The Interpregnancy Care Program

A pilot evaluation of interpregnancy primary care & social support for African-American women at risk for recurrent very-low-birth weight delivery
Study Team

Principal Investigator:
- Alfred W. Brann, Jr, MD

Co-principal Investigator:
- Anne Lang Dunlop, MD, MPH

Co-investigators:
- Denise Raynor, MD
- George Bugg, MD, MPH

Study Coordinator:
- Cynthia Dubin, CNM, FNP

Case Manager:
- Michelle Cox, RN

Resource Mothers:
- Patricia Ward & Joyce Scott

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The largest contributor to Georgia’s infant mortality rate is the birth of LBW and VLBW infants:

<table>
<thead>
<tr>
<th></th>
<th>% of Births</th>
<th>% of Infant Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW (&lt; 2500 g)</td>
<td>11%</td>
<td>70%</td>
</tr>
<tr>
<td>VLBW (&lt; 1500 g)</td>
<td>2%</td>
<td>50%</td>
</tr>
</tbody>
</table>

African-American women in Georgia have twice the rate of LBW and 3-4 times the rate of VLBW delivery compared to Caucasian women, resulting in twice the rate of infant mortality.¹

A growing body of evidence link the delivery of a VLBW infant to aspects of a woman's health status, including:

- Unrecognized and poorly-controlled medical problems;
- Reproductive tract infections (including BV and STI’s);
- Substance abuse disorders;
- Periodontal disease;
- Psychosocial problems including psychological stress and domestic violence.

Short interpregnancy intervals increase the risk of preterm/LBW delivery, particularly among low-income, African-American women, with the critical interval varying by race.

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Background

- No obstetrical or prenatal assessment or intervention has been successful in predicting or preventing a woman’s first preterm/LBW delivery.\(^5\)

- The single best predictor of a preterm/LBW delivery is a history of a previous preterm/LBW delivery.\(^6\)

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Goals of IPC Program

To evaluate the effectiveness of interpregnancy care (IPC; care received from delivery of one child until conception of the next) toward improving subsequent reproductive outcomes for women who delivered a VLBW infant by:

1. improving the woman's interpregnancy health (via reduction and management of her identified medical and social risks);

2. assisting the woman in developing and achieving her reproductive goals (which may include a planned pregnancy with an interpregnancy interval of at least 9 months, and preferably 18 months).

Recruitment/Enrollment:
- 29 women enrolled (of 38 eligible);
IPC Intervention Package

- Definition of an individualized IPC plan to address 7 areas epidemiologically linked to low birth weight/preterm delivery:
  - Reproductive planning (assistance in achieving intendedness and spacing)
  - Prevention, screening and treatment for sexually-transmitted infections
  - Micronutrient supplementation & screening/treatment for nutritional deficiencies
  - Prevention, screening and treatment for periodontal disease
  - Management of chronic disease
  - Treatment and referral for substance abuse
  - Screening and treatment for depression, psychosocial stressors, & domestic violence

- Provision of health and dental services in accordance with the IPC plan for 24 months;

- Community outreach via a trained Resource Mother.
Provision of IPC

- Contact with a multidisciplinary team:
  - Family nurse practitioner, family physician, periodontist,
    nurse case manager, social worker, and Resource Mother;
  - Primary care visits occurred every 1 - 3 months (dependent
    upon extent of health problems) in a group setting with
    integration of group educational experiences according to
    the Centering Pregnancy Model of prenatal care;\(^7\)
  - Home visits and telephone contact by the Resource Mother
    monthly to address psychosocial issues.

\(^7\) Rising SS. *J Nurse Midwifery* 1998.
Evaluation of IPC Program

1. Comparison of the health status of enrolled women pre- and post-participation in terms of conditions linked to LBW delivery;

2. Comparison of the proportion of enrolled women who achieve desirable and optimal interpregnancy intervals to that of a historical control cohort;

3. Comparison of the average number of pregnancies and adverse pregnancy outcomes experienced by women in the IPC and historical control cohorts (using Poisson regression).
Comparison Group:
An Historical Cohort from GMH

- Constructed from consecutive VLBW deliveries at GMH during an 18-month period preceding initiation of the IPC program (06/2001 through 12/2002);

- Same eligibility criteria and restricted to same census tracts of residence.
## Demographic Description
### Prior to Index VLBW Delivery

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IPC Intervention Cohort (n = 29)</th>
<th>Historical Control Cohort (n = 58)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teenagers (&lt; 20 years)</td>
<td>7/29 (24.1%)</td>
<td>12/58 (20.7%)</td>
</tr>
<tr>
<td>Women age 20 – 35 yrs</td>
<td>18/29 (62.1%)</td>
<td>43/58 (74.1%)</td>
</tr>
<tr>
<td>Women age ≥ 35 yrs</td>
<td>4/29 (13.8%)</td>
<td>3/58 (5.2%)</td>
</tr>
<tr>
<td><strong>Gravidity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>1-13 pregnancies</td>
<td>1-8 pregnancies</td>
</tr>
<tr>
<td>Median</td>
<td>2 pregnancies</td>
<td>2 pregnancies</td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primiparous</td>
<td>15/29 (51.7%)*</td>
<td>14/58 (24.1%)*</td>
</tr>
<tr>
<td>Prior preterm delivery</td>
<td>12/29 (41.4%)</td>
<td>19/58 (32.8%)</td>
</tr>
<tr>
<td>Prior term delivery</td>
<td>12/29 (41.4%)</td>
<td>36/58 (62.1%)</td>
</tr>
<tr>
<td>Prior spontaneous ab</td>
<td>15/29 (51.7%)</td>
<td>30/58 (51.7%)</td>
</tr>
</tbody>
</table>

* p-value for Fisher’s exact test = 0.0154
## Description of Birthed Index VLBW Infants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IPC Intervention Cohort</th>
<th>Historical Control Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight</td>
<td>944 g (520-1490)</td>
<td>1023 g (520-1480)</td>
</tr>
<tr>
<td>Multiple gestation</td>
<td>7/29 women (24.1%)*</td>
<td>3/58 women (5.2%)*</td>
</tr>
<tr>
<td>Stillborn</td>
<td>4/37 infants (10.8%) 3/4 (75%) macerated</td>
<td>4/61 infants (4.9%) 3/4 (75%) macerated</td>
</tr>
</tbody>
</table>

* *p*-value for Fisher’s exact test = 0.0140
Participation in IPC

- **During Initial 12 months of IPC Program:**
  - 21/29 (72%) actively participating;
  - 8/29 (28%) not actively participating:
    - 2 moved out of state;
    - 3 electively disenrolled (2 prior to 1st IPC visit; 1 after single visit);
    - 3 became lost to follow-up (2 prior to 1st IPC visit; 1 after single visit).

- **During Second 12 months of IPC Program:**
  - 16/29 (55%) completed follow-up;
  - 13/29 (45%) not actively participating:
    - In addition to 8 described above,
    - 1 disenrolled (working with health insurance benefits);
    - 4 lost to follow-up.
Impact of IPC: Chronic Health Outcomes

Health status of 7 (24%) of IPC women with chronic disease before and since enrollment:

1. Valvular heart disease; hepatitis C → Valve replacement surgery, on-going evaluation by infectious disease;
2. Sickle cell disease, severe anemia with non-compliance → Compliance with daily multivitamin and folic acid;
3. Hypertension, Diabetes, Asthma with non-compliance → Improved compliance with simplified medication regimen;
4. SLE, Hypertension, Renal insufficiency → Improved blood pressure control, re-established link with rheumatology clinic;
5. Pituitary tumor (prolactinoma) → Planned surgical resection;
6. Cardiac arrhythmias, panic attacks → Medical management;
7. Generalized anxiety disorder, depression, multi-substance abuse → patient lost to follow-up.

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Impact of IPC:
Other Health Outcomes

Health events for 21 active participants in IPC:

- 15 diagnosed and treated for reproductive tract infections;
- 5 diagnosed and treated iron-deficiency anemia;
- 8 screened positive for post-partum depression and linked to appropriate psychiatric evaluation and psychological support services;
- 7 evaluated and treated for oral infections and periodontal disease.
Impact of IPC:
Social Outcomes (Education)

Educational Attainment:

- 18/21 (86%) active participants without h.s diploma or GED at study entry;
- Of these 18, 13 (72%) were assisted in earning diploma or GED during the study:
  - 8/18 earned h.s. diploma or GED;
  - 5/18 enrolled in G.E.D. training program, but did not complete.
Impact of IPC:
Reproductive Planning

- **Reproductive plans development:**
  - 21/21 women stated a reproductive plan for themselves as part of the program.

- **Reproductive plans attainment:**
  - 21/21 women provided with a contraceptive method of their choosing.
Impact of IPC:
Conception within 9-months

<table>
<thead>
<tr>
<th>Outcome</th>
<th>IPC Intervention Cohort</th>
<th>GMH Historical Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of women who conceived ≥ 1 pregnancy within 9-mo of index VLBW delivery</td>
<td>0/29 (0%)*</td>
<td>18/58 (31%)*</td>
</tr>
</tbody>
</table>

* p-value for Fisher’s exact test = 0.0002
Impact of IPC: Conception within 18-months

**Outcome** | **IPC Intervention Cohort** | **GMH Historical Cohort**
--- | --- | ---
Proportion of women who conceived $\geq 1$ pregnancy within 18-mo of index VLBW delivery | 5/29 (17%)* | 29/58 (50%)*

* $p$-value for Fisher’s exact test = 0.0026
Impact of IPC:
No. pregnancies within 18-months

<table>
<thead>
<tr>
<th>No. of pregnancies</th>
<th>IPC Intervention Cohort n = 29</th>
<th>GMH Historical Cohort n = 58</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td><strong>Average per woman</strong></td>
<td><strong>0.241</strong>*</td>
<td><strong>0.621</strong>*</td>
</tr>
</tbody>
</table>

* A 61.2% reduction in the average no. of pregnancies within 18-months for women in the IPC cohort; p-value (Poisson regression) = 0.0222.

**Conclusion:** Women in the historical cohort had 2.57 (95% CI: 1.14 - 5.78) times as many pregnancies within 18-months of the index VLBW delivery as women in the IPC cohort, on average.
Impact of IPC:
Subsequent pregnancy outcomes

<table>
<thead>
<tr>
<th>IPC Intervention Cohort: 7 pregnancies within 18 months</th>
<th>GMH Historical Cohort: 36 pregnancies within 18 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/7 (43%) with adverse outcome:</td>
<td>21/36 (58%) with adverse outcomes:</td>
</tr>
<tr>
<td>- 1 liveborn, intermed. LBW (1500-2499g)</td>
<td>- 7 liveborn, intermed. LBW (1500-2499g)</td>
</tr>
<tr>
<td>- 2 spontaneous abortions (&lt; 20 wks’)</td>
<td>- 3 liveborn, VLBW (&lt; 1500 g)</td>
</tr>
<tr>
<td>3/7 (43%) liveborn, ≥ 2500 g</td>
<td>- 4 stillborns</td>
</tr>
<tr>
<td>1/7 (14%) electively aborted</td>
<td>- 3 ectopic pregnancies</td>
</tr>
<tr>
<td></td>
<td>- 3 spontaneous abortions (&lt; 20 wks’)</td>
</tr>
<tr>
<td></td>
<td>- 1 molar pregnancy</td>
</tr>
<tr>
<td></td>
<td>8/36 (22%) liveborn, ≥ 2500 g</td>
</tr>
<tr>
<td></td>
<td>6/36 (17%) electively aborted</td>
</tr>
<tr>
<td></td>
<td>1/36 (3%) unknown outcome</td>
</tr>
<tr>
<td></td>
<td>(delivered outside GMH)</td>
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</tbody>
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Impact of IPC:

No. adverse pregnancy outcomes

<table>
<thead>
<tr>
<th>No. adverse outcomes</th>
<th>IPC Intervention Cohort n = 29</th>
<th>GMH Historical Cohort n = 58</th>
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<tbody>
<tr>
<td>0</td>
<td>27</td>
<td>41</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Average per woman</td>
<td>0.103*</td>
<td>0.362*</td>
</tr>
</tbody>
</table>

* A 71.5% reduction in the average no. of adverse outcomes of pregnancies for women in the IPC cohort; p-value (Poisson regression) = 0.0424.

**Conclusion:** Women in the historical cohort had 3.51 (95% CI: 1.04 – 11.73) times as many adverse pregnancy outcomes for pregnancies conceived within 18-months of the index VLBW delivery than did women in the IPC cohort, on average.
Cost of IPC per Participant: Full 24 months

- Health care:
  - Mean charges = $2,397 (median = $2,104)
  - Mean visits = 7 (median = 6)
  - Mean cost per visit = $342 (median = $350)

- Resource mother outreach:
  - Estimated $1,800

Total Program Cost per Participant per 24-Months: $4,197
Costs of Hospital Care for Subsequently Birthed Infants

For historical control cohort: 10 liveborn infants < 2500 g conceived within 18-months of index VLBW delivery:

- Birth weight range: 730 – 2430 g (mean 1733)
- Initial hospitalization: 2 – 137 days (mean 29.9)

Cost of initial (delivery) hospitalization:

- Total cost: $555,763
- Cost per liveborn infant < 2500 g: $55,576
Cost Analysis

- The 29 enrolled women received 24-months of IPC at $4,197 each, and delivered 1 LBW infant (initial hospitalization $55,576) conceived within 18-months of the index VLBW:
  - **Cost of program**: $4,197 x 29 = $121,713
  - **Cost of LBW infant**: $55,576
  - **Total cost**: $177,289

- Based on the historical control cohort, we expected 5 LBW infants to be conceived within 18-months of the index VLBW:
  - **Cost of LBW infants**: $55,576 x 5 = $277,880

**Net savings**: $100,591
Lessons Learned: Impact of Interpregnancy Care

For women who have had a VLBW delivery, the provision of IPC contributes to:

- the availability of primary care for the identification and management of chronic and acute conditions epidemiologically-linked to LBW and preterm delivery;
- the development of a personal reproductive plan by participating women;
- the achievement of a 9-month interpregnancy interval;
- a reduction in the average number of pregnancies conceived within 18-months and the average number of adverse pregnancy outcomes.

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Lessons Learned:

Content of Interpregnancy Care

For women who have had a VLBW delivery:

- There is a substantial prevalence of unrecognized and/or poorly managed chronic diseases;
- Reproductive tract infections, iron-deficiency anemia, and substance abuse are common following a VLBW delivery;
- Substance abusers who do not enroll in treatment programs are difficult to track and have poor insight regarding the role of substance abuse in poor reproductive outcomes;
- The receipt of health care services for themselves is less of a priority than is securing income/employment, and this influences their health care seeking behaviors.
Acknowledgments

Support for the ‘Feasibility Phase’ of the IPC Program has been provided by the following:

- Vasser-Woolley Foundation
- Grady Memorial Hospital
- Centers for Disease Control & Prevention
- Rockdale Foundation
- Price Family Foundation
- March of Dimes
- Healthcare Georgia Foundation