Randomized Controlled Trial of Universal Nurse Home Visiting: Maternal, Infant, & Health Care Outcomes

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Funding

- The Duke Endowment
- Durham County Health Trust Fund
- NICHD
- Oak Foundation
- The Pew Charitable Trusts
- NC Race to the Top Early Learning Challenge
- Medicaid
- Philanthropy
Durham Family Initiative

- Challenge (2002) from The Duke Endowment to reduce Durham’s maltreatment rate by 50%
- Preventive System of Care: ~$385,000 savings
- Experimental programs began in 2002
- Tertiary prevention ➔
  Secondary prevention ➔
  Primary prevention
- Durham Connects launched in 2008
- Two RCTs
  - #1: July 1, 2009—December 31, 2010
  - #2: August 1, 2013-June 30, 2014

Just that one on one connection in my home was just what I needed. She helped me to continue my breast feeding journey and told me I was doing a good job. Those words mean so much to a new mommy...Thank you again Durham Connects for this wonderful program. All counties should have this kind of support for new mothers.
(TM, mother of 3)
Rates of Substantiations/Services Needed per 1,000 Children
Ages < 1 Year Old, by Fiscal Year
Durham County and 5 County Mean

Numbers based on unduplicated children with assessments.
Source: Line_Rates_v5_fy9612.sas
## Home Visiting Overview

- Programs based on demographic risk
- Selective (None are universal)
- Intensive (multi-year, may cost up to $15,000)
- Cannot affect population rates
- Nurse Family Partnership
- Healthy Families America

### Healthy Families Durham RCT

<table>
<thead>
<tr>
<th>Summary</th>
<th>Outcomes</th>
<th>Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1: 36m</td>
<td>• Decreased parent stress, child behavior problems, CPS reports</td>
<td>Change program duration</td>
</tr>
<tr>
<td>G2: 18m</td>
<td>• Increased Medicaid &amp; WIC</td>
<td></td>
</tr>
<tr>
<td>G3: SAU</td>
<td>• 36m v. 18m, NS</td>
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</table>
Improving Child and Family Well-Being in the Durham, North Carolina Community

Universal ★ Nurses ★ Postnatal ★ Brief

• Connect with *every* mother (and father) at birth; assess *unique* family risks (and needs)…

• Connect family with *matched* community resources based on *identified risk*…

• So that parents can connect with their infant.

www.durhamconnects.org
Durham Connects (DC)

- **Target population**
  - All Durham County residents giving birth in county
  - ~3,200 births eligible per year
  - Voluntary completion ~70%

- **Staff characteristics**
  - Home visitors are RNs w/public health or maternal/child experience
  - Support workers assist with scheduling., support nurses with connections, & complete post-visit calls
  - MSW employed by DSS partner
DC Intervention

- Engagement & recruitment in birth hospital
- Initial home visit
- 1-2 Follow-up Visits
  - Follow-up visits or calls for additional assessment, psychoeducation, and community connections
- Post-Visits Call (PVC)
  - 4 weeks after case closure
  - Ensure connects made to community resources
  - Identify new concerns / needs for additional resources
  - Track referral outcomes
DC Intervention

- Manualized intervention
- Health check of mother and baby.
- Informal interview in 4 domains: Health, Infant Care, Safety, & Parent Support
- Standardized screeners for depression, domestic violence, & substance use.
- Psychoeducation & community connections
- Follow up visits
- Connection to primary care
- A post-visit follow-up call 1 month after visit

FACT: 99% of mothers surveyed say their DC visit was helpful to them and their baby.
**DURHAM CONNECTS FAMILY RISK MATRIX**

<table>
<thead>
<tr>
<th>GOAL</th>
<th>Parental health</th>
<th>Infant health &amp; safety</th>
<th>Health care plans</th>
<th>Child care plans</th>
<th>Parent-child relationship</th>
<th>Management of infant crying</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mother is recovering from delivery, parents in good health, able to care for infant. Thought given to family planning.</td>
<td>Infant born at or near term and is in good health as are other children. Family has safety measures (e.g. CPR, smoke alarms.)</td>
<td>Primary health care for infant and mother is planned and scheduled as needed, and health insurance is in place.</td>
<td>Parent(s) has child care plan, including emergencies and respite with day care if needed.</td>
<td>Parent(s) and infant are growing into a sensitive and responsive relationship.</td>
<td>Parent(s) describes infant crying as normal and has planned response. Parent can identify crying that is out of normal range and has a plan to deal with this.</td>
</tr>
</tbody>
</table>

**No concerns, no immediate needs.**

1- Mother is recovering as expected with few concerns.

1- Infant health good, as expected, other children have health needs addressed.

1- PCP identified for both infant and mother, infant’s first visit completed, next visit scheduled.

1- Parent identifies care for each day, emergencies, and planned respite.

1- Parent understands infant’s needs and is responsive to infant signals.

1- Parent sees infant crying as normal and responds. May find cry difficult but can cope.

**Some needs for family well being in this factor, addressed during 1st home visit.**

2- Mother has minor health issues, but not expected to affect parenting. Advice and/or resources given during visit.

2- Minor infant health concerns (e.g., pre-term, postnatal condition). Advice and/or resources given during visit.

2- Uncertainty about medical home, regular care, or insurance. Advice and/or resources shared and medical home established during visit.

2- Care plan for 3 areas not in place, but adequate plan developed and/or resources suggested.

2- Parent not always understanding of infant cues and is perplexed or frustrated. Provided support and resources.

2- Parent is concerned about crying and needs reassurance; developed coping plan during visit.

**Significant family concerns and needs in this factor. Resources and follow up needed.**

3- Mother’s health presents a concern for infant and family. Follow up with visit and referral, if needed.

3- Infant or other child has health concerns. Requires follow up visit with link to PCP and CSC, if applicable.

3- Uncertainty about medical home, need, or plan. Follow up to ensure link is made.

3- Care plan for all three areas needed but not in place, even following discussion.

3- Parent not aware of need or unable to be responsive to infant signals. Follow up with visit and/or referral.

3- Parent is unable to cope with crying without external intervention. Follow up with visit and/or referral.

**This is an emergency situation for family risk and needs.**

4- Mother’s health presents immediate risk for infant.

4- Infant or other child has health or developmental problems requiring immediate intervention.

4- Failure to provide for primary care. Need immediate intervention.

4- Emergency child care problem. Call DSS.

4- Parent at risk of neglecting or harming the child. Call CPS.

4- Crying is out of control for parent and is at risk of neglecting or harming child. Call CPS and/or other emergency intervention.

### SUPPORT FOR A SAFE HOME

<table>
<thead>
<tr>
<th>Household/material supports</th>
<th>Family and community violence</th>
<th>History with parenting difficulties</th>
<th>Parent well being</th>
<th>Substance Abuse</th>
<th>Parent emotional support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GOAL</strong></td>
<td>Family has financial resources sufficient for basic needs.</td>
<td>Family experiences safety and security at home and in neighborhood.</td>
<td>No apparent risk factors for maltreatment with other children or in own childhood.</td>
<td>Parent(s) mental health adequate for meeting parenting demands.</td>
<td>Parent and family show no drug using seeking in household; no concerns about alcohol use that could interfere with parenting.</td>
</tr>
</tbody>
</table>

**No concerns, no immediate needs.**

1. Financial resources adequate for food, shelter, and transport. Medicaid, MCC, or public supports being utilized if appropriate.

1. No concerns about potential violence. Parent and infant feel safe.

1. No known prior history of maltreatment as a child or parenting difficulties with own children.

1. Parent mental health is sound. No anxiety or depression in excess of normal adjustment.

1. Parent denies use now or in past and interviewer has no reason for concern.

1. Parent names other person(s) who provide emotional, practical, and social support for parenting.

**Some needs for family well being in this factor, addressed during 1st home visit.**

2. Financial resources limited or under-utilized. Advice and/or resources suggested during visit.

2. Mild concerns. Issues discussed and resource information about emergency services left during the visit.

2. Parent has history of maltreatment as a child and/or CPS involvement as adult, but reports good resolution and plans. Resources suggested.

2. Some concern is present and resolved during visit. Resources suggested as needed.

2. Possible past history but current use is denied. Discussion with suggested resources if need occurs.

2. Parent initially lacking in support, but develops plan for seeking support during visit.

**Significant family concerns and needs in this factor. Resources and follow up needed.**

3. Financial resources inadequate and/or not utilized. Follow up and/or refer for support.

3. Concerns about safety in the home or neighborhood. Follow up and/or refer.

3. Recent CPS involvement and/or ongoing concerns. Follow up and/or refer.

3. Parent screens positive for significant anxiety or depression. Follow up and/or refer.

3. Substance abuse is a concern. Follow up and/or facilitate referral to treatment.

3. Parent lacking in support, which presents risk for family well being. Follow up and/or refer.

**This is an emergency situation for family risk and needs.**

4. Family’s financial status is urgent. Immediately contact DSS field worker.

4. Serious immediate concerns about safety. Call police or CPS.

4. Ongoing CPS investigation is active. Contact CPS about family needs.

4. Urgent need for mental health intervention for parent. Contact CPS.

4. Substance abuse a major issue. Contact CPS or immediate access to care.

4. Parent very isolated. Re-visit within 48 hours.

### SUPPORT FOR PARENT(S)

<p>| <strong>General impressions of infant well being and family capacity (please circle one)</strong> |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| 1- Family doing well.           | 2- Family doing well with mild concerns. | 3- There are some concerns in some areas (scored or not). Follow up. | 4- Major concerns. Follow up. | COMMENTS |</p>
<table>
<thead>
<tr>
<th>Factor</th>
<th>Pct Agree</th>
<th>Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental health</td>
<td>77.86</td>
<td>0.64</td>
</tr>
<tr>
<td>Infant health &amp; safety</td>
<td>74.05</td>
<td>0.59</td>
</tr>
<tr>
<td>Health care plans</td>
<td>77.86</td>
<td>0.55</td>
</tr>
<tr>
<td>Child care plans</td>
<td>78.63</td>
<td>0.62</td>
</tr>
<tr>
<td>Parent child relationship</td>
<td>88.37</td>
<td>0.59</td>
</tr>
<tr>
<td>Management of infant crying</td>
<td>94.57</td>
<td>0.84</td>
</tr>
<tr>
<td>Household &amp; material supports</td>
<td>77.69</td>
<td>0.59</td>
</tr>
<tr>
<td>Family &amp; community violence</td>
<td>88.71</td>
<td>0.65</td>
</tr>
<tr>
<td>History parenting difficulties</td>
<td>91.23</td>
<td>0.75</td>
</tr>
<tr>
<td>Parent well being</td>
<td>85.71</td>
<td>0.74</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>95.31</td>
<td>0.55</td>
</tr>
<tr>
<td>Parent emotional support</td>
<td>81.68</td>
<td>0.62</td>
</tr>
<tr>
<td>General impressions</td>
<td>74.81</td>
<td>0.61</td>
</tr>
</tbody>
</table>
12 Empirically Derived Risk Factors

**Health**
1. Parent Health
2. Infant Health & Safety
3. Health Care Plans

**Care of Infant**
4. Child Care Plans
5. Parent-Child Relationship
6. Management of Infant Crying

**Safe Home**
7. Household/Material Supports
8. Family & Community Violence
9. History of Parenting Difficulties

**Parent Support**
10. Parent Well-Being
11. Substance Abuse
12. Parent Emotional Support
DC RCT #1 (7/2009-12/2010)

- N = 4,777 births; DC for even dob (n = 2,327), SAU for odd dob (n = 2,450)
- 6, 12, 24 month outcomes
- Semi-annual follow up to age 5
- Families blind to experimental condition
- Randomly selected subset for in home interviews

<table>
<thead>
<tr>
<th>Selected</th>
<th>Consented</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>682</td>
<td>549</td>
<td>531</td>
</tr>
</tbody>
</table>
DC RCT #2

- August 2013—June 2014
- ~3,200 births
  - DC: Odd birth date
  - SAU: Even birth date
  - 70% received DC (ITT)
- In-home interviews with randomly selected subset
Engagement

- Demographic & health factors associated with participation
- 78% of eligible families participated
- Participation: Younger mothers, minority status, high poverty neighborhoods
- Non-participation: Greater number of risk factors

6 month outcomes

Infant Emergency Health Care at Age 6 Months

- Hospital Overnights
  - DC Families: Low
  - Control Families: High
  - p<.0001

- Total Emergency Care
  - DC Families: Moderate
  - Control Families: High
  - p<.0001

Emergency care episodes ↓ (34%)
Community connections ↑
Positive parenting ↑
Quality of out of home childcare ↑
Maternal anxiety ↓
Home environment ↑
Emergency Medical Care @ 12m

- Infant emergency medical care
  - 0-12 months
  - ED & urgent care visits
  - Hospital overnights (birth related complications excluded)

- Birth risk covariates
  - Birth weight < 2500g
  - Gestational age <37 weeks or birth complication
  - Insurance status
  - Maternal race/ethnicity
  - Infant gender
  - Dual or single parent household
Increased effect from 6 months
<table>
<thead>
<tr>
<th></th>
<th>0-12 months</th>
<th></th>
<th>6-12 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RR</td>
<td>CI</td>
<td>RR</td>
<td>CI</td>
</tr>
<tr>
<td>Any birth risk</td>
<td>2.97</td>
<td>2.51-3.52</td>
<td>1.26</td>
<td>0.89-1.78</td>
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<tr>
<td>Medicaid/uninsured</td>
<td>1.99</td>
<td>1.56-2.54</td>
<td>2.87</td>
<td>1.88-4.40</td>
</tr>
<tr>
<td>Mo minority status</td>
<td>0.86</td>
<td>0.68-1.09</td>
<td>0.75</td>
<td>0.51-1.11</td>
</tr>
<tr>
<td>Single parent</td>
<td>1.69</td>
<td>1.42-2.01</td>
<td>1.39</td>
<td>1.05-1.83</td>
</tr>
<tr>
<td>Gender (girl)</td>
<td>0.52</td>
<td>0.44-0.66</td>
<td>1.10</td>
<td>0.85-1.42</td>
</tr>
<tr>
<td>Treatment</td>
<td>0.55</td>
<td>0.46-0.65</td>
<td>0.74</td>
<td>0.57-0.96</td>
</tr>
<tr>
<td>Tx x birth risk</td>
<td>0.56</td>
<td>0.37-0.84</td>
<td>0.72</td>
<td>0.32-1.59</td>
</tr>
<tr>
<td>Tx x insurance</td>
<td>2.26</td>
<td>1.40-3.65</td>
<td>4.72</td>
<td>1.88-11.88</td>
</tr>
<tr>
<td>Tx x minority</td>
<td>2.90</td>
<td>1.78-4.75</td>
<td>4.21</td>
<td>1.92-9.23</td>
</tr>
<tr>
<td>Tx x single parent</td>
<td>1.24</td>
<td>0.88-1.74</td>
<td>1.89</td>
<td>1.11-3.22</td>
</tr>
<tr>
<td>Tx x gender</td>
<td>1.53</td>
<td>1.09-2.17</td>
<td>0.67</td>
<td>0.40-1.15</td>
</tr>
</tbody>
</table>
Return on Investment

$1.00 invested ➔ $3.02 saved

$2,230,900 for DC ➔ $6,737,318 in health care savings
Family Connections with Services
4 Week Post-Visit Call

- Nurse Community Referrals (1546) → 61% → Family Contact with Agency (936) → 64% → Family Received Services from Agency (600)

39%
24 month outcomes

Stable effects from 12 months
A Hypothetical Social Impact Bond Based on Dodge & Goodman, 2012

Cost to Government 6.9 million*

Government Cost Savings 1.9 million

Cost of Intervention 1.6 Million***

Cost to Government 3.4 million**

*Based on average emergency outpatient and overnight costs in DC control $2,172
**Based on average emergency outpatient and overnight costs in DC intervention $1,053
***Based on average participant cost of $500 a family
Dissemination

• Race to the Top Early Learning Challenge
  – NC among 9 awards DoE awards
    • 37 applicant states
  – $70,000,000
  – Transformation Zones

• Family Connects
  – 4 rural counties: Beaufort, Bertie, Chowan & Hyde
  – > 27% multiple, chronic risk factors


• Mother with 1st baby born at term with many questions about breastfeeding, pumping, food intake. Has set up child care. Mother, however, got teary eyed when describing difficult birth, initial Apgar of 1, cord round neck, meconium aspiration, resulting in important supportive counseling during visit. Needed postpartum appt. scheduled. Baby looked great, gaining weight. Family has no insurance or resources; referred to social worker.

• 1st time mother, 19 yo with long history of depression, but did not want treatment, nurse educated about baby blues and resources, if desired. Grandmother seen as very supportive; referral to Healthy Families Durham accepted.

• 22 yo mother with very fussy baby- consultation about feeding and PURPLE crying. Planned follow up with primary care for mother with concerns about her blood pressure, which continues out of normal range.

• Mother of 2nd baby, has services in place, has housing, high risk for depression, 4 days ago smoked weed, breast feeding, smokes cigarettes in house. History of fights in pregnancy, had to go to hospital when he broke her nose. Active CPS case. DC nurse will make an additional CPS report and try to facilitate mother referring herself to the Family Care Program.
## Healthy Families Durham & Durham Connects 6m follow up

<table>
<thead>
<tr>
<th>SUMMARY</th>
<th>OUTCOMES</th>
<th>FUTURE DIRECTIONS</th>
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</thead>
</table>
| **HEALTHY FAMILIES DURHAM (RCT)** | Enhanced HFA  
G1: 36m  
G2: 18m  
G3: SAU | ⇣ Parent stress, child behavior problems, CPS reports  
↑ Medicaid & WIC  
⊙ 18 vs. 36 months, NS | Change program duration |
| **DURHAM CONNECTS (6 month follow up)** | Brief, universal nurse home visit  
G1: DC  
G2: SAU | ↑ Connections, parenting, child care quality, home environment (6m)  
↓ ED visits, Hospital overnights (12m)  
↓ 50% high end medical, ES = 0.28  
★ $1.00/$3.02 cost-benefit | Replication in Beaufort, Bertie, Chowan, Hyde  
Family Check Up  
Behavioral Health “Home” |