

RESEARCH ARTICLE

Transitioning to virtual interaction during the COVID-19 pandemic: Impact on the Family Connects postpartum home visiting program activity

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Abstract

In this paper, we analyze program activity for Family Connects (FC), an evidence-based postpartum home-visiting intervention, during the COVID-19 pandemic. When the pandemic began, FC transitioned to a virtual protocol which maintains key psychosocial components of the in-person protocol and adjusts health assessments to address the lack of in-person contact. Program performance is contrasted for periods before the pandemic onset (April 2019–March 2020) and after the onset (April 2020–March 2021), involving 10,280 scheduled visits and 6696 visited families (46% non-Hispanic white; 20% non-Hispanic Black; 23% Hispanic; and 10% other race). Post-pandemic onset, FC program participation rates were at 89.8% of pre-pandemic levels. Home visitors observed post-onset increases in families' concerns about home safety but declines in families' needs related to infant care. Community connections were facilitated for 42.9% of visited families post-pandemic onset compared to 51.1% pre-pandemic onset. We conclude that post-pandemic onset virtual delivery rates of FC declined but are high enough to merit continued implementation during a period when some families will decline in-person visits. When in-person visits are deemed safe per public health guidelines, the findings suggest a hybrid approach that could maximize program outreach by prioritizing in-person contact and offering virtual delivery as a second choice.

KEYWORDS

COVID-19, Family Connects, home visiting, MIECHV

1 | INTRODUCTION

Home-visiting interventions have been designed to support families during the sensitive pre- and post-birth periods and improve optimal child development and early relationship development. Through providing education and facilitating connections between the family and com-

munity resources, home-visiting programs foster positive caregiver-child interactions (Sadler et al., 2013), promote knowledge and skills regarding child development (Olds et al., 2007) improve caregiver mental health (Tandon et al., 2020), and reduce the impact of social stressors on families (Howard & Brooks-Gunn, 2009). Research has shown that home-visiting programs have positive impact

on child development and well-being (Avellar & Supplee, 2013; U.S. Department of Health & Human Services, 2021a; Whitmore et al, 2018).

The support from home visitors is especially needed during periods of adversity, such as the ongoing COVID-19 pandemic, when uncertainty and disruption in daily lives can result in elevated levels of stress and hardship upon families (Seddighi et al., 2021; Williams et al., 2021). Studies conducted during the pandemic already indicated increases in family stress, caregiver mental health disorders, and domestic violence (Béland et al., 2021; Boserup et al., 2020; Cluver et al., 2020; Puertas-Gonzalez et al., 2021), making the continuity of home-visiting services during emergencies paramount to child and caregiver health and well-being.

At the onset of the COVID-19 pandemic, most home-visiting models transitioned from in-home visits to virtual visiting (Zero To Three, 2020), similar to broader health services (Koonin et al., 2020) and faced a daunting challenge of delivering care and intervention without in-home presence. Early evidence indicated that home-visiting staffing and caseloads were lower for Maternal, Infant, and Early Childhood Home Visiting (MIECHV) programs and that the volume of newly enrolled families declined in 2020 (Checa, 2021). Further, staff reports from the Florida MIECHV Initiative (Marshall et al., 2020) and the SafeCare home-visiting program (Self-Brown et al., 2020) indicate performance was affected by challenges in virtual program delivery (such as poor/restricted internet connection) and COVID-19 related disruptions in providers' daily routines (such as lack of adequate child care) during the early stages of the pandemic. Noteworthy, the above home-visiting initiatives are offered to vulnerable families who might face barriers to achieving positive maternal and child outcomes (Maternal & Child Health Bureau, 2021; Self-Brown et al., 2014). Families with vulnerabilities have also been disproportionately affected by the burden of the COVID-19 pandemic which might have affected program participation (Kirby, 2020; Raifman & Raifman, 2020). On the contrary, program completion rates and adherence to requirement protocol assessments remained at high levels during the transition to virtual delivery during the pandemic for the Welcome Baby universal home-visiting program for expectant mothers and women with infants in the Los Angeles County (Bock et al., 2021). However, the Welcome Baby recipients are considered low-risk which might have contributed to high program participation both pre- and post-pandemic onset (Bock et al., 2021).

The discrepancies in findings about home-visiting program activities via virtual delivery post-pandemic onset generate further questions about the impact of the COVID-19 pandemic *and* virtual delivery on home-visiting program performance metrics such as program uptake,

STATEMENT OF RELEVANCE

This research evaluates program performance metrics relative to delivering a postpartum intervention using virtual means during the times of crisis. Family support during crisis is key to fostering optimal family development and early relational health. In addition, supporting families' access to services regarding health care, infant care, home safety, and parental well-being is a fundamental element of basic needs provision in infant mental health work. Study findings may inform implementation strategies for family support programs during the ongoing COVID-19 pandemic, in the early stages of post-pandemic activity, and during future emergencies.

KEY FINDING

1. Post-pandemic onset, Family Connects, an evidence-based postpartum nurse homevisiting program, adapted its protocol to conduct psychosocial evaluations and physical assessments virtually.
2. Family Connects performance metrics were significantly lower for post-pandemic onset virtual delivery services as compared to pre-pandemic in-person protocol, although activity remained at a high level with program completion rates at 90% and community referral rates at 84% of the pre-pandemic levels
3. To maximize program activity, Family Connects has provided guidance to enable in-person visiting in areas where in-home contact with families can safely resume in accordance with local regulations while continuing to offer virtual modifications in communities with high level of COVID-19 transmission and for families reluctant to resume in-person services

follow-through rates, as well as the adherence to evidence-based program components such as community referrals. In addition, evidence about program activity in 2021, during vaccination campaigns and early reopening efforts, is lacking. We add to the existing knowledge on the impact of COVID-19 on home-visiting programs by examining a full year of program performance metrics post-pandemic onset and via virtual means for Family Connects (FC).

Family Connects is a short-term, postpartum home-visiting program that started in 2009 in Durham, North Carolina (Family Connects International, 2019a). In 2020, FC operated in 23 sites across the United States, serving over 9,000 birthing families (Family Connects International, 2019b). FC achieves population-level impact on child and family well-being by offering the program to all families in the community. The model meets Department of Health and Human Services (DHHS) criteria as an “evidence-based early childhood home-visiting service delivery model” (U.S. Department of Health & Human Services, 2021b) and is eligible for federal funding through the MIECHV program as a population-level screening and referral program. Findings from two randomized controlled trials of FC have shown improvements in well-being and health outcomes of infants and their families, including reduction in maternal anxiety and declines in child maltreatment investigations (Alonso-Marsden et al., 2013; Dodge et al., 2013; Dodge et al., 2014; Dodge et al., 2019; Goodman et al., 2019; Goodman et al., 2021).

When the COVID-19 pandemic began in March, 2020, the national office of FC paused all in-person home-visiting and began a transition to virtual implementation. Over a several-week period, FC developers adapted the protocol and manual for virtual delivery to retain key psychosocial components and adapt physical assessments to virtual contact. At the same time, FC sites were challenged not only with the rapid transition to virtual delivery but also by closures of community agencies that serve families and possible diversion of staff members to delivery of health care services in communities overcome with COVID-19 hospitalizations. The totality of the disruption brought about by the pandemic necessitates a careful evaluation of the FC activity post-pandemic onset, which we deliver in this paper. While some FC sites have returned to offering in-person visits in the fall of 2021 based on local rules and regulations, in this paper we focus on the first year of post-pandemic activity, when all visits were offered via virtual means only.

First, we describe changes in the national FC protocol post-pandemic onset and discuss site-level adjustments brought about by the COVID-19 pandemic. Next, we describe cross-time patterns of FC program reach, participation, clinical findings, and community connections post-pandemic onset and test differences in performance metrics pre-pandemic and post-pandemic onset. We discuss program delivery throughout the different stages of the pandemic—early response in the spring of 2020, the 2020 summer and winter pandemic waves, and activity during the first months of vaccination efforts in 2021. Last, based on the presented findings on post-pandemic virtual means FC activity, we conclude with a set of recommendations for home-visiting programs during the ongoing pub-

lic health emergency and beyond. Findings from this study can inform implementation strategies for home-visiting interventions during the ongoing COVID-19 pandemic as well as during future emergencies to assure family well-being and optimal child development.

2 | FAMILY CONNECTS PROTOCOL

FC is a systems approach to supporting families, combining top-down engagement and alignment of community resources and services with bottom-up intervention for family-specific needs through short-term, universal postpartum nurse home-visiting. The model is anchored in three core components.

The first is nurse home-visiting for families of every birth in a community catchment area. Under the traditional protocol, families with newborn children are first invited to participate in the program shortly after birth. Enrolled families receive an integrated home visit (IHV) from a registered nurse about 3 weeks after the delivery. During the visit, the nurse assesses the child's health and development, addresses caregiver concerns, and consults with parents to assess family strengths and needs systematically. When needs are identified, the nurse provides education or connects the family with community resources for longer-term support. The objective is not to resolve all of a family's difficulties directly, but rather to *connect* each family to appropriate levels of support. Nurses may also offer 1–2 follow-up home visits or phone calls for continued assessment and intervention, based on clinical judgment. Four weeks after the IHV, a FC team member follows up with a post-visit connection call to assess family satisfaction and confirm successful connections with community resources.

The second core component is community alignment of resources for families. The voice of the community is present in every step of the planning process with a mission to not just complete home visits but to support communities in transforming the broader system of care. Population impact is dependent on the program's ability to make appropriate and timely referrals and connections to community resources matched to family need and preference. These timely connections are facilitated by feedback loops that are created through collaborations and inform daily operations. Each FC site has dedicated staff who manage a comprehensive community alignment process, including engagement of key community stakeholders and services providers, creation of a comprehensive electronic directory of community resources and services (“agency finder”) used by nurses to match services to family need, and establishment of a Community Advisory Board supporting ongoing bi-directional communication alignment

of community services across agencies. The final core component is an electronic data system that houses the agency finder and serves as the clinical record for the intervention.

3 | CHANGES IN FC DELIVERY POST-PANDEMIC ONSET

3.1 | FC protocol modification

At the beginning of the pandemic, comprehensive guidance from FC leadership assured that the program remained operational post-pandemic onset. On March 18, 2020, FC leadership mandated all sites transition to provide virtual services for families via telehealth or telephonic support. The modified virtual protocol begins with a brief check-in call around 1 week after delivery. The brief “check-in” call was introduced at a week after birth in response to sites’ desire to engage families sooner to assess emerging needs during the pandemic and to encourage participation. It was *not* meant to substitute for the home visit but to increase frequency of contact between the FC staff and birthing families.

Within the modified virtual protocol, FC sites offer two virtual approaches to complete the in-home visit at 3 weeks after delivery: (1) a modified IHV, or (2) a structured supportive call. During the modified IHV, the nurse follows the standard IHV procedure, covering the same set of family health and well-being inquires with omission of the physical assessments for mother and baby. Similar to the standard IHV, validated screening tools for postpartum depression, substance use, and intimate partner violence are completed. Physical assessment is replaced with a head-to-toe verbal physical assessment, including a review of the signs and symptoms of postpartum preeclampsia (when applicable) and whether the caregiver or pediatric care provider had concerns about caregiver blood pressure or infant weight. Lactation consultation can be provided in a telehealth format. The nurse also universally provides evidence-based guidance across the topics relevant to all families of newborns, for example, feeding, safe sleep, infant soothing, postpartum mood disorders, and postpartum warning signs.

The structured supportive call was specifically designed to be a shorter intervention. It was introduced to meet the time and staffing constraints some sites faced with nurse time reallocated to COVID-19 efforts early post-pandemic onset. Such sites communicated their circumstances to the FC leadership and requested an alternative to the modified IHV in order to continue supporting families in their communities. The structured supportive call is based on the IHV protocol. The caregiver is asked about infant feeding, mood, healthcare access, concerns, and need for follow-

up. The same validated screeners (postpartum depression, substance use, and intimate partner violence) are utilized with the supportive call with the addition of a social driver screener to more rapidly explore those factors with a structured approach. Brief education is delivered with specific attention to postpartum warning signs and follow-up with the caregiver and pediatric medical home. The call ends with a summary of family strengths, a review of recommendations, and a plan for follow-up per the standard protocol.

Intervention quality during the transition to virtual means was continuously monitored through quantitative data analysis, enabling FC leadership to identify site-specific declines in performance and intervene quickly to support sites, for example, with establishing telehealth communication or training staff to follow telehealth protocols. In addition, FC leadership created fidelity metrics for modified IHVs and structured supportive calls to assure that virtual services maintain quality comparable to the pre-pandemic in-person visits.

3.2 | Adjustment in community alignment support

FC has also implemented changes to community alignment protocols. To support local community alignment specialists during the pandemic, the FC team provided technical assistance regarding process adjustments to community alignment, including mobilizing local Community Advisory Boards and community collaboratives in new ways, peer-to-peer and FC-led conversations regarding ways to operationalize resource identification adapted to this pandemic, and technical assistance to local FC sites regarding resource modifications, adaptations, and capacity considerations. The relationships and networks that are formed as part of the community alignment work can be activated during a crisis to gather, update, and disseminate changes to agency information for the benefit of nurses and community partners.

3.3 | FC protocol adjustments in practice

An example of how FC revised protocols provided system-wide support for communities during COVID-19 is seen in the ways data from the post visit connection (PVC) calls were used in the pandemic. The PVC call, a staff-initiated call to families to assess program effectiveness in connecting to resources 4 weeks after the last nurse visit, was integral during the pandemic as community resources faced closures, altered hours, and inability to meet the increased demand for their services. Data from these calls was used

in real time to understand community need and to allow local community alignment specialists to identify barriers, develop new connections and share this community-level information with both nursing staff, healthcare systems, and community partners.

4 | ANTICIPATED IMPACT OF VIRTUAL DELIVERY DURING THE PANDEMIC ON FC PROGRAM ACTIVITY

The introduction of the virtual protocol was key to maintaining FC operations under the social distancing guidelines. However, the transition was rapid and unexpected, leading to potential disruptions in specific performance indicators. In this section, we outline our expectations for the impact of the transition to virtual means *and* the COVID-19 pandemic together on FC activity in the early stages of the pandemic.

Due to hospitals' restriction on access to birthing wards during the COVID-19 pandemic, FC staff members were no longer able to reach families through an in-person contact. To facilitate scheduling, FC sites reached out to local hospital staff and staff of other key community-based organizations (CBO) serving families with infants and young children with a request to assist with contacting families. FC transitioned back to direct contact with families when local sites allowed this contact and continued to rely on hospital staff members when direct contact was not allowed. However, the initial post-pandemic onset discontinuity in access to birthing families might have resulted in program activity declines, especially with regard to scheduling.

Personnel factors might have contributed to changes in FC activity with regard to scheduling and program completion during the pandemic as well: staffing reassignment, staff family obligations, and new technical training to conduct visiting via virtual means. Early post-pandemic onset FC nurses were temporarily reassigned to support COVID-19 relief efforts. In addition, FC staff were affected by school closures and new responsibilities related to home schooling. Concerns about work-life balance and child care were voiced by home-visiting staff nationwide (Marshall et al., 2020; Self-Brown et al., 2020) and by FC staff in North Carolina (Gougler-Reeves, 2020).

In addition, efforts to follow a structured and unified transition to a virtual protocol could have introduced delays in program completion early post-pandemic onset. FC sites had to adjust to the national FC policy of virtual service delivery by identification of HIPAA-appropriate platforms to utilize, training of nurses on technology required to deliver the visit, and training on the protocols themselves. FC nurse training leadership pro-

vided multiple opportunities to facilitate knowledge transfer, to respond and clarify questions that nurses had about the protocols, and to innovate process flow allowing for increased adherence to the new protocols.

Finally, as FC protocol relied on in-home presence, the transition to virtual delivery post-pandemic onset has likely resulted in a decreased ability to identify family needs via virtual contact. A unique rapport established between a visiting nurse and the primary caregiver (usually the mother) in the privacy of the family home enabled FC staff to inquire about sensitive matters such as mental health, substance use, of inter-personal violence. Such level of rapport might have been difficult to establish virtually during the pandemic. FC nurses in North Carolina have identified concerns about the ability to observe family interactions or family environment or to fully—and safely—assess delicate topics such as substance use and intimate partner violence using virtual connections (Gougler-Reeves, 2020).

To summarize, we expect that several components of the FC activity were affected negatively in the transition to virtual means during the first year post-pandemic onset. We anticipate that during the first year post-pandemic onset, FC reached fewer families and that the ability to identify family needs had declined. At the same time, because of the increased efforts to strengthen community alignment described in the previous section, we anticipate that the FC staff ability to offer families community connections was maintained at the similar level or potentially even increased.

5 | KEY PERFORMANCE METRICS ANALYSIS

5.1 | Data

To describe changes in FC activity during the pandemic, we used program activity data collected by individual sites and shared with the Center for Child & Family Health, a community non-profit in Durham, NC, that serves as the national training and dissemination hub for the FC program. This study was approved by the Duke University Health System IRB (Protocol #Pro00105777).

We sampled data from FC sites that are certified *and* mature (that is, had over 18 months of activity prior to January 2020) *and* demonstrating program fidelity. These sites were selected in order to minimize fluctuations in program activity connected with initial site development. Our selection of mature FC sites for the implementation analysis assured that no changes or expansion of the program in the respective areas took place between 2019 and 2021, and program activity should be comparable between

pre- and post-pandemic performance, net of exogenous shocks. This selection resulted in a sample of five FC sites.

Program activity data for these sites were reviewed for April 2019 through March 2021 in order to provide FC activity analysis for a full year prior to the pandemic and a full year post pandemic onset. We were thus able to account for seasonal changes in program activity as well as compare initial changes potentially linked to development of virtual protocols with changes observed later in the year, throughout different COVID-19 waves and during early vaccination efforts.

Data for 10,280 scheduled visits were used to analyze scheduling and visit completion rates. Data for 6696 completed visits were used to analyze family needs and referral rates. No information about socio-demographic profiles of families who scheduled visit was available due to privacy protection measures implemented by FC sites. The population of families who completed visits was 46% non-Hispanic white ($n = 3114$), 20% non-Hispanic Black ($n = 1343$), and 23% ($n = 1534$) Hispanic. Further 10% ($n = 674$) identified as American Indian, Asian American and Pacific Islander, or other race.

5.2 | Measures

Four key performance metrics were included in the analyses: (1) the number of families consenting to begin program participation and scheduling FC visits; (2) the percentage of families that completed full participation in the program; (3) the percentage of families reporting needs and the nature of those needs; and (4) the percentage of families who received connections to community resources.

The visit was categorized as completed when the visit protocol has been initiated and at least 80% of the FC protocol activities were completed. Visits were considered as not completed when the visit was scheduled and conducted but fewer than 80% of the protocol activities were completed or when the visit was cancelled and further efforts to contact the family and reschedule were unsuccessful.

Family needs were measured using the FC Family Support Matrix, a FC-developed tool with 12 empirically derived factors across four domains linked to infant and caregiver physical and mental health (O'Donnell et al., 2021): (1) health care (caregiver health, infant health, and health care plan), (2) infant care (child care plans, caregiver-infant relationship, and management of infant crying), (3) home safety (material supports, family violence, caregiver history of maltreatment), and (4) caregiver well-being (caregiver depression and anxiety, substance use, and emotional support). For each factor, the

nurse scored family need as no need, a moderate need, a major need, or an emergency need.

The scoring procedure for the FC Family Support Matrix relies on multiple ways of collecting data during the home visit that combines physical assessment of the caregiver and infant, observation of the household and needs relevant to each of the 12 factors, and intentional queries about caregiver and infant physical and mental health (O'Donnell et al., 2021). FC staff were trained to observe the family and household with attention to the FC Family Support Matrix factors. For each of the 12 factors, specific guidelines were provided to FC staff with regards to identifying the family needs. For instance, with regard to infant crying, a situation when a caregiver responded to infant crying appropriately and managed their stress around infant crying was scored as no need (O'Donnell et al., 2020). If a caregiver appeared or reported being unsure about infant crying management, a score of moderate need was assigned. If caregivers had difficulty coping with infant crying, appeared frustrated with the infant crying, or assigned negative intentionality to infant crying, the needs were identified as major. A situation when the caregivers' response to infant crying raised significant concerns about child maltreatment was scored as an emergency need.

Families with no needs received no subsequent recommendations. For families with moderate needs, FC nurse provided education and supportive guidance. The FCs protocol outlines specific information to be offered the caregiver with regard to needs in each of the FC Family Support Matrix Factors. For management of infant crying, the nurse communicated with the family about the usual crying patterns, the expected caregiver reactions to crying, and practices for swaddling and soothing (O'Donnell et al., 2020). For families with major needs, the nurse discussed possible community resources to provide long-term support and facilitated a connection between the family and the resource. With the example of infant crying, available community referrals might have included but were not limited to primary care providers or parenting classes (O'Donnell et al., 2020). In rare cases of an emergency need such as visible child abuse or neglect or infant medical danger (less than 1% of all families), a 911 call was made.

Previous analysis of the reliability of the FC Family Support Matrix tool indicated that observer-rated adherence to the FC manual was 84% and interrater agreement on scoring of risk yielded a mean κ coefficient across nurses of .69 and across the 12 risk factors of .68, with coefficients over .60 considered substantial (Dodge et al., 2014). We present trends in overall risk identification (moderate, major, and emergency) to represent the totality of program activity across nurse intervention and community connections.

TABLE 1 Missing data patters for FC performance metrics April 2019–March 2021

	Pre-pandemic onset	Post-pandemic onset	Total
Scheduled visits	5162	5118	10,280
Scheduled visits with:			
Missing data on visit completion	2	24	26
Completed visits	3933	2763	6696
Completed visits with:			
Missing data on health care needs	17	196	213
Missing data on infant care needs	22	59	81
Missing data on home safety needs	31	288	319
Missing data on caregiver well-being needs	17	266	283
Missing data on referrals	14	46	60
Missing data on the number of referrals	14	46	60
Mean number of factors not scored in the FC Family Support Matrix (SD)	.09 (.74)	1.21 (1.92)	.55 (1.46)

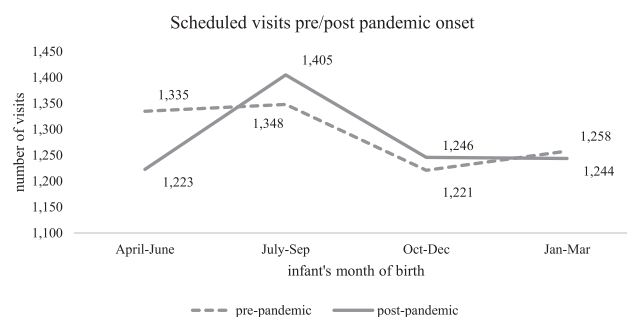
Note: Pre-pandemic onset: data include infants born between April 2019 and March 2020. Post-pandemic onset: data include infants born between April 2020 and March 2021.

Connections with community resources were measured using the percentage of families who were offered a referral and the average number of referrals made per visited family.

5.3 | Analytic Plan

To compare FC activity pre- and post-pandemic onset, we compared values for each of the performance metric for the 12 months before and after the pandemic onset—April 2019 through March 2020 and April 2020 through March 2021—as well as within each of the four quarters before and after the pandemic. Specifically, changes in scheduling activity pre-post pandemic onset were compared using the Wilcoxon rank-sum test for unmatched pairs, also known as the Mann-Whitney two-sample statistic (Mann & Whitney, 1947; Wilcoxon, 1945), using a 95% confidence level. Next, differences in visit completion rates, family needs, and community referral rates pre/post-pandemic onset were tested using chi-square and covariance analysis, for categorical and continuous measures, respectively, at a 99% confidence level due to large sample size. Further, for each of the comparisons, we exclude records with missing data on that metric. The number of records with missing data for each of the metrics is included in Table 1.

Sensitivity analyses were performed to address potential changes in the program in early 2020 but before government restrictions were imposed (February–March 2020). Results were substantively and numerically similar to those presented in the paper and available from the Authors upon request.



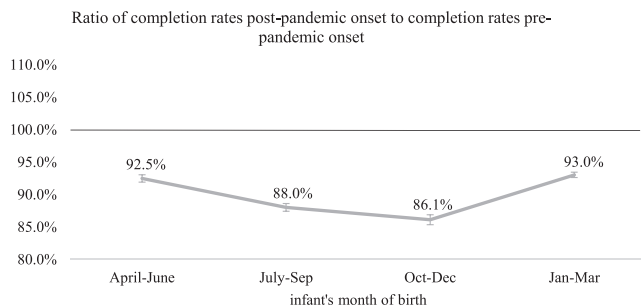
Note: Pre-pandemic onset: data include infants born between April 2019 and March 2020. Post-pandemic onset: data include infants born between April 2020 and March 2021.

FIGURE 1 Quarterly absolute number of scheduled visits in five certified and mature FC sites

6 | RESULTS

6.1 | Scheduling activity

Figure 1 illustrates the average number of scheduled FC interviews by quarter. In the first quarter of program activity post-pandemic onset, between April and June of 2020, scheduling declined by 8.4% compared with scheduling during the April-June period of 2019, from 1335 visits across the five sites to 1223 visits across the five sites ($z = 2.36$, P -value = .017). However, by the second quarter of the pandemic, between July and September, we no longer observed differences in scheduling activity pre-versus post-pandemic onset (1348 vs. 1405, $z = -.90$, P -value = .381). The number of scheduled visits in the third and fourth quarter pre-/post-pandemic onset was also not statistically different pre- and post-pandemic onset (1221 vs. 1246, $z = -.85$, P -value = .410 and 1258 vs. 1244,



Note: Completion rates are presented as ratios of post-pandemic activity in each quarter to pre-pandemic activity in the respective quarter a year before. For instance, for the first quarter, April-June 2020 data are compared to April-June of 2019. Vertical lines represent 95% confidence intervals.

FIGURE 2 Quarterly FC visit completion rates

$z = .51$, P -value = .623). In totality, over 12 months of the pandemic, 5118 families scheduled FC visits in the analyzed five sites, a number almost identical to 5162 visits scheduled in the previous 12 months ($z = .69$, P -value = .491).

6.2 | Visit completion rates

Cumulative completion rates for 12 months pre-pandemic onset averaged 75.3% ($n = 3885$) of scheduled FC visits. Post-pandemic onset, the cumulative completion rates declined to 67.6% ($n = 3444$) of scheduled visits ($\chi^2 = 74.16$, P -value = .000), in other words to 89.8% (CI = 89.5–90.1%) of the pre-pandemic performance. Figure 2 illustrates quarterly completion rates across four post-pandemic onset quarters of FC activity as compared to respective quarters pre-pandemic. In the first post-pandemic onset quarter, completion rates declined to 92.5% (CI = 91.9–93.0%) of the pre-pandemic activity (75.7%, $n = 1010$ to 70.0%, $n = 855$, $\chi^2 = 10.46$, P -value = .001). In the second and third quarter, completion rates dropped to 88.0% (CI = 87.4–88.6%) and 86.1% (CI = 85.3–86.9%) of the pre-pandemic performance (for the second quarter: 76.6%, $n = 1032$ and 67.4%, $n = 938$, $\chi^2 = 28.55$, P -value = .000; for the third quarter: 77.6%, $n = 948$, and 66.9%, $n = 827$, $\chi^2 = 35.63$, P -value = .000). By the fourth quarter of the pandemic, visit completion rates remained lower than the pre-pandemic performance—at 93.0% (CI = 92.6–93.4%) of the pre-pandemic activity (71.2%, $n = 895$ and 66.2% and $n = 824$, $\chi^2 = 7.17$, P -value = .007).

No differences were observed with respect to the socioeconomic status of families visited by FC pre- and post-pandemic onset. Pre-pandemic onset 54.5% ($n = 2610$) of visited families were families using Medicaid or without health insurance and post-pandemic onset, this percentage was 52.2% ($n = 1463$, $\chi^2 = 3.82$, P -value = .051). However, the percentage of visited families that identified as non-Hispanic Black and Hispanic declined slightly ($\chi^2 = 7.09$, P -value = .008 and $\chi^2 = 9.56$, P -value = .002). Pre-pandemic

onset, 21.2% ($n = 835$) of families visited by FC were families of non-Hispanic Black caregivers and 24.3% ($n = 957$) were to Hispanic caregivers. Post-pandemic onset, 18.6% ($n = 508$) of FC visits were to non-Hispanic black caregivers and 21.1% ($n = 577$) were to Hispanic caregivers.

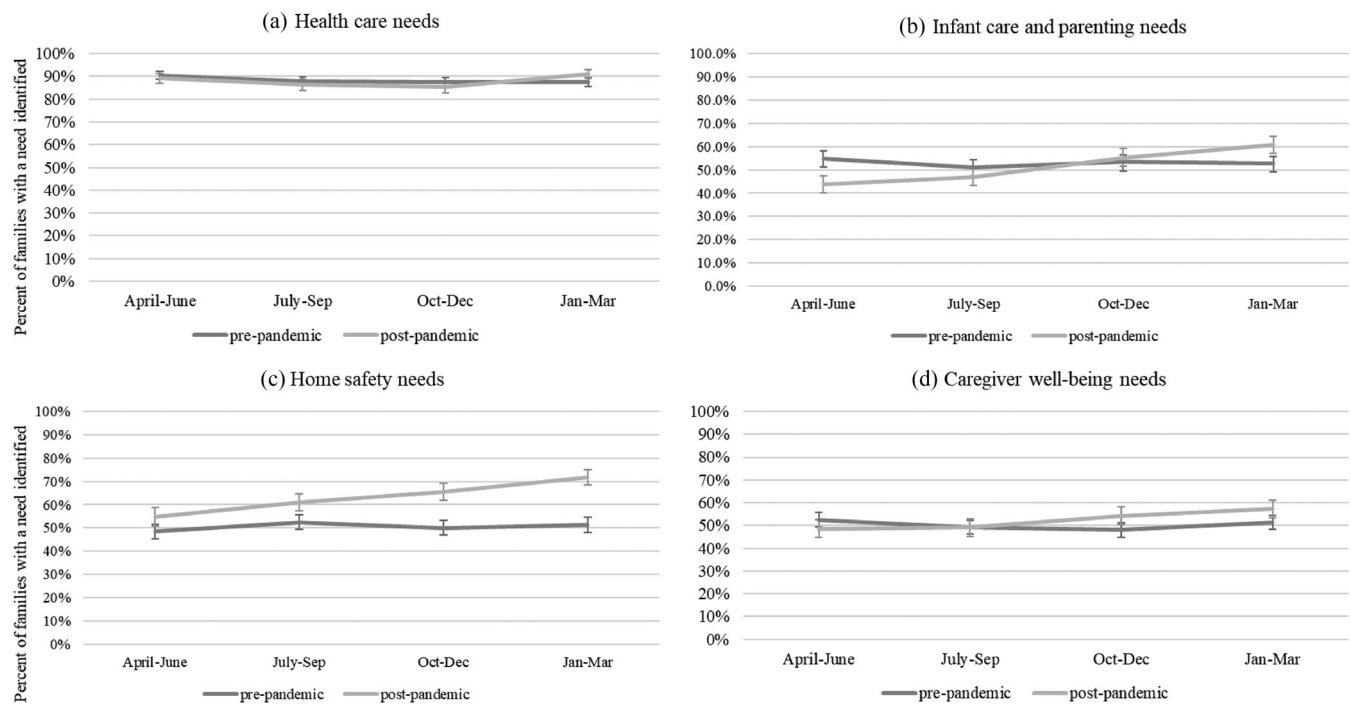
6.3 | Measurement of family needs

Next, we present pre/post-pandemic analysis of family needs for each of the four domains scored in the Family Connects Support Matrix. Caregiver/infant health and health insurance needs, as rated by nurses, did not differ significantly pre- to post-pandemic onset ($\chi^2 = .17$, $P = .677$). Pre-pandemic, 88.3% ($n = 3458$) families had health needs identified compared to 88.0% ($n = 2258$) post-pandemic onset (see quarterly comparison in Figure 3a and Table 2).

With regard to infant care (child care plans, caregiver-infant relationship, and infant crying), the families' needs have decreased once the pandemic has started ($\chi^2 = 8.67$, P -value = .003), from 54.6% to 51.1%. This decline was caused by a marked decrease in families' needs in the first post-pandemic quarter, from 54.9% ($n = 535$) to 43.8% ($n = 305$, $\chi^2 = 20.27$, P -value = .000, see Figure 3b and Table 2 below). However, by the fourth quarter of the pandemic, reporting of family needs in this domain has increased, from 52.7% ($n = 497$) pre-pandemic to 60.7% ($n = 406$) post-pandemic onset ($\chi^2 = 10.12$, P -value = .001).

Home safety needs had increased markedly ($\chi^2 = 98.49$, P -value = .000), from 50.6% ($n = 1976$) to 63.3% ($n = 1567$), specifically starting in the second post-pandemic quarter ($\chi^2 = 11.87$, P -value = .001, see Figure 3c and Table 2 below). This increase was largely due to nurses assessing the family violence factor risk as “moderate need” when only partial assessments of this factor were completed and nurses assessing the community risk of COVID-19 infection as “moderate need” in this domain outside of the traditional scoring strategy. With regards to caregiver well-being (depression and anxiety, substance use, emotional support), family needs' had remained at a similar level ($\chi^2 = 2.33$, $P = .126$). Specifically, before the start of the pandemic, needs were identified for 50.3% ($n = 1970$) of visits and post-pandemic onset, for 52.3% ($n = 1305$) of the visits (see Figure 3d and Table 2 for quarterly comparisons).

Another observed shift was that after the pandemic onset, the prevalence of missing data in risk factors scores in the 12 factor FC Family Support Matrix had increased (see Table 1). Before the pandemic onset, the mean number of factors missing (which means not scored) was minimal, at .09 (SD = .74) on a range from 0—all factors scored to 12—no factors scored. Post-pandemic onset, this number increased to 1.21 (SD = 1.92), indicating that on average at



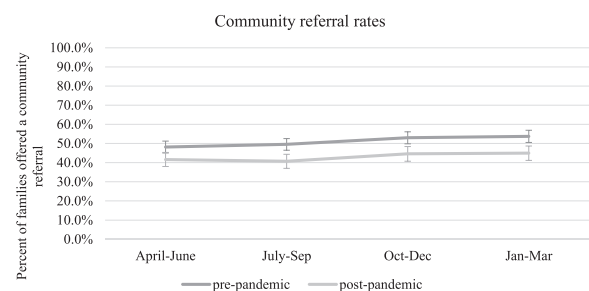
Note: Vertical lines represent 95% confidence intervals around the estimates. Pre-pandemic onset: data include infants visited between April-June 2019, July-September 2019, October-December 2019, and January-March 2020. Post-pandemic onset: data include infants visited between April-June 2020, July-September 2020, October-December 2020, and January-March 2021. Health care needs: caregiver and infant health and health insurance. Infant care needs: child care plans, caregiver-infant relationship, management of infant crying. Home safety needs: material supports, family violence, caregiver history of maltreatment. Caregiver well-being needs: anxiety and depression, substance use, emotional support.

FIGURE 3 Quarterly rates of risk identification for Family Connects

least one factor is not scored for each family ($F = 1091.29$, P -value = .000). The highest incidence of obstacles in risk scoring was reported for factors: caregiver-child interactions, caregiver anxiety and depression, and family violence.

6.4 | Community referrals

Finally, pre-pandemic onset, 51.1% ($n = 2001$) of families were offered a referral to community agencies to address major needs with respect to 12 risk factors (or very rarely were offered an emergency call to address an urgent need). Post-pandemic onset, referral rates declined to 42.9% ($n = 1166$, $\chi^2 = 42.66$, P -value = .001). Figure 4 illustrates that declines in referrals happened in each quarter of the post-pandemic onset activity (see also Table 2). At the same time, families who had a major or emergency need identified received more referrals to community agencies—from a mean of 1.6 (SD = 1.4) referrals pre-pandemic to a mean 2.0 (SD = 1.5) referrals post-pandemic onset ($F = 50.19$, P -value = .000). Specifically, as shown in Figure 5, in the second post-pandemic quarter, the mean number of referrals increased ($M = 1.5$, $SD = 1.3$ and $M = 2.0$, $SD = 1.5$, $F = 16.98$, P -value = .000). In the



Note: Vertical lines represent 95% confidence intervals around the estimates. Pre-pandemic onset: data include infants visited between April-June 2019, July-September 2019, October-December 2019, and January-March 2020. Post-pandemic onset: data include infants visited between April-June 2020, July-September 2020, October-December 2020, and January-March 2021.

FIGURE 4 Quarterly referral activity for Family Connects

third quarter, the increase was from a mean of 1.5 (SD = 1.5) referrals per family to a mean of 2.1 (SD = 1.5, $F = 25.67$, P -value = .000). In the fourth quarter, the increase was from a mean of 1.7 (SD = 1.6) to a mean of 2.1 (SD = 1.6, $F = 8.83$, P -value = 0.003).

7 | DISCUSSION

In March of 2020, FC leaders acted in the light of the emerging COVID-19 public health emergency and

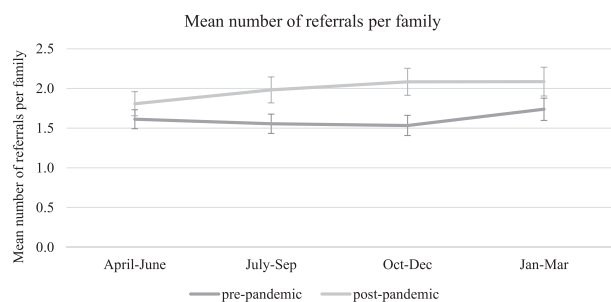
TABLE 2 Family Connects program activity pre- versus post-pandemic comparison

	Pre-pandemic onset	Post-pandemic onset		
Completed visits	3933	2763		
Health care needs			χ^2	P-value
Cumulative April–Mar (n)	88.30% (3458)	87.96% (2258)	.17	.677
Q1: April–June (n)	90.47% (883)	89.15% (567)	.74	.389
Q2: July–September (n)	87.86% (905)	86.30% (567)	.89	.348
Q3: October–December (n)	87.40% (846)	85.37 (531)	1.34	.247
Q4: January–March (n)	87.47% (824)	90.95% (593)	4.72	.030
Infant care needs			χ^2	P-value
Cumulative April–Mar (n)	54.56% (2608)	51.10% (1437)	8.67	.003
Q1: April–June (n)	54.93% (535)	43.76% (305)	20.27	.000
Q2: July–September (n)	51.17% (526)	46.84% (326)	3.11	.079
Q3: October–December (n)	53.31% (515)	55.3% (355)	.61	.434
Q4: January–March (n)	52.7% (497)	60.69% (406)	10.12	.001
Home safety needs			χ^2	P-value
Cumulative April–Mar (n)	50.64% (1976)	63.31% (1567)	98.49	.000
Q1: April–June (n)	48.51% (472)	54.71% (337)	5.80	.016
Q2: July–September (n)	52.48% (540)	61.09% (391)	11.87	.001
Q3: October–December (n)	50.10% (484)	65.59% (385)	35.52	.000
Q4: January–March (n)	51.39% (480)	71.84% (454)	65.45	.000
Caregiver well-being needs			χ^2	P-value
Cumulative April–Mar (n)	50.31% (1970)	52.26% (1305)	2.33	.126
Q1: April–June (n)	52.66% (513)	48.62% (317)	2.43	.119
Q2: July–September (n)	49.32% (507)	49.21% (311)	.00	.965
Q3: October–December (n)	48.03% (464)	54.30% (322)	5.77	.016
Q4: January–March (n)	51.37% (486)	57.26% (355)	5.21	.022
Families offered community referrals			χ^2	P-value
Cumulative April–Mar (n)	51.06% (2001)	42.91% (1166)	42.66	.000
Q1: April–June (n)	48.16 % (470)	41.65% (292)	6.95	.008
Q2: July–September (n)	49.56% (519)	40.69% (510)	13.19	.000
Q3: October–December (n)	53.00% (513)	44.58% (288)	10.97	.001
Q4: January–March (n)	53.70% (508)	44.94% (302)	12.06	.001
Mean number of referrals offered per family			F	P-value
Cumulative April–Mar (SD)	1.61 (1.44)	1.99 (1.48)	50.19	.000
Q1: April–June (SD)	1.16 (1.29)	1.81 (1.37)	3.94	.047
Q2: July–September (SD)	1.55 (1.34)	1.98 (1.50)	16.98	.000
Q3: October–December (SD)	1.53 (1.47)	2.08 (1.46)	25.67	.000
Q4: January–March (SD)	1.74 (1.63)	2.09 (1.58)	8.83	.003

Note: Pre-pandemic onset: data include infants visited between April 2019 and March 2020. Post-pandemic onset: data include infants visited between April 2020 and March 2021. * - among families that were offered at least one referral.

transitioned FC services to virtual means. During the initial pandemic onset there was a “shock” to FC operations starting in March of 2020 when the program transitioned to virtual delivery: fewer families scheduled FC visits, follow-through rates and community connection rates declined. Several factors led to this marked change. FC access to families was limited due to hospital entry restrictions. FC

sites experienced personnel reassignment due to staff delegation to COVID-19 relief efforts and staff availability was also affected by increasing family responsibilities once schools and child care centers closed. Training was needed to assure HIPAA compliancy and efficient virtual delivery of screeners pertaining to sensitive topics such as postpartum depression or domestic violence.



Note: Vertical lines represent 95% confidence intervals around the estimates. Pre-pandemic onset: data include infants visited between April-June 2019, July-September 2019, October-December 2019, and January-March 2020. Post-pandemic onset: data include infants visited between April-June 2020, July-September 2020, October-December 2020, and January-March 2021.

FIGURE 5 Quarterly mean number of risk-related referrals made per family among families with identified risks

By summer of 2020, FC activity had recovered to an extent. Novel avenues of recruitment were explored to overcome hospital entry restrictions, including building new connections with hospital staff and community-based organizations staff. A new, shorter, intervention, a structured supportive call, was introduced and offered to families as an option when completion of a full protocol visit was not possible due to family or site constraints. With support from FC leadership, site-level community alignment specialists monitored community agencies activity and availability of community connections to identify barriers and improve access to community support for families with identified risks. During the fall and winter of 2020, FC operations stabilized at moderately reduced levels, which continued during the spring of 2021. In sum, FC remained operational during the first year of the COVID-19 pandemic, providing crucial services to birthing families in times of crisis.

However, some beneficial aspects of the in-person contact were lost in the transition. In aggregate, program completion rates declined from 75.3% pre-pandemic to 67.6% post-pandemic onset, 89.8% of the pre-pandemic rate. During the pre-pandemic period, major risks were identified and referrals were offered to 51.1% of visited families. Following the pandemic onset, 42.9% of visited families had a major risk identified and referrals offered. Risk scoring and referral activity thus operated at 83.9% during the post-pandemic onset period to the pre-pandemic period.

As communities begin to allow in-person services after sufficient vaccination has occurred and in accordance with local rules and regulations, it is likely that even under these circumstances, some families will not consent to in-person home visit. There is thus a need to identify successful home-visiting protocol adjustments as well as emergent program delivery obstacles post-pandemic onset so that positive change can be reinforced and any challenges in implementation can be addressed. In the remainder of

this section, we use the FC example to offer recommendations for the field of home-visiting under the current public health context and in the long-term.

Findings about FC virtual activity post-pandemic onset indicate that program activity has decreased compared to in-person visiting pre-pandemic onset. Consequently, given these findings, the focus of home-visiting programs should be to prioritize in-person visits, to improve participation. Some FC sites have already resumed in-person visits taking into account local rules and regulations and COVID-19 transmission rates. However, families' reactions to in-person visits can be unpredictable in the current public health context. Some families are willing to see nurses in their homes again but others prefer virtual contact. Additionally, what remains unknown is the future program activity for in-person visits in a situation when new coronavirus variants emerge or in an event of a community-level COVID-19 outbreak.

Given the uncertainty of the families' potential reaction to in-person home-visiting and about the public health circumstances in the short-term, the FC recommendation is for home-visiting services to offer a hybrid delivery approach. This hybrid approach includes a re-introduction of the in-person home-visiting model under the traditional in-person protocol as soon as this mode of delivery is safe for families and home-visiting staff members in a community. At the same time, the hybrid model retains the virtual visit protocol as a second mode of implementation. The option of a virtual visit can be offered to families reluctant of in-person visit and during periods of spikes in COVID-19 infection rates within a community. Under this approach, the option for a virtual visit is offered to families only when they specifically decline an in-person visit. This recommended approach will maximize program participation in the uncertain future, as vaccination efforts progress and new strains of COVID-19 are identified.

Further, we recommend that home-visiting services continue to improve the virtual protocols. Specifically, we recommend rigorous evaluation of virtual protocols and further research to examine program shortcomings under virtual delivery. Limitations to program impact introduced by virtual delivery will vary across the home-visiting programs. With regard to FC, challenges were identified with scoring needs linked to caregiver-child interactions, caregiver depression and anxiety, and family violence. FC is currently exploring multiple enhancements, including refining screener protocols to increase completion rates and introducing new modes of assessing these items using virtual means.

In the long-term, we recommend that the field of home-visiting services advances toward thoroughly tested and evidence-based hybrid home visiting models that combine in-person services offered to all families when social

contact is safe and welcomed by the family and a virtual component activated when a home visit is restricted by public health recommendations, geographical location, or family reluctance. This long-term hybrid design will allow the program to react when another crisis falls upon a community, for instance a wild fire or a hurricane. We also envision potential positive long-term effects of moving to a hybrid model: population reach might increase with hard-to-reach populations, for instance, families in remote rural settings. Another potential positive change could be an increase in the dosage of encounters through less-expensive virtual delivery.

One of the benefits of in-person home-visiting services is the unique ability of home visitors to establish rapport with the family and to build relationships with families while in the privacy of their own home. We thus also recommend that during the virtual delivery of home-visiting services, existing modes and strategies used to form a relationship with the visited family be adapted or modified to achieve levels of trust and privacy comparable to the in-person experience. Identity confirmation protocols and encrypted audio/video calls can strengthen the families' sense of privacy while using virtual services (Shachar et al., 2020). Further, while using a video call, positioning the video camera so that the home visitor is clearly visible in the center of the screen and appears to maintain eye contact with the family members can create a sense of connectedness between the home visitor and the caregiver (Sabesan et al., 2014). Using visual aids and props and pausing frequently throughout the visit to assure that the visit protocol components are clearly understood can maintain family's engagement during the visit.

Finally, we urge that home-visiting programs to offer virtual services with intentional efforts to address inequities related to family supports access. Guidance on accessing Internet and video services should be offered to families lacking access to adequate technology or a stable Internet connection. An alternative option of a telephonic services should be offered to families when in-person, video, or Internet connections are not available. Interpretation and adaptive technologies should also be offered to families with limited English proficiency or hearing/vision impairments.

In times of crisis, families with small children are especially affected by insecurity and threats to well-being because of the disruption in their daily lives and potential economic uncertainty (Seddighi et al., 2021). Infants are the most vulnerable in these situations because they do not have the cognitive or verbal capacity to understand such events or to advocate for their emerging needs. At the same time, adversity in infancy has enduring consequences across the life course, leading to long-term eco-

nomical and public health impacts (Bellis et al., 2019). There is thus a special urgency to assure that social services for birthing families and families with infants remain operational and provide families with the assistance they need during the ongoing COVID-19 pandemic. Our recommendations from FC activity post-pandemic onset apply not only to other home-visiting services but also to the broad field of infant and early childhood preventive and targeted programs. We encourage such programs to adapt hybrid service modes that prioritize in-person services when such services are deemed safe for program staff and participating families but also preserve a secondary option of a virtual service to allow hesitant families to connect virtually in order to maintain population reach and program impact. We further encourage impact evaluation of virtual program components before permanently introducing virtual delivery as a main delivery option into intervention protocols.

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CONFLICT OF INTEREST

Drs. Dodge, Goodman, and Best acknowledge participation in Family Connects model dissemination. As the founder of Family Connects, Dr. Dodge provides periodic, in-kind consultation to sites implementing Family Connects. As director of research and evaluation for Family Connects, Dr. Goodman supports local evaluation efforts at some dissemination sites. As medical director for Family Connects, Dr. Best oversees site training and advises on local site clinical implementation work for dissemination sites. Dr. Rybińska and Dr. Bai report no conflict of interest.

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