



## 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

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*Co-investigators:*

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*Resource Mothers:*

- Patricia Ward & Joyce Scott



# Background

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

	<u>% of Births</u>	<u>% of Infant Deaths</u>
LBW (< 2500 g)	11%	70%
VLBW (< 1500 g)	2%	50%

- 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.<sup>1</sup>

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<sup>1</sup> *Georgia Perinatal Task Force Report, 1998.*



# Background

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- A growing body of evidence link the delivery of a VLBW infant to aspects of a woman's health status, including:<sup>1</sup>
  - 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,<sup>2</sup> particularly among low-income, African-American women,<sup>3</sup> with the critical interval varying by race.<sup>4</sup>

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<sup>1</sup> *Georgia Perinatal Task Force Report*, 1998. <sup>2</sup> Adams MM, et al. *Paediatr Peri Epi* 1997.

<sup>3</sup> Klerman LV, et al. *AJPH* 1998. <sup>4</sup> Rawlings JS, et al. *NEJM* 1995.



# Background

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- No obstetrical or prenatal assessment or intervention has been successful in predicting or preventing a woman's *first* preterm/LBW delivery;<sup>5</sup>
- The single best predictor of a preterm/LBW delivery is a history of a previous preterm/LBW delivery.<sup>6</sup>

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<sup>5</sup>Goldenberg RL, Rouse DJ. *NEJM* 1998.

<sup>6</sup>Adams MM, et al. *JAMA* 2000.



# Goals of IPC Program

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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).



# IPC Participants

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- Eligibility: African-American women who qualified for indigent care and delivered a VLBW infant at Grady Memorial Hospital (GMH) during the feasibility phase (11/2003 through 3/2004).
- Recruitment/Enrollment:
  - 29 women enrolled (of 38 eligible);
  - 24-months of follow-up complete 3/2006.



# IPC Intervention Package

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- 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

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- 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;<sup>7</sup>
- Home visits and telephone contact by the Resource Mother monthly to address psychosocial issues.

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<sup>7</sup> Rising SS. *J Nurse Midwifery* 1998.



# Evaluation of IPC Program

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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

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- 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

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

\* *p-value for Fisher's exact test = 0.0154*

## Description of Birthed Index VLBW Infants

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

\* *p-value for Fisher's exact test = 0.0140*



# Participation in IPC

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- **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 1<sup>st</sup> IPC visit; 1 after single visit);
    - 3 become lost to follow-up (2 prior to 1<sup>st</sup> 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

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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.



# Impact of IPC: Other Health Outcomes

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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)

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## **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

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- **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

Outcome	IPC Intervention Cohort	GMH Historical Cohort
Proportion of women who conceived $\geq 1$ pregnancy within 9-mo of index VLBW delivery	0/29 (0%)*	18/58 (31%)*

\* *p-value for Fisher's exact test = 0.0002*



# Impact of IPC: Conception within 18-months

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

*\* p-value for Fisher's exact test = 0.0026*

# Impact of IPC:

## No. pregnancies within 18-months

No. of pregnancies	IPC Intervention Cohort n = 29	GMH Historical Cohort n = 58
0	24	29
1	3	22
2	2	7
<b>Average per woman</b>	<b>0.241*</b>	<b>0.621*</b>

\* 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

<b><u>IPC Intervention Cohort:</u></b> <b>7 pregnancies within 18 months</b>	<b><u>GMH Historical Cohort:</u></b> <b>36 pregnancies within 18 months</b>
<ul style="list-style-type: none"><li>▪ <b>3/7 (43%) with adverse outcome:</b><ul style="list-style-type: none"><li>- 1 liveborn, intermed. LBW (1500-2499g)</li><li>- 2 spontaneous abortions (&lt; 20 wks')</li></ul></li><li>▪ <b>3/7 (43%) liveborn, <math>\geq</math> 2500 g</b></li><li>▪ <b>1/7 (14%) electively aborted</b></li></ul>	<ul style="list-style-type: none"><li>▪ <b>21/36 (58%) with adverse outcomes:</b><ul style="list-style-type: none"><li>- 7 liveborn, intermed. LBW (1500-2499g)</li><li>- 3 liveborn, VLBW (&lt; 1500 g)</li><li>- 4 stillborns</li><li>- 3 ectopic pregnancies</li><li>- 3 spontaneous abortions (&lt; 20 wks')</li><li>- 1 molar pregnancy</li></ul></li><li>▪ <b>8/36 (22%) liveborn, <math>\geq</math> 2500 g</b></li><li>▪ <b>6/36 (17%) electively aborted</b></li><li>▪ <b>1/36 (3%) unknown outcome</b> (delivered outside GMH)</li></ul>

# Impact of IPC:

## No. adverse pregnancy outcomes

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

\* 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

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- 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

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Total Program Cost per Participant per 24-Months: **\$4,197**





# Costs of Hospital Care for Subsequently Birthed Infants

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- 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

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- 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:*  $29 \times \$4,197 = \$ 121,713$
  - *Cost of LBW infant:* \$ 55,576
  - $\$ 177,289$
- 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:*  $5 \times \$55,576 = \$277,880$

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Net savings: \$100,591

# Lessons Learned:

## Impact of Interpregnancy Care

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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.

# Lessons Learned:

## Content of Interpregnancy Care

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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*

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