FAMILY CONNECTS
Springfield-Greene County

Family Connects:
A Prospective Economic Evaluation

SPRINGFIELD - GREENE COUNTY HEALTH

Family Connects is a program of
Springfield-Greene County Health.

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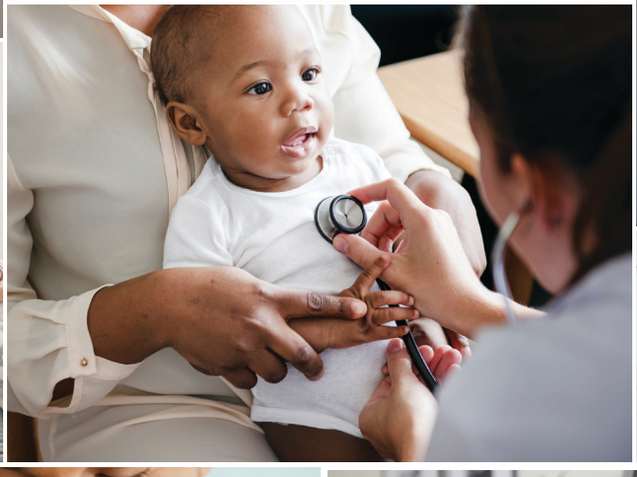
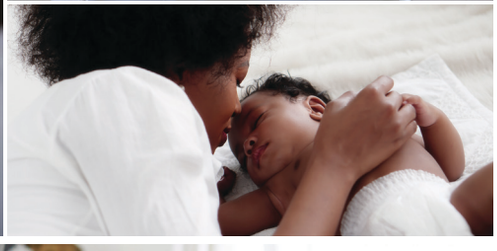

Executive Summary

Introduction

Family Connects is a universal and voluntary newborn home visitation model that pairs a family with a registered nurse to receive health assessments for the birthing parent and infant. During a Family Connects home visit, families receive screenings for substance use and mental health; education on caregiving, breastfeeding support, and safe sleep; and referrals to valuable community services.

Methods

This paper provides estimates of the cost benefit of the Family Connects program in Greene County from the societal perspective. The model compared a theoretical intervention arm to a non-intervention arm (no Family Connects program) over four calendar years (2024-2027). This evaluation focuses on the economic implications in the following categories: Infant and child emergency department (ED) visits, infant and child hospitalizations, postpartum anxiety and child protective services (CPS) investigations. The major costs within those categories include health care costs, productivity losses and welfare costs. For each category, peer-reviewed literature, reports and white papers were used to identify costs and consequences.

Research indicates the implementation of Family Connects leads to a 17% reduction in infant ED visits, a 73% reduction in infant hospital visits, a 30% reduction in postpartum anxiety and a 39% reduction in CPS investigations. These reductions were applied to the cohort group of the intervention arm. Costs associated with these outcomes were obtained from publicly available national data sources and applied to both the intervention arm and the non-intervention arm. All costs were estimated in US dollars and adjusted to the reference year 2022 using the Consumer Price Index. Using discount rates of 3% and 7%, the net present value of the annual costs for the intervention arm and non-intervention arm were calculated. The difference between these costs for the intervention arm and the non-intervention arm is the cost savings as a result of the Family Connects program. Using the cost savings, a standard formula can be applied to determine the ratio of the costs of an intervention to the benefits that accrue.

Results

Discounted at 3%, it is estimated that the cost savings of the Family Connects program will be $22.2 million. This includes the discounted present values of over $400,000 due to the reduction in ED visits, almost $16 million due to the reduction in inpatient visits, over $4 million due to the reduction in postpartum anxiety and almost $400,000 due to the reduction in CPS investigations. Based on a 7% annual discount rate, the cost savings are estimated to be over $20 million. The Family Connects program is expected to cost approximately $1.4 million annually. For every dollar invested in the Family Connects program, Greene County can expect approximately $4.08 in savings. This represents a 408% return on investment.

Conclusion

The Family Connects program represents a sound investment for the Greene County community since the benefits of prevention will very likely outweigh the costs of the program.

Introduction

Family Connects is a universal newborn home visitation program focusing on community alignment and engagement. It is a voluntary program where a family is paired with a registered nurse and will receive health assessments for the birthing parent and infant. During a Family Connects home visit, families receive screenings for substance use and mental health; education on caregiving, breastfeeding support and safe sleep; and referrals to valuable community services.[1] Connection to resources is the lasting impact these visits will have. Randomized control trials conducted by Family Connects International have documented the many benefits of Family Connects:

- A reduction in infant emergency room visits and hospital overnight stays,[2, 3, 4, 5]
- Mothers were less likely to report postpartum clinical anxiety,[6, 7]
- Improvement in home environments,[8]
- Mothers reported significantly more positive parenting behaviors,[9]
- A reduction in Child Protective Services investigations and,[10, 11]
- Increased connections to community resources.[12, 13]

Greene County residents who give birth at CoxHealth or Mercy will have the opportunity to meet with a Family Connects nurse in the hospital. Families can also self-refer through an online form. Those who choose to participate in Family Connects will receive a home visit from a trained nurse within the first 12 weeks with their new baby. Family Connects also serves people who became parents through foster care, adoption or surrogacy and families who already have other children. The system approach of Family Connects addresses six areas including community connections, enhanced use of higher quality childcare, higher quality parenting behaviors, enhanced home environments, improved maternal mental health and reduction of emergency department utilization.

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1 Debra Best and Kimberly Friedman, "Achieving Whole Person Care in the Postpartum Period Through Partnership Between Medical Providers and Community Organizations," Family Connects International, 2021, https://familyconnects.org/wp-content/uploads/2023/01/v2-Achieving-WP-Care-in-the-Postpartum-Period-2021.pdf.pdf

2 Kenneth A. Dodge et al., "Randomized Controlled Trial of Universal Postnatal Nurse Home Visiting: Impact on Emergency Care," *Pediatrics* 132, no. Supplement 2 (2013): S140-6, https://doi.org/10.1542/peds.2013-1021M

3 W. Benjamin Goodman et al., "Randomized controlled trial of Family Connects: Effects on child emergency medical care from birth to 24 months," *Development and Psychopathology* 31 (2019): 1863-72, https://doi.org/10.1017/S0954579419000889

4 W. Benjamin Goodman et al., "Effect of a Universal Postpartum Nurse Home Visiting Program on Child Maltreatment and Emergency Medical Care at 5 Years of Age," *JAMA Network Open* 4, no. 7 (2021): e2116024, https://doi.org/10.1001/jamanetworkopen.2021.16024

5 Kenneth A. Dodge et al., "Effect of a Community Agency-Administered Nurse Home Visitation Program on Program Use and Maternal and Infant Health Outcomes: A Randomized Clinical Trial," *JAMA Network Open* 2, no. 11 (2019): e1914522. https://doi.org/10.1001/jamanetworkopen.2019.14522

6 Kenneth A. Dodge et al., "Implementation and Randomized Controlled Trial Evaluation of Universal Postnatal Nurse Home Visiting," *American Journal of Public Health* 104, no. S1 (2014): S136-43, https://doi.org/10.2105/AJPH.2013.301361

7 Dodge et al., 2019

8 Dodge et al., 2014

9 Dodge et al., 2014

10 Goodman et al., 2021

11 Dodge et al., 2019

12 Dodge et al., 2014

13 Dodge et al., 2019

As documented by the Centers for Disease Control and Prevention, early childhood home visitation programs like Family Connects help build safe, stable, nurturing and supportive home environments.[14] Given the documented success of Family Connects, Springfield-Greene County Health is proud to be bringing this program to Greene County.

Several studies have assessed the clinical and societal benefits of Family Connects, but none consider the economic implications of multiple of the documented benefits of the program. In this paper, estimates of the cost benefit of the Family Connects program in Greene County are presented.

Methods

General Overview

This economic evaluation measures costs from the societal perspective. All costs were estimated in US dollars and adjusted to the reference year 2022 using the Consumer Price Index. Future costs were discounted at both 3% and 7% to reflect their present value, as recommended by the Department of Health and Human Services' Office of the Assistant Secretary for Planning and Evaluation.[15]

Table 1. 4-Year Population Determinations, Intervention Arm

	2024	2025	2026	2027
No. of births	3,355	3,331	3,301	3,308
Enrolled in FC	2,090	2,075	2,057	2,061
Control	1,265	1,256	1,244	1,247
Running Total	3,355	5,421	7,466	9,530

The model compared a theoretical intervention arm to the non-intervention arm (no Family Connects program) over four calendar years (2024-2027). The time interval was chosen because Greene County seeks funding of 1 million per year for three years from the State legislature. Family Connects will launch early in the 2024 calendar year but the funding follows the fiscal year schedule. For this reason, four calendar years are necessary to examine the results from three years of funding. The number of eligible participants for the intervention arm was determined using a projection based on a five-year running average of the number of hospital births in Greene County. Though Family Connects will be available to all newborns in Greene County, the number of hospital births was used to remain consistent with known conditions regarding enrollment rates in the existing research. According to the literature, when implemented by a community agency, the program can expect a 76% participation rate among eligible families. Of those who participate, 82% complete the program. This amount was 'assigned' to the cohort group.

The difference between the year's projected number of births and the cohort group was 'assigned' to the control group. The annual estimates for cohort and control enrollment in the intervention arm are outlined in **Table 1**. Based on outcomes shown in the literature, this evaluation focuses on the economic implications of Family Connects on the population

[14] Centers for Disease Control and Prevention, "Adverse Childhood Experiences (ACEs) Prevention: Resource for Action," 2019, https://www.cdc.gov/violenceprevention/pdf/ACEs-Prevention-Resource_508.pdf

[15] Department of Health and Human Services, "Guidelines for Regulatory Impact Analysis: A Primer," 2016, https://aspe.hhs.gov/sites/default/files/private/pdf/242931/HHS_RIAGuidancePrimer.pdf

of Greene County in the following categories: Infant and child emergency department visits, infant and child hospitalizations, postpartum anxiety and child protective services investigations.[16, 17, 18] The major types of costs within those categories include health care costs, costs due to productivity losses and welfare costs. For each category, peer-reviewed literature, reports and white papers were used to identify costs and consequences. **Table 2** provides estimate values and sources for the majority of the inputs into the model.

Table 2. Parameters and Costs used in the Evaluation

Parameter	Point Estimate	Source
Child-related Outcomes		
Rate of ED Visits, %		1
Age 0-1	21.81	
Age 1-2	28.94	
Age 2-3	31.63	
Age 3-4	16.88	
Cost per ED Visit, $		1, 2, 3
Age 0-1	412.75	
Age 1-2	592.58	
Age 2-3	499.56	
Age 3-4	417.92	
Rate of IP Discharges, %		1
Age 0-1	23.45	
Age 1-2	2.96	
Age 2-3	3.06	
Age 3-4	2.53	
Cost per IP Discharge, $		1, 2, 3
Age 0-1	10,892.23	
Age 1-2	11,885.22	
Age 2-3	8,052.56	
Age 3-4	10,431.72	
Children subjected to CPS investigations, %	4.5	20
Child maltreatment associated healthcare costs, per case, $	43,017.00	19
Child maltreatment associated welfare costs, per case, $	10,370.60	19
Maternal-related Outcomes		
Labor force participation among women with children < 6 years, %	67.9	6
Cost of job absenteeism, per capita, $	1,060.21	18
Cost of job presenteeism, per capita, $	3,427.76	18

16 Dodge et al., 2019
17 Dodge et al., 2013
18 Dodge et al., 2019

Table 2 cont.		
Baseline rate of unemployment, %	4.7	7
Likelihood of unemployment among women with PMAD, %	6.37	18
Cost per unemployed woman, $	47,900.00	5
Individual OOP healthcare costs for women without PMAD, $	708.31	18
Individual OOP healthcare costs for women with PMAD, $	1,073.97	18
Individual insurer costs for women without PMAD, $	4,156.75	18
Individual insurer costs for women with PMAD, $	6,018.37	18
Other inputs		
Discount rate, %	3 and 7	9
Prevalence of PMAD, %	8.5	15

Note. ED = emergency department, IP = inpatient; CPS = child protective services; PMAD = perinatal mood and anxiety disorder; unemployment = people who do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work; OOP = out-of-pocket.

Emergency Department Visits

To generate incidence estimates, the average rates of emergency department (ED) visits per year for children aged 0-4 years were calculated. Using the Medical Expenditure Panel Survey (MEPS) 2019 Full Year Consolidated Data File, the average number of ED visits was determined for children aged 0-1 years, 1-2 years, 2-3 years and 3-4 years. These averages were then applied to the control group of the intervention arm and the non-intervention arm to obtain the rate of ED visits per year. Research indicates the implementation of Family Connects leads to a 17% reduction in ED visits for participants.[19] This reduction was multiplied by the averages previously mentioned and applied to the cohort group of the intervention arm.

Costs associated with ED visit expenses include facility and physician expenses and include all payment categories such as out of pocket, Medicaid and private insurance. To generate cost estimates for children who had an ED visit, the median expenses associated with the visit were calculated. Using the MEPS 2017, 2018 and 2019 Full Year Consolidated Data Files, the average median cost for emergency department visits was calculated separately for children aged 0-1 years, 1-2 years, 2-3 years and 3-4 years. All costs were adjusted to 2022 dollars using the Consumer Price Index. These costs were then applied to the number of visits projected for children in both the intervention arm and the non-intervention arm.

Using discount rates of 3% and 7%, the net present value of the annual costs for the intervention arm and non-intervention arm were calculated. The difference between these values is the cost savings as a result of the Family Connects program.

Hospital Overnights

The incidence estimates for hospital visits were calculated in the same manner as described for ED visits. Research similarly indicates the implementation of Family Connects leads to a 73% reduction in hospital overnights for participants.[20] This reduction was multiplied by the incidence averages by age and applied to the cohort group of the intervention arm.

19 Goodman et al., 2021
20 Goodman et al., 2021

Costs associated with inpatient visits include facility expenses like room and board, diagnosis and laboratory work and physician services. As with the costs associated with ED visit expenses, all payment categories were included. Using the MEPS 2017, 2018 and 2019 Full Year Consolidated Data Files, the average median cost for hospital visits was calculated separately for children aged 0-1 years, 1-2 years, 2-3 years and 3-4 years. All costs were adjusted to 2022 dollars using the Consumer Price Index. These costs were then applied to the number of visits projected for children in both the intervention arm and the non-intervention arm.

Using discount rates of 3% and 7%, the net present value of annual costs for the intervention arm and non-intervention arm were calculated. The difference between these values is the cost savings as a result of the Family Connects program.

Postpartum Anxiety

A systematic review of postpartum women, which indicated that 8.5% of postpartum mothers experience one or more anxiety disorders, was used to generate prevalence estimates.[21] This prevalence was applied to the control group of the intervention arm and the non-intervention arm. Research indicates the implementation of Family Connects leads to a 30% reduction in postpartum anxiety.[22] This reduction was multiplied by the 8.5% prevalence and applied to the cohort group of the intervention arm. It was also assumed that there would be several birthing parents who recovered from postpartum anxiety in the years following the birth. Based on previous studies, it was assumed two thirds of birthing parents achieved remission by the end of the first year postpartum.[23]

Costs associated with postpartum anxiety include costs associated with absenteeism, presenteeism, unemployment and healthcare costs (including out of pocket and insurer). The methodology for calculating cost estimates varied depending on the category of cost. These costs were applied to the number of postpartum anxiety cases projected for birthing parents in both the intervention arm and the non-intervention arm.

- **Job absenteeism and presenteeism:** The per-capita expected cost of job absenteeism and job presenteeism was obtained from the literature and adjusted to the reference year of 2022. The labor force participation of mothers was obtained from the Bureau of Labor Statistics. This percentage was applied to the projected number of birthing parents with postpartum anxiety each year. The resulting number was then multiplied by the per-capita costs to obtain annual estimates of absenteeism and presenteeism costs associated with postpartum anxiety.
- **Unemployment:** According to the Bureau of Labor Statistics, unemployment is defined as "people who do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work." The rate of unemployment among women with perinatal mood and anxiety disorders (PMAD) was applied to the number of projected birthing parents with postpartum anxiety in a given year. The resulting number was then multiplied by the cost per unemployed woman.
- **Healthcare costs:** Individual out of pocket health care costs and individual insurer health care costs were obtained from the literature for both women with PMAD and without PMAD. The applicable costs were applied to the intervention and non-intervention arms to obtain the total health care costs associated with postpartum anxiety.

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21 Janice H. Goodman, Grace R. Watson, and Brendon Stubbs, "Anxiety disorders in postpartum women: A systematic review and meta-analysis," Journal of Affective Disorders 203 (2016): 298-331, https://doi.org/10.1016/j.jad.2016.05.033

22 Dodge et al., 2014

23 Goodman et al., 2016

Using discount rates of 3% and 7%, the net present value of the annual costs for the intervention arm and non-intervention arm were calculated. The difference between these values is the cost savings as a result of the Family Connects program.

Child Protective Services Investigations

To generate incidence estimates, the average rate of children subjected to child protective services (CPS) investigations was obtained. According to the literature, children in unsubstantiated cases have similar maltreatment experiences and developmental outcomes to children in substantiated cases.[24] As a result, no distinction was made regarding the results of the investigation in this evaluation. Using data from the Annie E. Casey Foundation, the five-year average rate of children subjected to CPS investigations was calculated. This rate was applied to the control group of the intervention arm and the non-intervention arm to obtain the number of investigations per year. Research indicates the implementation of Family Connects leads to a 39% reduction in CPS investigations.[25] This reduction was multiplied by the rate of children subjected to CPS investigations and applied to the cohort group of the intervention arm.

Costs associated with CPS investigations included in this evaluation are the short-term healthcare costs of the child and the welfare costs. Studies indicate there are many long-term costs associated with CPS investigations including productivity loss, criminal justice and long-term medical costs. [26, 27] These were not included since they are beyond the scope of the four-year evaluation interval. The costs included in this evaluation were obtained from the literature, adjusted to the reference year and applied to the number of investigations projected in both the intervention arm and the non-intervention arm.

Using discount rates of 3% and 7%, the net present value of the annual costs for the intervention arm and non-intervention arm were calculated. The difference between these values is the cost savings as a result of the Family Connects program.

Cost Benefit Calculation

Using the cost savings calculated in each of the previous steps, one can apply a standard formula for the ratio of the costs of an intervention to the benefits that accrue:

$$CB_{FC} = \frac{(\sum CS)}{(C_{IA}\text{-}C_{NIA})}$$

in which CB_{FC} is the cost-benefit ratio that accrues from the Family Connects program, CS is the cost savings of the intervention arm as compared to the non-intervention arm for each of the four measured outcomes, C_{IA} is the cost to administer the intervention arm and C_{NIA} is the cost to administer the non-intervention arm.

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[24] Curtis Florence et al., "Health Care Costs Associated With Child Maltreatment: Impact on Medicaid," Pediatrics, 132, no. 2 (2013): 312-8, https://doi.org/10.1542/peds.2012-2212
Goodman et al., 2021

[25] Goodman et al., 2021

[26] Xiangming Fang et al., "The economic burden of child maltreatment in the United States and implications for prevention," Child Abuse & Neglect 36 (2012): 156-65, https://doi.org/10.1016/j.chiabu.2011.10.006

[27] Cora Peterson, Curtis Florence, and Joanne Klevens, "The economic burden of child maltreatment in the United States," Child Abuse and Neglect 86 (2018): 178-83, https://doi.org/10.1016/j.chiabu.2018.09.018

Results

Cost Savings

Table 3 presents the cost savings of the Family Connects program over four years. Discounted at 3%, it is estimated the cost savings of the Family Connects program will be $21.3 million. This includes the discounted present values of over $400,000 due to the reduction in ED visits, over $16 million due to the reduction in inpatient visits, almost $4 million due to the reduction in postpartum anxiety and almost $400,000 due to the reduction in CPS investigations. Because cost estimates vary as a function of the discount rate, the cost savings using the discount rate of 7% was also estimated. Based on a 7% annual discount rate, the cost savings are estimated to over $19 million.

Table 3. 4-Year Projected Cost Savings of the Family Connects Program

	2024	2025	2025	2026	Total, NPV, 3%	Total, NPV, 7%
Reduced ED Visits, $	32,194	94,415	148,262	174,748	411,194	366,895
Reduced IP Visits, $	3,899,418	4,424,353	4,758,262	5,146,615	16,883,404	15,319,204
Reduced PPA, $					3,577,828	3,243,984
Absenteeism & Presenteeism	166,055	215,422	233,374	251,326	801,145	725,588
Unemployment	239,500	239,500	239,500	287,400	932,804	847,780
Medical costs, OOP	57,995	76,252	81,622	85,918	279,213	252,977
Medical costs, Insurer	324,993	427,304	457,397	481,471	1,564,666	1,417,640
Reduced CPS investigations, $					396,894	361,670
Healthcare costs	86,034	86,034	86,034	86,034	319,797	291,415
Child welfare costs	20,741	20,741	20,741	20,741	77,097	70,255

Note. ED = emergency department, IP = inpatient; PPA = postpartum anxiety; OOP = out-of-pocket.

Cost Benefit

The Family Connects program is expected to cost approximately $1.4 million annually. This annual program cost was discounted at both 3% and 7% to be inputted for C_{IA} into the cost-benefit ratio calculation. Since the non-intervention arm of our theoretical intervention is the lack of the Family Connects program availability, C_{NIA} would be $0. **Table 4** presents the results of the cost-benefit ratio calculations. For every dollar invested in the Family Connects program, Greene County can expect approximately $4.08 in savings.

Table 4. Cost Savings, Program Costs, and Cost-Benefit Calculation Results

Cost Savings, NPV 3%	Program Costs, NPV 3%	Cost-Benefit, NPV 3%	Cost Savings, NPV 7%	Program Costs, NPV 7%	Cost Benefit, NPV 7%
$21,269,320.13	$5,203,937.76	$4.09	$19,291,753.01	$4,742,095.76	$4.07

Limitations

This study's estimates are limited in a number of ways. First, this analysis relied on previous national estimates of healthcare costs, productivity costs and welfare costs. Applying inflation to those previous estimates to update costs to present value likely insufficiently captures cost changes during the intervention period. Additionally, these national averages may not represent the true value of costs in Greene County. It cannot be determined whether these cost averages would be overestimates or underestimates. Second, though a four-year evaluation period was selected to examine the impacts of funding over fiscal years, research indicates that some savings from the improved outcomes would not be captured in this timeframe. For example, reducing child protective services investigations is believed to reduce juvenile arrests when the children involved are in their teens and productivity loss when the children involved are adults.[28, 29] As a result, the estimated savings from the Family Connects program, specifically through the reduction of CPS investigations, is likely an underestimate. Third, as previously described, enrollment in the Family Connects program will not be limited to hospital births. As a result, the cost savings predicted in this model are likely an underestimate due to the exclusion of additional participants. Fourth, many outcomes reported by Family Connects were not easily quantifiable for the scope of this analysis. For example, the administration of Family Connects leads to an increase in community connections and an increase in out of home childcare.[30, 31] These may have financial benefit to communities and provide additional cost savings but could not be quantified. As a result, the cost savings included in this analysis are likely an underestimate. Fifth, some studies regarding postpartum anxiety document an increased enrollment in social benefit programs (SNAP, Medicaid, TANF, etc.) in women with untreated postpartum anxiety. This may represent additional cost savings that were not included in this model. Sixth, to simplify calculations, it was assumed that all births were single births, and each birth was a new participant in the Family Connects program. This likely overestimates cost savings by failing to account for families that may have already participated in the Family Connects program during a previous birth. Seventh, every attempt was made to find 2022 prevalence and cost estimates. For some calculations, this was not possible. For all cases where 2022 data was not available, the most recent data year available was used. Despite limitations, this study proposes common sense methodology to quantify financial benefit of a social program for policy makers.

Conclusion

In summary, it is estimated that administering the Family Connects program to families of Greene County will provide an approximate 408% return on investment. For every $1 spent on the costs of the program, Greene County will see $4.08 in savings through the reduction in infant and child emergency department visits, infant and child hospitalizations, postpartum anxiety, and child protective services investigations. As such, the Family Connects program represents a sound investment for the Greene County community since the benefits of prevention will very likely outweigh the costs of the program.

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28 Fang et al., 2012
29 Peterson, Florence, and Klevens, 2018
30 Dodge et al., 2019
31 Dodge et al., 2014

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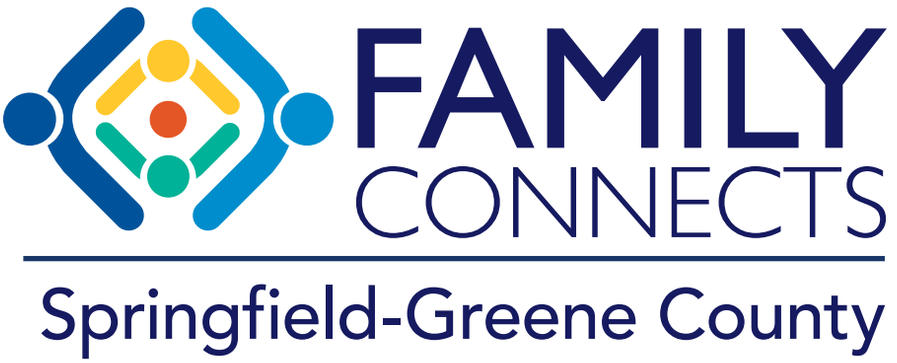
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