The Impact of Prenatal Care Coordination on Birth Outcomes in Wisconsin

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Objectives

- Discuss the background, purpose, and significance of the study
- Review the conceptual framework and key literature related to this study
- Present the research findings
- Discuss the conclusions and recommendations
Background

- Decreasing rate of infant mortality over past 50 years
- Plateaued at approx. 7 deaths/1,000 births over last ten years
- Increasing disparities between Caucasian and African American infant mortality—Disparity in WI worse than US rate of disparity
Leading causes of infant mortality: congenital malformations, disorders related to short gestation and low birth weight, and SIDS

Prenatal Care Coordination (PNCC) introduced in 1985 as a Medicaid benefit to impact low birth weight and prematurity
Challenges in Evaluating PNCC Programs

- Definition of services varies from state to state; program to program
- Service population varies from state to state (universal vs. targeted)
Purpose of this Study

To measure the effectiveness of the Wisconsin Medicaid benefit of PNCC and its impact on healthy birth outcomes.
Significance

- Link the evaluation to Wisconsin’s goals and objectives for PNCC
- Disaggregate the effect on different levels of birth weights—normal, low, and very low
- Also measure the effect on other birth outcomes—preterm birth and NICU admission
- Measure the effect of intensity of service on birth outcomes
Significance (cont.)

- Explore relationships between determinants of health (moderating variables) and effect of the program on birth outcomes
- Contribute to the development of nursing as a profession
Determinants of Health Adapted to PNCC (Evans & Stoddart, 1990)

Social Environment
- Income
- *Marital Status
- *Age
- *Race
- *Education
- Mental Health
- Exposure to Violence
- Family Relationships

Genetic Endowment
Genetic Diseases (i.e. Sickle Cell, PKU, hemophilia, etc.)

Individual Responses
- Lifestyle Behaviors:
  - Alcohol Use
  - Drug Use
  - Nutrition
  - *Smoking
- Biology:
  - Previous Preterm Birth
  - *Chronic Disease
  - *Pregnancy History

Physical Environment
- Transportation
- Housing
- Telephone
- *Rural/Urban

Health & Function: Healthy Birth

Disease
- Birth Weight
- Preterm Birth
- NICU Transfer
- (Outcomes)

Health Care Service
- PNCC Initiation & Intensity (Intervention)
- *Medical Prenatal Care Adequacy

Well Being

Prosperity
Social Environment

- More likely to seek support from family & friends, have a labor support person, and involve father of baby (Olds et al., 1986)
- Receiving psychosocial assessment & intervention reduced risk of LBW baby (Wilkinson et al., 1998)
- Single women who received PNCC less likely to deliver LBW baby (Baldwin et al., 1998)
Teen mothers who receive PNCC have reduced rates of LBW births (Hardy et al., 1987; Korenbrot et al., 1989; Olds et al., 1989; Baldwin et al., 1998).

Significant improvement for African American women in Baldwin et al. study, but not in three smaller studies (Jewell & Russell, 2000; Klerman, et al., 2001; Thompson et al., 1998).
Physical Environment

- One stop shopping reduced # of LBW babies and “drop-in” deliveries (Michala & Miner, 1991)
- Transportation resources key need of women who receive PNCC (State of WI, 2006)
Genetic Endowment

No studies were reviewed that addressed this determinant
Individual Response - Biology

- Reductions in kidney infection (Olds et al., 1986)
- Reduction in incidence of anemia (Hardy et al., 1987)
- Reduction in preeclampsia (Hardy et al., 1987)
- Reduction in subsequent premature birth (Loomis & Martin, 2000)
Individual Response - Lifestyle

- Smoking: Significant reductions noted by Olds et al.; Middleton & al.; Ricketts et al. (2005) noted reduction in smoking and correlation with LBW

- Alcohol: Limited study
Individual Response-Lifestyle (Cont.)

- Nutrition: Increased weight gain (Olds), higher weight gains (Hardy), increased vitamin use (Piper et al, 1996), link between nutrition and LBW (Ricketts, 2005), increased utilization of WIC (Bradley & Martin, 1994; Olds et al.; Reichman & Teitler, 2003).
Health Care—Medical Prenatal Care

- More medical prenatal visits (Hardy)
- Reduction in delayed care or no care (Middleton; Tyson, 1997)
- Increased rate of adequate care (Baldwin & Chen, 1996; Jewell & Russell; Poland et al., 1992; Piper et al., 1996; Baldwin et al., 1998)
Health Care-PNCC

- Women who received phone calls had higher mean birth weights (Little et al., 2002)
- PNCC provided by paraprofessionals resulted in higher birth weights than controls (Poland et al., 1992)
Bradley & Martin (1996) Classified cases as adequate, intermediate, or inadequate. # of visits did not predict birthweight. Intermediate and Adequate/intermediate were significant predictors of birthweight. Limitations: Low # in adequate group; selection bias. Further study recommended.
Baldwin & Chen (1996)
Looked at timing and initiation of PHN contact
1st trimester PHN contact protective for adequate medical prenatal care and significant for predicting gestational age, but not for birthweight
# of visits not a predictor for birthweight, gestational age, or adequate medical prenatal care
The Move from Efficacy to Effectiveness

- State-wide studies of PNCC vary
- Support relationship between PNCC and reduced incidence of LBW: Kentucky, North Carolina, Florida, and Washington
- Did not support relationship between PNCC and reduced incidence of LBW: Iowa, Tennessee, and Wisconsin
Research Question

What effect does PNCC have on birth outcomes?

- Hypotheses 1-4: PNCC or not and relationship with birth weight, low birth weight, preterm birth, & NICU admission

- Hypotheses 5-8: Intensity of PNCC and relationship with birth weight, low birth weight, preterm birth, & NICU admission
Study Design

Medicaid Births

- Received PNCC
  - N=10,715
  - Outcomes
    - Low Birth Weight
    - Very Low Birth Weight
    - Preterm Birth
    - NICU Transfer

- Did Not Receive PNCC
  - N=34,691

High Intensity PNCC
- N=4,837
- Outcomes
  - Low Birth Weight
  - Very Low Birth Weight
  - Preterm Birth
  - NICU Transfer

Low Intensity PNCC
- N=5,873
- Outcomes
  - Low Birth Weight
  - Very Low Birth Weight
  - Preterm Birth
  - NICU Transfer

Questions:

1. Question #1
2. Question #2
Three types of Variables

**Outcome Variables (Dependent):**
- Birth weight, Preterm Birth, NICU Admission

**Intervention Variables (Independent):**
- PNCC, Intensity of PNCC

**Covariates (Determinants of Health)**
Outcome Variables

- Birthweight: Normal, low birth weight (<2500 gms), and very low birth weight (<1500 gms)
- Preterm Birth: < 37 weeks gestation
- NICU Transfer: Yes or No
**Intervention Variables**

- PNCC Services: Yes or NO
- Intensity: Four groups
  - Early entrance (< 16 weeks)/high intensity (≥ 4 hours)
  - Early entrance (< 16 weeks)/low intensity (< 4 hours)
  - Late entrance (≥ 16 weeks)/high intensity (≥ 4 hours)
  - Late entrance (≥ 16 weeks)/low intensity (< 4 hours)
Covariates (Determinants of Health)

- **Social:** Age, Race, Education, Marital Status
- **Physical:** Urban/Rural
- **Individual Response:** Smoking, Medical History, Pregnancy History
- **Health Care:** Medical Prenatal Care Adequacy
Sample

- All Medicaid births in WI in 2001 & 2002 (N = 45,406)
- Total # of women who received PNCC = 10,715 (23.6% of sample)
Sample Attributes

- **Age**: Range 12-50 years (M = 23.87)
- **Race**: 60% Caucasian; 23% Non-Hispanic Black; 11% Hispanic; 3% Native American; 3% Laotian/Hmong
- **Marital Status**: 66% Single
- **Education**: Range None to Graduate Level (M = 12 years)
Sample Attributes (cont)

- Geography: 54% Urban; 46% Rural
- Smoking: 30% smoked cigarettes
- Pregnancy History: 33% Primips; 8% 6+ pregnancies
- Medical History: 49% had at least one medical condition
- Medical Prenatal Care: 65% had Adequate care per Kessner index
PNCC Intervention

- 52% initiated care at < 16 weeks
- 45% had high intensity service
- 45% of care in public sector agencies; 48% in private sector agencies
- 22% of care provided in homes; 77% of care provided in clinics/offices
Data Management

- Upon finalization of IRB approval and completion of Data Use Agreements with State of WI, data were electronically transferred to researcher.
- All data were de-identified.
- All data were encrypted.
- Frequencies were compared to assure a full transfer.
Data Analysis

- Univariate and bivariate analyses conducted
- Logistic Regression conducted, using one of four birth indicators as outcome variable, PNCC as intervention variable, and eight covariates as part of formula
- Odds ratios and significance used for analyses
## Results of Question #1: Impact of PNCC

<table>
<thead>
<tr>
<th>Birth Outcome</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Birth Weight</td>
<td>.842</td>
<td>.777, .912</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Very Low Birth Weight</td>
<td>.709</td>
<td>.587, .855</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Preterm Birth</td>
<td>.831</td>
<td>.776, .890</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>NICU Admission</td>
<td>.829</td>
<td>.759, .906</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>
## Covariates’ Impact on Birth Outcomes (Odds Ratios in Presence of PNNC)

<table>
<thead>
<tr>
<th>Covariate</th>
<th>LBW</th>
<th>VLBW</th>
<th>Preterm</th>
<th>NICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmarried</td>
<td>1.086</td>
<td>1.352</td>
<td>1.123</td>
<td>1.148</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>1.731</td>
<td>2.134</td>
<td>1.489</td>
<td>1.315</td>
</tr>
<tr>
<td>Smoked Cigarettes</td>
<td>1.638</td>
<td>1.350</td>
<td>1.086</td>
<td>NS</td>
</tr>
<tr>
<td>6+ Pregnancies</td>
<td>1.289</td>
<td>1.423</td>
<td>1.387</td>
<td>1.301</td>
</tr>
<tr>
<td>Medical Condition</td>
<td>1.470</td>
<td>1.707</td>
<td>1.267</td>
<td>1.648</td>
</tr>
<tr>
<td>&lt; High School Education</td>
<td>NS</td>
<td>1.184</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Late Prenatal Care</td>
<td>NS</td>
<td>NS</td>
<td>1.111</td>
<td>NS</td>
</tr>
<tr>
<td>Urban Resident</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>1.324</td>
</tr>
</tbody>
</table>
### Results of Question #2: Impact of High Intensity PNCC Services

<table>
<thead>
<tr>
<th>Birth Outcome</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Birth Weight</td>
<td>.790</td>
<td>.685, .912</td>
<td>.001</td>
</tr>
<tr>
<td>Very Low Birth Weight</td>
<td>.533</td>
<td>.375, .758</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Preterm Birth</td>
<td>.744</td>
<td>.657, .842</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>NICU Admission</td>
<td>.796</td>
<td>.678, .935</td>
<td>.006</td>
</tr>
</tbody>
</table>
## Covariates’ Impact on Birth Outcomes (Odds Ratios in Presence of High Intensity PNNC)

<table>
<thead>
<tr>
<th>Covariate</th>
<th>LBW</th>
<th>VLBW</th>
<th>Preterm</th>
<th>NICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic Black</td>
<td>1.667</td>
<td>2.293</td>
<td>1.386</td>
<td>NS</td>
</tr>
<tr>
<td>Smoked Cigarettes</td>
<td>1.613</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>6+ Pregnancies</td>
<td>NS</td>
<td>NS</td>
<td>1.515</td>
<td>NS</td>
</tr>
<tr>
<td>Medical Condition</td>
<td>1.534</td>
<td>2.125</td>
<td>1.361</td>
<td>1.849</td>
</tr>
<tr>
<td>Late Prenatal Care</td>
<td>NS</td>
<td>NS</td>
<td>1.192</td>
<td>NS</td>
</tr>
<tr>
<td>Urban Resident</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>1.442</td>
</tr>
</tbody>
</table>
24% of the PNCC population had less than 2 hours of service.

New analyses comparing OR of total PNCC and 2+ hours of service.

All OR’s significant at < .0001.

<table>
<thead>
<tr>
<th>Birth Outcome</th>
<th>Total PNCC</th>
<th>2+ Hours PNCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW</td>
<td>.842</td>
<td>.822</td>
</tr>
<tr>
<td>VLBW</td>
<td>.709</td>
<td>.683</td>
</tr>
<tr>
<td>Preterm</td>
<td>.831</td>
<td>.798</td>
</tr>
<tr>
<td>NICU</td>
<td>.829</td>
<td>.818</td>
</tr>
</tbody>
</table>
## Impact of PNCC for Specific Populations

<table>
<thead>
<tr>
<th>Covariate</th>
<th>LBW</th>
<th>VLBW</th>
<th>Preterm</th>
<th>NICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>.842</td>
<td>.709</td>
<td>.831</td>
<td>.829</td>
</tr>
<tr>
<td>&lt; 18 years of age</td>
<td>.599</td>
<td>.486</td>
<td>.722</td>
<td>.567</td>
</tr>
<tr>
<td>Unmarried</td>
<td>.804</td>
<td>.627</td>
<td>.796</td>
<td>.790</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>.738</td>
<td>.594</td>
<td>.722</td>
<td>.725</td>
</tr>
<tr>
<td>Smoked Cigarettes</td>
<td>.874</td>
<td>.686</td>
<td>NS</td>
<td>.750</td>
</tr>
<tr>
<td>6+ Pregnancies</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>.727</td>
</tr>
<tr>
<td>Medical Condition</td>
<td>.857</td>
<td>.791</td>
<td>.861</td>
<td>.865</td>
</tr>
</tbody>
</table>
Discussion—Impact of PNCC

- PNCC significantly protected against LBW, VLBW, Preterm Birth, and NICU admission (16-29% less likely to happen)
- This happened in a population significantly more at risk than the general population
- More women could benefit from the program (93% had at least one risk factor; only 23.6% of population received PNCC)
Discussion—Impact of PNCC (cont)

- Protective effect could be even greater based on evidence from other studies
- Data suggests interventions focused on specific determinants would enhance the protective effect
Discussion—PNCC Dosage

- Late initiation/High intensity had significant protective effect on all four birth outcomes.
- High intensity also had the same effect.
- Early initiation increased risk of VLBW, Preterm birth, NICU transfer.
- Sustained intervention is necessary to create relationship that provides emotional support and motivates behavior change.
Discussion—Additional Findings

- PNCC more effective within social determinant of health populations
- Many women receive far too low a dose of PNCC
- Significant cost savings may be secured through the program
Recommendations for Nursing Practice

- Enhance outreach
- Improve engagement
- Focus interventions based on assessment
- Design systems of care with a life cycle and social ecological approach
Social Ecological Model

- Individual
- Family/
  Interpersonal
- Institutional
- Community
- Policy
Recommendations for Health Policy

- Make PNCC universally available to women on Medicaid
- Restructure reimbursement to reward outreach, engagement, and outcome achievement
- Enhance data systems to monitor outcomes
- Enhance linkages between PNCC Providers, HMO’s and medical providers
- Ongoing training and record audits
Recommendations for Research

Further analysis of:

- Dosage
- Specific interventions
- Types of providers
- Setting of care provision
- Cost effectiveness
- Random Controlled Studies of Standard vs. Enhanced PNCC
Conclusion

- PNCC is an effective intervention in reducing the risk of LBW, VLBW, and preterm births, and NICU transfers.
- The intervention is even more effective when delivered in higher doses.
- These findings suggest that WI should expand and enhance PNCC.
Conclusion (cont.)

- Provide universal access
- Customize interventions and use evidence-based approaches
- Reward outreach to high risk groups and higher intensity of services
- Maintain an integrated, holistic approach to care
- Assure fidelity of the model
Questions & Discussion
Thank You!

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