No such thing as a free lunch: Acknowledging the cost of breastfeeding as a method to improve outcomes

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Disclosures

<table>
<thead>
<tr>
<th>Required disclosures</th>
<th>Commercial Interests</th>
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</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>Baxter</td>
</tr>
</tbody>
</table>

Objectives

- Identify factors related to United States families not meeting their lactation goal.
- Determine the next steps in intervention to overcome barriers to sustained lactation.
Breastfeeding is natural

Picasso "Rose 7" 1905

But our world is not

Human milk as a biological system
Why do gaps in sustaining breastfeeding persist? Important to differentiate the barriers.

- Establishing informed “feeding intention”
- Mammary gland function
- The lactation trajectory and its barriers and facilitators

![Graph showing percentage of babies receiving any and exclusive breast milk during the first 12 months among children born in 2019.](image)
What are the barriers during the birth hospitalization?

What are the barriers through the first year?
Women with diabetes

In South Carolina Non-Hispanic Black population, gestational diabetes associated with increased odds of breastfeeding initiation

Stevens et al 2019

CDC report

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Secondary analysis of U.S. Infant Feeding Practices Study II
195 pregnant women with gestational diabetes mellitus
2815 pregnant women without gestational diabetes

Women with gestational diabetes mellitus
Adjusted odds ratio (95% CI)
Had no significant delay in secretory activation (lactogenesis II) 1.26 (0.79, 2.05)
Were less likely to say breastfeeding is the best way to feed an infant 0.62 (0.46, 0.85)
More likely to say the fathers of their infants prefer formula feeding 1.74 (1.02, 2.97)
More likely to say their physicians prefer formula feeding 2.82 (1.17, 6.79)
Less likely to report comfortable breastfeeding in front of female friends 0.7 (0.50, 0.98)
Less likely to have newborn stay in their hospital room 0.55 (0.36, 0.85)

Barriers to Exclusive Breastfeeding Among Women With Gestational Diabetes Mellitus in the United States

Do women with diabetes intend to breastfeed?

<table>
<thead>
<tr>
<th>Variable</th>
<th>No diabetes</th>
<th>Diabetes</th>
<th>Adjusted odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/Ethnicity</td>
<td>Non-Hispanic White</td>
<td>1.24 (0.96, 1.61)</td>
<td>1.26 (0.79, 2.05)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>30-39</td>
<td>0.86 (0.66, 1.12)</td>
<td>1.74 (1.02, 2.97)</td>
</tr>
<tr>
<td>Education</td>
<td>High school or less</td>
<td>0.53 (0.34, 0.86)</td>
<td>0.53 (0.34, 0.86)</td>
</tr>
<tr>
<td>Income</td>
<td>Below poverty level</td>
<td>1.37 (0.77, 2.43)</td>
<td>3.82 (1.37, 6.79)</td>
</tr>
<tr>
<td>Type of health insurance</td>
<td>Public insurance</td>
<td>0.71 (0.51, 1.00)</td>
<td>0.7 (0.50, 0.98)</td>
</tr>
<tr>
<td>Other</td>
<td>0.55 (0.36, 0.85)</td>
<td>0.55 (0.36, 0.85)</td>
<td></td>
</tr>
</tbody>
</table>
Breastfeeding outcomes related to postnatal hypoglycemia and NICU admission

Doughty et al 2022

Doughty and Taylor 2021; Doughty 2022

Women were informed. Women intended to breastfeed. Women had confidence in their breastfeeding. Infant biological factors, provider practices, and potentially maternal biological factors relate to breastfeeding outcomes.

Establishing informed “feeding intention”

The lactation trajectory and its barriers and facilitators

Other barriers to increasing the breastfeeding trajectory
In a referral center Baby Friendly Hospital,

9% increase in breastfeeding for non-Black mothers
14% increase in breastfeeding for Black mothers

Of mothers who initiated breastfeeding, Black mothers compared to non-Black mothers were less likely to sustain to hospital discharge (mean 2 days) (69.4% compared to 84.6%) (p<0.0001).

<table>
<thead>
<tr>
<th>Race</th>
<th>Pre</th>
<th>Post</th>
<th>Increased</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHB</td>
<td>0.482 (0.460-0.503)</td>
<td>0.482 (0.460-0.503)</td>
<td>0.482 (0.460-0.503)</td>
<td>0.482 (0.460-0.503)</td>
</tr>
<tr>
<td>HW</td>
<td>0.474 (0.451-0.496)</td>
<td>0.474 (0.451-0.496)</td>
<td>0.474 (0.451-0.496)</td>
<td>0.474 (0.451-0.496)</td>
</tr>
<tr>
<td>HB</td>
<td>0.476 (0.453-0.499)</td>
<td>0.476 (0.453-0.499)</td>
<td>0.476 (0.453-0.499)</td>
<td>0.476 (0.453-0.499)</td>
</tr>
<tr>
<td>AS</td>
<td>0.485 (0.462-0.508)</td>
<td>0.485 (0.462-0.508)</td>
<td>0.485 (0.462-0.508)</td>
<td>0.485 (0.462-0.508)</td>
</tr>
<tr>
<td>OH</td>
<td>0.479 (0.455-0.503)</td>
<td>0.479 (0.455-0.503)</td>
<td>0.479 (0.455-0.503)</td>
<td>0.479 (0.455-0.503)</td>
</tr>
</tbody>
</table>

Northeastern academic hospital

NHB= non-Hispanic Black, HW= Hispanic White, HB= Hispanic Black, AS= Asian, OH= Other Hispanic
Reasons for Formula Feeding by Race/Ethnicity among Infants Receiving Formula

<table>
<thead>
<tr>
<th>Reason</th>
<th>NHB</th>
<th>HW</th>
<th>HB</th>
<th>OH</th>
<th>AS</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documented Reason</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Infant Complication</td>
<td>414</td>
<td>115</td>
<td>42</td>
<td>71</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Maternal Complication</td>
<td>36</td>
<td>4</td>
<td>2</td>
<td>19</td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Maternal Request</td>
<td>427</td>
<td>130</td>
<td>32</td>
<td>101</td>
<td></td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

More than one response possible

Difference by Race in Breastfeeding Outcomes—Why?

- Black mothers do not trust or are not informed about the benefits of breastfeeding?
- Black women overwhelmingly report breastfeeding to be the healthiest and most desirable method to feed their infant
- Black women are more likely to have lower socioeconomic status which relates to higher formula use?
- Maternal mortality differs by race despite socioeconomic status
- Structural racism?

- When formula is supplemented, nursing documentation “infant complication” most likely for White women while “maternal request” most likely for Black women. Why?

Healthcare providers’ approach matters

How we prioritize lactation

How we overcome bias
Barriers to increasing the breastfeeding trajectory after breastfeeding established

Establishing informed "feeding intention"

The lactation trajectory and its barriers and facilitators

Mammary gland function

Breastfeeding Balanced with

The obligations of women in the first-year post-birth

Total quantified costs:
- $120-445 for equipment
- $39.16/month for 1st 6 months and $45.56/month thereafter for food
- $73/year for vitamin D supplementation

Opportunity cost:
- Time of 3-4 hours/day
- Birth inside and outside the work force
- Unpaid care work in the U.S. is ~40% of the U.S. Gross Domestic Product
- Applied $7.25/hour federal minimum wage to 3-4 hours per day

Total Marginal Direct Cost of Breastfeeding for 1st Year
- $8,640.07-$11,611.32 (U.S. federal poverty line for family with 2 kids is $18,310)
The Loss of Milk Production as a Loss in Gross Domestic Product (GDP)

<table>
<thead>
<tr>
<th>Country</th>
<th>Milk Production Volume</th>
<th>Potential Value of Production</th>
<th>Actual Value of Milk Production</th>
<th>Biologically Possible Value of Production</th>
<th>Lost Production Value</th>
<th>Lost Production Value % of Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>42</td>
<td>1369</td>
<td>684</td>
<td>107 087</td>
<td>63 113</td>
<td>58</td>
</tr>
<tr>
<td>Norway</td>
<td>11</td>
<td>18</td>
<td>957</td>
<td>1055</td>
<td>599</td>
<td>40</td>
</tr>
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</table>

*Production volume calculated as the sum of total numbers month ending each month from age 0-24 months, multiplied by monthly milk intake for each kg.

Table 4: Annual Production of Human Mllk for Infants, 0-24 Months, 2009-2010

The Ecological System Showing Interacting Factors that Influence Whether a Mother Can Afford to Breastfeed

Economic and social policies and culture
Public health, employment and welfare policies
Health care, nutrition, and workplace systems
Breastfeeding support and legal and legislative aspects

Bettinelli et al. 2024

Baker et al. 2023
Paid family leave relates to breastfeeding at 6 months and less Postpartum depression symptoms but no Difference in postpartum visit attendance

State-Paid Family Leave and State 6-month Breastfeeding Rate

Government support of parenting may increase inequities
ABM Paid Maternity Leave—Importance to Society, Breastfeeding, and Sustainable Development

Recommend:
- 6 months paid leave at 100% pay or cash equivalent available to all mothers regardless of income, employment, or immigration status.
- Minimum of 16 weeks of fully paid leave.
- Partial pay for low-wage workers is insufficient.
- Leave and work arrangements should be flexible whenever possible. Longer flexible leave for parents of sick and preterm infants is essential.
- Providing adequate paid leave for partners has multiple benefits.
- Increasing minimum wages can help more families utilize paid leave.
- Cash benefits per birth can help informal workers and undocumented mothers afford to take leave.
- Equitable paid maternity leave must be primarily provided by governments and cannot be accomplished by employers alone.

Another cost in the U.S.

Annual excess deaths attributable to suboptimal breastfeeding\(^1\): 3,340 (95% CI 1,886 to 4,785)
- 78% maternal due to
  - Myocardial infarction (n=986)
  - Breast cancer (n=838)
  - Diabetes (n=473)
- 22% pediatric due to
  - Sudden Infant Death Syndrome (n=492)
  - Necrotizing enterocolitis (n=190)

For every 597 women who optimally breastfeed, one maternal or child death is prevented.

Annual medical costs related to suboptimal breastfeeding\(^1\): $3.0 billion

What can we do?

Continue the great work to invest in decreasing the “cost” for women to breastfeed, to obtain lactation support, and to obtain their own healthcare.
Once example- Decreasing the “cost” for women to obtain lactation support and healthcare

During the pandemic, mobile medical clinic for newborn visits
258 women and 260 infants
96% show rate for scheduled visits

Domains of Patient- and Family-Centered Care Achieved

Maternal cardiovascular health

Maternal blood pressure outcomes
70% with BP reading >120/80

Intervention delivered
20% contact with obstetric provider
13% outpatient or ER evaluation
6.1% emergent treatment
Health Equity As we Reach out To 4th trimester Mothers On Mobile Services
HEART-4-MOMS

To Facilitate Lactation Trajectory: Recognize the Need to Invest

- Breastfeeding support requires work
- Develop specialized systems for populations with lower breastfeeding rates
- Special needs for women with diabetes
- Anti-racism programs in lactation support
- Family leave
- Equitable
- Women’s health
  - Through breastfeeding support
  - Convenient

The Yale Neonatal NOuRISH Team
Nutrition Outcomes Research In Sustaining Mother and Infant Health

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- Camilia Martin (Cornell), Kristin Santoro (BIDMC)
- Cynthia Blanco (UTHCSA), Kara Calkins (UCLA), Daniel Robinson (Northwestern)
- Sharon Donovan (Illinois) and Robert Chapkin (Texas A&M)
- Carol Wagner, Bruce Hollis, Jimmy Roberts (MUSC)
- Jennifer Canvasser, Amy Hair, Jae Kim (NEC Society)
- Career development mentees: Ariel Salas (UAB) and Katie Ottilini (Children’s National)