Novel strategies to increase use of mother's own milk in the NICU

Aloka L. Patel, MD
Professor of Pediatrics

April 12, 2024

Disclosures

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- I have no real or apparent conflicts of interest related to the content of this presentation.

- The following terms are used throughout this presentation for simplicity: *mother, woman/women, mother's own milk, breastmilk,* and *breastfeeding* for anatomic clarity and brevity in this lecture.
- All concepts discussed here are applicable to transgender, nonbinary and non-birthing people who lactate and/or chest feed.
- The term "*mother's own milk*" is intended to distinguish milk provided by a parent from donor human milk, knowing that not all human milk may come from a parent who identifies as a mother.
- We acknowledge that it is important to utilize a patient's preferred pronouns and other preferred terminology when addressing patients directly regarding their lactation experience.

Outline

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- To articulate the benefits of mother's own milk feedings for infants and their mothers
- To review the variation in mother's own milk and in US NICUs
- To identify factors mediating racial/ethnic disparities in mother's own milk feedings
- To evaluate potential strategies to increase mother's own milk feedings

AAP recommends maternal human milk as optimal nutrition for VLBW infants

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- "AAP supports continued breastfeeding, along with appropriate complementary foods introduced at about 6 months, as long as mutually desired by mother and child for 2 years or beyond."
- The potent benefits of human milk are such that all preterm infants should receive human milk. Mother's own milk, fresh or frozen, should be the primary diet, and it should be fortified appropriately for the infant born weighing less than 1.5 kg."
- " Although a mother's own milk is always preferred, donor human milk may be used for high-risk infants when the mother's own milk is not available or the mother cannot provide milk. Priority should be given to providing donor human milk to infants <1500g birth weight.""


POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics

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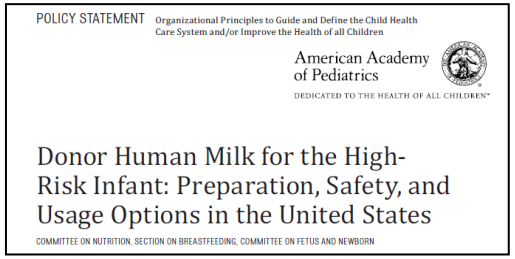
Breastfeeding and the Use of Human Milk

Joan Younger Meek, MD, MS, RD, FAAP, FABM, IBCLC,[a] Lawrence Noble, MD, FAAP, FABM, IBCLC,[b,c] and the Section on Breastfeeding


POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics

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Donor Human Milk for the High-Risk Infant: Preparation, Safety, and Usage Options in the United States

COMMITTEE ON NUTRITION, SECTION ON BREASTFEEDING, COMMITTEE ON FETUS AND NEWBORN

AMERICAN ACADEMY OF PEDIATRICS POLICY STATEMENTS 2017 & 2022

Mother's Own Milk (MOM) Components

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- **Nutrients:**
  - Protein:
    - Whey:Casein 70:30
    - majority α-lactalbumin
  - Lipids:
    - milk fat globule
    - fatty acids
    - Bile-salt–stimulated lipase
    - Arachadonic and docoshexaenoic acid
  - Carbohydrates:
    - Lactose
    - Oligosaccharides
  - Lower concentrations of Ca and Phos
- **Anti-infective**
  - Secretory IgA
  - Oligosaccharides
  - Lactoferrin
  - Lysozyme
  - Lymphocytes
  - Transforming growth factor-β
- **Impact on intestinal microbiota (synbiotic)**
  - Human milk Oligosaccharides - prebiotic
  - Lactic acid bacteria – probiotic
- **Immunomodulatory**
  - Soluble CD14
  - Soluble Toll like receptor 2
  - Transforming growth factor-β
  - platelet-activating factor acetylhydrolase
  - IL 10
- **Antioxidant**
  - Inositol
  - vitamin E
  - beta carotene
  - Lactoferrin
- **Tissue maturation / development**
  - long-chain polyunsaturated fatty acids
  - Epidermal growth factor
  - Stem cells
  - Milk fat globule membrane

Rautava S. *Breastfeed Med* 2009; Lonnerdal B. *Am J Clin Nutr* 2003; Lonnerdal B. *J Pediatr* 2010; Shoji H. *Ped Research* 2007; Perez PF. *Pediatrics* 2007; Hassiotou F. *Stem Cells* 2012; Briere C. *Breastfeed Med* 2017; Miller JB. *British Journal of Nutrition* 1999; Bode L. *Glycobiology* 2012; Newburg DS. *Ped Research* 2007; Moro. *J Pediatr Gastroent Nutr* 2002

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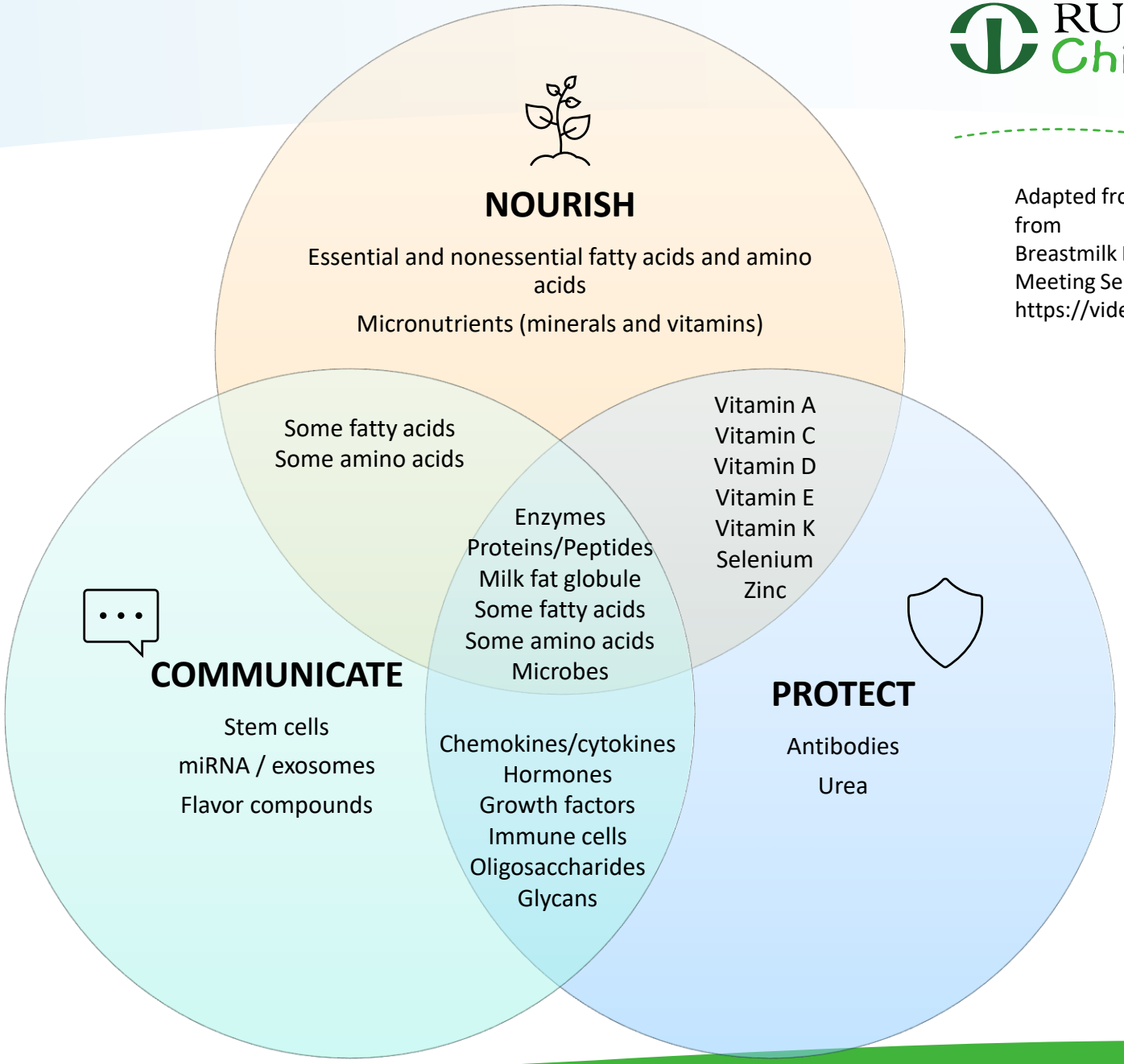
Adapted from **Bridget E. Young PhD** & **Shelley McGuire PhD** from
Breastmilk Ecology: Genesis of Infant Nutrition (BEGIN)
Meeting Series: Working Group 2: Human Milk Composition
https://videocast.nih.gov/watch=40152



MOM: Personalized Medicine

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SPECIFIC & PERSONALIZED:

- Enteromammary pathway - specific antibodies to pathogens secreted into MOM
- MOM microbiome is highly specific to the breastfeeding dyad - programming function for the infant gut microbiota
- Synergistic anti-infective interactions between MOM and enzymes in the infant's stomach and saliva

Lemay et al. PLoS One 2013
Al-Shehri et al. PLoS One 2015
Demers-Mathieu et al. Nutrients 2018
Patel AL et al. *Pediatric Research* 2021

RUMC: The LOVE MOM Cohort

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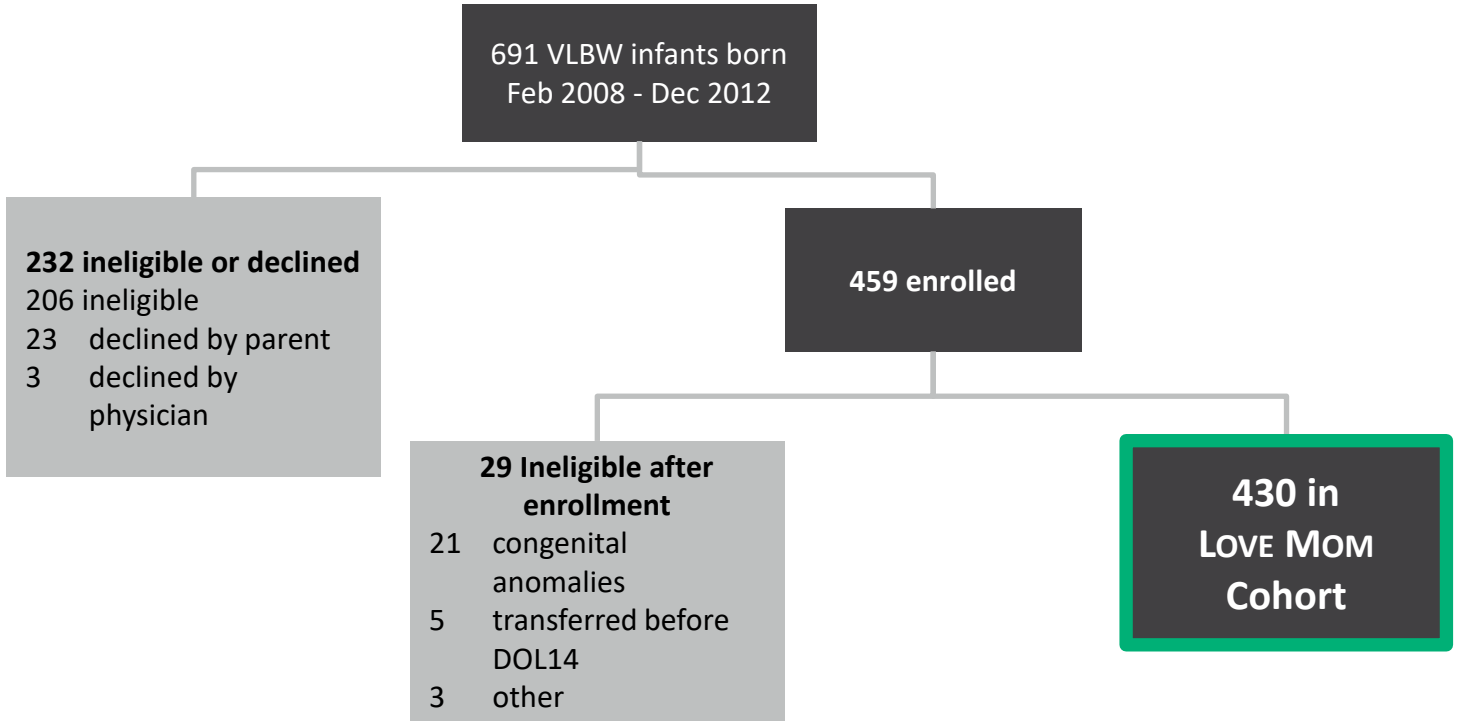
Longitudinal Outcomes of Very Low Birthweight Infants Exposed to Mothers' Own Milk



WIC eligible – low SES	74%
Married	38%
Completed 4-yr college	19%
Non-Hispanic Black	51%
Non-Hispanic White/Asian	22%
Hispanic	27%
Multiple gestation	15%
Previously breastfed	28%
Initial goal of any MOM	91%
Mean daily pumping #	4.5 times/day
Infant gestational age	28 weeks

NR010009; PI: Paula Meier, PhD

MOM Feedings and VLBW Infants

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Late onset sepsis

Journal of Perinatology (2013) 33, 514–519
© 2013 Nature America, Inc. All rights reserved 0743-8346/13
www.nature.com/jp

ORIGINAL ARTICLE

Impact of early human milk on sepsis and health-care costs in very low birth weight infants

AL Patel[1,2], TJ Johnson[2,3], JL Engstrom[2,4], LF Fogg[2], BJ Jegier[2], HR Bigger[1] and PP Meier[1,2]

Rehospitalization after discharge

Journal of Perinatology (2019) 39:120–128
https://doi.org/10.1038/s41372-018-0246-0

ARTICLE

NICU human milk dose and health care use after NICU discharge in very low birth weight infants

Tricia J. Johnson[1] · Kousiki Patra[1] · Michelle M. Greene[1] · Matthew Hamilton[1,2] · Elizabeth Dabrowski[1,3] · Paula P. Meier[1] · Aloka L. Patel[1]

Overall Cost Savings

PharmacoEconomics - Open (2022) 6:451–460
https://doi.org/10.1007/s41669-022-00324-8

ORIGINAL RESEARCH ARTICLE

Cost Savings of Mother's Own Milk for Very Low Birth Weight Infants in the Neonatal Intensive Care Unit

Tricia J. Johnson[1] · Aloka L. Patel[2] · Michael E. Schoeny[3] · Paula P. Meier[3]

Neurodevelopment

Neonatology: 2017 ; 112(4): 330–336. doi:10.1159/000475834.

NICU Human Milk Dose and 20-Month Neurodevelopmental Outcome in Very Low Birth Weight Infants

Kousiki Patra, MD[1], Matthew Hamilton, DO[1], Tricia Johnson, PhD[2], Michelle Greene, PhD[1], Elizabeth Dabrowski, MD[3], Paula P. Meier, PhD[1,4], and Aloka L. Patel, MD[1,4]

ROP

Retinopathy of Prematurity and Mother's Own Milk

Katherine Rodriguez MD, Jennifer Rossen MD, Jack Cohen MD, FACS, Aloka Patel MD, Paula Meier PhD, RN, FAAN, Tricia Johnson PhD, Robert Kimura MD, Michael Schoeny PhD, Jean Silvestri MD, William Haufe, Hunter Phillips

Rush University Children's Hospital, Rush University System for Health, Chicago, IL, United States

BPD

Original article

Influence of own mother's milk on bronchopulmonary dysplasia and costs

Aloka L Patel,[1,2] Tricia J Johnson,[3] Beverley Robin,[1] Harold R Bigger,[1] Ashley Buchanan,[1] Elizabeth Christian,[4] Vikram Nandhan,[1] Anita Shroff,[4] Michael Schoeny,[2] Janet L Engstrom,[2] Paula P Meier[1,2]

NEC

Neonatology

Original Paper

Neonatology 2015;107:271–276
DOI: 10.1159/000370058

Received: August 27, 2014
Accepted after revision: November 21, 2014
Published online: March 3, 2015

Cost Savings of Human Milk as a Strategy to Reduce the Incidence of Necrotizing Enterocolitis in Very Low Birth Weight Infants

Tricia J. Johnson[a, b] Aloka L. Patel[b, c] Harold R. Bigger[c] Janet L. Engstrom[b] Paula P. Meier[b, c]

Differential Effects of the Single-Family Room Neonatal Intensive Care Unit on 18- to 24-Month Bayley Scores of Preterm Infants

Betty Vohr, MD[1,2], Elisabeth McGowan, MD[1,2], Leslie McKinley, MS, RD, LDN[1], Richard Tucker, BA[1], Lenore Keszler, MD[1,2], and Barbara Alksninis, PNP, NNP[1]

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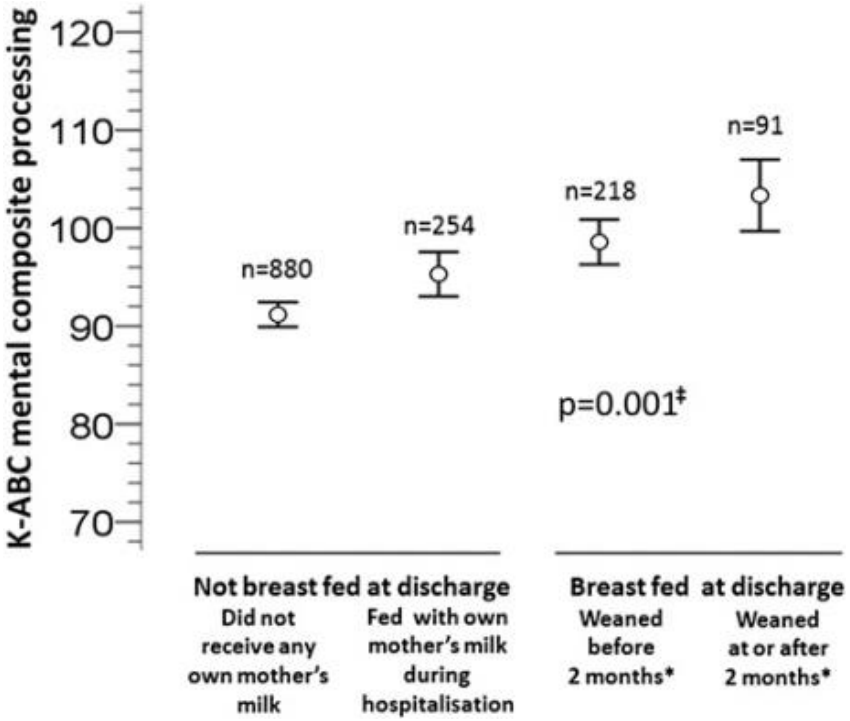
691 infants
BW ≤ 1250g
2007-2011

Every increase of 10 mL/kg/day of human milk intake at 4 weeks predicted higher Bayley scores:
Cognitive (0.29)
Language (0.34)
Motor (0.24)

Vohr et al., *Pediatrics* 2006;
Vohr et al., *Pediatrics* 2007;
Vohr et al., *J Pediatrics* 2017

France and Australia: MOM and ND Outcomes

Epipage cohort:
1462 preterm infants 22-32wk
Born 1997
5 yr outcomes



Rozé et al., BMJ Open 2012

Australian cohort:
180 very preterm infants at age 7 years
BW <1250g
Born 2001-2003

Found positive associations of MOM intake with size of the deep nuclear gray matter and hippocampus at term equivalent age

MOM intake (for every day that MOM>50% intake in first 28 days) associated with neurodevelopmental outcomes:

- Full scale IQ +0.5
- Verbal IQ +0.4
- Performance IQ +0.5
- Math computation +0.5
- Working memory +0.5
- Motor function +0.1

Belfort et al. J Peds 2016

Contents lists available at ScienceDirect

NeuroImage

journal homepage: www.elsevier.com/locate/neuroimage

Early breast milk exposure modifies brain connectivity in preterm infants

Manuel Blesa [a], Gemma Sullivan [a], Devasuda Anblagan [a,b], Emma J. Telford [a], Alan J. Quigley [c], Sarah A. Sparrow [a], Ahmed Serag [a], Scott I. Semple [d], Mark E. Bastin [b], James P. Boardman [a,b,*]

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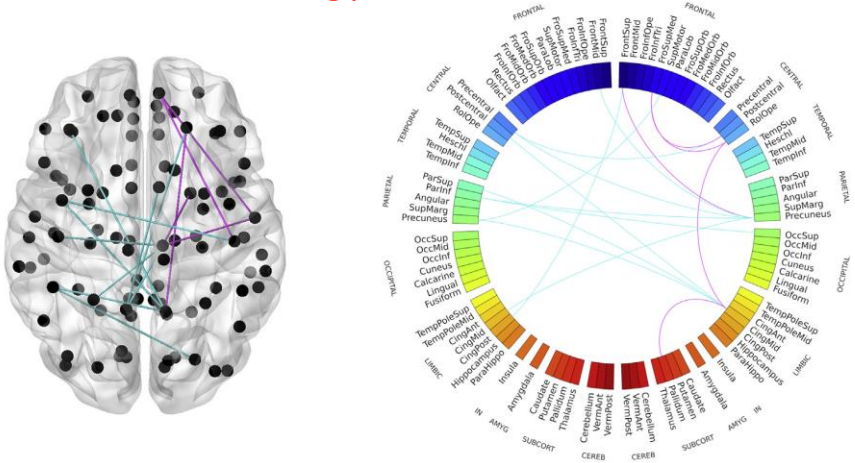
- Neonatal breast milk exposure and brain MRI at term equivalent age
- 47 preterm infants
- mean gestational age 29.43 weeks, range 23.28–33.0
- Fractional anisotropy-weighted connectivity was increased (p=.039) in infants who received >=75% of exclusive breast milk feeds (57 days median) compared to <75% of exclusive breast milk feeds (19 days median)
- The connections involved included intra- and inter- hemispheric fronto-parietal and limbic system structures
- Dose-dependent relationship with breast milk exposure (adjusted for gestational age at birth, chorioamnionitis, and BPD)

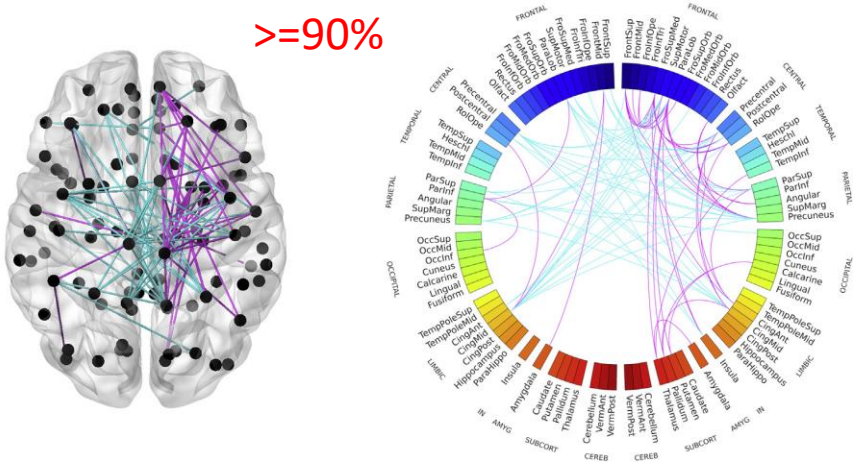
a)

>=75%



b)

>=90%



Intake of mother's milk by very-low-birth-weight infants and variation in DNA methylation of genes involved in neurodevelopment at 5.5 years of age

Jingxiong Xu,[1,2] Jean Shin,[1] Meghan McGee,[3] Sharon Unger,[4,5,6,7] Nicole Bando,[1,4] Julie Sato,[8,9,10] Marlee Vandewouw,[8,10,11,12] Yash Patel,[13] Helen M Branson,[14,15] Tomas Paus,[9,13,16,17,18] Zdenka Pausova,[1,4,19] and Deborah L O'Connor[1,4,6]

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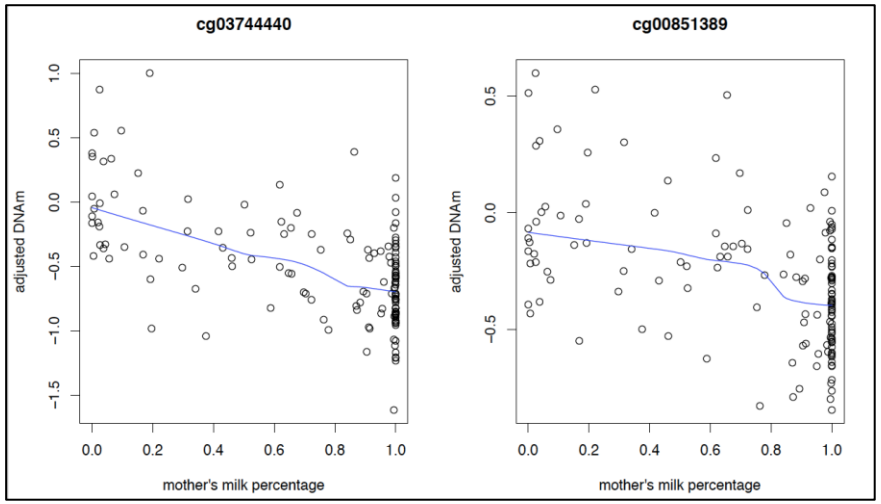
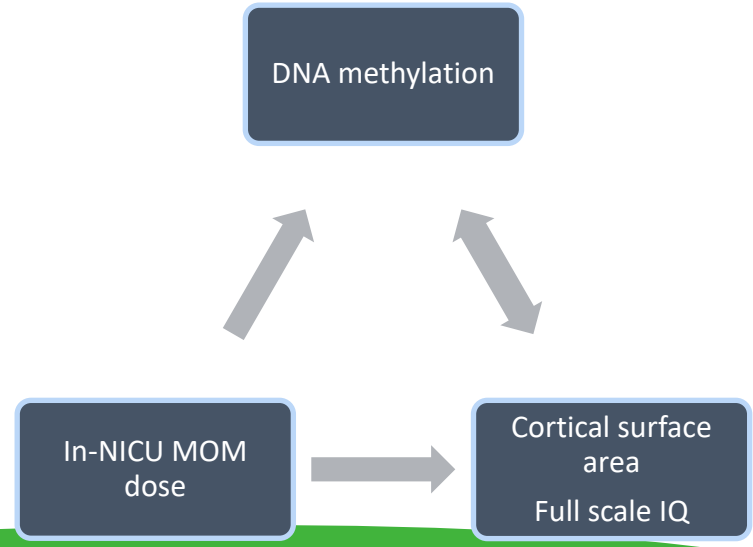


EPIGENETIC EFFECTS:

- 143 former VLBW infants in DoMINO study studied at 5.5 yr
- Buccal cells and brain MRI scans were obtained at 5.5 yr
- In-NICU MOM intake associated with variations in DNA methylation of genes enriched in neurodevelopmental pathways in early childhood
- These methylation variations associated with brain cortical surface area and IQ
- All these associations were such that higher percentage mother's milk intake was associated with lower DNAm, and lower DNAm was associated with larger cortical surface area and higher Full-Scale IQ.



Xu et al. *Am J Clin Nutr* 2022

Maternal Health

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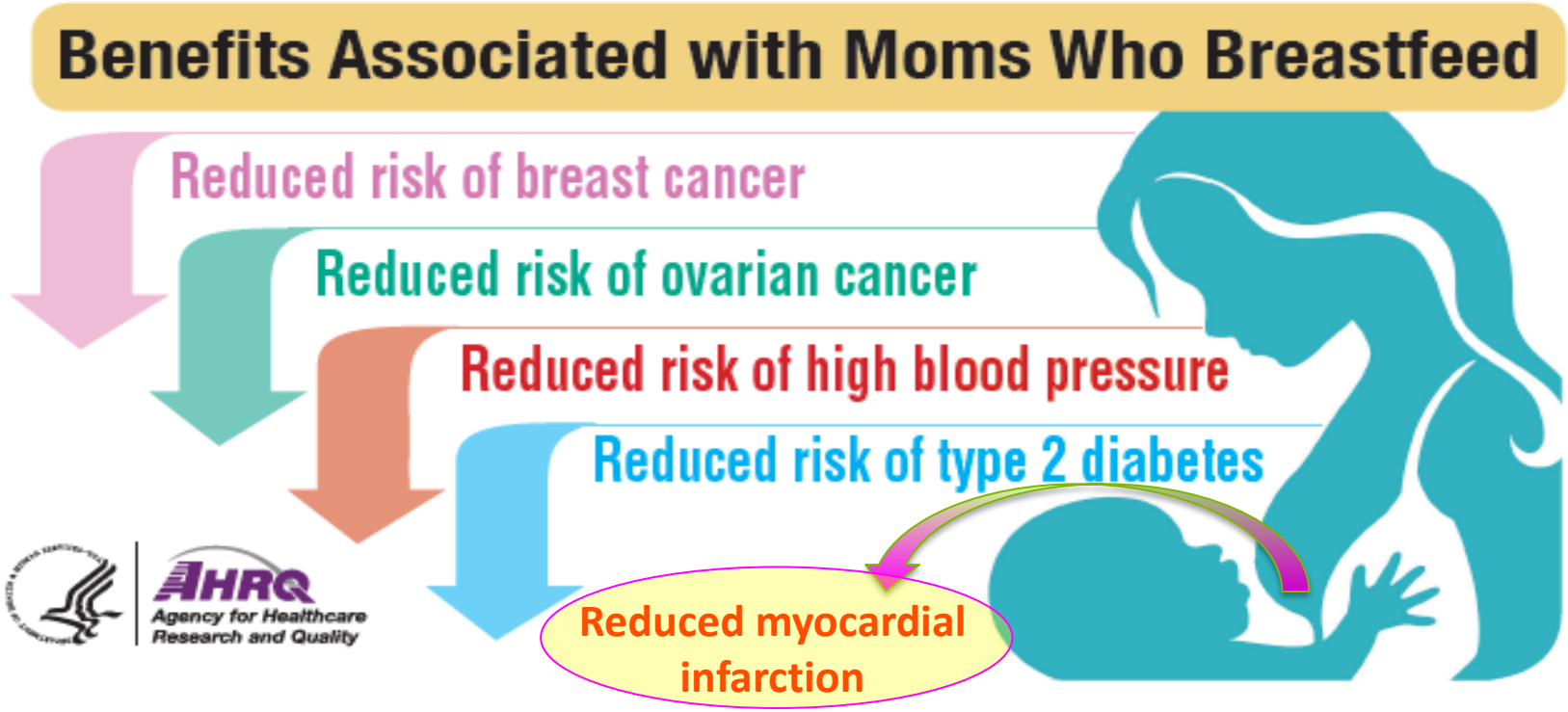
Breastfeeding is an essential part of women's reproductive health – recovery of maternal physiological systems to their preconception state



Breastfeeding Programs and Policies, Breastfeeding Uptake, and Maternal Health Outcomes in Developed Countries. Comparative Effectiveness Review No. 210. AHRQ Publication No. 18-EHC014-EF. July 2018

Schwarz EB et al. *Obstet Gynecol* 2009;
Victora CG et al. *Lancet* 2016;
Asiodu IV et al. *Breastfeed Med* 2021;
Parikh NI. *Circulation* 2021

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Variation in mother's own milk use in US NICUs

JAMA Pediatrics | Original Investigation

Breastfeeding Trends by Race/Ethnicity Among US Children Born From 2009 to 2015

Ruowei Li, MD, PhD; Cria G. Perrine, PhD; Erica H. Anstey, PhD; Jian Chen, MS; Carol A. MacGowan, MPH, RDN, LD; Laurie D. Elam-Evans, PhD, MPH

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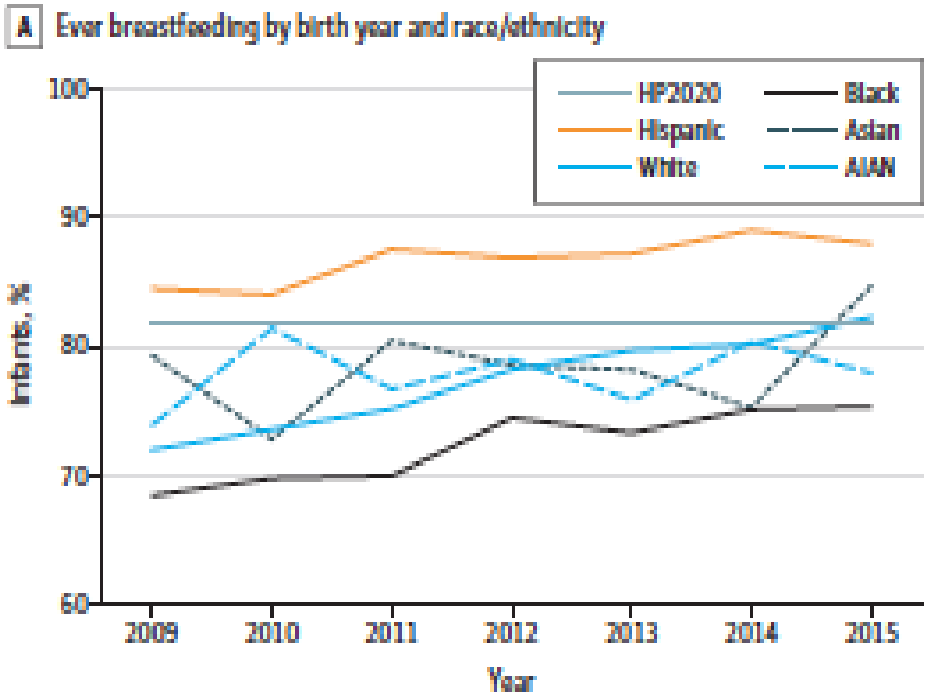
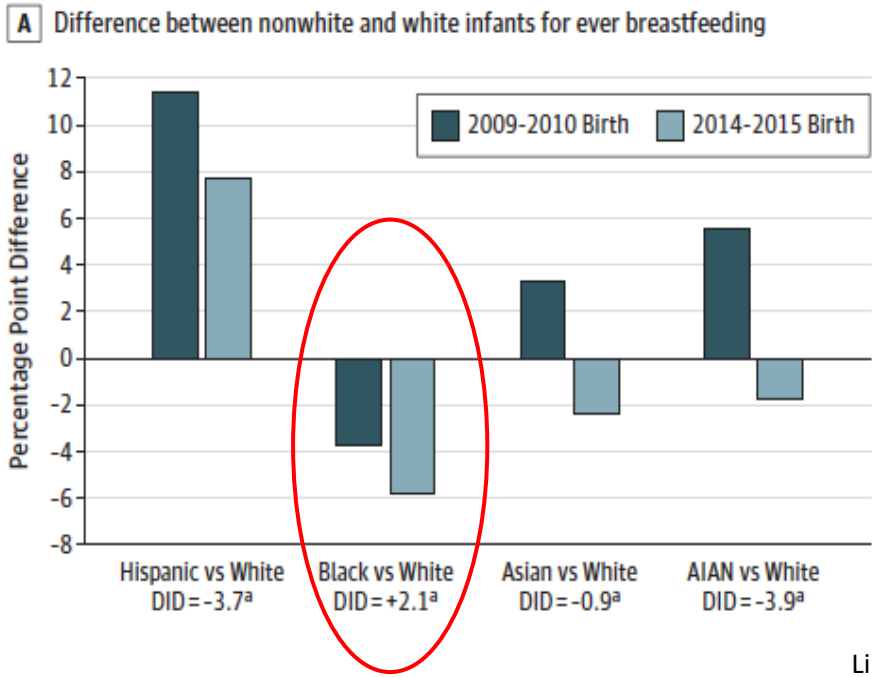
- National Immunization Survey–Child (NIS-Child)
- 167,842 infants
- 2009-2015





Li R et al. *JAMA Pediatrics* 2019

Historical Breastfeeding Rates

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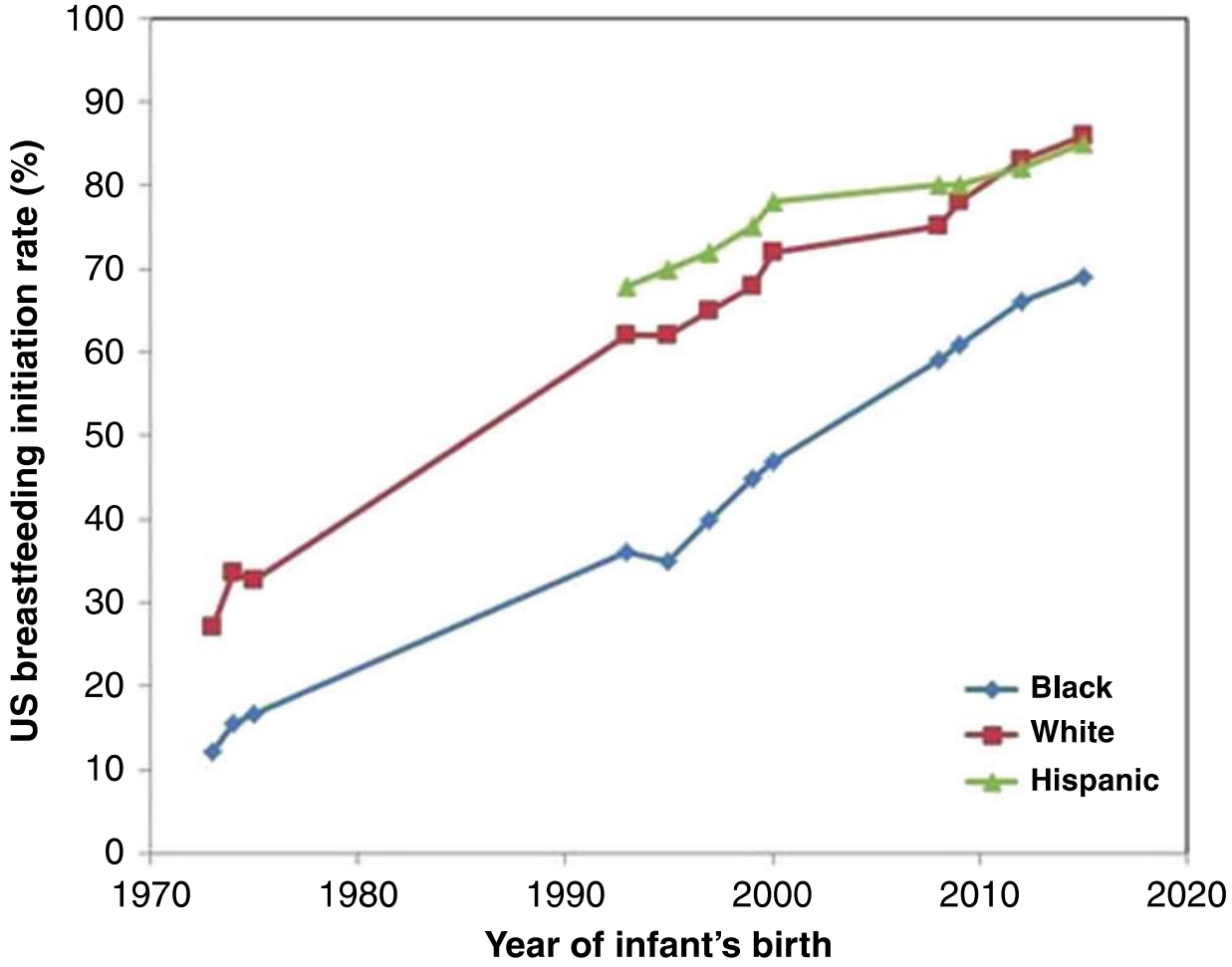

Fig. 5 US breastfeeding rates from 1970 to 2015 by maternal race/ethnicity. Based on data from refs. [103–105]

Patel AL et al. *Ped Research* 2021

Journal of Perinatology www.nature.com/jp

ARTICLE

Check for updates

Achieving healthy people 2030 breastfeeding targets in the United States: challenges and opportunities

Tonse N. K. Raju [1]✉

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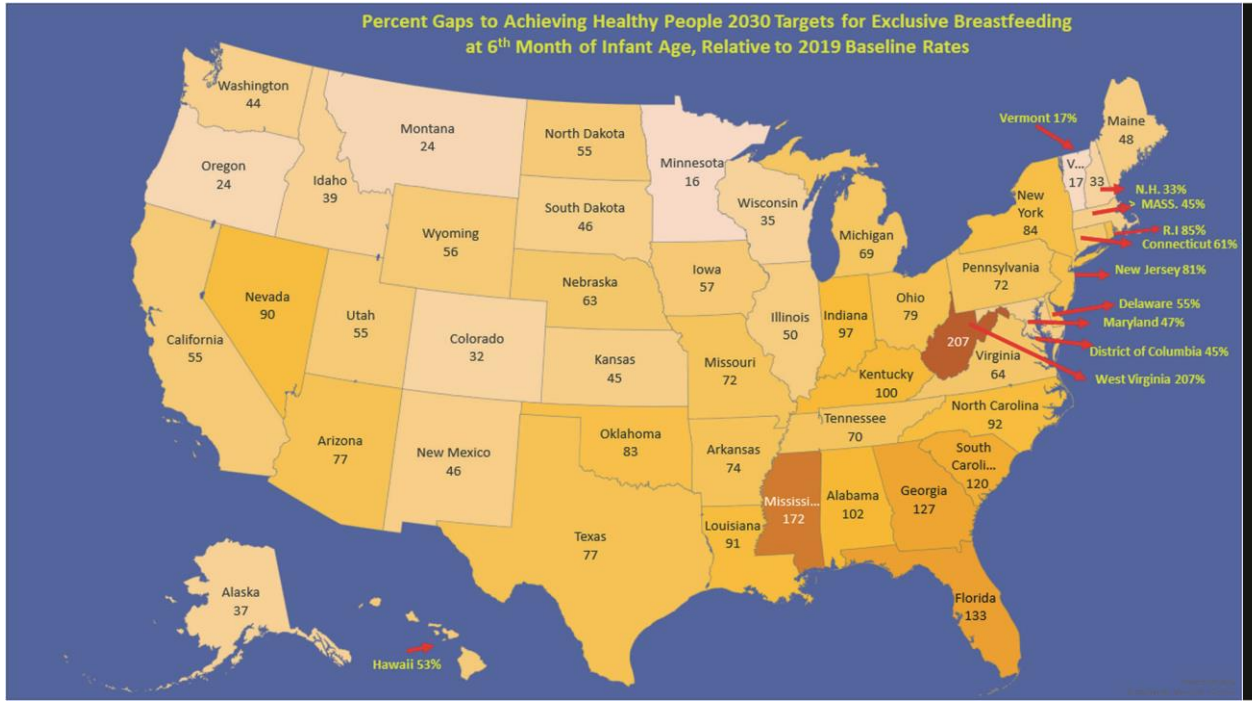
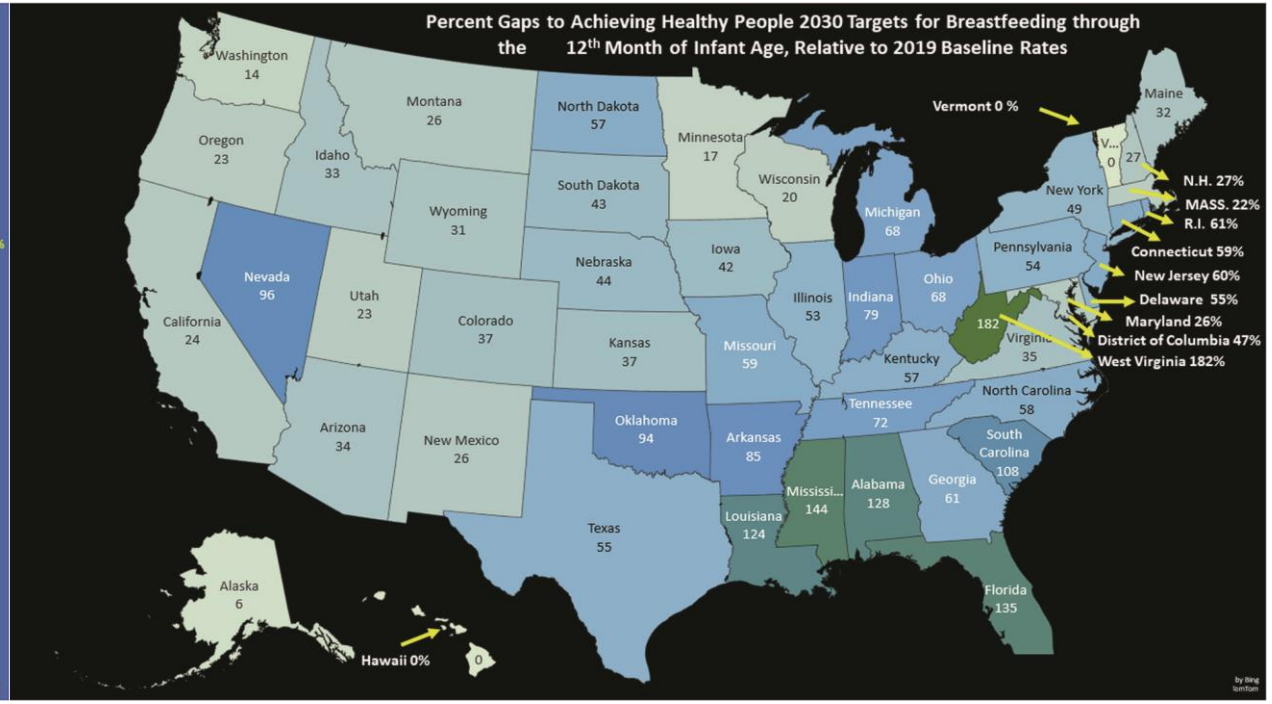
The Healthy People 2030 (HP2030) goals to increase

- Exclusively breastfeed through 6 months from 24% to 42%
- Continue breastfeeding through 12 months from 43% to 54%





Raju T. *J Perinatol* 2022

Racial/Ethnic Disparities in NICU MOM

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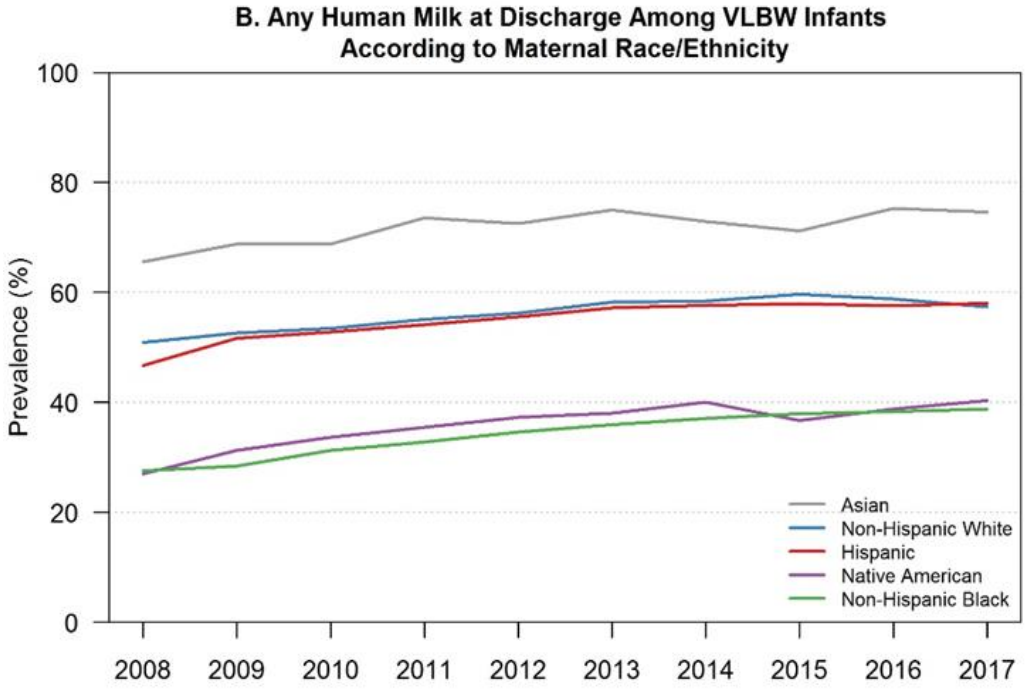

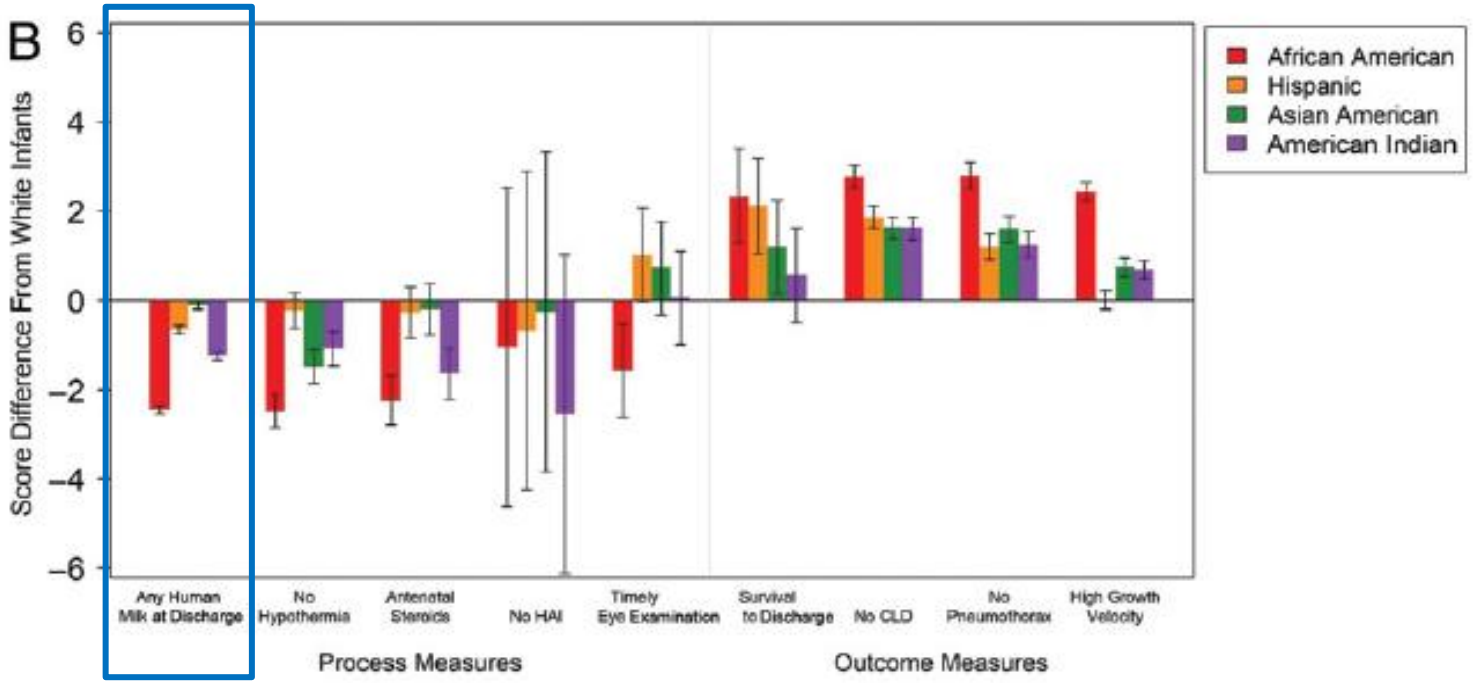

Parker MG et al. VON data. *JAMA Pediatrics* 2019
Edwards EM et al. VON data 2015-19. *Pediatrics* 2021

Quality of Care in US NICUs by Race and Ethnicity

Erika M. Edwards, PhD, MPH,[a,b,c] Lucy T. Greenberg, MS,[a] Jochen Profit, MD, MPH,[d,e] David Draper, PhD,[f] Daniel Helkey, MS,[d] Jeffrey D. Horbar, MD,[a,b]

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TABLE 3 Baby-MONITOR Measure Scores by Race and Ethnicity Compared With White Infants

	Race/Ethnicity Overall Compared With White Infants		Race/Ethnicity Within NICU Compared With White Infants in the Same NICU	
Measure and Race and Ethnicity	No. Infants	Baby-MONITOR Score (99% CI)	No. NICUs	Mean Baby-MONITOR Score (99% CI)
Any human milk at discharge				
African American	48801	−2.4 (−2.5 to −2.3)	707	−1.03 (−1.16 to −0.89)
Hispanic	29760	−0.6 (−0.7 to −0.5)	711	−0.25 (−0.37 to −0.14)
Asian American	8434	−0.1 (−0.2 to 0.0)	642	−0.10 (−0.21 to 0.02)
American Indian	1326	−1.2 (−1.3 to −1.1)	233	−0.77 (−1.03 to −0.5)

Edwards EM et al. VON data 2015-19. *Pediatrics* 2021

MOM after NICU Discharge

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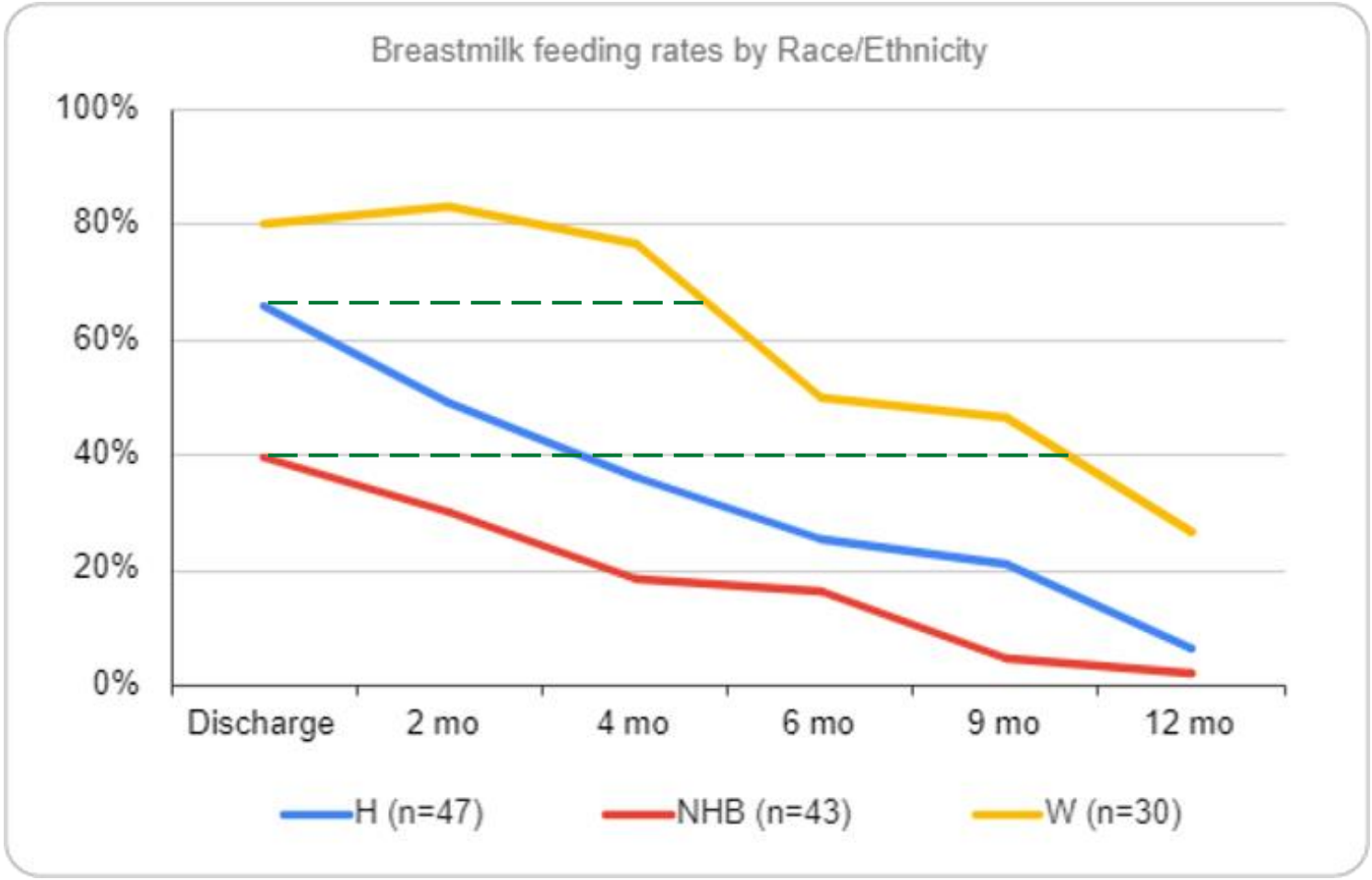
- Retrospective cohort
- Preterm infants (GA <37 weeks) born in 2018-2019
- Followed with a pediatrician at our academic medical center after NICU discharge
- Feeding history collected at routine visits (newborn, and 2, 4, 6, 9 and 12 months)
- 120 infants completed all visits through 12 months



Unpublished Data
Larsen N et al, under review

Factors mediating racial/ethnic disparities in mother's own milk feedings

Socioecological Model

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Series

Breastfeeding 1

Breastfeeding: crucially important, but increasingly challenged in a market-driven world

Rafael Pérez-Escamilla, Cecília Tomori, Sonia Hernández-Cordero, Phillip Baker, Aluisio J D Barros, France Bégin, Donna J Chapman, Laurence M Grummer-Strawn, David McCoy, Purnima Menon, Paulo Augusto Ribeiro Neves, Ellen Piwoz, Nigel Rollins, Cesar G Victora, Linda Richter, on behalf of the 2023 Lancet Breastfeeding Series Group*

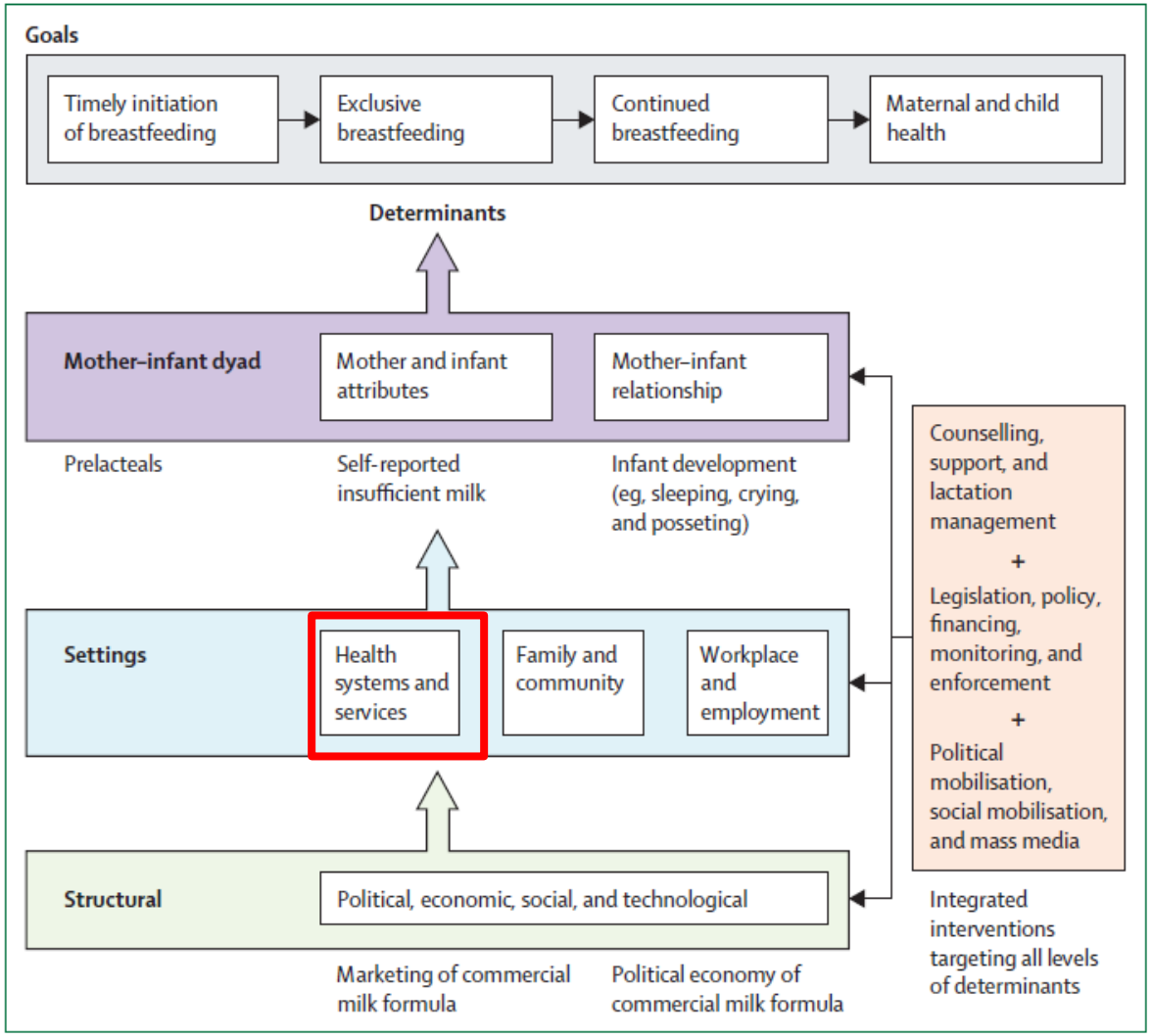

Figure 1: The 2023 *Lancet* breastfeeding Series framework

Pérez-Escamilla R et al. *Lancet* 2023

Barriers Faced by Mothers in the NICU

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Delayed Lactogenesis

- Premature delivery
- Cesarean delivery
- Maternal blood loss
- High BMI
- Diabetes mellitus
- Maternal hypertension
- Prolonged bedrest
- Duration and stress of labor

Other Barriers

- Mother-infant separation
- Stress associated with NICU
- Lack of skin to skin (STS)
- Breast pump dependence
- Cost or lack of equipment
- Lack of training/ availability of hospital providers
- Maternal health issues
- Limited maternity leave
- Transportation issues
- Competing responsibilities
- Lack of knowledge
- Lack of family support
- Embarrassment

Nommsen-Rivers et al. *Am J Clin Nutr* 2010
Hurst. *J Midwifery and Women's Health* 2007
Marshall et al. *J Clin Endocri & Metab* 2010
Hernandez et al., *PLoS ONE* 2012
Parker and Patel. *Sem Perinatol* 2017

LOVE MOM Cohort:

Large disparity in MOM at NICU discharge

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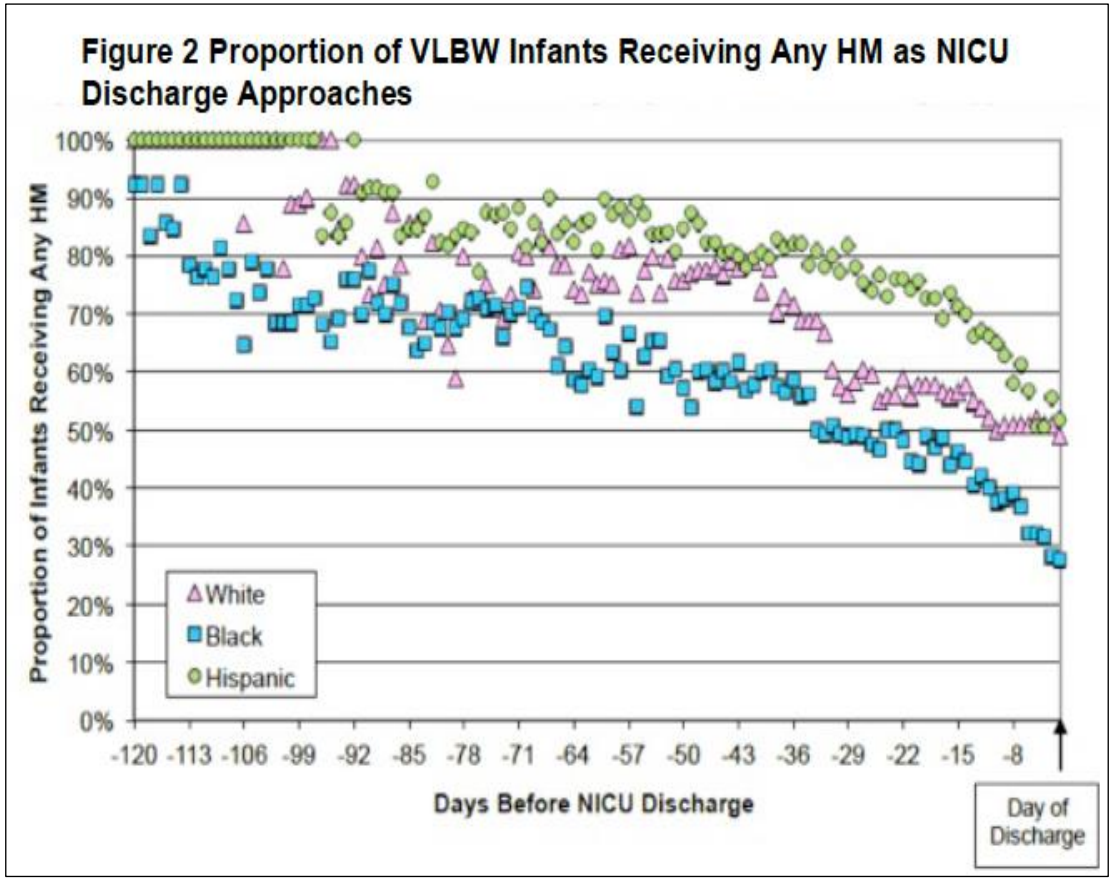

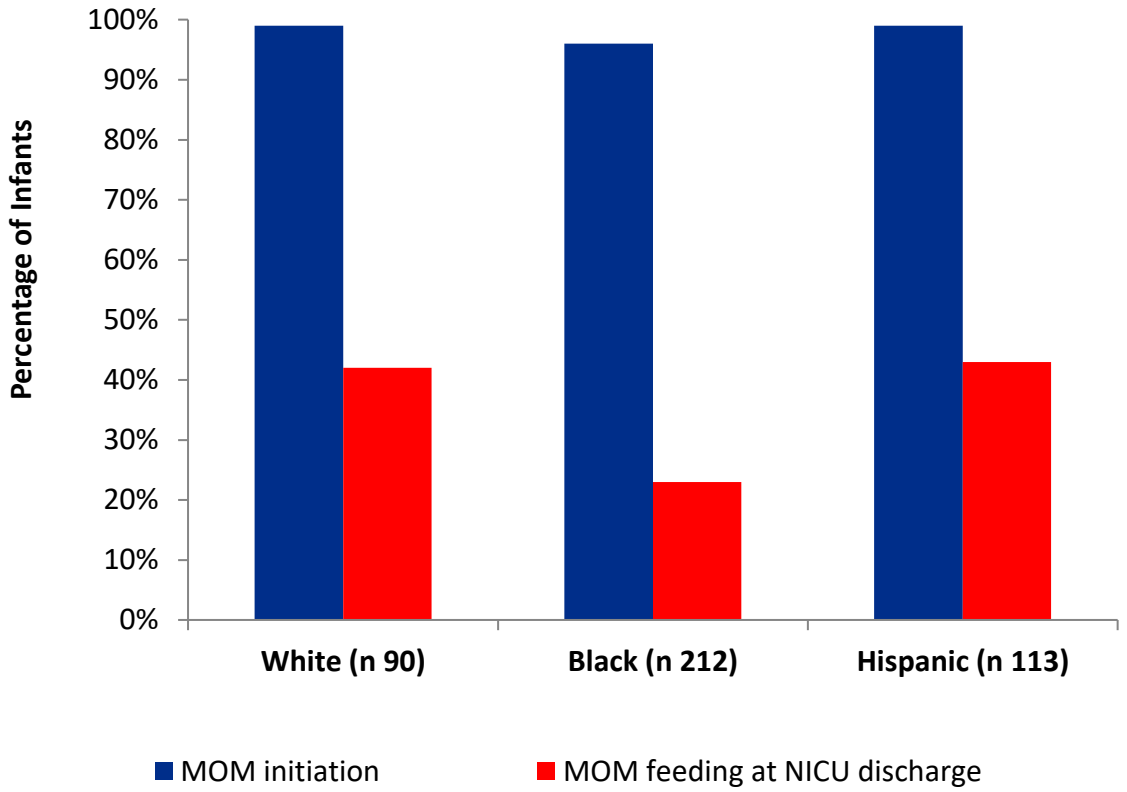

Bigger et al. J Perinatol 2014
Patel AL et al. *Pediatr Res* 2019

Conceptual Model

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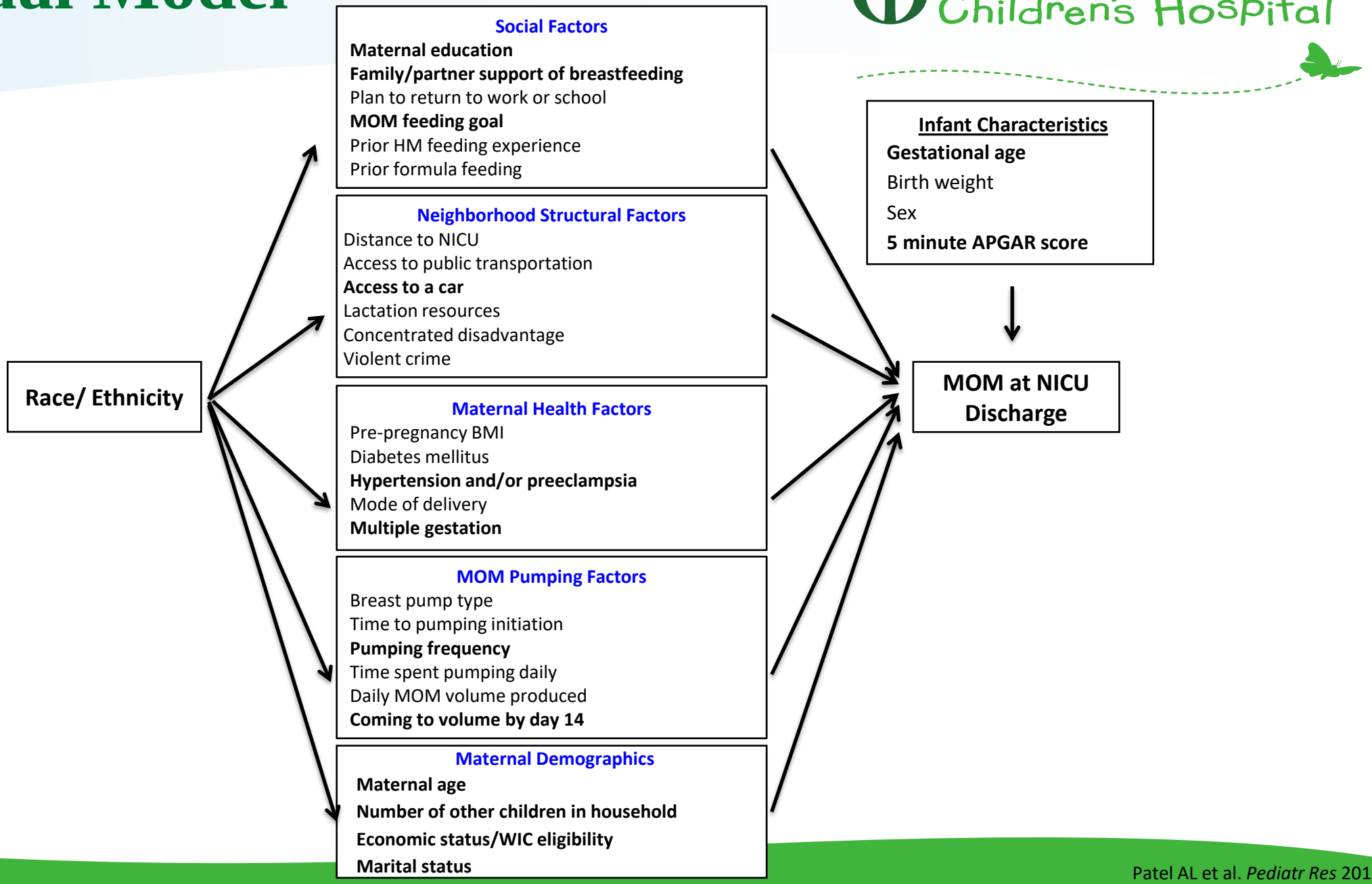

Patel AL et al. *Pediatr Res* 2019

MOM at NICU Discharge

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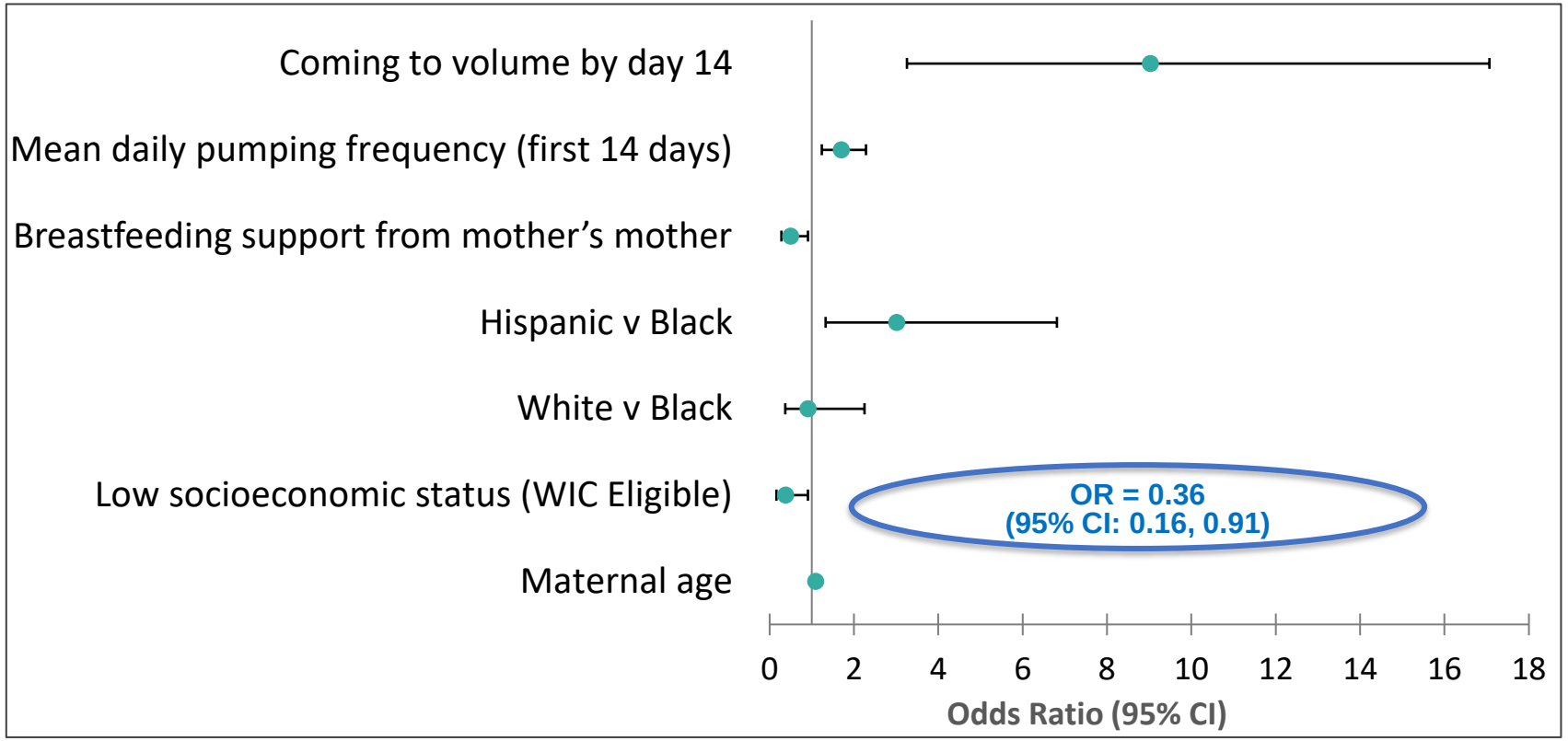
Pediatric RESEARCH www.nature.com/pr

CLINICAL RESEARCH ARTICLE

Mediators of racial and ethnic disparity in mother's own milk feeding in very low birth weight infants

Aloka L. Patel[1], Michael E. Schoeny[2], Rebecca Hoban[3], Tricia J. Johnson[4], Harold Bigger[1], Janet L. Engstrom[2], Erin Fleurant[5], Brittany Riley[6] and Paula P. Meier[1]



White vs. Black mothers

- maternal age
- low SES
- daily pumping frequency

Hispanic vs. Black mothers

- maternal age
- daily pumping frequency

Patel AL et al. *Pediatr Res* 2019

Impact of DM on MOM

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Review

2016

international lactation consultant association

Journal of Human Lactation
1–9
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Use of Donor Human Milk and Maternal Breastfeeding Rates: A Systematic Review

Thomas Williams, MRCPCH[1], Harish Nair, MD, PhD[2], Judith Simpson, MD[3], and Nicholas Embleton, MD[4]

The Effect of a Donor Milk Policy on the Diet of Very Low Birth Weight Infants

Journal of Human Lactation
2014, Vol. 30(3) 310–316
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2013

Kathleen A. Marinelli, MD, IBCLC[1,2,3], Mary M. Lussier, BSN, IBCLC[1,2], Elizabeth Brownell, PhD, MA[1,2,3], Victor C. Herson, MD[1,2,3], and James I. Hagadorn, MD, MS[1,2,3]

Journal of Paediatrics and Child Health

doi:10.1111/jpc.14062

ORIGINAL ARTICLE

2018

Factors associated with infants receiving their mother's own breast milk on discharge from hospital in a unit where pasteurised donor human milk is available

Didier Tshamala,[1] Anita Pelecanos[2] and Mark W Davies[3]

[1]Neonatal Intensive Care Unit, Mater Mother's Newborn Care Services, Mater Mothers' Hospital, [2]Statistics Unit, Queensland Institute of Medical Research

2016

Impact of Donor Milk Availability on Breast Milk Use and Necrotizing Enterocolitis Rates

Agata Kantorowska, BS,[a] Julia C. Wei, MPH,[b] Ronald S. Cohen, MD,[c] Ruth A. Lawrence, MD,[d] Jeffrey B. Gould, MD,[c,e] Henry C. Lee, MD, MS[c,e]

THE JOURNAL OF PEDIATRICS • www.jpeds.com ORIGINAL ARTICLES

2019

Consumption of Mother's Own Milk by Infants Born Extremely Preterm Following Implementation of a Donor Human Milk Program: A Retrospective Cohort Study

Leslie A. Parker, PhD[1], Nicole Cacho, DO, MPH[2], Clara Engelmann, MHA[3], Jaime Benedict, BSN[4], Susan Wymer, MSN[1], Weaver Michael, PhD[1], and Josef Neu, MD[2]

Alyahya et al. International Breastfeeding Journal (2019) 14:39
https://doi.org/10.1186/s13006-019-0233-x

2019

International Breastfeeding Journal

RESEARCH Open Access

Donated human milk use and subsequent feeding pattern in neonatal units

Wesam Alyahya[1*], Debbie Barnett[2], Andrew Cooper[2], Ada L. Garcia[1], Christine A. Edwards[1], David Young[3] and Judith H. Simpson[2]

Impact of DM on MOM

BREASTFEEDING MEDICINE
Volume XX, Number XX, 2020
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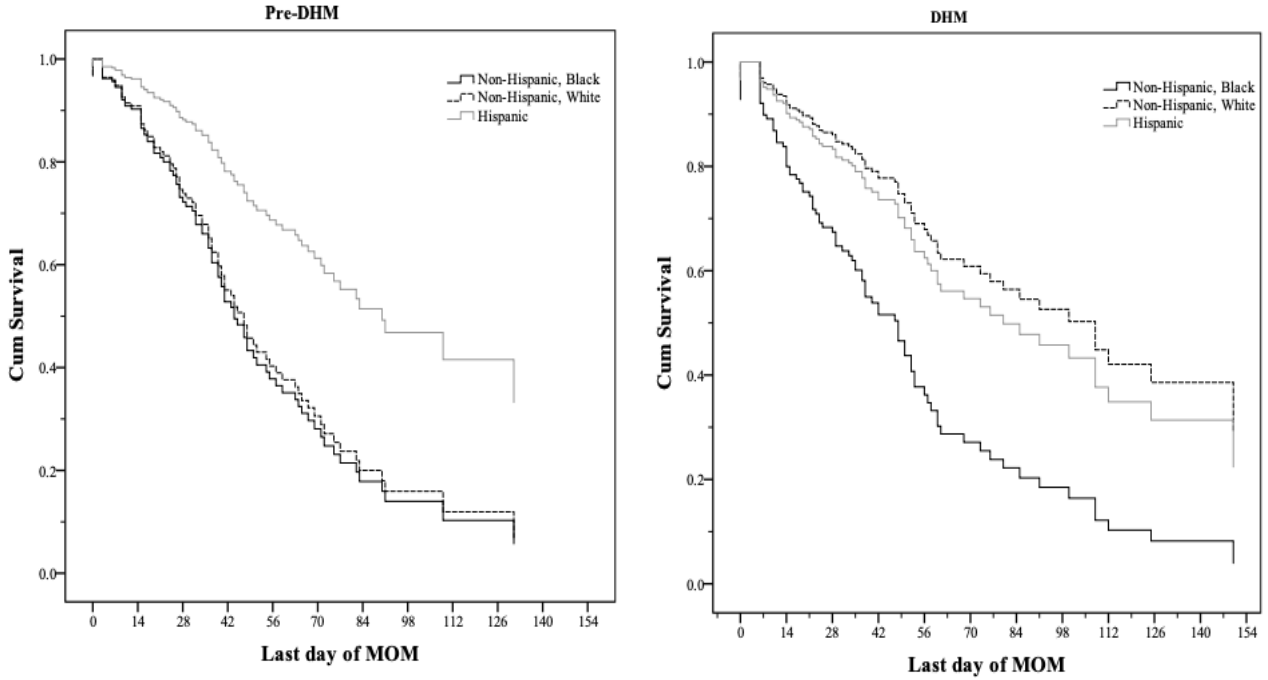
DOI: 10.1089/bfm.2020.0212

The Interaction of Donor Human Milk Availability and Race/Ethnicity on Provision of Mother's Own Milk for Very Low Birth Weight Infants

Anita Esquerra-Zwiers,[1,2] Michael E. Schoeny,[2] Janet Engstrom,[2] Jennifer Wicks,[3] Jennifer Szotek,[4] Paula Meier,[2,5] and Aloka L. Patel[5]

- Retrospective study of 313 VLBW infants (2011-2015)
- 57% non-Hispanic Black, 22% Hispanic, 21% non-Hispanic White

	Pre-DHM	DHM
First feeding type = MOM*	89%	75%
Exclusive MOM DOL 1-14*	68%	55%
Feedings initiated ≤ 3 d*	55%	72%
Any Formula*	82%	69%
Any MOM at Discharge	41%	44%
Last day MOM	43	42.5



Esquerra-Zwiers et al. *Breastfeed Med* 2020

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Potential strategies to increase mother's own milk feedings

NICU Lactation Strategies

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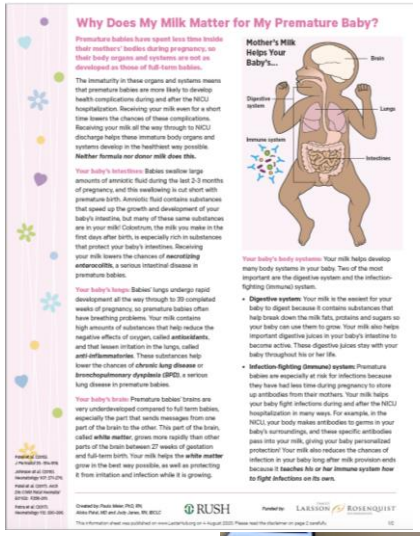
- Parent education – prenatally and postnatally
- Staff education
- Access to NICU-specific and culturally adapted lactation expertise
- Early milk expression
- Frequent pumping +/- hand expression
- Monitoring milk volumes during the first 14 days postpartum to achieve at least 500ml/day (coming to volume)
- Skin-to-skin (STS)
- Successful transition to direct breastfeeding



Mago-Shah et al. *J Perinatol* 2023; Hoban R et al. *Semin Perinatol* 2021; Parker and Patel. *Sem Perinatol* 2017; Hoban R et al. *Breastfeed Med* 2018; Gharib et al 2018; Meier et al. *J Perinatol* 2016; Meier et al. *Clin Perinatol* 2016; Bixby C et al. *Breastfeed Me*d 2016; Dereddy et al. *J Human Lact* 2015; Colaizy et al, 2008; Lee HC et al. *Pediatric*s 2012; Parker et al. *J Hum Lac*t 2016; Sisk et al. *Pediatric*s 2006; Philipp et al. *J Perinat* 2000
https://lactahub.org/nicu-training/ http://www.neoqic.org/humanmilk/human-milk-educational-materials

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Who bears the cost of feedings?

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Mother's Own Milk

Mother
$12.35 / 100 mL

Donor Milk

NICU
$21.18 / 100 mL

Johnson et al, *J Peds* 2020

Breastfeeding is not free!

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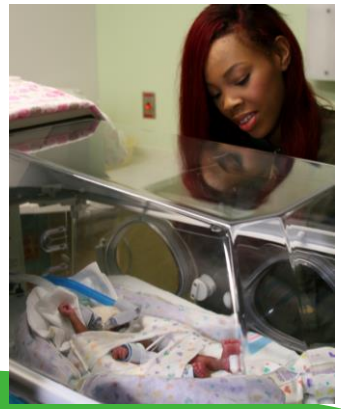
Benefits

1. Reduced incidence of neonatal morbidities
2. Reduced incidence of childhood health conditions
3. Reduced incidence of maternal diseases
4. Improvement in neurodevelopment
5. Reduction in infant mortality
6. Avoidance of costly healthcare services
7. Reduction in healthcare costs

Costs

1. Access to evidence-based lactation care
2. "Opportunity costs" of breastfeeding in terms of mother's own time
3. Breastfeeding supplies
4. Employer and government policies to support breastfeeding



Are cash transfers one approach for mitigating economic barriers?

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Unconditional Cash Transfers	Conditional Cash Transfers
Payments or financial transfers made without any expectation beyond eligibility Temporary Assistance for Needy Families (TANF), Medicaid	Payments or financial transfers made in return for fulfilling specific behavioral conditions Have been used to increase children's school attendance, childhood vaccinations and adherence to prenatal visits

World Health Organization, 2008

Are conditional cash transfers one approach for mitigating economic barriers?

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Conditional cash transfers are being used across the world to increase preventive health, including breastfeeding rates

Research on incentives to increase breastfeeding in term infants suggests

- Mothers value cash or cash equivalents more than other financial incentives such as grocery vouchers or baby supplies
- Healthcare providers are generally positive but caution about choosing the proper incentive and monitoring that its use did not impact other family or provider relationships

World Health Organization, 2008

Financial incentives for breastfeeding: Nourishing Start for Health (NOSH)

BMJ Open

Cluster randomised controlled trial of a financial incentive for mothers to improve breast feeding in areas with low breastfeeding rates: the NOSH study protocol

Clare Relton,[1] Mark Strong,[2] Mary J Renfrew,[3] Kate Thomas,[2] Julia Burrows,[2] Barbara Whelan,[1] Heather M Whitford,[3] Elaine Scott,[1] Julia Fox-Rushby,[4] Nana Anoyke,[4] Sabina Sanghera,[4] Maxine Johnson,[1] Easton Sue,[1] Stephen Walters[2]

Goal: increase breastfeeding prevalence and duration in wards with low breastfeeding rates in the UK

Financial incentive: shopping vouchers of £40 over 6 months: 2 days, 10 days, 6 weeks, 3 months, 6 months

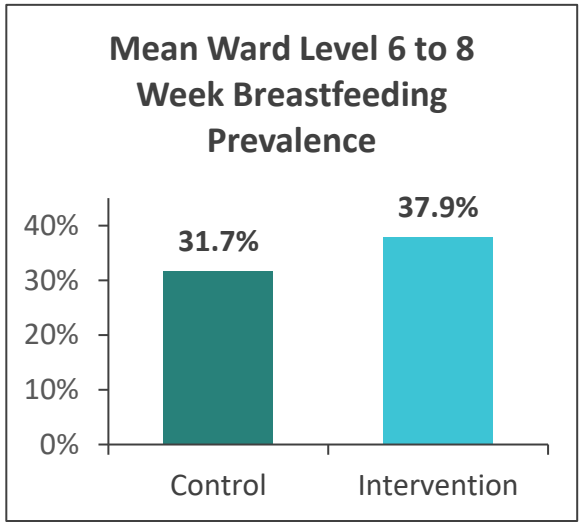
Comparison: Usual care following Baby Friendly standards

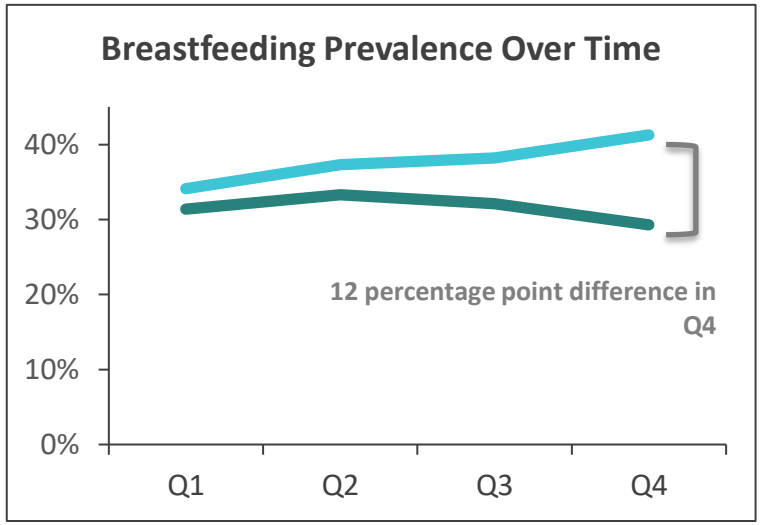
Conditionality: baby receiving breast milk

Evidence: woman's signed claim form

April 2015 – March 2016

N = 10,010 mother-infant dyads





5.7 percentage point different in breastfeeding prevalence after adjusting for baseline rates and ward

Relton C et al, *BMJ Open* 2016;
Relton C et al, *JAMA Pediatr* 2018

Financial incentives for breastfeeding: Pilot study of low-income Puerto Rican mothers

Incentive-based Intervention to Maintain Breastfeeding Among Low-income Puerto Rican Mothers

Yukiko Washio, PhD,[a] Mara Humphreys, MEd,[b] Elisa Colchado, MEd,[b] Maria Sierra-Ortiz, MSW,[c] Zugui Zhang, PhD,[a] Bradley N. Collins, PhD,[d] Linda M. Kilby, PhD, RD, LDN,[e] Donna J. Chapman, PhD, RD,[f]
Stephan T. Higgins, PhD,[g] Kimberly C. Kirby, PhD[h,i]

Goal: increase breastfeeding prevalence among Puerto Rican mothers receiving WIC in Philadephia

Financial incentive: monthly payment that increased by $10 each month ($20, $30,… $70) for a maximum of $270

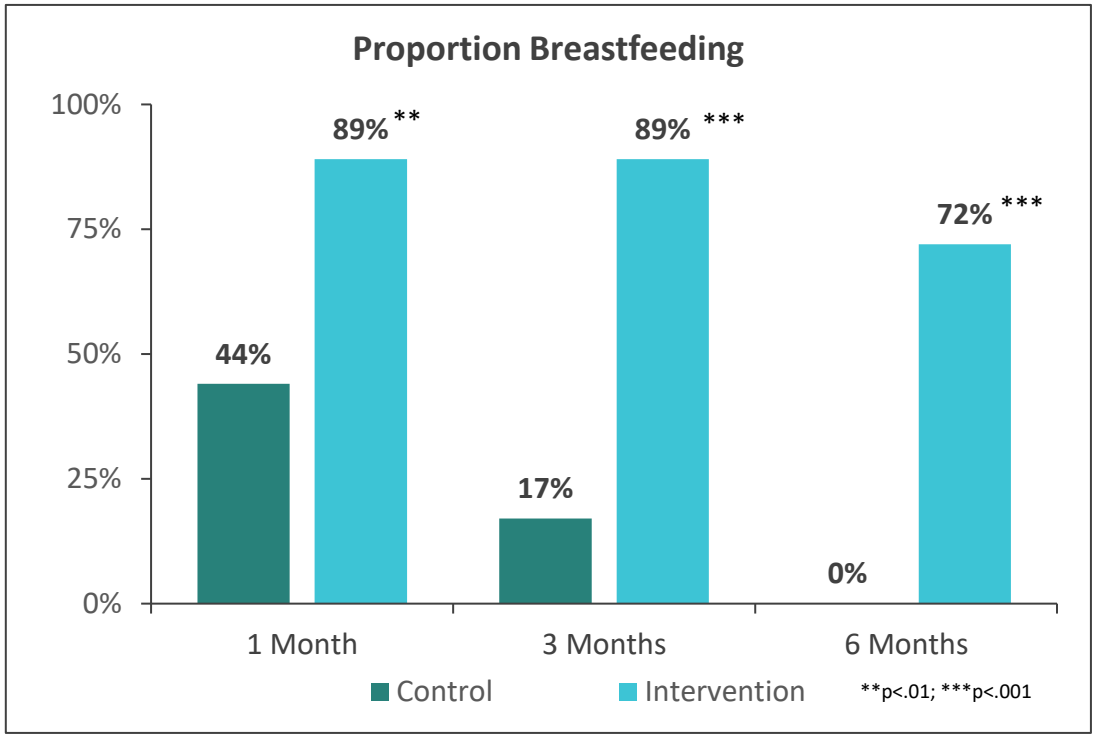
Comparison: WIC only versus WIC plus financial incentive

Conditionality: continued breastfeeding

Evidence: demonstrated breastfeeding at visit

Feb 2015 – Feb 2016

N = 36 mothers



Washio et al, *Pediatrics* 2017

Financial incentives for breastfeeding: BOOST (Breastfeeding Onset & Onward with Support Tools) randomized trial

BMJ Open

Individual breastfeeding support with contingent incentives for low-income mothers in the USA: the 'BOOST (Breastfeeding Onset & Onward with Support Tools)' randomised controlled trial protocol

Yukiko Washio [1], Bradley N Collins,[2] Alison Hunt-Johnson,[2] Zugui Zhang,[3] Gail Herrine,[4] Matthew Hoffman,[5] Linda Kilby,[6] Donna Chapman,[7] Lydia M Furman[8]

Goal: assess monthly financial incentives contingent on observed breastfeeding for 6 months postpartum among WIC-enrolled mothers on breastfeeding rates over 12 months in two cities (Philadelphia, Newark)

Financial incentive: monthly payment plus bonus incentive

Comparison:

standard care control (WIC + home-based intervention support)

versus

standard care + financial incentive

Conditionality: continued breastfeeding

Evidence: demonstrated breastfeeding at each home visit

June 2019 – April 2023

N = 168 mothers

Financial incentive

- $20 at month 1, with payments escalating by $10 through month 6 ($20, $30, … $70)
- Bonus incentive of $50 at baseline, 3 and 6 months → contingent on selecting full WIC breastfeeding food package

Control group receives lump-sump payment at end of 6 months based on number of completed home visits

Washio et al, *BMJ Open*, 2020

ReDiMOM Trial

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- Randomized controlled trial to test an intervention designed to remove economic barriers to breastmilk provision during the infant's NICU stay
- Mothers and their preterm infants (<32 weeks gestational age) randomized to one of two arms:

1 Mother Provides MOM

Standard NICU Lactation Care

OR

2 NICU Acquires MOM

STUDY PROTOCOL Open Access

Study protocol for reducing disparity in receipt of mother's own milk in very low birth weight infants (ReDiMOM): a randomized trial to improve adherence to sustained maternal breast pump use

Tricia J. Johnson[1*], Paula P. Meier[2,3], Michael E. Schoeny[4], Amelia Bucek[2], Judy E. Janes[2], Jesse J. Kwiek[5], John A. F. Zupancic[6,7], Sarah A. Keim[8,9,10] and Aloka L. Patel[2]

Johnson et al, B*MC Pediatrics* 2022

NIH National Institute on Minority Health and Health Disparities NIMHD

ReDiMOM Trial

Aim 1: Compare infant and maternal MOM outcomes for **NICU acquires MOM** versus **mother provides MOM**

- Receipt of MOM at NICU discharge

Aim 2: Describe and compare the cost of NICU acquires MOM versus NICU acquires donor human milk as supplemental feedings

Aim 3: Compare the cost-effectiveness of **NICU acquires MOM** versus **mother provides MOM** for the infant and maternal outcomes

SUB-STUDIES

Maternal Matriarchs Qualitative Sub-Study (Dr. Devane-Johnson)

Family structure (Dr. Leslie Harris)

Pumping patterns (Amelia Tan - student volunteer)

Family out of pocket costs

Johnson TJ et al, *BMC Pediatrics* 2022

Design of conditional cash transfer

1. Near real-time opportunity cost payment via HIPAA compliant debit card
2. Opportunity cost payment tied to the Illinois minimum wage rate ($14 in 2024; increasing annually by $1 to max of $15 in 2025)
3. Opportunity cost payment tied to the average time spent pumping by mothers of preterm infants (2 hours/day)
4. Validation of pumping collected via SMART breast pump

Up to $96 per week

- For average 73-day NICU stay, maximum of **$2044**
- Maximum transfer amount/week equivalent to 35% increase in monthly income for family of 3 at the federal poverty level

Data Collection

Electronic Medical Record
REDCap Questionnaires
Smart Pump
Laboratory Analysis
Financial Records
Qualitative interviews

Maternal

- Health and lactation history
- Work and economic history
- Pump log
- Visitation
- Lactation practices
- COVID-19 experiences
- Stress
- Work, opportunity and out-of-pocket costs
- Serial milk samples

Infant

- Medical information/outcomes
- Cost of care

Intervention

- Smart pump electronic data
- Opportunity cost payments
- Intervention perceptions

ReDiMOM Follow-up Study

Prospective cohort study that leverages the ReDiMOM RCT to assess outcomes through 20 months' corrected age (CA) in the Neonatal High Risk Follow-Up Clinic

Aim 1: Determine the effect of RCT treatment group on early childhood outcomes:

- Neurodevelopment
- Adiposity
- Duration of MOM feedings over the first year of life
- Total cost of care and cost-effectiveness

Aim 2: Determine the association between the total number of days MOM is received in the first year of life and early childhood outcomes

NIH Eunice Kennedy Shriver National Institute of Child Health and Human Development

ReDiMOM 6-Year Pilot Study

RUSH UNIVERSITY Children's Hospital

Aim 1: Determine the effect of ReDiMOM on childhood (6 yr) outcomes:

- Neurodevelopment
- Behavior
- Health (growth, adiposity, BP, hospitalizations)
- Quality of life
- Costs

Aim 2: Determine the association between the dose of MOM received and childhood outcomes

Childhood Education: Mammals and Milk

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Objective: To provide breastmilk feeding education to potentially help future generations realize breastmilk feeding is the norm for all mammals, including humans, and help reduce racial and ethnic disparities in breastmilk provision.

RUSH EDUCATION and CAREER HUB

Chicago Public School: Pickard Elementary

Conclusions

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- The breastfeeding gap between Black and White infants in the US may be increasing
- The majority of NICUs still encounter racial/ethnic disparities in maintenance of lactation with fewer Black infants receiving MOM at NICU discharge
- Breastfeeding is not free
  - The cost is borne by the parent providing milk
  - Magnified for parents of infants in the NICU and/or low-income parents
- Conditional cash transfers are being tested worldwide, in term and preterm infants, in community and in hospital settings
- Qualitative studies are necessary to better understand mothers' experiences in providing MOM
- Our efforts should focus on supporting MOM and breastfeeding broadly, without which DHM will not be available as a second option
- We need innovative strategies that address structural and socioeconomic barriers
- We need cost-effectiveness analyses (short- and long-term) to facilitate translation into policy and practice

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LOVE MOM Cohort Study
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Briana Jegier, PhD, MS-HSM
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Beverley Robin, MD

2021 John C. Searle Innovator Award The Rush

Thank you to the infants and their parents who participated in our studies!

Thank you

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