



THE FOLLOWING BABY BACK HOME PROGRAM: IMPACT ON LOW-BIRTH-WEIGHT PRETERM INFANTS

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Executive Summary

The Following Baby Back Home (FBBH) program is a home visiting intervention, delivered by a nurse-social worker team, designed to support medically fragile low birthweight preterm (LBWPT) infants following discharge from neonatal intensive care units (NICUs). The program seeks to optimize infant health and developmental outcomes by facilitating healthcare engagement, monitoring growth and development, coordinating services, connecting families with community resources, and providing parent education during the critical transition from hospital to home. Given the elevated risk of morbidity, developmental delay, and mortality among LBWPT infants, FBBH addresses an important gap in post-discharge care by providing ongoing support to both infants and their families through age three.

This quasi-experimental, intention-to-treat evaluation compared FBBH enrollees with a one-to-one propensity score matched comparison group of similarly high-risk infants, using birth certificate records and the Arkansas All-Payer Claims Database (APCD) for infants born January 1, 2014, through December 31, 2022. Of 1,192 enrollees with a valid birth certificate record, 768 were identified for matching. Matching combined exact-category matching on twelve clinical and demographic characteristics with greedy nearest-neighbor propensity score matching on remaining maternal, socioeconomic, and clinical diagnostic covariates, plus COVID-19 period. Consistent with HomVEE version 2.1 standards, categorical matching variables were dichotomized and baseline equivalence assessed using standardized mean differences. Match rates were 94% for the mortality analysis (721 pairs) and 89% for birth-to-age-1 healthcare utilization outcomes. Because 53.2% of families received fewer than twelve months of service, the intention-to-treat approach yields conservative estimates.

The evaluation provides evidence that participation in FBBH is associated with improved health outcomes and increased engagement with healthcare services during the first year of life. Most notably, infants enrolled in FBBH experienced significantly lower odds of infant mortality compared with matched controls. Infants in the comparison group were more than three times as likely to die before their first birthday as those enrolled in FBBH (adjusted odds ratio [aOR] = 3.27, 95% CI = 1.13-9.46, $p = .029$). Mortality occurred among 0.6% of FBBH infants compared with 1.9% of infants in the matched comparison group. This finding represents the most consequential outcome of the evaluation and suggests that FBBH contributes meaningfully to improved survival among medically fragile infants.

The evaluation also demonstrated significant improvements in preventive healthcare utilization. FBBH participants received more healthcare visits during which immunizations were administered and were more likely to complete at least three immunization-related visits during their first year of life, a proxy measure for adherence to the recommended immunization schedule. These findings suggest that the program effectively promotes preventive care and strengthens adherence to recommended pediatric healthcare guidelines.

Consistent with the program's theory of change, FBBH participants demonstrated significantly greater engagement with outpatient healthcare services than matched controls. Infants enrolled in the program experienced higher rates of overall outpatient utilization, including greater use of speech-language pathology services and other non-wellness medical visits. The increased use of specialized developmental and rehabilitative services may reflect the effectiveness of FBBH's developmental surveillance, screening, referral, and care coordination activities. These findings

indicate that home visiting teams successfully connect families with appropriate healthcare resources and support timely intervention for emerging developmental concerns.

FBBH participants also exhibited higher rates of urgent healthcare utilization, including inpatient hospitalizations and emergency department (ED) visits. Although these findings may initially appear less favorable, increased healthcare utilization among FBBH infants may reflect greater recognition of health concerns, enhanced caregiver understanding of when medical evaluation is necessary, and improved access to healthcare services. Notably, increased healthcare engagement occurred concurrently with substantially lower infant mortality, suggesting that the additional inpatient and emergency care may have facilitated timely medical intervention and contributed to improved survival outcomes. Furthermore, many ED visits among FBBH infants were related to the evaluation and management of existing health conditions, consistent with the program's emphasis on condition-specific education and ongoing health monitoring. It should be noted, however, that this evaluation cannot establish that increased inpatient and urgent care is associated with the differences demonstrated in infant mortality; the findings are concurrent and not causal.

An important contribution of this evaluation is its assessment of program effectiveness across pre-pandemic, pandemic, and post-pandemic periods. By incorporating COVID-19 exposure periods into the matching process, the study demonstrated that positive program outcomes persisted despite significant disruptions to healthcare delivery and service provision associated with the pandemic. These findings strengthen confidence in the robustness and generalizability of the FBBH model.

Several limitations should be considered when interpreting these results. Administrative claims data measure healthcare utilization rather than underlying health status and therefore cannot capture unmet healthcare needs when care was not sought. Additionally, immunization completion was assessed using claims associated with immunization visits rather than vaccine-specific records. Some eligible participants were excluded because of missing data required for matching, and current administrative data structures do not allow for reliable identification of same-gender twins and multiples. Nevertheless, the study's use of statewide claims data, rigorous propensity score matching procedures, and a large sample of medically fragile infants strengthen the validity of the findings.

Overall, the results indicate that FBBH is an effective intervention for improving outcomes among LBWPT infants. The program is associated with lower infant mortality, greater adherence to preventive care, increased access to developmental and specialty services, and enhanced engagement with healthcare systems during a period of heightened medical vulnerability. These findings are consistent with prior evaluations of FBBH and contribute to a growing evidence base supporting intensive home visiting services for medically fragile infants. When considered alongside previous analyses demonstrating a benefit-to-cost ratio of 27.95:1 and substantial net economic benefits, the evidence suggests that FBBH represents both an effective public health intervention and a sound investment in the long-term well-being of high-risk children and families. Continued support for nurse-social worker home visiting models should therefore be considered an important component of care coordination strategies for medically complex infants transitioning from NICU to community-based care.

Introduction

The general goals of Arkansas' promising approach intervention, Following Baby Back Home (FBBH), are to maximize the health and developmental progress of low birthweight preterm (<2,500 grams and <37 weeks gestation; LBWPT) infants, within the constraints of their medical conditions, and to improve the family's skill and confidence in providing a safe, stimulating, and nurturing home environment. The FBBH intervention is provided by a registered nurse and licensed social worker team to support the families of LBWPT infants after discharge from the neonatal intensive care unit (NICU) (Casey et al., 2017). Infants who graduate from the NICU are at increased risk for developmental and behavioral morbidities and death (Ely & Driscoll, 2017). Parents often require support to understand special medical needs of these infants (Matos et al., 2020; Ramey et al., 1992; Rohana et al., 2018; Wells et al., 2017).

According to the model developer (Casey et al., 2017), the FBBH program is designed to optimize the health and developmental progress of LBWPT infants through monitoring infants' health issues and growth, conducting developmental screenings, and completing referrals for health and developmental support when needs are identified. The FBBH service extends beyond the child's health and healthcare to include family assessments to support broader family needs. When needs are identified, teams provide direct education using the Parents as Teachers® curriculum materials (Parents as Teachers, 2022) and referrals for community services.

Eligibility for the FBBH program is based on chronic medical conditions identified by a neonatologist at the time of NICU discharge. Referrals to the FBBH program are solicited from all NICUs in Arkansas with the majority originating from Level IIIB and Level IV facilities (Arkansas Department of Health, n.d.) that serve the most medically fragile infants from across the state. The FBBH program initially provides two home visits per month for the first two months after enrollment, starting as close as possible to the transition home, then one home visit per month until the child reaches age 1, and finally alternating home and phone/virtual visits every month until age 3.

During the time of the evaluation, the FBBH program teams were in six locations in Arkansas, each serving up to 45 families (270 total). MIECHV funded two of the six teams. A central administrative team provides model training, monitors fidelity, and provides clinical support to teams as needed. A previous study demonstrated that in the first year of life, infants in the FBBH program had more medical appointments, immunizations, and a lower likelihood of infant death compared to a propensity score matched comparison group of infants (McKelvey et al., 2021).

The goal of the evaluation is to assess whether FBBH supports the health and developmental progress of LBWPT infants with Neonatal Intensive Care Unit (NICU) hospitalizations. As shown in the logic model in Appendix A, FBBH achieves these general goals by 1) improving adherence to medical appointments and immunizations; 2) facilitating coordination of health care; 3) monitoring children's growth and development; 4) identifying local resources to meet the needs of the family and infants, including developmental intervention services; and 5) providing parent education.

Evaluation Questions

This evaluation is designed to address three primary research questions; devised to compare children who received FBBH services to a propensity score matched comparison group. Health and healthcare outcomes include: 1) improved markers of child health (infant mortality and completion of immunizations); 2) outpatient doctor visits from NICU discharge to age 1; and 3) urgent healthcare use, measured as hospitalizations and emergency department (ED) visits.

Methods

Design, Procedures, and Data/Measures

This study used a quasi-experimental, intention-to-treat design with administrative data to examine the outcomes of the children and their mothers in FBBH (treatment) to similarly high-risk children and their mothers (control; non-FBBH). This design is appropriate given the pragmatic limitation of randomizing treatment assignment. In a well-balanced match, where FBBH and non-FBBH are systematically similar (across demographic, socio-economic, and underlying medical conditions of infants), differences between FBBH and non-FBBH outcomes will determine the effectiveness of the FBBH treatment. An intention-to-treat approach was taken as FBBH infants may have been enrolled in the intervention, but parents/guardians may have subsequently declined to receive services at any time after enrollment. Indeed, while the largest proportion of families in the FBBH program (46.8%) remain enrolled for at least one year, 28.1%, 9.7%, and 15.4% enrolled for less than three months, three to six months, and six to twelve months, respectively. This intention-to-treat approach will produce conservative analytic results (Gupta, 2011).

The analytic sample for the analyses includes all infants and their mothers referred to and enrolled in FBBH who could be located in the Arkansas Birth Certificate data and All-Payer Claims Database (APCD), who had insurance enrollment data, and for whom an adequate propensity score match (PSM) could be made. The outcomes focused on a review of state vital records and insurance claims examining infant mortality, immunizations, and the frequency of medical visits for the child as defined below.

Infant mortality, defined as death within the first year of life (Centers for Disease Control and Prevention, 2020), was a primary outcome in this evaluation. Several secondary outcomes were assessed. The number of immunization visits in the first year of life was used as a proxy for completion of the pediatric immunization series. Guidelines recommend a minimum of five encounters (not including influenza vaccination) in the first 18 months of birth, with the first doses administered at birth and the last doses between 12 and 18 months of age (American Academy of Pediatrics, 2019). For this evaluation, we considered immunization coverage to be complete if an infant had at least 3 immunization encounters in the first year of life after birth hospital discharge. The health system use outcomes assessed include inpatient hospitalizations, ED visits (all and visits for evaluation and management), outpatient visits (specifically wellness, speech language therapies (Swanson, 2018), Early Intervention and Day

Treatment (EIDT, which are developmental early childhood programs) services,¹ and non-wellness visits) and filled pharmacy prescriptions. Claims codes are available upon request.

Analysis

At the first analytic stage, a one-to-one FBBH and non-FBBH infant matching strategy was implemented using a combination of exact category and greedy nearest neighbor matching algorithm. These independent variables specifically included the child's gender and type of healthcare coverage for their NICU stay, the mother's race/ethnicity, education, teenage status, WIC receipt, insurance type, and marital status at birth, the mother's smoking status during pregnancy, the rurality of residence based on rural-urban commuting area code (RUCA), the weight and gestational age of the child at birth, the Apgar score five minutes after birth, the child's length of stay in the NICU, the newborn respiratory disease indicator, history of intraventricular hemorrhage, convulsions, presence of critical congenital heart disease, chromosome abnormality, use of gastrostomy tube, and the Arkansas Perinatal Regionalization Levels of Care (Arkansas Department of Health, n.d.) of the facility of longest stay as infants may have transferred from one NICU to another. In addition, COVID pandemic time categories (pre-, during-, and post-pandemic) were included as a matching variable to account for differences in health burden and healthcare utilization patterns. Children born before March 2019, having a first birthday before the pandemic, were assigned the pre-pandemic category. Children born between March 2019 and June 2022 were assigned the during-pandemic category, and children born after June 2022 were assigned the post-pandemic category. Under version 2.1 of the Home Visiting Evidence of Effectiveness (HomVEE) standards, baseline equivalence should be examined in terms of standardized mean differences, which is applicable to both binary and continuous variables. Based on our correspondence with HomVEE, we dichotomized each categorical variables used in propensity score match to enable the application of the conventional definition of standardized mean differences.

To be matched, both infant groups had to be identical in the following categories: gender, WIC receipt, NICU length-of-stay category, the newborn respiratory disease indicator, history of intraventricular hemorrhage, convulsions, presence of critical congenital heart disease, chromosome abnormality, use of gastrostomy tube, type of insurance used in NICU, birth weight category, and gestational age category. In addition, using SAS (SAS Institute, Cary, NC) proc psmatch (D'Agostino, 2005; SAS Institute, 2018), both groups were matched by propensity score (probability of each group being assigned to the FBBH treatment was equal or nearly equal based on all remaining covariates included in the logistic regression model).

Count distribution outcome models were fitted by specifying (1) a negative binomial distribution in presence of significant over-dispersion and (2) a Poisson distribution otherwise (immunization and wellness visit) with a log-link function. A binomial distribution with a logit-link function was used for the binary outcomes. Differences were determined using incident rate ratios (IRR, for Poisson count), adjusted odds ratios (aOR, for binary outcomes) and p-values. For infant mortality, Firth's logistic regression model was applied to compute aOR. Firth's logistic

¹ <https://humanservices.arkansas.gov/divisions-shared-services/developmental-disabilities-services/service-for-children-with-dd-id-needs/developmental-daycare-eidt-age-0-21/>

regression is a standard method applied to analyze rare events with small samples and is appropriate to estimate aOR.

Sample characteristics

The primary population targeted in this evaluation were medically complex, LBWPT infants and their families, living in 57 Arkansas counties in the Northeast, Northwest, River Valley, Central, South, and Southwest regions of the state. The infants are referred from all Arkansas NICUs and out-of-state NICUs for Arkansas infants living in the program coverage area. Eligible infants are those with a NICU admission or a NICU-like admission identified by a Neonatologist. These infants may have chronic medical problems that may include chronic lung disease, congenital heart disease, suspected genetic syndromes, and perinatal brain injury such as intraventricular hemorrhage (IVH), serious infections, ongoing feeding problems, and growth concerns.

Infants and their mothers served by FBBH with dates of birth between January 1, 2014, and December 31, 2022, with a valid Arkansas birth certificate record were eligible for inclusion (N=1192). Enrollees who did not meet the following criteria were excluded: 1) not identifiable/uniquely identifiable by HASH ID in birth certificate (N=146); 2) not in the APCD eligibility file (N=51), 3) not in hospital record at birth (N=13), and 4) those with missing data in key covariates for propensity score matching (N=214); resulting in a final sample of 768 infants for matching. The sample was not limited based on the duration in the FBBH program.

The base dataset for the propensity score match control sample was created by using inclusion-exclusion criteria almost identical to that of the treatment group. APCD enrollment between Jan. 1, 2014, to Dec. 31, 2023, and birth certificate records from Jan. 1, 2014, to Dec. 31, 2022, were used to identify the study population. The control group was matched with the FBBH group based on the characteristics described above. The final control group contained those who satisfied the inclusion and exclusion criteria and were matched with a FBBH participant.

For the analysis comparing the FBBH infant mortality rate, we utilized all participants who satisfied the inclusion and exclusion criteria as a candidate for the propensity score match. The final mortality sample included 721 participants (94% out of 768 candidates) for whom an adequate propensity score match was made (Effect Size [ES]<0.25, Standardized Difference [SD]<0.15, and Variance Ratio [VR] within the recommended range of 0.5 to 2.0) (SAS Institute, 2018). The pre- and post-PSM characteristics for the infants included in the infant mortality analysis is provided in Table B-1.

For healthcare utilization outcomes from NICU discharge to the child's first birthday, we further restricted the study population and potential controls by requiring a continuous enrollment in APCD for one year with one allowable gap of 30 days to ensure that we captured the entirety of healthcare utilizations experienced during the first year of life. Out of 724 candidates with almost continuous enrollment, a match was made for 644 FBBH participants (89%). All variables post-matching are balanced across groups as described above (SAS Institute, 2018). The pre- and post-PSM characteristics are provided in Tables B-2.

Results

Results

Infant Mortality: We compared the mortality rate of FBBH enrollees with the matched control group. The adjusted odds ratio was computed using the FBBH recipients as the referent group. As shown in Table 1, infants in the control group had significantly greater odds of infant mortality than FBBH infants (aOR=3.27 [95% CI=1.13-9.46], $p=.029$).

Table 1. Infant Mortality Difference

Infant Mortality	Treatment (N=721)	Control (N=721)	Firth OR (95% CI) ^a	P Value
Death by Age 1 (n, %)	4 (0.6)	14 (1.9)	3.27 (1.13-9.46)	0.029

Note. ^aOdds ratio (OR) is calculated by a logistic regression model. Note: Reference=FBBH treatment; CI=confidence interval.

Immunizations: Findings in Appendix C show that in their first year of life, FBBH infants received significantly more medical visits in which immunizations were received than the control group. In addition, a greater proportion of FBBH infants, compared to control infants, completed at least 3 visits, a proxy for completing the immunization series.

Outpatient Healthcare Utilization: The outpatient healthcare utilization outcomes are shown in Appendix C. From the day after the NICU discharge to the first birthday, infants in FBBH had significantly more use of the outpatient healthcare system than the non-FBBH matched control group. This includes the total number of outpatient visits, and visits specifically for speech/language pathology therapy and non-wellness.

Urgent Healthcare Utilization: The urgent healthcare utilization outcomes are also shown in Appendix C. From the day after the NICU stay to their first birthday, infants in FBBH had significantly more inpatient stays. There were also a greater number of ED visits, both the total number of visits and those specifically for evaluation and management of an existing condition.

Discussion

The results of this evaluation of the FBBH intervention add to the current literature on the benefits of home visiting programs targeting LBWPT infants. Together the findings demonstrate that home visiting for medically fragile LBWPT infants supports access and use of the medical community. The findings demonstrate that FBBH infants have more medical visits and outpatient visits overall. When we specifically examine speech-language pathology outpatient visits, infants in FBBH had a greater likelihood of receiving specialized support – perhaps owing to the developmental screening and care management of the FBBH home visiting teams. In addition to having more healthcare encounters overall, infants in FBBH had a greater number of encounters that included immunizations. This also resulted in a larger proportion of children in FBBH having had at least 3 medical visits where immunizations were provided, indicating a greater likelihood of completing the immunization series.

Infants in the FBBH group had more hospitalizations, more emergency department visits (though, this was partially driven by visits for evaluation and management of existing conditions), and more non-wellness healthcare encounters compared the counterparts in the

matched control group. At face value, these are findings for which the direction of impact could be seen as more ambiguous, or even unfavorable. However, infants in FBBH had significantly lower odds of infant mortality than infants in the propensity-matched control group, suggesting that the increased healthcare encounters reflected needed healthcare intervention that likely contributed to the reduced infant mortality. By helping parents to recognize when their infant needs medical care and carefully monitoring of the health status of these fragile infants, the FBBH intervention may contribute to both the increase in healthcare use and reduction in infant deaths.

Our study also expands the current literature by investigating, for the first time, examining outcomes across COVID-19 pandemic phases (pre, during, post). Further, matching infants based on the COVID phase, we found that, even with the pandemic disrupting the FBBH services and health systems in general, findings from previous evaluations persisted. Thus, this analysis lends additional support for the robust impacts of the model on children's health and healthcare use.

Limitations

We were unable to incorporate analyses on all infants who received FBBH; we excluded one year of data because Arkansas birth certificates were modified in 2014 to include a greater number of family characteristics, making older birth certificate records missing data elements for matching. The APCD does not record the type of vaccines administered. Given this limitation, billing codes were used to capture the number of visits in which immunizations occurred and whether or not there were at least 3 such visits in the first year of life as a proxy for completion of the immunization series. Another data limitation was that, at this time, there is no established method to uniquely identify twins and multiples of the same gender because they are given the same individual identifier called HASH ID in the APCD (an anonymous and unique 44-character identifier that incorporates a person's last name and date of birth) used for this report, therefore these findings may not be generalizable to that study population.

The use of medical claims available in the APCD is a strength of the study, in that it includes data for all public and nearly all private insurance providers in the state of Arkansas. Medical claims data are currently available for 7,911,838 individuals with commercial, Medicaid, Medicare, Arkansas State/School Employees, and Workers' Compensation coverage.² This permits the examination of outcomes for children across sociodemographic and economic strata. That said, a recent study reported that 7.7% of Arkansans' children are uninsured,³ but that rate has been increasing in recent years, making earlier data more complete. This would most likely impact immunizations provided free of charge for uninsured children through the state's Vaccines for Children⁴ program, which may impact outcomes should a child receive a vaccine using the program during a period of being uninsured. Our outcomes reflect health care

² <https://achiapcd.atlassian.net/wiki/spaces/HTIR/pages/2621505562/Infographics+Arkansas+APCD>

³ <https://ccf.georgetown.edu/2025/09/12/u-s-and-state-by-state-child-health-coverage-trends/>

⁴ <https://healthy.arkansas.gov/programs-services/community-family-child-health/immunizations/vaccines-for-children/>

utilization rather than health outcomes and should not be interpreted as measures of underlying health status. The analysis is limited to care that was sought and documented for specific health issues or conditions. If a child experienced a health issue but care was not sought, this would not be captured in administrative data.

Regarding study limitations related to type of health care utilization, it is possible that one family may seek care in the emergency department (ED), whereas another family may seek care in a clinic for the same health issue or condition. To address this potential variation in care-seeking patterns, we analyzed ED visits by provider-perceived urgency. Additionally, rurality was included as a matching variable to help minimize bias related to differences in access to clinics and routine sources of care.

Conclusions

LBWPT infants are at significantly greater risk for ongoing health and developmental problems in the early years of life. Problems often arise in these infants due to poor follow-up and coordination between various medical providers, as well as other community providers. In addition, parents of these infants are often confused about the need for follow-up for various medical treatments, or to whom they should bring their concerns.

The results of this study of the FBBH intervention add to the current literature on the benefits of home visiting programs targeting LBWPT infants. Our program evaluation documents the benefits of the nurse/social worker home-visiting model on greater utilization of the healthcare system and also on the health of these high-risk children. Our research expands the current literature by investigating the effects of the program across COVID-19 pandemic phases, while using updated PSM strategies that align with the HomVEE clearing house criteria. Together the findings demonstrate that home visiting for medically fragile LBWPT infants supports access and use of the medical community. The findings demonstrate that FBBH infants have more medical visits — during which immunizations occur. Most significantly, infants in FBBH had significantly lower odds of infant mortality than children in the matched control group. The FBBH intervention specifically supports parents to recognize the need for medical intervention. We speculate that the careful monitoring of the health status of these fragile infants resulted in more acute care, along with more pharmacy use, which in turn, likely contributed to the reduced infant mortality. Future planning for the care of very fragile LBWPT infants should include a home visiting approach as part of the ongoing care management and evaluate the enhanced linkages to outpatient visits.

Results suggest that nurse/social worker home visiting teams can positively affect the health of medically fragile LBWPT infants. Our findings are among the first to document increases in speech/language therapies and non-wellness clinical visits for infants supported by home visiting. Unlike some of the literature examining home visiting for LBWPT infants, which reports reduction in ED use for home-visited infants (Edraki et al., 2012; Liu et al., 2018; Vohr et al., 2018), our findings document increased use of emergency care for infants in FBBH in the first year of life. Increased ED utilization in a medically complex group is expected, and in many cases, warranted (O'Mahony et al., 2013). Our data also suggest that ED visits of FBBH infants were more likely to be for evaluation and management, which may be representative of enhanced, condition specific education that families receive. Similar findings have been reported by another home visiting program for LBWPT infants, where hospital and ED use is higher when infants are younger but decreases as children age (Vohr et al., 2017). A nurse-

social worker home visiting program for low-income families has also resulted in increased ED use for more minor reasons (Meghea et al., 2015).

Our results suggest that LBWPT children are an appropriately selected group to receive home visits from a program like FBBH. Overall, the findings from this evaluation are consistent with those from previous analyses (Casey et al., 2017; Lewis et al., 2023; McKelvey et al., 2021). Similar outcomes as those reported in this evaluation were used to investigate the return on investment for the FBBH program (Lewis et al., 2023). The study documented a benefit-to-cost ratio of 27.95 for FBBH, with a net economic benefit of \$83,020 for avoided deaths, program costs, and healthcare costs. The study also reported comparable medical care costs incurred by FBBH infants and the comparison group. Taken together, these findings support the conclusion that FBBH positively impacts child health outcomes and has a substantial return on investment.

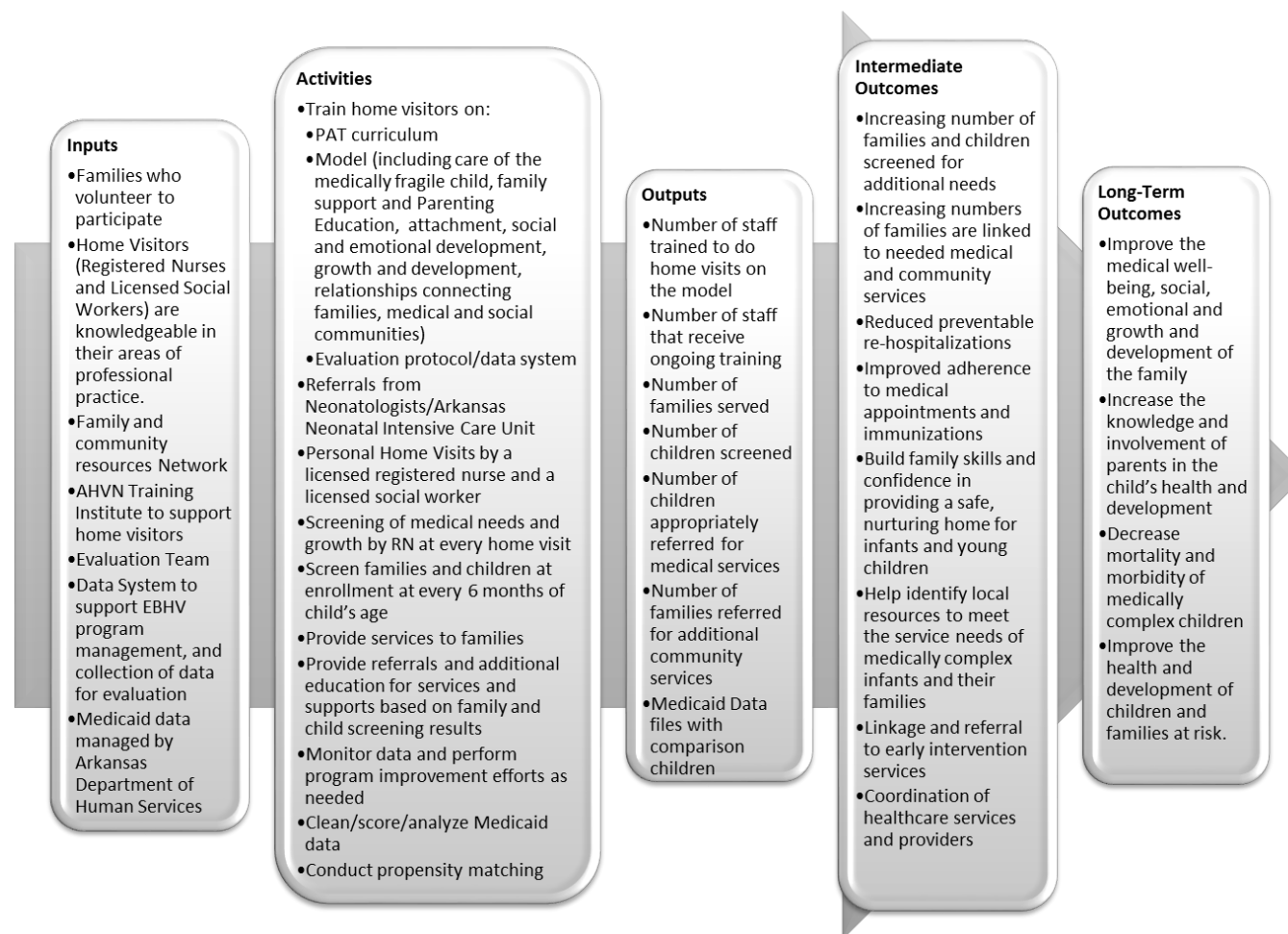
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Appendix A. Logic Model for the FBBH Evaluation

Following Baby Back Home Improves Outcomes for Medically Fragile Children



Appendix B. Characteristics of Samples Pre- and Post-Propensity Score Matching

Table B-1. Following Baby Back Home Treatment and Control Groups Background Characteristics, Pre- and Post-Propensity Score Matching — Infant Mortality

		Unmatched (N=187,912)			PS Matched (N=1442)					
		Treatment (N=768)	Control (N=187,144)		Treatment (N=721)	Matched Control (N=721)				
Continuous	Unit	Mean (SE)	Mean (SE)	P*	Mean (SE)	Mean (SE)	ES	SD	VR	P
Apgar: 5 Mins	Score	6.4 (2.3)	8.5 (1.1)	<0.001	6.4 (2.3)	6.3 (2.3)	0.03	0.04	0.94	0.599
Gestational age	Weeks	32.4 (4.4)	38.3 (1.8)	<0.001	32.3 (4.4)	32.4 (4.5)	-0.01	-0.01	0.97	0.846
Weight	Grams	1,983.0 (945.5)	3,229.4 (563.7)	<0.001	1,962.7 (942.1)	1,969.5 (953.9)	-0.01	-0.01	0.98	0.892
Birth Hospital Stay	Days	53.7 (41.2)	4.9 (10.1)	<0.001	52.9 (40.9)	52.0 (40.2)	0.02	0.03	1.03	0.673
Categorical variables	Category	N (%)	N (%)	P	N (%)	N (%)	ES	SD	VR	P
Child Race/Ethnicity	White	437 (56.9)	122,134 (65.3)	<0.001	410 (56.9)	410 (56.9)	Ref			1.000
	Black	249 (32.4)	39,443 (21.1)	<0.001	239 (33.1)	242 (33.6)	-0.01	0.01	0.99	0.867
	Hispanic	39 (5.1)	16,751 (9.0)	<0.001	34 (4.7)	34 (4.7)	0.00	0.00	1.00	1.000
	Other	43 (5.6)	8,816 (4.7)	0.246	38 (5.3)	35 (4.9)	0.05	-0.02	1.08	0.719
Mother Education	No HS Diploma	151 (19.7)	27,562 (14.7)	<0.001	142 (19.7)	117 (16.2)	0.14	-0.09	1.16	0.086
	HS Diploma	464 (60.4)	116,815 (62.4)	0.253	443 (61.4)	466 (64.6)	-0.08	0.07	1.04	0.210
	College	153 (19.9)	42,767 (22.9)	0.054	136 (18.9)	138 (19.1)	Ref			0.893
Gestational Age Category	<28 weeks	132 (17.2)	680 (0.4)	<0.001	128 (17.8)	128 (17.8)	0.00	1.000	1.00	1.000
	28-31 weeks	173 (22.5)	1,556 (0.8)	<0.001	162 (22.5)	162 (22.5)	0.00	1.000	1.00	1.000
	32-37 weeks	349 (45.4)	37,580 (20.1)	<0.001	324 (44.9)	324 (44.9)	0.00	1.000	1.00	1.000
	38-41 weeks	114 (14.8)	147,328 (78.7)	<0.001	107 (14.8)	107 (14.8)	Ref			1.000
Birth Weight	Very Low	223 (29.0)	171,008 (91.4)	<0.001	202 (28.0)	202 (28.0)	0.00	1.000	1.00	1.000
	Low	271 (35.3)	14,179 (7.6)	<0.001	257 (35.6)	257 (35.6)	0.00	1.000	1.00	1.000
	Normal	274 (35.7)	1,957 (1.0)	<0.001	262 (36.3)	262 (36.3)	Ref			1.000
Apgar: 5 Mins	0-3	108 (14.1)	1,989 (1.1)	<0.001	100 (13.9)	106 (14.7)	-0.04	0.03	0.95	0.652
	4-6	249 (32.4)	6,378 (3.4)	<0.001	235 (32.6)	244 (33.8)	-0.03	0.04	0.98	0.615

		Unmatched (N=187,912)			PS Matched (N=1442)					
		Treatment (N=768)	Control (N=187,144)		Treatment (N=721)	Matched Control (N=721)				
	7-10	411 (53.5)	178,777 (95.5)	<0.001	386 (53.5)	371 (51.5)	Ref			0.429
Birth Hospital Stay Length	0-4 days	34 (4.4)	159,177 (85.1)	<0.001	31 (4.3)	31 (4.3)	Ref			1.000
	5-9 days	51 (6.6)	15,433 (8.2)	0.106	49 (6.8)	49 (6.8)	0.00	1.000	1.00	1.000
	10-20 days	96 (12.5)	6,284 (3.4)	<0.001	95 (13.2)	95 (13.2)	0.00	1.000	1.00	1.000
	21-46 days	236 (30.7)	3,991 (2.1)	<0.001	223 (30.9)	223 (30.9)	0.00	1.000	1.00	1.000
	47-93 days	215 (28.0)	1,635 (0.9)	<0.001	201 (27.9)	201 (27.9)	0.00	1.000	1.00	1.000
	94-183 days	136 (17.7)	624 (0.3)	<0.001	122 (16.9)	122 (16.9)	0.00	1.000	1.00	1.000
COVID Category	Before	467 (60.8)	109,858 (58.7)	0.237	443 (61.4)	426 (59.1)	0.06	-0.05	0.98	0.360
	During	265 (34.5)	66,051 (35.3)	0.648	244 (33.8)	261 (36.2)	-0.06	0.05	0.97	0.348
	After	36 (4.7)	11,235 (6.0)	0.125	34 (4.7)	34 (4.7)	Ref			1.000
Facility Level of Longest Stay	4	234 (30.5)	3,664 (2.0)	<0.001	209 (29.0)	208 (28.8)	0.00	0.00	1.00	0.954
	3b	81 (10.5)	40,414 (21.6)	<0.001	71 (9.8)	77 (10.7)	0.02	-0.02	1.00	0.603
	3a	391 (50.9)	31,145 (16.6)	<0.001	384 (53.3)	379 (52.6)	-0.05	0.02	0.93	0.792
	other	62 (8.1)	111,921 (59.8)	<0.001	57 (7.9)	57 (7.9)	Ref			1.000
Binary variables		N (%)	N (%)	P	N (%)	N (%)	ES	SD	VR	P
Child Gender: Female		348 (45.3)	91,229 (48.7)	0.057	327 (45.4)	327 (45.4)	0.00	0.00	1.00	1.000
WIC		444 (57.8)	99,954 (53.4)	0.015	427 (59.2)	427 (59.2)	0.00	0.00	1.00	1.000
Insurance: Private		52 (6.8)	30,805 (16.5)	<0.001	41 (5.7)	41 (5.7)	0.00	0.00	1.00	1.000
RUCA: Urban		397 (51.7)	104,388 (55.8)	0.023	370 (51.3)	376 (52.1)	-0.02	0.02	1.00	0.752
Mother Smoke		181 (23.6)	35,789 (19.1)	0.002	174 (24.1)	173 (24.0)	0.00	0.00	1.00	0.951
Mother Married		269 (35.0)	87,719 (46.9)	<0.001	243 (33.7)	253 (35.1)	-0.04	0.03	0.98	0.579
Teenage Mother		91 (11.8)	18,562 (9.9)	0.074	87 (12.1)	79 (11.0)	0.07	-0.04	1.09	0.509
Chromosome Anomaly		28 (3.6)	322 (0.2)	<0.001	14 (1.9)	14 (1.9)	0.00	0.00	1.00	1.000
Congenital Heart Disease		21 (2.7)	429 (0.2)	<0.001	13 (1.8)	13 (1.8)	0.00	0.00	1.00	1.000
Convulsion		28 (3.6)	519 (0.3)	<0.001	19 (2.6)	19 (2.6)	0.00	0.00	1.00	1.000
Gastrostomy Tube		211 (27.5)	1,876 (1.0)	<0.001	187 (25.9)	187 (25.9)	0.00	0.00	1.00	1.000
Intraventricular Hemorrhage		29 (3.8)	219 (0.1)	<0.001	25 (3.5)	25 (3.5)	0.00	0.00	1.00	1.000
Respiratory Disease		574 (74.7)	13,115 (7.0)	<0.001	536 (74.3)	536 (74.3)	0.00	0.00	1.00	1.000
Notes: *Continuous variable P value based on t-test for continuous variables and chi-square for categorical variables. 89.0% of treatment participants found a match. Abbreviations: HS=High School; RUCA=rural-urban commuting area code; NICU=neonatal intensive care unit; SE=standard error; PS=propensity score; ES= effect size; Std Diff=standardized difference; VR=variance ratio										

Table B-2. Following Baby Back Home Treatment and Control Groups Background Characteristics, Pre- and Post-Propensity Score Matching — Birth to Age 1

		Unmatched (N=172,418)				PS Matched (N=1288)				
		Treatment (N=724)	Control (N=171,694)		Treatment (N=644)	Matched Control (N=644)				
Continuous	Unit	Mean (SE)	Mean (SE)	P*	Mean (SE)	Mean (SE)	ES	SD	VR	P
Apgar: 5 Mins	Score	6.4 (2.3)	8.5 (1.1)	<0.001	6.4 (2.2)	6.4 (2.3)	-0.01	-0.01	0.91	0.837
Gestational age	Weeks	32.3 (4.5)	38.3 (1.8)	<0.001	32.2 (4.5)	32.3 (4.5)	-0.03	-0.03	0.99	0.635
Weight	Grams	1,966.3 (948.3)	3,228.9 (563.0)	<0.001	1,943.4 (944.6)	1,952.5 (961.4)	-0.01	-0.01	0.97	0.864
Birth Hospital Stay	Days	54.3 (41.6)	4.9 (10.0)	<0.001	53.4 (41.5)	52.2 (40.7)	0.03	0.04	1.04	0.588
Categorical variables	Category	N (%)	N (%)	P	N (%)	N (%)	ES	SD	VR	P
Child Race/Ethnicity	White	411 (56.8)	111,499 (64.9)	<0.001	362 (56.2)	365 (56.7)	Ref			0.866
	Black	234 (32.3)	36,898 (21.5)	<0.001	216 (33.5)	212 (32.9)	0.02	-0.01	1.01	0.813
	Hispanic	37 (5.1)	15,502 (9.0)	<0.001	31 (4.8)	30 (4.7)	0.02	-0.01	1.03	0.896
	Other	42 (5.8)	7,795 (4.5)	0.104	35 (5.4)	37 (5.7)	-0.04	0.01	0.95	0.808
Mother Education	No HS diploma	141 (19.5)	25,212 (14.7)	<0.001	124 (19.3)	113 (17.5)	0.07	-0.05	1.07	0.429
	HS diploma	438 (60.5)	108,807 (63.4)	0.109	399 (62.0)	406 (63.0)	-0.03	0.02	1.01	0.687
	College	145 (20.0)	37,675 (21.9)	0.214	121 (18.8)	125 (19.4)	Ref			0.777
Gestational Age Category	<28 weeks	129 (17.8)	603 (0.4)	<0.001	121 (18.8)	121 (18.8)	0.00	1.000	1.00	1.000
	28-31 weeks	165 (22.8)	1,429 (0.8)	<0.001	146 (22.7)	146 (22.7)	0.00	1.000	1.00	1.000
	32-37 weeks	325 (44.9)	34,541 (20.1)	<0.001	287 (44.6)	287 (44.6)	0.00	1.000	1.00	1.000
	38-41 weeks	105 (14.5)	135,121 (78.7)	<0.001	90 (14.0)	90 (14.0)	Ref			1.000
Birth Weight	Very Low	205 (28.3)	156,886 (91.4)	<0.001	173 (26.9)	173 (26.9)	0.00	1.000	1.00	1.000
	Low	253 (34.9)	13,044 (7.6)	<0.001	231 (35.9)	231 (35.9)	0.00	1.000	1.00	1.000
	Normal	266 (36.7)	1,764 (1.0)	<0.001	240 (37.3)	240 (37.3)	Ref			1.000
Apgar: 5 Mins	0-3	102 (14.1)	1,791 (1.0)	<0.001	87 (13.5)	96 (14.9)	-0.07	0.05	0.92	0.473
	4-6	235 (32.5)	5,793 (3.4)	<0.001	210 (32.6)	189 (29.3)	0.09	-0.09	1.06	0.206
	7-10	387 (53.5)	164,110 (95.6)	<0.001	347 (53.9)	359 (55.7)	Ref			0.502
Birth Hospital Stay Length	0-4 days	32 (4.4)	146,097 (85.1)	<0.001	27 (4.2)	27 (4.2)	Ref			1.000
	5-9 days	47 (6.5)	14,080 (8.2)	0.094	43 (6.7)	43 (6.7)	0.00	1.000	1.00	1.000

		Unmatched (N=172,418)				PS Matched (N=1288)				
		Treatment (N=724)	Control (N=171,694)		Treatment (N=644)	Matched Control (N=644)				
	10-20 days	89 (12.3)	5,787 (3.4)	<0.001	87 (13.5)	87 (13.5)	0.00	1.000	1.00	1.000
	21-46 days	221 (30.5)	3,664 (2.1)	<0.001	196 (30.4)	196 (30.4)	0.00	1.000	1.00	1.000
	47-93 days	204 (28.2)	1,500 (0.9)	<0.001	180 (28.0)	180 (28.0)	0.00	1.000	1.00	1.000
	94-183 days	131 (18.1)	566 (0.3)	<0.001	111 (17.2)	111 (17.2)	0.00	1.000	1.00	1.000
COVID Category	Before	440 (60.8)	101,772 (59.3)	0.413	395 (61.3)	390 (60.6)	0.02	-0.02	0.99	0.775
	During	248 (34.3)	59,677 (34.8)	0.776	217 (33.7)	232 (36.0)	-0.06	0.05	0.97	0.380
	After	36 (5.0)	10,245 (6.0)	0.259	32 (5.0)	22 (3.4)	Ref			0.164
Facility Level of Longest Stay	4	223 (30.8)	3,348 (1.9)	<0.001	189 (29.3)	184 (28.6)	0.02	-0.02	1.02	0.759
	3b	76 (10.5)	36,684 (21.4)	<0.001	60 (9.3)	60 (9.3)	0.00	0.00	1.00	1.000
	3a	366 (50.6)	28,353 (16.5)	<0.001	343 (53.3)	343 (53.3)	0.00	0.00	1.00	1.000
	other	59 (8.1)	103,309 (60.2)	<0.001	52 (8.1)	57 (8.9)	Ref			0.617
Binary variables		N (%)	N (%)	P	N (%)	N (%)	ES	SD	VR	P
Child Gender: Female		323 (44.6)	83,714 (48.8)	0.026	289 (44.9)	289 (44.9)	0.00	0.00	1.00	1.000
WIC		426 (58.8)	93,725 (54.6)	0.022	392 (60.9)	392 (60.9)	0.00	0.00	1.00	1.000
Insurance: Private		45 (6.2)	25,320 (14.7)	<0.001	30 (4.7)	30 (4.7)	0.00	0.00	1.00	1.000
RUCA: Urban		371 (51.2)	95,056 (55.4)	0.026	324 (50.3)	308 (47.8)	0.06	-0.05	1.00	0.373
Mother Smoke		170 (23.5)	33,096 (19.3)	0.004	156 (24.2)	140 (21.7)	0.09	-0.06	1.08	0.289
Mother Married		251 (34.7)	79,104 (46.1)	<0.001	212 (32.9)	229 (35.6)	-0.07	0.05	0.96	0.318
Teenage Mother		89 (12.3)	17,200 (10.0)	0.042	81 (12.6)	74 (11.5)	0.09	-0.06	1.08	0.549
Chromosome Anomaly		27 (3.7)	283 (0.2)	<0.001	8 (1.2)	8 (1.2)	0.00	0.00	1.00	1.000
Congenital Heart Disease		18 (2.5)	375 (0.2)	<0.001	10 (1.6)	10 (1.6)	0.00	0.00	1.00	1.000
Convulsion		26 (3.6)	471 (0.3)	<0.001	16 (2.5)	16 (2.5)	0.00	0.00	1.00	1.000
Gastrostomy Tube		202 (27.9)	1,741 (1.0)	<0.001	165 (25.6)	165 (25.6)	0.00	0.00	1.00	1.000
Intraventricular Hemorrhage		28 (3.9)	193 (0.1)	<0.001	21 (3.3)	21 (3.3)	0.00	0.00	1.00	1.000
Respiratory Disease		543 (75.0)	12,021 (7.0)	<0.001	484 (75.2)	484 (75.2)	0.00	0.00	1.00	1.000
Notes: *Continuous variable P value based on t-test for continuous variables and chi-square for categorical variables. 89.0% of treatment participants found a match. Abbreviations: HS=High School; RUCA=rural-urban commuting area code; NICU=neonatal intensive care unit; SE=standard error; PS=propensity score; ES=effect size; Std Diff=standardized difference; VR=variance ratio										

Appendix C. Following Baby Back Home Treatment and Control Group Health Care Utilization and Outcome Measures Differences

NICU Discharge to Age 1				
Healthcare Utilization Outcome	Treatment (N=658)	Control (N=658)	aOR/IRR (95% CI) ^a	P-Value
Inpatient stays (M, SE)	0.42 (0.03)	0.28 (0.03)	1.49 (1.18-1.88)	<0.001
ED visits (M, SE)	1.74 (0.09)	1.35 (0.07)	1.29 (1.12-1.48)	<0.001
Non-Urgent ED visits (M, SE)	0.14 (0.02)	0.09 (0.01)	1.60 (1.10-2.33)	0.013
Outpatient visits	21.9 (0.84)	16.9 (0.63)	1.29 (1.19-1.40)	<0.001
Wellness visits (M, SE)	3.70 (0.06)	3.56 (0.06)	1.04 (0.98-1.10)	0.188
SLP visits (M, SE)	5.14 (0.58)	2.82 (0.38)	1.82 (1.35-2.45)	<0.001
EIDT visits (M, SE)	3.34 (0.53)	2.00 (0.36)	1.67 (0.87-3.19)	0.124
Non-wellness/Non-SLP/non-EIDT visits (M, SE)	11.4 (0.31)	9.37 (0.32)	1.22 (1.12-1.32)	<0.001
Prescription medications (filled; M, SE)	10.7 (0.47)	8.94 (0.41)	1.19 (1.06-1.35)	0.004
Immunization visits (M, SE)	3.01 (0.05)	2.74 (0.05)	1.10 (1.03-1.17)	0.004
≥ 3 immunization visits (proportion, SE) ^b	460 (71.4)	402 (62.4)	1.50 (1.19-1.90)	<0.001

NOTE: In presence of overdispersion, negative binomial distribution was used instead of Poisson. Immunization and wellness visits did not exhibit overdispersion and Poisson distribution was fitted. ^aIncidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model. ^bThree immunizations are needed between the day after birth and 12 months to be guideline compliant. Abbreviations: ED = emergency department; SLP = Speech Language Pathology; EIDT = Early Intervention Day Treatment, IRR=incidence rate ratio; aOR= adjusted odds ratio; M=mean; SE=standard error; CI=confidence interval.

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