02		0.21
Any prior runaways	-0.91	^	0.50	-0.06		0.45
Prior mental health treatment need	-0.57	***	0.07	-0.33	***	0.06
Prior SUD treatment need	-0.22		0.25	0.23		0.20
N	1,434			1,080		
AUC	0.723			0.695		

Notes:

^ $p < 0.10$, ** $p < 0.01$, and *** $p < 0.001$.

Exhibit A15

Survival Analysis Estimating Effects of the HHM on Time from Event Start to Permanency

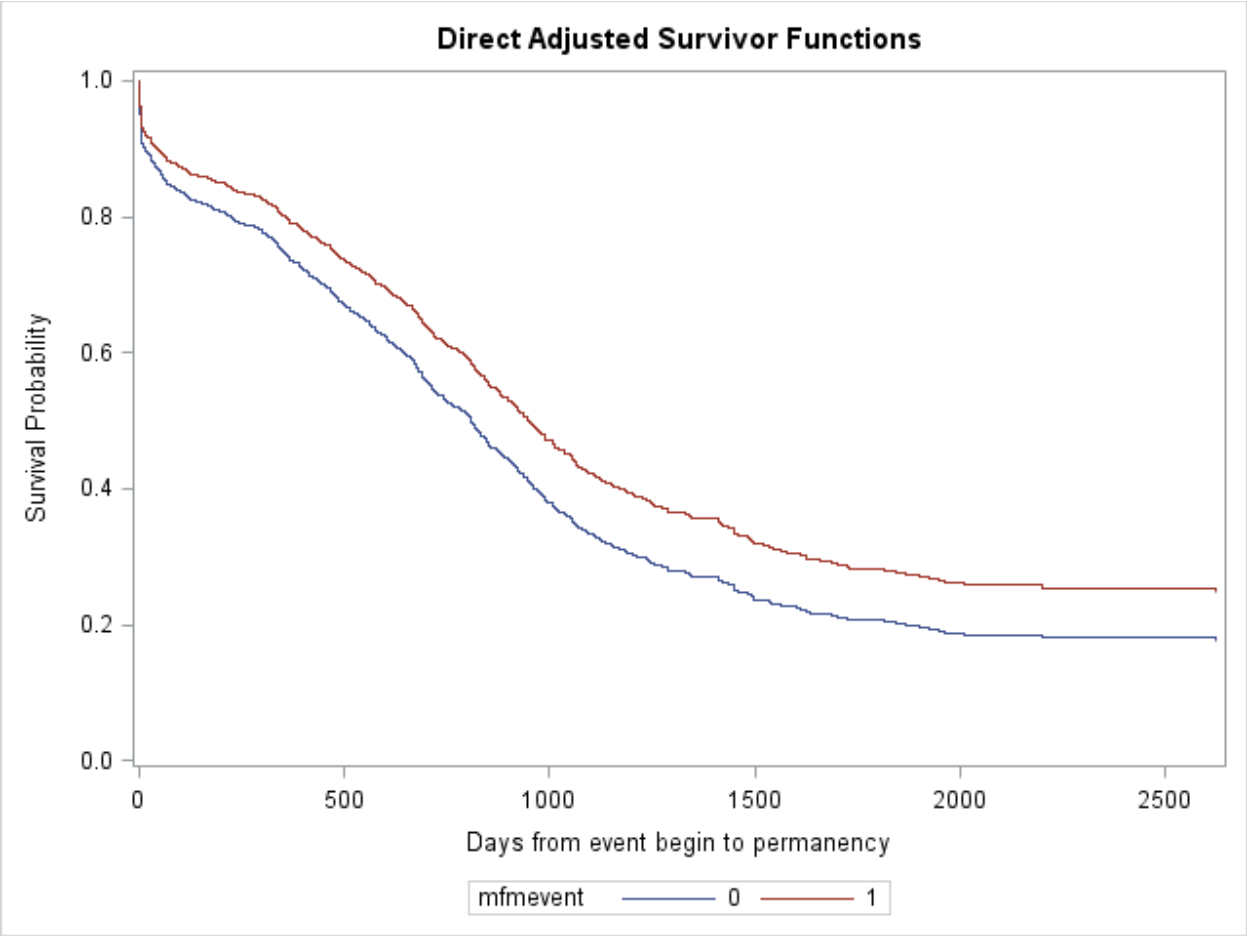
Covariate	Time to permanency			
	Coefficient	p	SE	Hazard ratio
HHM	-0.28	***	0.05	0.76
Age (reference group 5 to 10 years old)				
under 12 months	-0.12		0.11	0.89
1-2 years old	-0.02		0.14	0.98
3-4 years old	0.12	**	0.04	1.13
11-14 years old	-0.22		0.18	0.80
over 15 years old	-0.30		0.24	0.74
Male	0.07		0.07	1.07
Race (reference group is White/undetermined)				
Black	-0.22	***	0.06	0.80
Asian/Pacific Islander	0.09		0.07	1.10
Native American	-0.53	***	0.11	0.59
Hispanic	-0.28	***	0.05	0.75
Child placing agency	0.06		0.05	1.06
No. of removal episodes to date	-0.07		0.06	0.93
No. of prior placement events in removal	-0.10	***	0.02	0.91
Month in episode prior to event	0.00		0.00	1.00
Year of index placement (reference group is 2009-2011)				
2003-2005	-0.71	***	0.08	0.49
2006-2008	-0.36	***	0.01	0.70
2012-2014	-0.36	**	0.13	0.70
2015-2017	-0.37	***	0.05	0.69
Any prior arrest	-0.22		0.18	0.80
Any prior runaways	-0.40		0.29	0.67
Prior mental health treatment need	-0.32	***	0.06	0.73
Prior SUD treatment need	0.02		0.12	1.02
N	1,580			
Generalized R^2	0.1398			
Chi-Square	237.85	***		

Notes:

** p < 0.01 and *** p < 0.001.

Exhibit A16

Survival Curve Estimating Effects of the HHM on Time from Event Start to Permanency



Note:

Mfmevent 0 = Comparison group, mfmevent 1 = HHM group.

Results of the logistic regression analyses of new out-of-home placements within one year and within two years of achieving permanency for the subsample of youth who achieved permanency are reported in Exhibit A17. Exhibit A18 provides survival analysis results for new out-of-home placements.

Exhibit A17

Logistic Regression Estimating Effects of the HHM on New Out-of-Home Placements within One Year and Two Years from Permanency

	New out-of-home placements within one year of permanency			New out-of-home placements within two years of permanency		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
HHM	0.71	^	0.37	0.32		0.73
Age (reference group 5 to 10 years old)						
under 12 months	-0.20		0.74	0.02		0.50
1-2 years old	0.36		1.06	0.71		0.70
3-4 years old	0.29		0.50	0.15		0.73
11-14 years old	-0.32	^	0.17	0.46		0.31
over 15 years old	-0.97	**	0.30	-0.50		0.45
Male	-0.72	^	0.41	-1.02	***	0.17
Race (reference group is White/undetermined)						
Black	-0.44	***	0.09	-0.29	^	0.16
Asian/Pacific Islander	-0.49		0.38	-0.23	*	0.11
Native American	-0.14		0.15	-0.20		0.28
Hispanic	-0.88		0.58	-1.43	**	0.49
Child placing agency	-1.02	***	0.24	-1.58	***	0.22
Exceptional rate payment	0.90		0.65	1.52	**	0.51
No. of removal episodes to date	0.18	*	0.08	0.23	**	0.08
No. of prior placement events in removal	-0.54	***	0.10	-0.75	***	0.12
Year of index placement (reference group is 2009-2011)						
Before 2009	-0.12		0.53	-0.45		0.39
2012-2014	0.93	***	0.22	0.98	***	0.26
2015-2017	1.53	***	0.32	1.78	***	0.18
Prior mental health treatment need	0.52	***	0.15	0.41	***	0.10
Prior SUD treatment need	-0.10		0.78	-0.45		0.58
N	687			511		
AUC	0.772			0.825		

Note:
^ p < 0.10, * p < 0.05, ** p < 0.01, and *** p < 0.001.

Exhibit A18

Survival Analysis Estimating Effects of the HHM on Time to New Out of Home Placement after Permanency

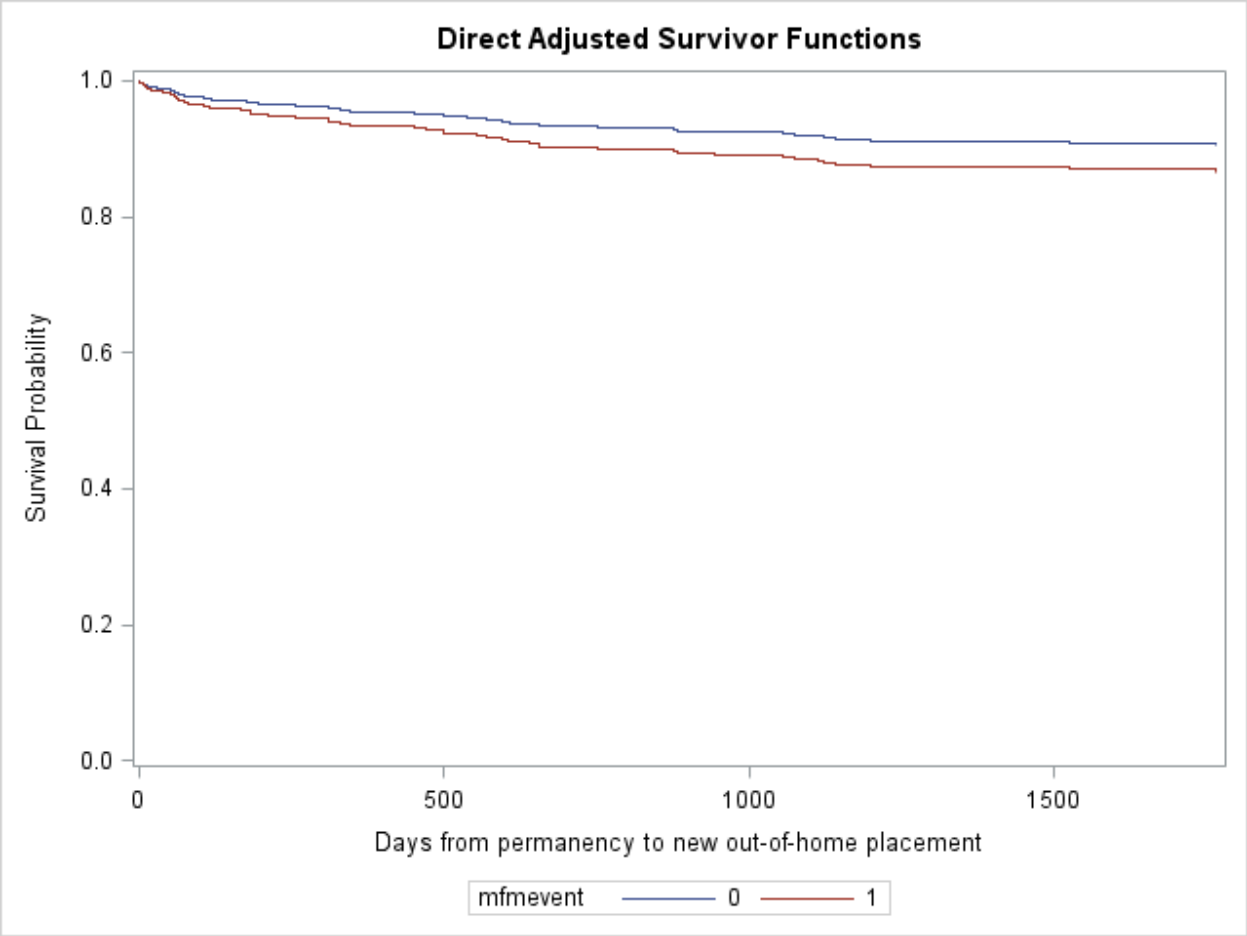
	Time from permanence to new out-of-home placement			
Covariate	**Coefficient**	**p**	**SE**	**Hazard ratio**
HHM	0.39		0.30	1.48
Age (reference group 5 to 10 years old)				
under 12 months	-0.05		0.54	0.95
1-2 years old	0.36		0.77	1.44
3-4 years old	0.21		0.36	1.24
11-14 years old	0.18	*	0.08	1.20
over 15 years old	-0.83	***	0.13	0.44
Male	-0.51	**	0.18	0.60
Race (reference group is White/undetermined)				
Black	-0.12		0.19	0.89
Asian/Pacific Islander	-0.40	^	0.23	0.67
Native American	-0.06		0.22	0.94
Hispanic	-1.10	*	0.44	0.33
Child placing agency	-1.34	***	0.24	0.26
Exceptional rate payment	0.67		0.52	1.95
No. of removal episodes to date	0.09	***	0.01	1.10
No. of prior placement events in removal	-0.38	***	0.11	0.68
Year of index placement (reference group is 2009-2011)				
Before 2009	0.41		0.41	1.51
2012-2014	0.52	***	0.11	1.68
2015-2017	0.58	***	0.15	1.79
Prior mental health treatment need	0.21		0.27	1.23
Prior SUD treatment need	0.07		0.33	1.07
N	860			
Generalized R^2	0.047			
Chi-Square	41.41	**		

Notes:

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Exhibit A19

Survival Curve Estimating Effects of the HHM on Time to
New Out-of-Home Placement after Permanency



Note:
Mfmevent 0 = Comparison group, mfmevent 1 = HHM group.

Results of the logistic regression analyses of new reports to CPS within one year and within two years of exiting the child welfare system for the subsample of youth who exited during our follow-up period are reported in Exhibit A20. Exhibit A21 provides survival analysis results for new reports to CPS.

Exhibit A20

Logistic Regression Estimating the Relationship between HHM and New Reports to CPS within One Year and Two Years of Exiting the Child Welfare System

	New reports within one year of exit			New reports within two years of exit		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
HHM	0.428	***	0.120	0.150		0.130
Age (reference group 5 to 10 years old)						
under 12 months	-0.972		0.630	-0.199		0.503
1-2 years old	0.495		0.724	0.229		0.598
3-4 years old	-0.012		0.114	-0.228		0.168
11-14 years old	-0.080		0.188	0.255		0.236
over 15 years old	-0.585		0.447	-0.103	^	0.061
Male	0.094		0.277	0.068		0.152
Race (reference group is White/undetermined)						
Black	0.136		0.311	0.148		0.200
Asian/Pacific Islander	-1.486	**	0.551	-0.100		0.323
Native American	-0.614	**	0.231	-0.639	^	0.327
Hispanic	-0.375		0.228	-0.241		0.263
Child placing agency	-1.029	***	0.171	-1.545	***	0.207
Exceptional rate payment	0.268		0.449	0.335		0.453
No. of removal episodes to date	-0.042		0.109	0.055		0.053
No. of prior placement events in removal	-0.243	**	0.081	-0.191	**	0.063
Year of index placement (reference group is 2009-2011)						
Before 2009	0.325		0.229	0.308		0.219
2012-2014	0.692	***	0.139	0.645	**	0.250
2015-2017	1.286	***	0.180	0.817	***	0.176
Prior mental health treatment need	0.146		0.186	0.084		0.176
Prior SUD treatment need	0.588		0.538	-0.232		0.305
N	721			568		
AUC	0.708			0.683		

Note:
^ p < 0.10, ** p < 0.01, and *** p < 0.001.

Exhibit A21

Survival Analysis Estimating the Relationship between HHM and Time to New Report to CPS after Exiting the Child Welfare System

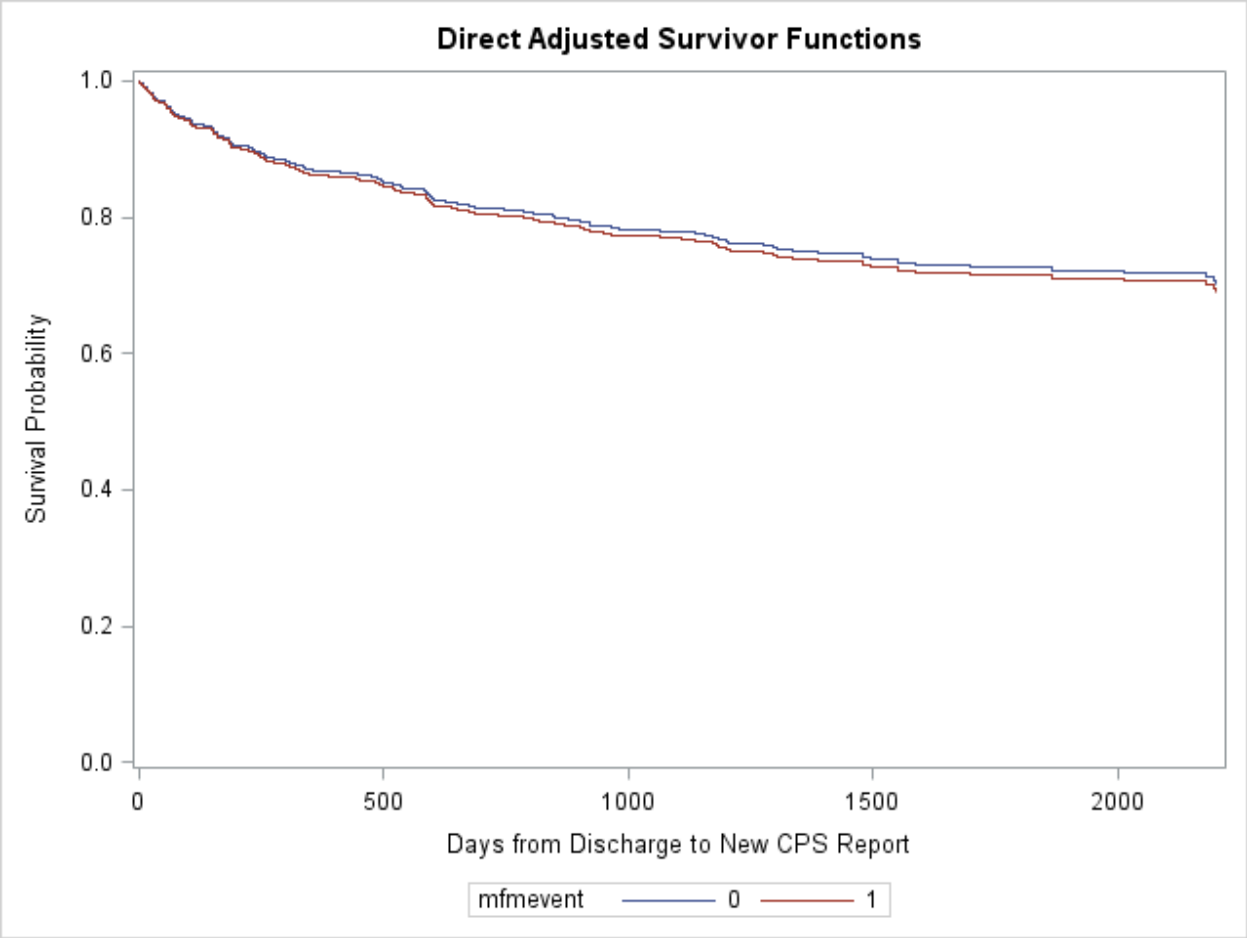
	Time from exit to new report to CPS			
Covariate	**Coefficient**	**p**	**SE**	**Hazard ratio**
HHM	0.053		0.138	1.055
Age (reference group 5 to 10 years old)				
under 12 months	-0.540		0.387	0.583
1-2 years old	0.132		0.304	1.141
3-4 years old	0.025		0.191	1.025
11-14 years old	0.139		0.128	1.149
over 15 years old	-0.439	*	0.188	0.645
Male	0.145		0.139	1.156
Race (reference group is White/undetermined)				
Black	0.215		0.139	1.24
Asian/Pacific Islander	0.008		0.149	1.008
Native American	-0.373		0.270	0.689
Hispanic	-0.076		0.152	0.927
Child placing agency	-1.124	***	0.092	0.325
Exceptional rate payment	-0.080		0.340	0.923
No. of removal episodes to date	-0.010		0.079	0.99
No. of prior placement events in removal	-0.194	***	0.034	0.824
Year of index placement (reference group is 2009-2011)				
Before2009	0.137		0.240	1.146
2012-2014	0.217		0.163	1.242
2015-2017	0.240	^	0.145	1.271
Prior mental health treatment need	0.218	^	0.119	1.244
Prior SUD treatment need	0.160		0.369	1.174
N	894			
Generalized R^2	0.053			
Chi-Square	49.011	***		

Note:

^ $p < 0.10$, * $p < 0.05$, and *** $p < 0.001$.

Exhibit A22

Survival Curve Estimating the Relationship between HHM and Time to New Report to CPS after Exiting the Child Welfare System



Note:
Mfmevent 0 = Comparison group, mfmevent 1 = HHM group.

Results of the logistic regression analysis of placement with siblings is reported in Exhibit A23.

Exhibit A23

Logistic Regression Estimating Effects of the HHM on Placement with Siblings

	Placement in foster home with sibling		
Covariate	**Coefficient**	**p**	**SE**
HHM	-0.09		0.21
Age (reference group 5 to 10 years old)			
under 12 months	-0.83	***	0.12
1-2 years old	0.12		0.21
3-4 years old	0.19		0.25
11-14 years old	-1.10	***	0.10
over 15 years old	-0.85	**	0.32
Male	-0.06		0.24
Race (reference group is White/undetermined)			
Black	-0.50	*	0.23
Asian/Pacific Islander	-0.53		0.40
Native American	-0.22		0.21
Hispanic	0.26		0.18
Child placing agency	0.06		0.14
No. of removal episodes to date	-0.09		0.08
No. of prior placement events in removal	-0.17	^	0.10
Year of index placement (reference group is 2009-2011)			
2003-2005	1.04	**	0.38
2006-2008	-0.94	***	0.28
2012-2014	-0.04		0.14
2015-2017	0.02		0.42
Any prior arrest	-1.15		0.83
Any prior runaways	-0.05		1.21
Prior mental health treatment need	-0.18	*	0.09
Prior SUD treatment need	-0.45		0.45
N	681		
AUC	0.730		

Note:

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Results of the logistic regression analysis of runaway from care is reported in Exhibit A24.

Exhibit A24

Logistic Regression Estimating Effects of the HHM on Runaway from Care

Covariate	Runaway from care		
	Coefficient	p	SE
HHM	1.20	***	0.11
Age (reference group over 15 years old)			
11-14 years old	-1.53	***	0.12
Male	0.62	***	0.11
Race (reference group is White/undetermined)			
Black	0.19	***	0.05
Asian/Pacific Islander	0.59		0.76
Native American	0.64	***	0.08
Hispanic	-1.64	***	0.12
Child placing agency	-0.30		0.22
Exceptional rate payment	-0.15		0.16
No. of removal episodes to date	-0.12	***	0.02
No. of prior placement events in removal	-0.01	**	0.00
Year of index placement (reference group is 2009-2011)			
Before 2009	0.25		0.29
2012-2014	0.14		0.18
2015-2017	-1.23	***	0.19
Any prior runaways	1.20	***	0.18
Prior mental health treatment need	0.39		0.52
Prior SUD treatment need	0.71	***	0.09
N	502		
AUC	0.869		

Note:
** $p < 0.01$ and *** $p < 0.001$.

Results of the logistic regression analyses of caregiver license retention for one and two years from first record of a foster care license being issued are reported in Exhibit A25. Exhibit A26 provides survival analysis results for caregiver license retention.

Exhibit A25

Logistic Regression Estimating Group Differences in Caregiver Retention at One and Two Years

	One-year retention			Two-year retention		
Covariate	**Coefficient**	**p**	**SE**	**Coefficient**	**p**	**SE**
HHM	1.51	*	0.66	1.86	***	0.15
N	2,119			1,337		
AUC	0.516			0.516		

Note:
* p < 0.05 and *** p < 0.001.

Exhibit A26

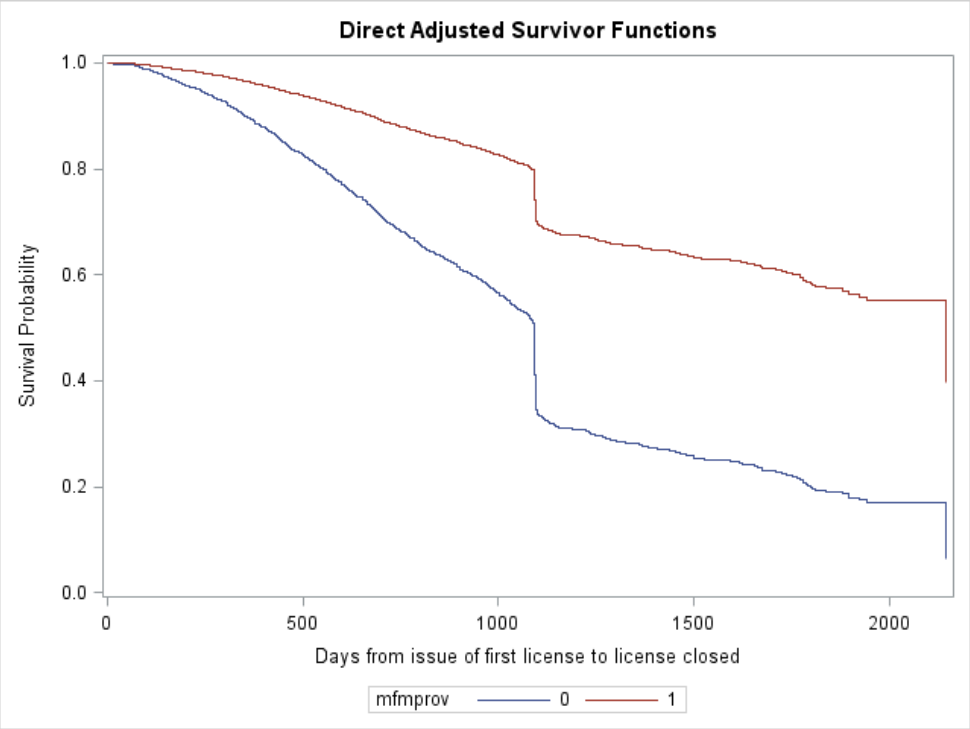
Survival Analysis Estimating Group Differences in Caregiver Retention
(Time to License Closure)

	Caregiver retention			
Covariate	**Coefficient**	**p**	**SE**	**Hazard ratio**
HHM	-1.10	***	0.49	0.33
N	2,508			
Generalized R^2	0.019			
Chi-Square	47.561	***		

Note:
*** p < 0.001.

Exhibit A27

Survival Curve Estimating Group Differences in Caregiver Retention
(Time to License Closure)



Note:
mfmprov 0 = Comparison foster homes, mfmprov 1 = HHM foster homes.

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For further information, contact:
Rebecca Goodvin at 360.664.9077, rebecca.goodvin@wsipp.wa.gov

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