The BLUES Project:
Targeting Social Determinants of Health to Address the City’s High Infant Death Rate

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Presentation Overview

- History of the BLUES Project
- Overview of infant mortality in Tennessee
- The BLUES Project intervention
- Outcomes of the BLUES Project in Shelby County
- Future directions and program expansion
The BLUES Project

- **The Blues Project (BLUES)** is a collaborative effort with researchers at the University of Tennessee Health Science Center and BlueCross BlueShield of Tennessee to impact the high infant mortality rate in Memphis, TN.

- Designed initially to be clinic/site-based alternative to Nurse Home Visitation Programs.

- Since 2005, the BLUES model has matured to be an evidence-based, holistic approach to delivery of health services and for addressing health disparities.

- Our goal is to help families have full term, healthy babies, assist parents in developing their own support systems, and empower mothers AND fathers to set and achieve attainable life goals.

- BLUES address health, social, behavioral and environmental risk factors for infant mortality, maternal and child health outcomes.
The infant mortality rate (IMR) is the number of deaths of infants under one year of age per 1,000 live births in a given population.

IMR is used to compare the health and well-being of populations across and within countries.

In 2006, Tennessee’s IMR was ranked 45th in the nation (8.7 per 1,000 live births), with only five states having higher infant death rates.

In 2006, the black infant death rate (16.8 per 1,000 live births) was 2.5 times the rate for white babies (6.6 per 1,000 live births).

In 2007, 718 babies born in Tennessee died before their first birthdays.

Infant Mortality – TN Counties

- In 2004, Memphis, Tennessee ranked 1st nationally with a rate of 12.8 overall and an alarming 17.4 for Black infants.

- In 2006, Shelby County, TN ranked 1st in the state with an overall infant mortality rate of 13.8 per 1,000 live births.

- Hamilton County, TN had the 2nd highest IMR (11.2 per 1,000 live births) compared to other metropolitan areas in Tennessee and the highest Black IMR (23.7 per 1,000 births).

- 2008 data show a significant IMR decrease from 2006 for both Shelby County (12.3) and Hamilton County (9.7)

*Source: Tennessee Department of Health [http://hit.state.tn.us/InfMort10Form.aspx]
Infant Mortality – Risk Factors

- Prematurity (<37 weeks gestation) and Low birth weight (LBW<2500 grams) are major causes of infant mortality (IM)\(^1\).
- IM strongly associated with various maternal socioeconomic, environmental and behavioral risk factors\(^2,3\).
- Poverty
- Minority race/ethnicity
- Low parental education
- Single parent households

The BLUES Intervention

- **The BLUES Model** is 3-fold:
  - Health
  - Social Support
  - Community Outreach

- **BLUES** offers:
  1. Immediate access to prenatal and continued care for mom and baby for the insured and uninsured.
  2. Prenatal and Postnatal education
  3. Individualized case management
  4. Support and Empowerment
  5. Family planning (BIRTH SPACING)
  6. Information to help moms and dads continue their education and secure employment
  7. Referrals to community resources and services
The BLUES Team Approach

BLUES Mom¹

Obgyn and Pediatric providers

Social Services Behavioral Specialists
Disease Management Team (MCO)

Health Educator

Social Worker (LCSW)

Community Outreach Specialist

¹Eligibility: Less than 29 weeks gestation and volunteer to receive prenatal, post-partum follow-up, and pediatric care at participating BLUES clinics.
The BLUES Process

- Attend at least 1 monthly clinic-based, psycho-educational group session; and/or meet individually with clinic BLUES team member.

- 36 session curriculum
  - 10 prenatal
  - 25 post partum
  - Pre/Post Knowledge test
  - Exit interview
  - All sessions include topics on goal setting, contraception, birth spacing, education, and employment

- Receive at least 1 monthly phone contact from Community Outreach Staff
  - Case management
  - Identify resources and maintain referrals
  - Conduct follow-up
BLUES: Evidence-Based Research

- 4-year, prospective cohort study (2005-2009)

- Sample
  - 1,071 mothers recruited at 4 community health clinics
  - 96% African American mothers
  - Single, adult, less than high school education
  - 100% Medicaid eligible
  - Retention = 84% (900 deliveries)
  - Completion = 65% (exit)
  - 18% (162) active study participants

- Outcome Measures included:
  1. Birth Outcomes
  2. Social/Behavioral Outcomes
  3. Cost Effectiveness
BLUES - Birth Outcome Measures

- Primary Measures
  - Low Birth Weight (<2500 grams or 5 lbs 8 ounces)
  - Prematurity (<37 weeks gestation)
  - Infant Mortality (deaths/1,000 live births in the 1st year of life)

- Compare BLUES outcomes to Control births
  - Controls were women receiving prenatal care at participating BLUES community health clinics
  - <29 weeks gestation at onset of prenatal care
  - delivering a live baby during 2005-2007
  - Controls did not receive the BLUES Project Intervention.
BLUES – Social/Behavioral Outcome Measures

- **Primary Measures**
  - Change in socio-demographic characteristics from baseline to 24 months post partum (education and employment status)

- **Assessment, diagnosis, treatment and follow-up**
  - 50-item Psycho-social screening assessment at baseline, 6-weeks post partum, and 24 months post partum
    - Stress
    - Depression
    - Domestic violence
    - Substance abuse
    - Social support
    - Education and employment
BLUES – Cost Effectiveness Measures

- Medical - (health care cost and return on investment)
- Individual - (overall benefit to mothers)
- Family - (overall benefit to families)
- Community - (overall benefit to county/state)
BLUES - Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>BLUES&lt;sup&gt;1&lt;/sup&gt; (n=824)</th>
<th>Controls&lt;sup&gt;2&lt;/sup&gt; (n=758)</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother Age (years)</td>
<td>22.5</td>
<td>22.8</td>
<td>.79</td>
<td>.4312</td>
</tr>
<tr>
<td>Onset of prenatal care (wks)</td>
<td>12.08</td>
<td>25.16</td>
<td>2.15</td>
<td>.0322</td>
</tr>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>χ²</td>
</tr>
<tr>
<td>Teen (&lt;20 years)</td>
<td>272</td>
<td>227</td>
<td>.2962</td>
<td>.5863</td>
</tr>
<tr>
<td>Single Mother</td>
<td>824</td>
<td>758</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Education (&lt;high school)</td>
<td>453</td>
<td>462</td>
<td>1.7617</td>
<td>.1844</td>
</tr>
<tr>
<td>Unemployed</td>
<td>552</td>
<td>478</td>
<td>.8454</td>
<td>.3579</td>
</tr>
<tr>
<td>African American</td>
<td>791</td>
<td>743</td>
<td>.8311</td>
<td>.3619</td>
</tr>
<tr>
<td>STD</td>
<td>181</td>
<td>30</td>
<td>32.4236&lt;</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Substance Abuse</td>
<td>280</td>
<td>174</td>
<td>7.8318</td>
<td>.0051</td>
</tr>
<tr>
<td>Parity</td>
<td>428</td>
<td>349</td>
<td>1.6409</td>
<td>.2002</td>
</tr>
</tbody>
</table>

<sup>1</sup>Demographics at baseline / initial program exposure from both maternal self-report and patient medical record

<sup>2</sup>Demographics at onset of prenatal care identified from patient medical record
### Table 1: Prevalence of Low Birth Weight, Prematurity, and Infant Death in BLUES and Control groups

<table>
<thead>
<tr>
<th></th>
<th>BLUES (n = 824)</th>
<th>Controls(^1) (n = 758)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW(^2)</td>
<td>81 (9.81)</td>
<td>141 (18.60)</td>
<td>0.0008</td>
</tr>
<tr>
<td>Prematurity(^3)</td>
<td>72 (8.72)</td>
<td>150 (19.77)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Infant deaths</td>
<td>2 (0.24)</td>
<td>24 (3.10)</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

\(^1\)Randomly selected cohort of control births from the same clinics (2005-2007); Control cases were selected from clinic patient records based on the variables gestational age at 1\(^{st}\) prenatal visit (<29 wks), calculated using the first day of the last menstrual period (LMP), and date of delivery.

\(^2\)LBW = birth weight < 2500 grams

\(^3\)Prematurity = < 37 weeks gestation
**Table 2: Pregnancy and delivery outcomes in BLUES and Control groups**

<table>
<thead>
<tr>
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<th>BLUES (n = 824)</th>
<th>Controls(^1) (n = 758)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal days hospital stay</td>
<td>3.05 (5.42)</td>
<td>8.55 (8.80)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat STD/Infections during pregnancy n (%)</td>
<td>205 (24.93%)</td>
<td>482 (63.57%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Substance abuse during pregnancy n (%)</td>
<td>77 (9.36%)</td>
<td>168 (22.18%)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

\(^1\) a cohort of control births from the same clinics (2005-2007); Control cases were selected from clinic patient records based on the variables gestational age at 1st prenatal visit (<29 wks), calculated using the first day of the last menstrual period (LMP), and date of delivery.
**Predictors of poor birth outcomes**

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late onset prenatal care (&gt;25 wks)</td>
<td>Lower birth weights</td>
</tr>
<tr>
<td>Lack of social support</td>
<td>Shorter gestation</td>
</tr>
<tr>
<td>Maternal distress</td>
<td></td>
</tr>
<tr>
<td>Domestic violence</td>
<td></td>
</tr>
<tr>
<td>Undiagnosed mental illness</td>
<td></td>
</tr>
<tr>
<td>Maternal depression</td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td></td>
</tr>
<tr>
<td>Early onset prenatal care (&lt;25 wks)</td>
<td>Higher birth weights</td>
</tr>
<tr>
<td>Prenatal contact with BLUES team (≥10)</td>
<td>Longer gestation</td>
</tr>
</tbody>
</table>
# BLUES SOCIAL / BEHAVIORAL OUTCOMES

Table 3: Socio-demographic status change in BLUES mothers from baseline\(^1\) to 24-months postpartum (N=535) \(^2\)

<table>
<thead>
<tr>
<th>Socio-demographic Status</th>
<th>Baseline(^1)</th>
<th>24-months Postpartum</th>
<th>Percent Change</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>355 (66)</td>
<td>128 (24)</td>
<td>-64%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; High school</td>
<td>251 (47)</td>
<td>188 (35)</td>
<td>-26%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>High school or GED</td>
<td>175 (33)</td>
<td>260 (49)</td>
<td>+48%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Some college</td>
<td>65 (12)</td>
<td>77 (14)</td>
<td>+17%</td>
<td>0.2796</td>
</tr>
<tr>
<td>College graduate</td>
<td>8 (1)</td>
<td>10 (2)</td>
<td>+100%</td>
<td>0.6345</td>
</tr>
</tbody>
</table>

\(^1\)Baseline = initial program exposure
\(^2\)18% of enrolled participants are actively receiving the BLUES Project intervention
**BLUES**

**Social / Behavioral Outcomes**

Table 4: Psycho-social change in BLUES mothers from baseline\(^1\) to 24-months postpartum (N=535) \(^2\)

<table>
<thead>
<tr>
<th>Psychosocial risk (Yes or No)</th>
<th>Baseline(^1)</th>
<th>Postpartum</th>
<th>% Change</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall risk</td>
<td>529 (98.9)</td>
<td>530 (99.1)</td>
<td>+0.20</td>
<td>.3100</td>
</tr>
<tr>
<td>Stress</td>
<td>165 (30.8)</td>
<td>167 (31.3)</td>
<td>+2</td>
<td>.3600</td>
</tr>
<tr>
<td>Social support</td>
<td>353 (65.9)</td>
<td>509 (95.2)</td>
<td>+44</td>
<td>&lt;.0100</td>
</tr>
<tr>
<td>Mental health</td>
<td>351 (65.7)</td>
<td>509 (95.1)</td>
<td>+45</td>
<td>&lt;.0100</td>
</tr>
<tr>
<td>Depression</td>
<td>232 (43.3)</td>
<td>416 (77.81)</td>
<td>+80</td>
<td>.0300</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>167 (31.3)</td>
<td>83 (15.5)</td>
<td>-50</td>
<td>&lt;.0100</td>
</tr>
<tr>
<td>Domestic Violence</td>
<td>98 (18.3)</td>
<td>42 (7.9)</td>
<td>-57</td>
<td>&lt;.0100</td>
</tr>
</tbody>
</table>

\(^1\)Baseline = initial program exposure  
\(^2\)18% of enrolled participants are actively receiving the BLUES II intervention
BLUES moms and babies experienced shorter hospital and neonatal days stay compared to controls. This added up to a savings of more than 1,467 hospital days and a total savings of $17 million for 824 mothers.

BLUES costs appr. $2,400 per mom over 3 years.

For every dollar invested in BLUES, there is $8.50 returned.

### Cost Effectiveness - Medical

<table>
<thead>
<tr>
<th></th>
<th>BLUES (N=824)</th>
<th>Controls (N=758)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deliveries</td>
<td>Neonatal Days</td>
</tr>
<tr>
<td>Preterm/ lbw</td>
<td>81</td>
<td>3.05</td>
</tr>
<tr>
<td>Uncomplicated</td>
<td>743</td>
<td>2.32</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For every dollar invested in BLUES, there is $8.50 returned.
Cost Effectiveness - Individual

1. Healthy, uncomplicated pregnancy and delivery
2. Increased social support
3. Increased screening, diagnosis, referrals, and treatment for mental and/or behavioral health services
4. Increased empowerment and self-sufficiency
5. Healthier mothers – (physically, mentally, and emotionally)
There are lifelong consequences for families and communities resulting from preterm and low birth weight deliveries and infant mortality.

Several social factors associated with poverty are also related to poor child health, specifically low parental education, minority race/ethnic status, and single-parent household.

- Few preterm and/or low birth weight deliveries
- 99.8% infant survival rate from birth through the 2nd year of life.
- 90% compliance with on-time EPSDT/immunizations

BLUES
- High education attainment
- Increased employment rates
- Normal, happy, healthy infants whose parents are contributing members of their communities
Cost Effectiveness - Community

Healthy Mothers → Healthy Babies → Healthy Communities → Healthy Families
Future Directions For the BLUES Project

- $1.7 million grant from BCBS Tennessee Health Foundation
- Expand services in Shelby County, TN and to Hamilton County, TN
- BLUES Project (Phase III) purposes to:
  1. demonstrate the scalability of the program and work to build a self-sustained structure of care that will expand, not only in the state of Tennessee, but across the country in cities with similar demographics/health outcomes to Memphis
  2. duplicate the BLUES model to prove the effectiveness of intervention for decreasing infant mortality risks (prematurity and low birth weight);
  3. compare the birth and child health outcomes of the Hamilton County participants to those in Shelby County, and
  4. establish the Blues Project as an effective, data-driven and cost-efficient model for reducing the health disparity of infant mortality in Tennessee.
Future Directions For the BLUES Project

Expansion of BLUES to Hamilton County, TN

<table>
<thead>
<tr>
<th></th>
<th>Hamilton County</th>
<th>The BLUES Project</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prematurity</td>
<td>16.00%</td>
<td>8.43%</td>
<td>(-7.57%)</td>
</tr>
<tr>
<td>Low Birth Weight</td>
<td>18.60%</td>
<td>10.50%</td>
<td>(-8.10%)</td>
</tr>
<tr>
<td>Infant Mortality</td>
<td>11.2% (23.7% AA)</td>
<td>0.26%</td>
<td>(-10.94% AA)</td>
</tr>
</tbody>
</table>

• Pilot BLUES for 500 pregnant women in Hamilton County, TN
• Four zip codes with the highest rate of preterm births/infant deaths in Hamilton County were identified (37410, 37408, 37406, and 37403). Will target health clinics offering both Ob/Gyn and Pediatric care services in each zip code.
• Control sample will be recruited from the same participating community health clinics.
The BLUES Project serves a large number of women and is the result of widespread community collaboration.

Over 1,000 at-risk mothers have been served by the BLUES Project since its inception in 2005.

Overall, BLUES is proving to be an effective model for reducing infant mortality, premature delivery and low birth weight, particularly for African American infants.
Conclusions

- BLUES demonstrates the impact that social support can yield; not only in terms of birth outcomes, but overall health and quality of life for at-risk mothers.

- The BLUES model is holistic in scope compared to other programs and empowers women to overcome social and economic barriers adversely affecting their health and that of their children.

- We can conclude that this cost-effective, collaborative approach to health care holds promise for improving the health and social outcomes of our mothers, children, families, and communities.
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