

Yale SCHOOL OF MEDICINE | Yale
NewHaven
Health
Yale New Haven
Children's Hospital

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

Sarah N. Taylor, MD, MSCR

1

Disclosures

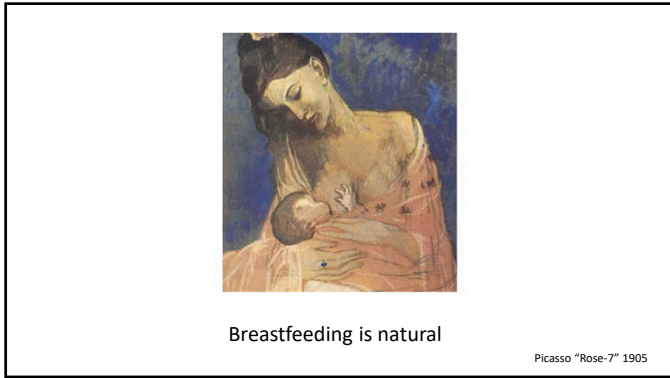
Required disclosures	Commercial Interests
Consultant	Baxter

2

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.

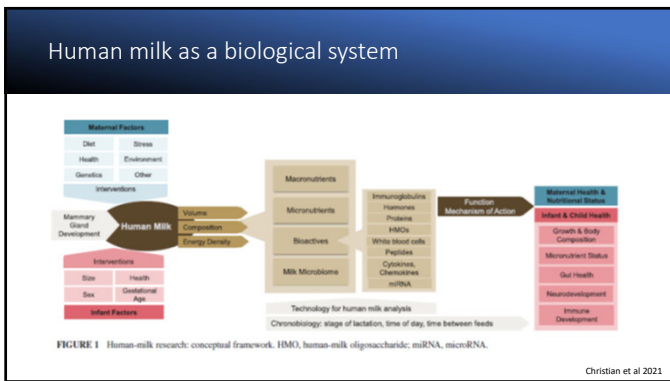
3



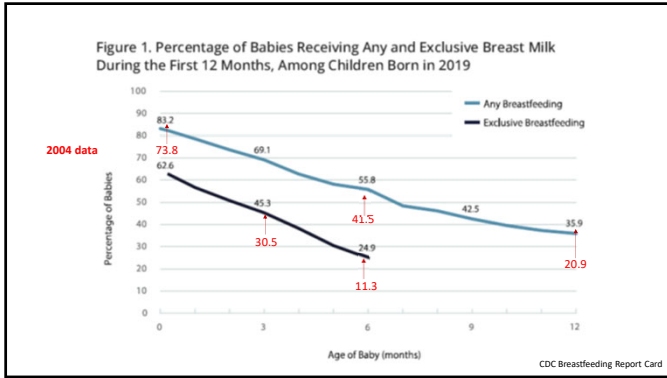
4



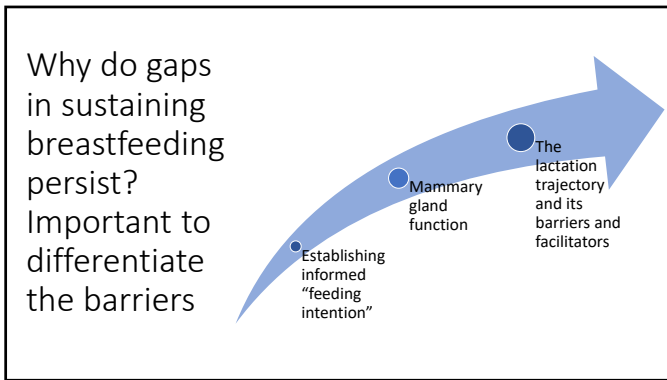
5



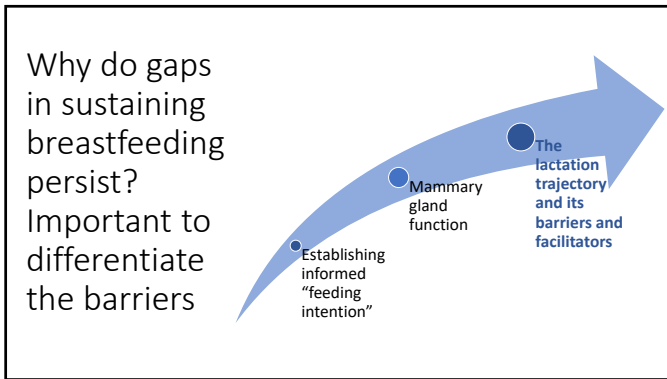
6



7




8



9

What are the barriers during the birth hospitalization?

What are the barriers through the first year?



10

Baby Friendly Hospital Initiative

World Health Organization

- 10 Steps
- Prenatal, Perinatal, Postnatal interventions



11

Baby Friendly Hospital Initiative

	Early initiation of breastfeeding (within 1 h of birth)	Exclusive breastfeeding for 0-5 months	Continued breastfeeding for 12-23 months	Any breastfeeding up to 6 months
Overall	29 studies RR 1.11 (1.06-1.16)	51 studies RR 1.46 (1.37-1.56)	Eight studies RR 1.18 (1.03-1.35)	47 studies RR 1.44 (1.30-1.57)
Early friendly support	Ten studies RR 1.20 (1.13-1.28)	15 studies RR 1.43 (1.33-1.64)	Three studies RR 1.26 (0.96-1.64)	13 studies RR 1.66 (1.34-2.07)
Counselling* or education	Two studies RR 1.12 (1.05-1.19)	Three studies RR 1.66 (1.43-1.92)	Five studies RR 1.15 (0.99-1.35)	Five studies RR 1.47 (1.29-1.68)
Special training of health staff	Three studies RR 1.09 (1.01-1.18)	Five studies RR 1.35 (1.14-1.63)	No studies	Five studies RR 1.33 (1.07-1.67)

Robins NC et al 2016; Sinha B et al 2015

12

Breastfeeding outcomes related to postnatal hypoglycemia and NICU admission

Variable	No diabetes (n=29)	Diabetes (n=25)	p
Infant sex, n (%)			0.41
Male	8 (27.6)	11 (39.3)	
Female	21 (72.4)	17 (60.7)	
Mode of delivery, n (%)			0.42
Vaginal	15 (51.7)	18 (64.3)	
C-section	14 (48.3)	10 (35.7)	
NICU admission, n (%)			0.05*
Yes	2 (6.9)	9 (32.1)	
No	27 (93.1)	19 (67.9)	
Infant hypoglycemia, n (%)			0.002
Yes	2 (6.9)	12 (42.9)	
No	27 (93.1)	16 (57.1)	
Infant gestational age, mean (SD)	38.3 (1.0)	38.3 (1.1)	0.87
Infant birth weight (g), mean (SD)	3152.6 (471.8)	3382.3 (526.7)	0.08

Variable	EBF (n=57)	p	Met intention to EBF (n=57)	p	Met intention for any BF (n=57)	p
Maternal diabetes status, n (%)						
Diabetes	3 (10.7)	0.01	3 (11.6)	<0.001	3 (11.1)	0.002
No diabetes	12 (41.4)		11 (37.3)		12 (39.0)	
Race/ethnicity, n (%)		1.00*		1.00*		1.00*
Non-Hispanic White	6 (23.0)		6 (33.3)		6 (27.3)	
Non-Hispanic Black	5 (26.3)		4 (40.0)		5 (29.4)	
Hispanic	1 (5.0)		1 (4.7)		1 (5.3)	
Other	1 (2.0)		1 (3.3)		1 (3.3)	
Parity, n (%)		0.80		0.90		0.97
Multiparous	8 (29.6)		7 (36.8)		8 (39.6)	
Primiparous	7 (29.0)		7 (38.9)		7 (29.6)	
Mode of delivery, n (%)		0.16		0.25		0.24
Vaginal	12 (33.3)		10 (45.5)		11 (35.5)	
C-section	4 (16.7)		4 (26.7)		4 (20.0)	
Infant hypoglycemia, n (%)		0.002*		0.002*		0.000*
Yes	0 (0.0)		0 (0.0)		0 (0.0)	
No	15 (54.9)		14 (50.0)		15 (59.5)	
NICU admission, n (%)		0.00*		0.00*		0.02*
Yes	0 (0.0)		0 (0.0)		0 (0.0)	
No	13 (32.6)		14 (47.2)		13 (36.6)	

Doughty et al 2022

Yale School of Medicine | Yale New Haven Health | Yale School of Nursing

19

Women with gestational diabetes

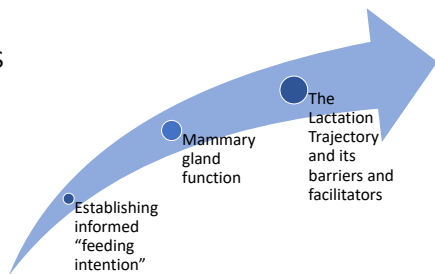
Maternal Biological Factors	Infant Biological Factors	Provider Practices	Breastfeeding Experiences and Support	Cognitive and Social Factors
<ul style="list-style-type: none"> Maternal obesity¹⁰ Delayed onset of lactation¹¹ Pregnancy and birth complications, including cesarean section delivery¹² 	<ul style="list-style-type: none"> Neonatal hypoglycemia^{13, 14} Impaired suck-reflect skills and suckling pattern^{15, 16} 	<ul style="list-style-type: none"> Less perceived support for breastfeeding from mother's physician¹⁷ In longer hospital hospitalization^{18, 19} Less breastfeeding support in the hospital²⁰ Less training in during the hospital stay²¹ 	<ul style="list-style-type: none"> Infant problems with sucking or lack of interest²² Less breastfeeding support from baby's father²³ Less mother breastfeeding in front of husband²⁴ 	<ul style="list-style-type: none"> Reduced breastfeeding self-efficacy²⁵

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.

Doughty and Taylor 2021; Doughty 2022

20

Other barriers to increasing the breastfeeding trajectory



21


TABLE 2. BREASTFEEDING INITIATION BY RACE FOR COMPARED BETWEEN BIRTHS PRE- AND POST-BABY-FRIENDLY HOSPITAL INITIATIVE

Initiation of breastfeeding	Pre-BFHH n = 3079	Post-BFHH n = 3606	Increased likelihood (95% CI)
All mothers	69%	81%	1.17 (1.13-1.19)
Black mothers	52%	66%	1.27 (1.19-1.35)
Non-Black mothers	81%	90%	1.1 (1.07-1.13)

CI, confidence interval.

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

In a referral center Baby Friendly Hospital,



Hemingway et al 2020

22

TABLE 2. BREASTFEEDING INITIATION BY RACE FOR COMPARED BETWEEN BIRTHS PRE- AND POST-BABY-FRIENDLY HOSPITAL INITIATIVE


Initiation of breastfeeding	Pre-BFHH n = 3079	Post-BFHH n = 3606	Increased likelihood (95% CI)
All mothers	69%	81%	1.17 (1.13-1.19)
Black mothers	52%	66%	1.27 (1.19-1.35)
Non-Black mothers	81%	90%	1.1 (1.07-1.13)

CI, confidence interval.

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

In a referral center Baby Friendly Hospital,

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).



Hemingway et al 2020


23

Northeastern academic hospital

Odds of exclusive breastfeeding between Non-Hispanic White and other racial/ethnic groups

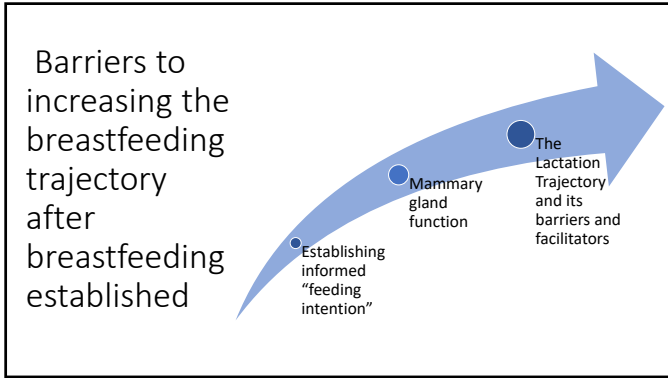
Race	ODDS RATIO	Pr<z
NHB	0.482 (0.380-0.613)	<0.0001
HW	0.474 (0.341-0.661)	<0.0001
HB	0.706 (0.327-1.524)	0.3751
AS	0.381 (0.296-0.491)	<0.0001
OH	0.379 (0.293-0.488)	<0.0001

NHB- non-Hispanic Black,
HW- Hispanic White,
HB- Hispanic Black,
AS- Asian,
OH-Other Hispanic

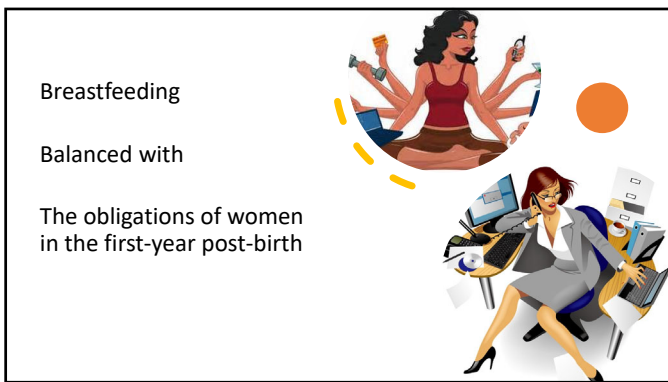


Forson-Dare, unpublished

24



28



29

PERSPECTIVE
No such thing as a free lunch: The direct marginal costs of breastfeeding
Sarah E. Mahoney, Sarah N. Taylor and Howard P. Gardner 2023

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
- Both inside and outside the work force
- Unpaid care work in the U.S. is ~40% of the U.S. Gross Domestic Product (Gibb et al 1999)
- 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)

2023

30

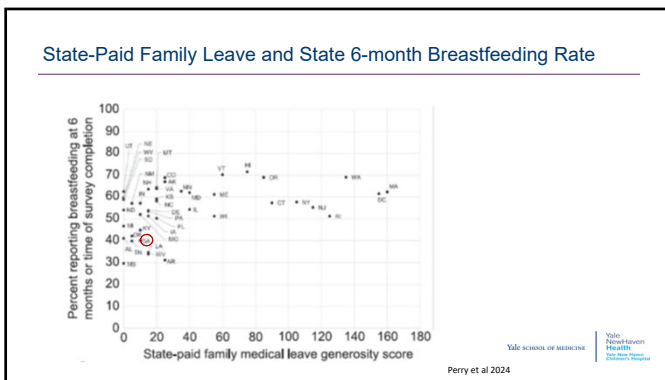
Table 2. Poisson and Logistic Regression Results for the Likelihood of Breastfeeding, Postpartum Depression Symptoms, and Postpartum Visit Attendance*

	Breastfeeding at 6 mo or at time of survey (RR, 95% CI)	Postpartum Depression Symptoms (OR, 95% CI)	Postpartum Visit Attendance (RR, 95% CI)
State paid family leave benef?	Ref	Ref	Ref
Low	1.00 (1.07-1.10)	0.90 (0.83-0.96)	1.01 (1.01-1.02)
Medium	1.09 (1.07-1.11)	0.90 (0.82-0.98)	1.00 (0.99-1.00)
High	Ref	Ref	Ref
Mothers birth year			
2005	1.00 (0.96-1.02)	1.01 (0.94-1.08)	1.01 (1.00-1.01)
2006	1.00 (0.96-1.02)	1.00 (0.93-1.07)	1.01 (1.00-1.02)
2007	1.02 (1.00-1.04)	1.01 (0.93-1.09)	1.01 (1.00-1.02)
Age (y)			
19 or younger	0.81 (0.73-0.87)	1.47 (1.29-1.66)	0.99 (0.97-1.01)
20-24	0.95 (0.93-0.96)	1.24 (1.21-1.28)	0.99 (0.98-1.00)
25-29	Ref	Ref	Ref
30-34	1.01 (1.00-1.03)	0.94 (0.90-1.01)	1.01 (1.00-1.01)
35-39	0.99 (0.96-1.03)	0.90 (0.82-0.98)	1.01 (1.00-1.02)
40-49	0.95 (0.92-0.99)	0.86 (0.77-0.95)	1.00 (0.98-1.01)
Race and ethnicity			
Asian	1.04 (1.02-1.07)	2.12 (1.94-2.31)	1.00 (0.99-1.01)
Hispanic	1.01 (1.00-1.00)	0.95 (0.90-0.92)	1.00 (0.97-0.99)
Non-Hispanic Black	0.87 (0.84-0.89)	1.14 (1.09-1.20)	0.99 (0.98-1.00)
Non-Hispanic White	Ref	Ref	Ref
Marital status			
Married	1.11 (1.08-1.14)	1.21 (1.19-1.24)	0.97 (0.97-0.98)
Never married	1.21 (1.16-1.26)	0.98 (0.91-0.98)	1.00 (0.99-1.02)
Single	1.39 (1.36-1.42)	0.90 (0.83-0.96)	1.02 (1.01-1.03)
Household income (\$)			
20,000 or less	0.81 (0.78-0.84)	1.70 (1.54-1.88)	0.96 (0.94-0.97)
20,001-40,000	0.95 (0.93-0.96)	1.45 (1.32-1.59)	0.99 (0.98-1.00)
40,001-60,000	1.00 (0.97-1.02)	1.29 (1.18-1.42)	1.00 (0.99-1.00)
60,001-80,000	0.97 (0.93-0.99)	0.87 (0.77-1.00)	1.00 (0.99-1.01)
80,001 or more	Ref	Ref	Ref
Educational attainment			
Less than high school	0.81 (0.82-0.87)	1.41 (1.27-1.57)	0.90 (0.88-0.91)
Graduated high school	0.87 (0.82-0.89)	1.11 (1.03-1.19)	0.96 (0.95-0.97)
Some college	0.90 (0.78-0.82)	1.20 (1.10-1.30)	0.93 (0.92-0.99)
Graduated college	Ref	Ref	Ref
Parity			
0	1.02 (1.00-1.03)	1.00 (1.01-1.01)	0.90 (0.90-0.90)
1	1.05 (1.03-1.06)	1.11 (1.03-1.20)	0.96 (0.95-0.97)
2	1.05 (1.07-1.11)	1.03 (0.98-1.09)	0.93 (0.93-0.94)
3 or more	Ref	Ref	Ref
Unintended pregnancy	1.06 (1.03-1.09)	1.04 (0.95-1.13)	0.95 (0.94-0.96)
Delivery covered by Medicaid	0.86 (0.84-0.89)	0.88 (0.79-1.02)	0.97 (0.96-0.99)

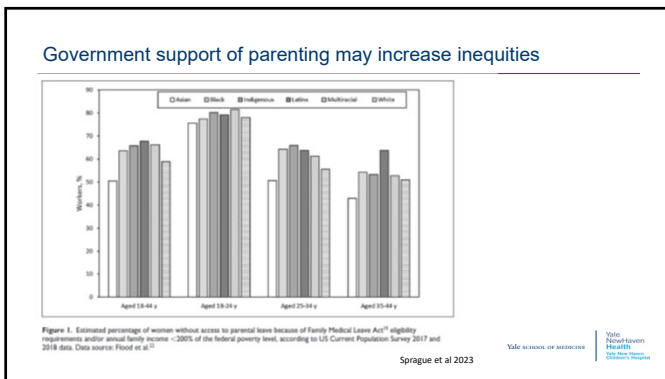
Perry et al 2024

Paid family leave relates to Breastfeeding at 6 months and less Postpartum depression symptoms but no Difference in postpartum visit attendance

34



35



36

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 18 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

Yale SCHOOL OF MEDICINE
 Yale University
 School of Medicine
 333 Cedar Street
 New Haven, CT 06510
 Bettinelli et al 2024

37

Another cost in the U.S.

Annual excess deaths attributable to suboptimal breastfeeding= 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= \$3.0 billion

Bartick et al 2016
 Yale SCHOOL OF MEDICINE
 Yale University
 School of Medicine
 333 Cedar Street
 New Haven, CT 06510

38

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

Yale SCHOOL OF MEDICINE
 Yale University
 School of Medicine
 333 Cedar Street
 New Haven, CT 06510

39

Once example- Decreasing the “cost” for women to obtain lactation support and healthcare



During the pandemic, mobile medical clinic for newborn visits



Leslie Sude

258 women and 260 infants
96% show rate for scheduled visits

Artavia Boone accesses postnatal health care during the pandemic via a NWHF-supported mobile clinic.
Photo Courtesy of Leslie Sude, MD and Angel Ojeda
<https://www.cghn.org/articles/nwhf-partners-with-mobile-medical-unit>

Rosenberg et al 2022



40

Domains of Patient- and Family-Centered Care Achieved

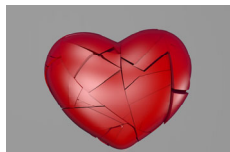


41

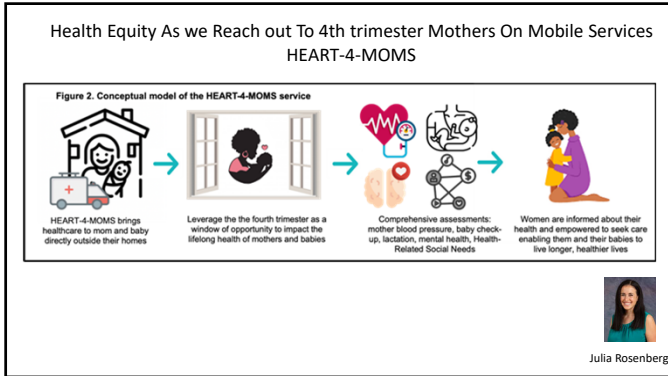
Maternal cardiovascular health

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

Intervention delivered
20% contact with obstetric provider
15% outpatient or ER evaluation
6.1% emergent treatment



42



43

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


Yale School of Medicine | Yale Global Health | The Yale School of Medicine | Children's Hospital

44


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

Investigators: Caty Buck, Veronika Shabanova, Angela Montgomery
Team: Ruthfirst Ayande, Christine Henry, Tessa Kehoe, Terri Motraghi, Taryn Donovan, Dina Pasacretra, James Lawrence, Ellery Neiderer, Ambika Bhatnager, Justyna Breuler, Gabi Wiggill, Inumidun Oyeboode

Collaborators:
Liza Konnikova and Bunmi Olatoye (Yale)
Kimberly Doughty (Fairfield)
Camilla 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 Ottolini (Children's National)



5th Annual Richard A Ehrenkranz Symposium
June 4, 2024
Yale University
New Haven, CT



Yale Pediatrics 100 Years in 2022!
sarah.n.taylor@yale.edu

45
