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Online data supplement

Spirometry - Biological controls and 3L syringes were used for calibration. Participants were advised to abstain from short acting bronchodilators for four hours and long acting bronchodilators for 12 hours. Height and weight were measured to the nearest 0.1 cm and 0.1 kg respectively. At the 12 year follow up only baseline spirometry was performed (SpiroCard™ PC spirometer, QRS Diagnostic, Plymouth, MN, USA). At the 18 year follow up, both pre and post bronchodilator (Salbutamol) parameters were measured with an Easy One™ (ndd Medical technologies Inc, Andover MA).

Mediators and confounders- We have previously published a causal diagram [1] to identify confounders and mediators of the relationship between breastfeeding and lung function. Based on this diagram, the following factors were considered as potential mediators: the number of parental reports of lower and upper respiratory tract infections diagnosed by a doctor within the first two years of life; skin prick test reactivity (to one or more allergen) at 6, 12 and 24 months; and the child's height and BMI measured at 12 years and 18 years. A number of factors were considered as potential confounders: maternal and paternal smoking status (at the time of recruitment to the study), maternal and paternal education (higher education or not) and socioeconomic status of the family (ANU3_2 classifications according to the father's occupation at the time of recruitment to the study –see reference [2]. Eczema, defined as either doctor diagnosed eczema, or a rash treated with a topical steroid excluding the nappy and the scalp areas, prior to the cessation of breastfeeding was considered as a potential confounder, as we have previously demonstrated that early onset eczema was associated with prolonged breastfeeding in this cohort [3]. A diagnosis of cough rattle and wheeze prior to cessation of breast feeding was also considered as a potential confounder for similar reasons.

Online repository table S1- Multivariable associations between breastfeeding and pre bronchodilator lung function outcomes at 12 years of age (n=364).

Lung function	Exclusive breastfeeding		Total breastfeeding	
Pre bronchodilator	Effect per week (95%CI)	P value	Effect per week (95%CI)	P value
Model 1				
FVC (ml)	-0.5 (-4.9,3.9)	0.836	-0.7(-2.1,0.8)	0.355
FEV ₁ (ml)	-0.5(-4.4,3.3)	0.782	-0.7(-2.0,0.5)	0.258
MEF (ml/s)	8.9(-1.1,19.0)	0.082	0.2(-3.6,3.1)	0.883
FER %	0.0(-0.1,0.1)	0.875	0.0(-0.1,0.1)	0.767
Model 2*				
FVC (ml)	-0.6(-5.2,3.9)	0.783	-0.9(-2.5,0.6)	0.228
FEV ₁ (ml)	-0.5(-4.6,3.4)	0.789	-0.9(-2.2,0.5)	0.205
MEF (ml/s)	9.5(-0.7,19.7)	0.069	0.4(-3.5,3.6)	0.978
FER %	0.0(-0.1,0.1)	0.999	0.0(0,0)	0.891
Model 3				
FVC (ml)	-0.6(-5.4,4.1)	0.875	-1.0(-2.6,0.6)	0.226
FEV ₁ (ml)	-0.4(-4.6,3.7)	0.839	-1.0(-2.5,0.4)	0.151
MEF (ml/s)	11.2(0.5,21.8)	0.040	-0.2(-3.5,3.9)	0.934
FER %	0.0(-0.1,0.1)	0.916	0.0(0,0)	0.809
Model 4				
FVC (ml)	0.3(-4.6,5.1)	0.919	-0.8(-2.5,0.9)	0.335
FEV ₁ (ml)	-0.1(-4.3,4.2)	0.974	-0.8(-2.2,0.7)	0.316
MEF (ml/s)	8.8(-2.0,19.6)	0.110	0.8(-3.0,4.6)	0.691
FER %	0.0(-1.0,0.1)	0.745	0.0(0,0)	0.908
Model 5				
FVC (ml)	0.2(-5.5,5.8)	0.948	-0.9(-2.8,1.0)	0.347
FEV ₁ (ml)	0.2(-4.8,5.3)	0.932	-0.9(-2.5,0.9)	0.332
MEF (ml/s)	10.1(-0.5,20.7)	0.061	0.1(-3.6,3.7)	0.977
FER %	-0.1(0.1,0.1)	0.999	0.0(0,0)	0.891

Effects expressed as mean change in lung function associated with each additional week of breastfeeding, for both exclusive and total duration of breastfeeding; CI – Confidence Interval

Model 1- Adjusted for gender, height and age

Model 2* - results presented in main tables –Adjustments as per model 1, with additional adjustment for maternal and paternal status of education, maternal and paternal status of smoking and socioeconomic status

Model 3 –As per model 2, with additional adjustment for onset of eczema prior to cessation of breastfeeding

Model 4 –As per model 2, with additional adjustment for onset of cough rattle and wheeze prior to cessation of breastfeeding

Model 5-As per model 2, height is removed from the model

Online repository table S2- Multivariable associations between breastfeeding and pre bronchodilator lung function outcomes at 18 years of age (n=409).

Lung function Pre bronchodilator	Exclusive breastfeeding		Total breastfeeding	
	Effect per week (95%CI)	P value	Effect per week (95%CI)	P value
Model 1				
FVC (ml)	-3.1(-9.2,3.0)	0.325	-1.1(-3.1,0.9)	0.295
FEV ₁ (ml)	1.5(-3.9,6.9)	0.591	-0.5(-2.3,1.3)	0.587
MEF (ml/s)	12.7(1.2,24.2)	0.030	-0.7(-4.5,3.1)	0.785
FER %	0.1(0,0.2)	0.021	0(0,0)	0.567
Model 2*				
FVC (ml)	-3.8(-10.1,2.5)	0.233	-1.5(-3.7,0.6)	0.168
FEV ₁ (ml)	0.2(-5.4,5.8)	0.951	-1.1((-3.0,0.8)	0.242
MEF (ml/s)	10.5(-1.2,22.2)	0.078	-1.8(-5.8,2.2)	0.373
FER %	0.1(0,0.2)	0.061	0(0,0)	0.914
Model 3				
FVC (ml)	-4.2(-10.8,2.4)	0.213	-1.6(-3.9,0.6)	0.154
FEV ₁ (ml)	-0.6(-6.5,5.3)	0.846	-1.2(-3.3,0.7)	0.208
MEF (ml/s)	9.3(-2.9,21.6)	0.135	-2.1(-6.3,2.1)	0.327
FER %	0.1(0,0.2)	0.103	0(0,0)	0.967
Model 4				
FVC (ml)	-2.7(-9.42,4.1)	0.438	-1.4(-3.7,0.9)	0.251
FEV ₁ (ml)	0(-5.9,5.9)	0.915	-1.2(-3.2,0.9)	0.267
MEF (ml/s)	7.3(-5.1,19.8)	0.246	-2.2(-6.5,2.1)	0.314
FER %	0.1(0,0.2)	0.280	0(0,0)	0.818
Model 5				
FVC (ml)	-0.1(-1.2,6.9)	0.971	-0.5(-2.9,1.9)	0.703
FEV ₁ (ml)	3.2(-3.0,9.4)	0.316	-0.1(-2.3,2.0)	0.905
MEF (ml/s)	13.7(1.6,25.5)	0.026	-0.5(-4.6,3.5)	0.793
FER %	0.1(0,0.2)	0.059	0(0,0)	0.751

Effects expressed as mean change in lung function associated with each additional week of breastfeeding, for both exclusive and total duration of breastfeeding; CI – Confidence Interval

Model 1- Adjusted for gender, height and age

Model 2* - results presented in main tables –Adjustment as per model 1, with additional adjustment for maternal and paternal status of education, maternal and paternal status of smoking and socioeconomic status

Model 3 –As per model 2, with additional adjustment for onset of eczema prior to cessation of breastfeeding

Model 4 –As per model 2, with additional adjustment for onset of cough rattle and wheeze prior to cessation of breastfeeding

Model 5-As per model 2, height removed from the model

Online repository table S3 - Multivariable associations between breastfeeding and post bronchodilator lung function outcomes at 18 years of age.

Lung function Post bronchodilator	Exclusive breastfeeding		Total breastfeeding	
	Effect per week 95%CI	P value	Effect per week 95%CI	P value
Model 1				
FVC (ml)	-3.6(-9.5,2.2)	0.220	-1.2(-3.1,0.8)	0.239
FEV ₁ (ml)	-1.2(-6.2,3.8)	0.644	-0.7(-2.3,0.9)	0.426
MEF (ml/s)	5.2(-6.2,16.6)	0.371	-1.4(-5.1,2.3)	0.461
FER %	0.0 (0,0.1)	0.201	0(0,0)	0.412
Model 2*				
FVC (ml)	-4.0(-10.1,2.0)	0.194	-1.4(-3.5,0.7)	0.179
FEV ₁ (ml)	-2.1(-7.2,3.0)	0.425	-2.8(-6.7,1.1)	0.161
MEF (ml/s)	2.7(-8.9,14.2)	0.652	-1.2(-2.9,0.6)	0.182
FER %	0(0,0.1)	0.425	0(0,0)	0.862
Model 3				
FVC (ml)	-4.5(-10.8,1.9)	0.165	-1.7(-3.8,0.5)	0.132
FEV ₁ (ml)	-2.6(-8.0,2.8)	0.339	-1.3(-3.2,0.5)	0.150
MEF (ml/s)	3.3(-8.8,15.4)	0.590	-2.8(-6.8,1.3)	0.187
FER %	0(0,0.1)	0.377	0(0,0)	0.738
Model 4				
FVC (ml)	-2.9(-9.3,3.5)	0.376	-1.8(-4.1,0.4)	0.114
FEV ₁ (ml)	-2.1(-7.6,3.3)	0.441	-1.5(-3.4,0.4)	0.118
MEF (ml/s)	0.1(-12.2,12.4)	0.986	-3.4(-7.7,0.8)	0.113
FER %	0(-0.1,0.1)	0.991	0(0,0)	0.959
Model 5				
FVC (ml)	-0.1(-7.1,6.9)	0.980	-0.4(-2.7,2.0)	0.761
FEV ₁ (ml)	1.4(-4.6,7.3)	0.650	-0.2(-2.2,1.8)	0.865
MEF (ml/s)	6.6(-5.3,18.3)	0.276	-1.5(-5.6,2.5)	0.460
FER %	0(0,0.1)	0.382	0(0,0)	0.708

Effects expressed as mean change in lung function associated with each additional week of breastfeeding, for both exclusive and total duration of breastfeeding

Model 1- Adjusted for gender, height and age

Model 2* - results presented in main tables –Adjustment as per model 1, with additional adjustment for maternal and paternal status of education, maternal and paternal status of smoking and socioeconomic status

Model 3 –As per model 2, with additional adjustment for onset of eczema prior to cessation of breastfeeding

Model 4 –As per model 2, with additional adjustment for onset of cough rattle and wheeze prior to cessation of breastfeeding

Model 5-As per model 2, height removed from the model

Online repository table S4- The associations between breastfeeding and potential mediators of the relationship between breastfeeding and lung function

Anthropometry*	Exclusive breastfeeding (per week)			Total breastfeeding (per week)		
	Effect per week	95% CI	P value	Effect per week	95% CI	P
Height at 12 years (cm)	0.03	-0.05,0.11	0.489	0.01	-0.02,0.035	0.558
Height at 18 years (cm)	0.08	0.01,0.15	0.022	0.03	0.01,0.05	0.029
BMI at 12 years (kg/m ²)	-0.03	-0.09,0.02	0.192	-0.02	-0.36,-0.01	0.025
BMI at 18 years (kg/m ²)	-0.39	-0.08,0.01	0.075	-0.13	-0.27,0.01	0.068

Infections	Effect per week	95%CI	P value	Effect per week	95%CI	P value
Number of Upper respiratory tract infections in 1 st year of life (600/620)	-1.004	-1.01,-1.0	0.132	-1.002	-1.004,1.0	0.044
	Odds Ratio	95%CI	P value	Odds Ratio	95%CI	P value
Presence of Lower respiratory tract infection in 1 st year of life (617/620)	0.98	0.96,1.00	1.00	0.99	0.98,1.00	0.245

Sensitization to any allergen	Odds Ratio	95% CI	P value	Odds Ratio	95% CI	P value
6 months (551/620)	1.01	0.99,1.04	0.375	1.00	0.99,1.01	0.485
12 months (543/620)	0.99	0.98,1.01	0.806	0.99	0.99,1.00	0.297
24 months (448/620)	1.02	0.99,1.04	0.128	1.00	0.99,1.01	0.149

CI – Confidence Interval: *Only Height and BMI are adjusted for age and gender

I Upper respiratory tract infections- linear regression models using the log transformed data

¶ Lower respiratory tract infections- logistic regression models, a dichotomous variable was created none vs any lower respiratory tract infections within the first year of life

Online repository table S5-Association between breastfeeding (both total and exclusive duration) and lung function outcomes at 12 and 18 years stratified by maternal asthma status

Effect expressed as per week increase of breastfeeding duration

Lung function parameter	Without maternal asthma n=351	With maternal asthma n=269	P for interaction
At 12 years	Effect per week, 95%CI	Effect per week, 95%CI	
Exclusive breastfeeding			
FVC ml	-0.8(-7.6,6.0)	-1.2(-7.5,5.1)	0.930
FEV ₁ ml	0.1(-5.8,6.1)	-1.7(-7.2,3.8)	0.655
MEF ml/s	12.3(-2.9,27.5)	9.1(-5.1,23.2)	0.758
FER %	0(-0.1,0.1)	0(-0.1,0.1)	0.614
Total breastfeeding			
FVC ml	-1.3(-3.6,1.1)	-0.8(-2.9,1.2)	0.785
FEV ₁ ml	-0.7(-2.8,1.3)	-1.1(-2.9,0.7)	0.790
MEF ml/s	-0.8(-6.1,4.4)	0.8(-3.8,5.5)	0.635
FER %	0(0,0.1)	0(-0.1,0)	0.466
At 18 years			
Exclusive breastfeeding			
Pre bronchodilator			
FVC ml	0.5(-8.9,9.8)	-7.8(-16.2,0.6)	0.192
FEV ₁ ml	0.8(-7.5,9.2)	-0.9(-8.3,6.6)	0.762
MEF ml/s	10.3(-7.1,27.6)	10.2(-5.3,25.6)	0.992
FER %	0(-0.1,0.1)	0.1(0,0.2)	0.339
Post bronchodilator			
FVC ml	0.9(-8.0,9.9)	-8.8(-16.8,-0.8)	0.107
FEV ₁ ml	-0.4(-7.9,7.3)	-4.1(-10.9,2.8)	0.472
MEF ml/s	5.0(-12.2,22.2)	0.2(-15.2,15.5)	0.676
FER %	0(-0.1,0.2)	0.1(0,0.2)	0.271
Total breastfeeding			
Pre bronchodilator			
FVC ml	0(-3.2,3.1)	-3.1(-5.9,-0.3)	0.143
FEV ₁ ml	-0.1(-2.8,2.7)	-2.1(-4.5,0.4)	0.256
MEF ml/s	-0.9(-6.8,4.9)	-2.3(-7.6,2.9)	0.713
FER %	0(-0.1,0.1)	0(0,0.1)	0.801
Post bronchodilator			
FVC ml	0.4(-2.6,3.4)	-3.4(-6.1,-0.7)	0.054
FEV ₁ ml	0.2(-2.4,2.7)	-2.5(-4.8,-0.2)	0.107
MEF ml/s	-1.3(-7.1,4.4)	-3.9(-9.0,1.3)	0.503
FER %	0(0,0.1)	0(0,0.1)	0.682

*Adjusted for gender, age, height, parents education level, parental smoking status and socioeconomic status

Online repository table S6- Effect of additional* adjustment for birth weight on the associations between breastfeeding and lung function outcomes.

The effect						
	Without birth weight* (226)			With birth weight** (226)		
At 12 years	β	(95%CI)	P value	β	(95%CI)	P value
Exclusive breastfeeding						
FVC (ml)	4.23	-1.85,10.32	0.171	3.80	-2.43,10.03	0.231
FEV ₁ (ml)	3.80	-1.44,9.04	0.154	3.03	-2.32,8.39	0.265
MEF (ml/s)	17.62	4.83,30.42	0.007	15.01	1.99,28.04	0.024
FER (%)	00	-0.12,0.18	0.795	00	-0.13,0.12	0.647
Total breastfeeding						
FVC (ml)	1.56	-0.48,3.61	0.135	1.45	-0.62,3.52	0.170
FEV ₁ (ml)	1.38	-0.38,3.15	0.124	1.19	-0.58,2.98	0.187
MEF (ml/s)	2.11	-2.26,6.48	0.343	1.37	-3.01,5.75	0.539
FER (%)	00	-0.04,0.03	0.875	00	-0.04,0.03	0.771
At 18 years						
Pre bronchodilator						
Exclusive breastfeeding						
FVC (ml)	0.81	-6.74,8.35	0.833	0.50	-7.21,8.21	0.898
FEV ₁ (ml)	3.57	-3.12,10.26	0.294	3.37	-3.47,10.20	0.333
MEF (ml/s)	10.57	-3.12,24.27	0.130	10.39	-3.61,24.40	0.145
FER (%)	0.06	-0.03,0.16	0.192	0.06	-0.03,0.17	0.197
Total breastfeeding						
FVC (ml)	0.85	-1.67,3.36	0.508	0.79	-1.76,3.34	0.542
FEV ₁ (ml)	1.04	-1.19,3.27	0.359	0.99	-1.27,3.24	0.390
MEF (ml/s)	0.37	-4.21,4.95	0.874	0.25	-4.39,4.88	0.917
FER (%)	0.01	-0.02,0.04	0.719	0.01	-0.03,0.04	0.732
Post bronchodilator						
Exclusive breastfeeding						
FVC (ml)	-0.19	-7.36,6.98	0.958	-0.66	-7.97,6.65	0.858
FEV ₁ (ml)	1.04	-4.99,7.07	0.736	1.02	-5.14,7.17	0.745
MEF (ml/s)	3.21	-10.49,16.91	0.645	3.97	-9.99,17.95	0.576
FER (%)	0.03	-0.05,0.11	0.532	0.03	-0.05,0.12	0.410
Total breastfeeding						
FVC (ml)	0.45	-1.95,2.85	0.712	0.36	-2.06,2.78	0.771
FEV ₁ (ml)	0.80	-1.20,2.81	0.430	0.81	-1.21,2.84	0.430
MEF (ml/s)	-0.26	-4.81,4.28	0.909	0.10	-4.69,4.48	0.964
FER (%)	0.01	-0.01,0.04	0.411	0.02	-0.01,0.04	0.334

*All models adjusted for gender, age and height at the time of spirometry

**Also adjusted for birth weight.

*Excludes a child with reported birth weight of 7 Kg

References

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