Supplemental Material

Breastfeeding in the first days of life is associated with lower blood pressure at 3 years of age

Kozeta Miliku MD, PhD, Theo J. Moraes MD, PhD, Allan Becker MD,

Piushkumar Mandhane MD, PhD, Malcolm Sears MB, ChB,

Stuart E. Turvey MD, PhD, Padmaja Subbarao MD, MSc, and Meghan B. Azad

PhD

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Table S1. General descriptive characteristics of the original and imputed dataset (N=2382).

	Original Non-Imputed (N=2382)	Covariates Imputed (N=2382)
Maternal characteristics		
Age, years	32.5 (4.6)	32.5 (4.6)
Race, White (%)	1763 (74.0)	1772 (74.4)
Post-secondary degree (%)	1800 (75.6)	1844 (77.4)
Smoking during pregnancy (%)	174 (7.3)	194 (8.10)
Pre-pregnancy body mass index, kg/m^2	23.1 (18.3, 39.7)	23.1 (18.3, 39.6)
Stress during pregnancy (%)		
Never	674 (28.3)	NI
Sometimes	1022 (42.9)	NI
Often	493 (20.7)	NI
Gestational hypertension (%)	112 (4.7)	NI
Preeclampsia (%)	84 (9.6)	NI
Birth characteristics		
Caesarian section delivery (%)	588 (24.7)	NI
Girls (%)	1129 (47.4)	1129 (47.4)
Gestational age, weeks	39.2 (1.4)	39.2 (1.4)
Weight, grams	3452 (480)	3454 (480)
Child characteristics		
Age, months	36.4 (2.0)	36.4 (2.1)
Screen time, hours	1.6 (1.3)	1.6 (1.4)
Body mass index, z score*	0.6 (1.0)	0.6 (1.1)
Systolic blood pressure, mmHg	99 (9)	NI
Diastolic blood pressure, mmHg	58 (7)	NI

Values are means (SD) for continuous variables with a normal distribution, numbers (%) for categorical variables, or medians (95% range) for continuous variables with skewed distribution. Abbreviations: NI, non-imputed. Non-imputed covariates were not included in the analyses.

Table S2. Subject characteristics in the population included in the analyses (N=2382) compared with the population without blood pressure measurements at 3 years (N=883).

	Subjects included in the population for analysis (N=2382)	Subjects with No blood pressure measurements at 3 years (N=883)	P value
Maternal characteristics			
Age, years	32.5 (4.6)	31.8 (5.0)	**<0.01**
Race, White (%)	1763 (74.0)	576 (65.2)	**0.02**
Post-secondary degree (%)	1800 (75.6)	590 (66.8)	**<0.01**
Smoking during pregnancy (%)	174 (7.3)	107 (12.1)	**<0.01**
Pre-pregnancy body mass index, kg/m^2	23.1 (18.3, 39.7)	24.0 (18.1, 41.0)	**<0.01**
Birth characteristics			
Girls (%)	1129 (47.4)	416 (47.1)	0.91
Gestational age, weeks	39.2 (1.4)	39.1 (1.4)	**0.02**
Weight, grams	3452 (480)	3426 (493)	0.18
Lifetime breastfeeding ever (%)	2333 (97.9)	853 (96.6)	**0.03**
Exclusive breastfeeding at 3 months	1463 (61.5)	421 (47.7)	**<0.01**
Child characteristics			
Age, months	36.4 (2.0)	36.3 (2.3)	0.59
Screen time, hours	1.6 (1.3)	2.0 (1.8)	**<0.01**
Sugar sweeten beverages, any (%)	1697 (83.7)	326 (81.9)	0.21
Body mass index, z score*	0.6 (1.0)	0.6 (1.0)	0.26
Systolic blood pressure, mmHg	99 (9)	-	
Diastolic blood pressure, mmHg	58 (7)	-	

Values are means (SD), percentages (%), or medians (95% range) for variables with skewed distribution based on non-imputed data. Differences in maternal, infant and childhood characteristics (compared with the group without blood pressure measurements) were evaluated using T-test for continuous normally distributed variables, Mann Whitney for non-normally distributed variables, and Chi-squared tests for categorical variables. *P-value <0.05.

Table S3. Associations of infant feeding with blood pressure at the age of 3 years in the CHILD Cohort Study.

	Systolic Blood Pressure Models *mmHg (95%CI)*		*Diastolic Blood Pressure Models* *mmHg (95%CI)*	
	Confounder	**Birth**	**Confounder**	**Birth**
Breastfeeding (N=2,382)				
Never (N = 49)	*0.00 (Reference)*		*0.00 (Reference)*	
Ever (N = 2,333)	**-3.35*** **(-6.05, -0.66)**	**-3.31*** **(-6.01, -0.61)**	-1.62 (-3.50, 0.26)	-1.63 (-3.50, 0.25)
Early Limited (n=98)	**-4.15*** **(-7.38, -0.92)**	**-4.12*** **(-7.36, -0.89)**	**-2.61*** **(-4.87, -0.36)**	**-2.59*** **(-4.84, -0.33)**
Sustained (n=2,235)	**-3.29*** **(-5.99, -0.59)**	**-3.24*** **(-5.94, -0.54)**	-1.54 (-3.42, 0.34)	-1.55 (-3.43, 0.34)
Breastfeeding duration (N=2,333)˜				
>0 – 2.9 months (n = 261)	*0.00 (Reference)*		*0.00 (Reference)*	
3 – 5.9 months (n = 242)	0.16 (-1.50, 1.82)	0.18 (-1.48, 1.85)	0.75 (-0.41, 1.91)	0.73 (-0.43, 1.89)
6 – 11.9 months (n = 719)	-0.30 (-1.66, 1.07)	-0.28 (-1.65, 1.09)	0.01 (-0.95, 0.96)	0 (-0.95, 0.95)
≥12 months (n = 1,111)	0.01 (-1.35, 1.33)	0.03 (-1.31, 1.37)	0.61 (-0.32, 1.54)	0.58 (-0.35, 1.52)
Breastfeeding exclusivity at 3 months (N=2,329)˜				
No (n = 163)	*0.00 (Reference)*		*0.00 (Reference)*	
Partial (n = 605)	0.31 (-1.09, 1.71)	0.32 (-1.08, 1.72)	0.92 (-0.05, 1.90)	0.92 (-0.06, 1.89)
Exclusive (n = 1,463)	-0.27 (-1.57, 1.02)	-0.24 (-1.54, 1.05)	0.18 (-0.72, 1.08)	0.14 (-0.76, 1.05)

Values are regression coefficients (95% confidence interval) based on multiple linear regression models. Estimates are based on multiple imputed data. Confounder model is adjusted for maternal age, pre-pregnancy body mass index, ethnicity, educational level, smoking during pregnancy, and length of staying in the hospital at delivery, and child's sex, current age, screen time and sugar sweetened beverages intake; Birth model is confounder model additionally adjusted for gestational age and weight at birth. *P – values < 0.05

Table S4. Associations of infant feeding with blood pressure at the age of 3 years in the CHILD Cohort Study among never and early limited breastfed infants (N=147).

	Systolic Blood Pressure mmHg (95%CI)	Diastolic Blood Pressure mmHg (95%CI)
Breastfeeding (N=147)		
Never (N = 49)	0.00 (Reference)	0.00 (Reference)
Early Limited (n=98)	-4.58* (-8.03, -1.13)	-2.28* (-4.47, -0.09)

Values are regression coefficients (95% confidence interval) based on multivariable adjusted linear regression models. Estimates are based on multiple imputed data. Models are adjusted for maternal age, pre-pregnancy body mass index, ethnicity, educational level, smoking during pregnancy, and length of staying in the hospital at delivery, and child's sex, gestational age and weight at birth, current age, screen time and sugar sweetened beverages intake, and current body mass index. *P – values < 0.05

Figure S1. Flowchart of study participants included for the main analysis.

Pregnant mothers recruited in the
CHILD study
n=3,455

n=159 ineligible:
miscarriage, preterm birth, or congenital
anomalies

Eligible mothers and infants
n=3,296

n=31 excluded:
no information on infant feeding

Children with available information
on infant feeding
n=3,265

n= 391 excluded:
no visit to the research center at 3 year
follow up visits

Children available for follow up
measurements at the age of 3 years
n=2,874

n=492 excluded:
no blood pressure measurements
available (477) and blood pressure
values outside |4SD| (15)

Children with infant feeding data
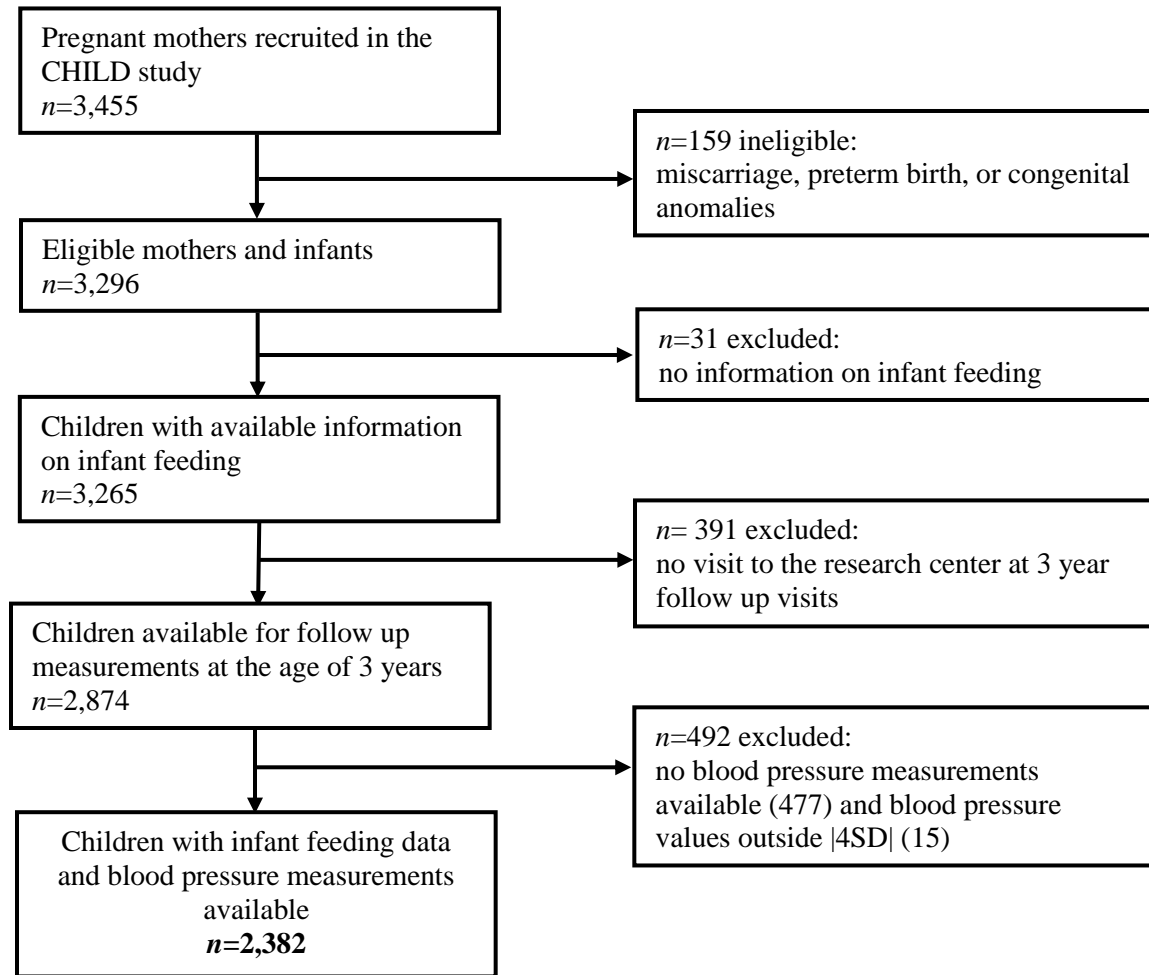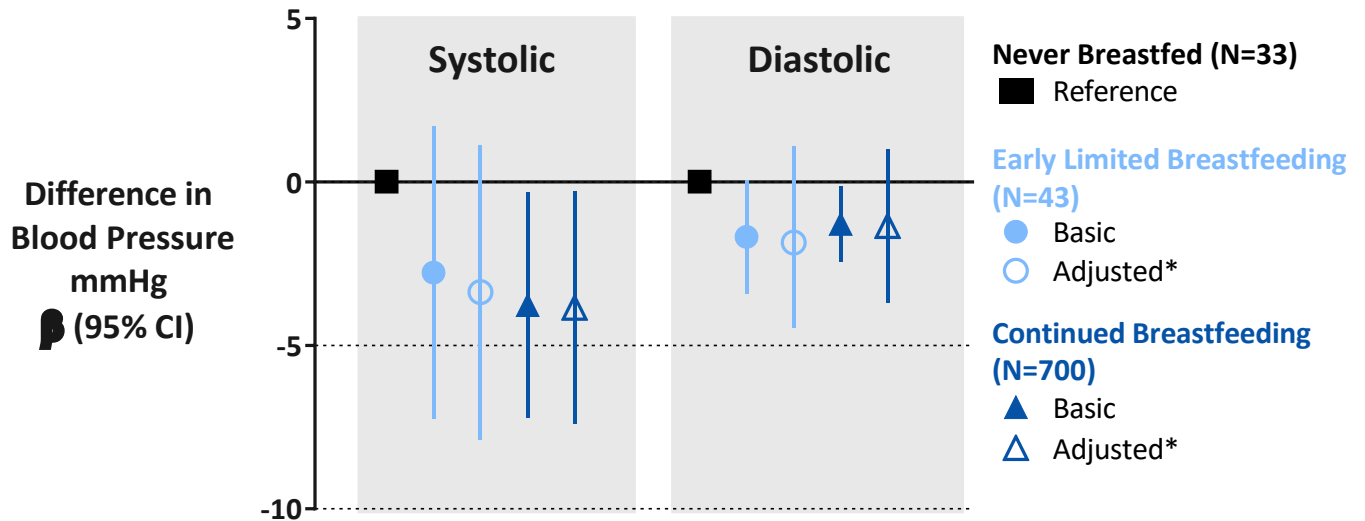and blood pressure measurements
available
***n*=2,382**

Figure S2. Any breastfeeding (even early limited breastfeeding during the birth hospital stay) is associated with lower blood pressure at age 3 years in the Manitoba site of the CHILD Cohort Study.

Values are regression coefficients (95% confidence interval) based on multiple linear regression models. Basic model is adjusted for child's age at visit and sex. *Adjusted model is fully adjusted BMI model (see Table 2) adjusted for maternal age, pre-pregnancy body mass index, ethnicity, educational level, smoking during pregnancy, length of stay in the hospital at delivery, gestational age and weight and birth, and child's sex, current age, screen time, sugar sweetened beverage intake, and current BMI. Estimates are based on imputed data.