Infant Feeding in America:
*Don’t Break a Mother’s Heart*

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*Conflicts of Interest: None*
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**Objectives**

- Review recent literature linking suboptimal breastfeeding to maternal obesity and cardiovascular disease
- Discuss the relationship between breastfeeding and maternal risk of cancer
- Appreciate the role breastfeeding could play in eliminating health disparities
Is there butter in that bottle??

Humans are Mammals

- Lactation follows pregnancy
- “Resets” maternal physiology
Humans are Mammals

- Mothers who don’t “recover” from pregnancy are at increased risk of obesity, cancer, heart disease, and early death
Less Lactation = More Obesity

If <6 months Lactation, Maternal Weight goes UP

Bobrow KL Intl J of Obesity 2012

Wiklund P Pub Hlth Nutr 2011
Lactation and visceral fat?

- Visceral fat is metabolically active & increases risk of diabetes and atherosclerosis
- Visceral fat accumulates during pregnancy
- Hypothesize that lactation takes this off...
Lactation and visceral fat

- If NEVER lactated, moms had more visceral adiposity
  - 36.96 cm² (95% CI: 20.92, 53.01)
- If lactated <3 months after any birth
  - 20.38 cm² (95% CI: 2.70, 38.06)

Compared to moms who lactated for >3 months/birth, adjusted for age, parity, birth outcome, years since last birth, SES, lifestyle, optimism, anxiety, early adult BMI, max gestational weight gain, family history, and current BMI

McClure CK, Schwarz EB, et al
Matern Child Health J 2012
Marked benefit with only one month of lactation!

- Risk of DM ↑ in never lactated vs. nulliparous
  - OR 1.92 (95% CI 1.1-3.3)

- Risk of DM similar if ≥1 month lactation vs. nulliparous
  - OR 1.01 (95% CI 0.6-1.8)


Moms who don’t breastfeed more likely to develop diabetes

<table>
<thead>
<tr>
<th>In healthy weight women (BMI&lt;25)</th>
<th>OR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parous, no breastfeeding</td>
<td>1.62 (1.13-2.31)</td>
</tr>
<tr>
<td>Parous, breastfed up to 3 months/child</td>
<td>1.22 (0.89-1.67)</td>
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<tr>
<td>Parous, breastfed &gt;3 months/child</td>
<td>1.16 (0.86-1.57)</td>
</tr>
<tr>
<td>Nulliparous</td>
<td>1.00 (1.00-1.00)</td>
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<th>In overweight women (BMI≥25)</th>
<th>OR (95%CI)</th>
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<tr>
<td>Parous, no breastfeeding</td>
<td>1.52 (1.26-1.83)</td>
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<tr>
<td>Parous, breastfed up to 3 months/child</td>
<td>1.12 (0.94-1.33)</td>
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<tr>
<td>Parous, breastfed &gt;3 months/child</td>
<td>0.93 (0.79-1.11)</td>
</tr>
<tr>
<td>Nulliparous</td>
<td>1.00 (1.00-1.00)</td>
</tr>
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Liu B et al. Dia Care 2010;33:1239-1241

Especially if overweight prior to pregnancy
Nurses Health Study

• Each year of any lactation decreases risk of DM by 15% (95% CI 1%-27%)
  – Independent of BMI, smoking, diet, exercise
• Exclusive lactation reduced risk even further
• Effect lasts 15 years from last birth

Stuebe et al. JAMA (2005)
<9 months lactation after first birth
= MORE hypertension

Stuebe A et al Am J Epi 2011
<table>
<thead>
<tr>
<th>Breastfeeding per child</th>
<th>45 to &lt;54 years</th>
<th>Odds ratio (99% CI)</th>
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<tbody>
<tr>
<td>Never</td>
<td>0.97 (0.69 to 1.36); p=0.22</td>
<td></td>
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<tr>
<td>1 to &lt;3 months</td>
<td>0.76 (0.57 to 1.00); p=0.01</td>
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<tr>
<td>3 to &lt;6 months</td>
<td>0.81 (0.57 to 1.16); p=0.001</td>
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<tr>
<td>6 to &lt;12 months</td>
<td>0.80 (0.44 to 1.41); p=0.001</td>
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<tr>
<td>12 to &lt;18 months</td>
<td>0.82 (0.43 to 1.61); p=0.001</td>
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<tr>
<td>18+ months</td>
<td>0.43 (0.23 to 0.82); p=0.01</td>
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<th>Breastfeeding per child</th>
<th>54 to &lt;64 years</th>
<th>Odds ratio (99% CI)</th>
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<tr>
<td>Never</td>
<td>0.90 (0.76 to 1.05); p=0.10</td>
<td></td>
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<tr>
<td>1 to &lt;3 months</td>
<td>0.81 (0.69 to 0.97); p=0.002</td>
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<td>3 to &lt;6 months</td>
<td>0.71 (0.60 to 0.84); p=0.001</td>
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<tr>
<td>6 to &lt;12 months</td>
<td>0.64 (0.51 to 0.81); p=0.001</td>
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<td>12 to &lt;18 months</td>
<td>0.84 (0.39 to 1.98); p=0.001</td>
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<th>64+ years</th>
<th>Odds ratio (99% CI)</th>
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<tr>
<td>Never</td>
<td>1.04 (0.92 to 1.22); p=0.30</td>
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<tr>
<td>1 to &lt;3 months</td>
<td>1.04 (0.91 to 1.20); p=0.45</td>
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<tr>
<td>3 to &lt;6 months</td>
<td>1.12 (0.97 to 1.29); p=0.04</td>
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<tr>
<td>6 to &lt;12 months</td>
<td>0.97 (0.86 to 1.11); p=0.25</td>
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<tr>
<td>12 to &lt;18 months</td>
<td>0.59 (0.17 to 0.64); p=0.002</td>
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Lactation and Heart Disease

• CVD prior to WHI enrollment was more common among moms who never lactated than moms who breastfed for 1+ year
  – Independent of sociodemographic, lifestyle, family history variables, and BMI
  OR=1.10, 95% CI=1.02-1.18

Schwarz EB, et al Ob Gyn 2009

CVD by Parity

With 1 birth
• 7-12 months lactation decreased CVD
  HR=0.72, 95% CI 0.53-0.97

With 2 births
• 24+ months of lactation decreased CVD
  HR=0.58, 95% CI 0.35-0.95

Schwarz EB, et al Ob Gyn 2009
Incident CHD

After adjusting for age, parity, history of still birth, early-adult adiposity, family history and lifestyle

23% lower risk of coronary heart disease
When lifetime duration of lactation >2 years vs never

Stuebe AM et al AJOG. 2009

Any more *objective* measures of CVD risk?
Subclinical CVD

Mothers who never breastfed were more likely than those who breastfed after every birth to have:

- Aortic calcification
  - aOR*=3.85 (1.47-10.00)
- Coronary artery calcification
  - aOR*=2.78 (1.05-7.14)

*Adjusted for SES, Lifestyle, and Family Hx variables

Schwarz EB, Ob Gyn 2010

Subclinical CVD

- Aortic Calcification
  - after adjustment for BMI and traditional risk factors including:
    - Systolic Blood Pressure
    - HDL, triglycerides, total cholesterol
    - C-reactive protein,
    - glucose, and insulin
  - aOR=5.26, 95% CI 1.47-20.00

Schwarz EB, Ob Gyn 2010
What is the mechanism

- **Vasopressin is activated during pregnancy by the corpus lutea → activated thirst centers**
  - Increased blood volume
  - Decreased plasma Na concentration & osmolality
  - Vasoconstriction
- **Oxytocin is activated in the postpartum period**
  - Peripheral natriuretic action (stimulate ANP secretion)
  - Reduces stress-induced vasoconstriction


Prospective vs. Retrospective Evidence
20 Mice

- Similar BP at 1 week gestation
  - Lactated for 3 weeks
  - Pups removed at birth
- Blood pressure measured with non-invasive tail-cuff
- Adipose tissue measured by CT
- Cardiac function by ultrasound

Poole A, et al AJOG 2014

Mouse model

*Visceral Adiposity*

![Graph showing VAT (% of total area) over time with P<0.05 for 1 mo PP and 2 mo PP between L and NL groups.]

Poole A, et al AJOG 2014
Mouse model

**Blood Pressure**

1 month Postpartum,

- SBP (122.2 ± 7.1 vs 96.8 ± 9.8 mmHg, P=0.04)
- DBP (87.0 ± 6.8 vs 65.9 ± 6.1 mmHg, P=0.04)
- MAP (102.7 ± 7.1 vs 80.2 ± 6.8 mmHg; P=0.04)

*ALL measures of BP were significantly higher in mice that didn’t lactate*

---

Mouse model

**Cardiac Function**

2 months Postpartum,

- Ejection Fraction (51.7 ± 1.5 vs 60.5 ± 3.7 %; P=0.04)
- Cardiac output (13.6 ± 0.8 vs 17.3 ± 1.4; P=0.04)
- MV E/A (1.4 ± 0.1 vs 1.7 ± 0.1; P=0.04)

*ALL measures of cardiac function were significantly lower in mice that didn’t lactate*

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Poole A, et al AJOG 2014
PROBIT

• “Baby Friendly Hospital”
• 16 intervention sites vs. 15 control sites
• 8569 vs 7923 mom/baby pairs

• Breastfeeding rates improved (but were low in both arms)
  – Exclusive at 3 mos: 6% vs. 43% in intervention
  – Exclusive at 6 mos: 0.6% vs. 8% in intervention
  – Any at 12 mos: 11% vs. 20% in intervention


PROBIT maternal data
11.5 years of fup

• 30.3% vs. 35% have measured HTN
• 17.2% vs. 22.6% diagnosed with HTN

• Simple chi-square→p<0.001
• Adjust for clustering by site→p>0.05

A year of lactation vs. Statins for primary prevention of heart disease

NNT to prevent a case of maternal
   – Cardiovascular disease = 126 vs. 245 for statins
   – Diabetes = 88 vs. 495 for statins
   – HTN = 33 vs ???

Lactation = Less cancer

Mothers who don’t lactate have

- 5% higher risk of invasive breast cancer
  - 47 studies on lactation and breast cancer!

- 30-50% higher risk of ovarian cancer

*Lancet* 2002, **360**: 187-195
Riman T. Acta Obstet Gynecol Scand. 2004

Breast cancer

**RRR 7%** (95% CI 5-9%) for each birth,
* p < 0.0001

*At each parity level, RRR 0.96 (p=0.02) for ever vs. never breastfeeding*

**RRR 4%** (95% CI 3-6) per year lactation, *p < 0.0001*

Breast cancer

- Women with a first degree relative with breast cancer
  - NHS II data, prospective cohort
  - Ever breastfed vs. never
  - HR of 0.41 (95% CI, 0.22-0.75)
  - For high risk women, this is comparable to therapies like tamoxifen!


Breast cancer mechanisms

- Lactogenesis leads to terminal differentiation of breast tissue, reducing malignant transformation

- Lactation suppresses ovulation reducing estrogen exposure
Ovarian cancer

Meta-analysis of 5 prospective + 30 case control

- 30% higher risk of ovarian CA among moms who never breastfed
- Ever vs. never breastfeeding
  - RR 0.76 (95% CI, 0.69-0.83)
- Risk ↓ by 8% for every additional 5 months
  - RR: 0.92 (95% CI, 0.90-0.95)

- Large degree of heterogeneity between studies
- Many did not address potential confounders such as BMI, OCP use, smoking and parity

Riman T. Acta Obstet Gynecol Scand. 2004

Ovarian cancer

Nurses' Heath Studies:

- 50% greater risk of ovarian cancer if never breastfed vs. breastfed for 18+ months.
- 2% risk reduction per month of lactation

Cramer DM Cancer Epidemiol Biomarkers Prev 2005
Ovarian cancer mechanisms

- Lactation suppresses ovulation
- Antibodies to MUC-1, which develop during mastitis, may reduce risk of ovarian cancer

Pinheiro SF. *Cancer Epidemiol Biomarkers Prev.*, 2010
Cramer DM. *Cancer Epidemiol Biomarkers Prev* 2005

All for the same low price

- 53,847 from Hypertension
- 13,946 from Heart Attacks
- 4,981 cases of Breast cancer
4,396 Maternal Deaths?

$18.3 billion
The Ultimate Health Disparity
• Diarrhea
• Ear infections
• Pneumonia
• Inflammatory Bowel Disease
• Leukemia
Sudden Infant Death Syndrome

MRI scans of human brain development
What we say matters

- 8% of physicians felt their advice on breastfeeding was important
- >30% of patients reported that clinician’s advice was very important
- At 6 weeks postpartum
  - 70% of women who thought physician favored breastfeeding were still breastfeeding
  - 54% of women who thought their physician had no preference were still breastfeeding


Questions?
Comments?
Collaboration?
schwarzeb@upmc.edu
Additional Reading

Lactation and Cardiovascular Disease
- Stuebe AM et al. *AJOG*. 2009
- Schwarz EB, et al *Ob Gyn*. 2010

Lactation and Diabetes Mellitus

Lactation Support matters

Lactation consultants tripled the number >80% breastfeeding at 3 mos compared to usual care alone
+/- electronically prompted anticipatory guidance

LC: OR 3.2 (95% CI 1.1-9.1)
LC+EP: OR 2.7 (95% CI 1.1-6.8)

To prevent 1 dyad from nonexclusive breastfeeding

NNT = 10.3 (95% CI 5.6-50.7)