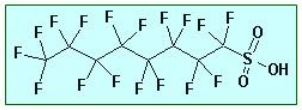
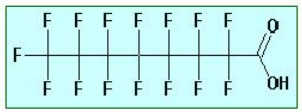
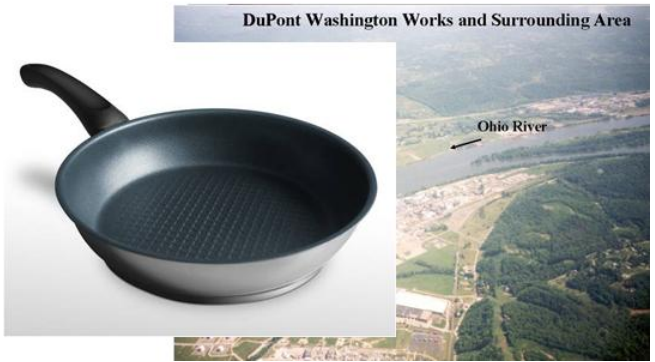
Breastfeeding: are second thoughts prompted by contaminants? A case-study from C8 Science panel study population







Debapriya Mondal, PhD
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8th Network Conference on POPS 2014

Acknowledgements

- Tony Fletcher and colleagues, LSHTM
- Other C8 Science Panel research teams

- Funding from the C8 Class Action Settlement Agreement between DuPont and Plaintiffs. The C8 Science Panel, this research and its conclusions are independent of either party to the lawsuit.

Breast-feeding

Positive health value of breast-feeding infants

Measurable health benefits to nursing mothers

Environmental pollutants- PCBs, PBDEs
Environmental pollutants- PFAAs?

Breast-feeding: a potential excretion route for mothers and implications for infant exposure to Perfluoroalkyl acids

Research | Children's Health

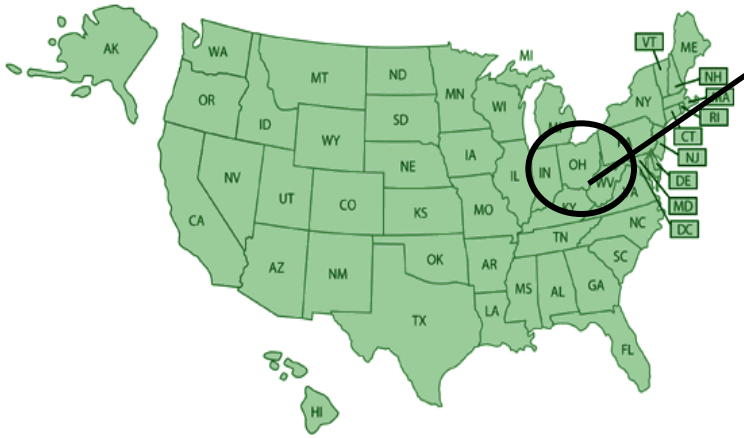
Breastfeeding: A Potential Excretion Route for Mothers and Implications for Infant Exposure to Perfluoroalkyl Acids

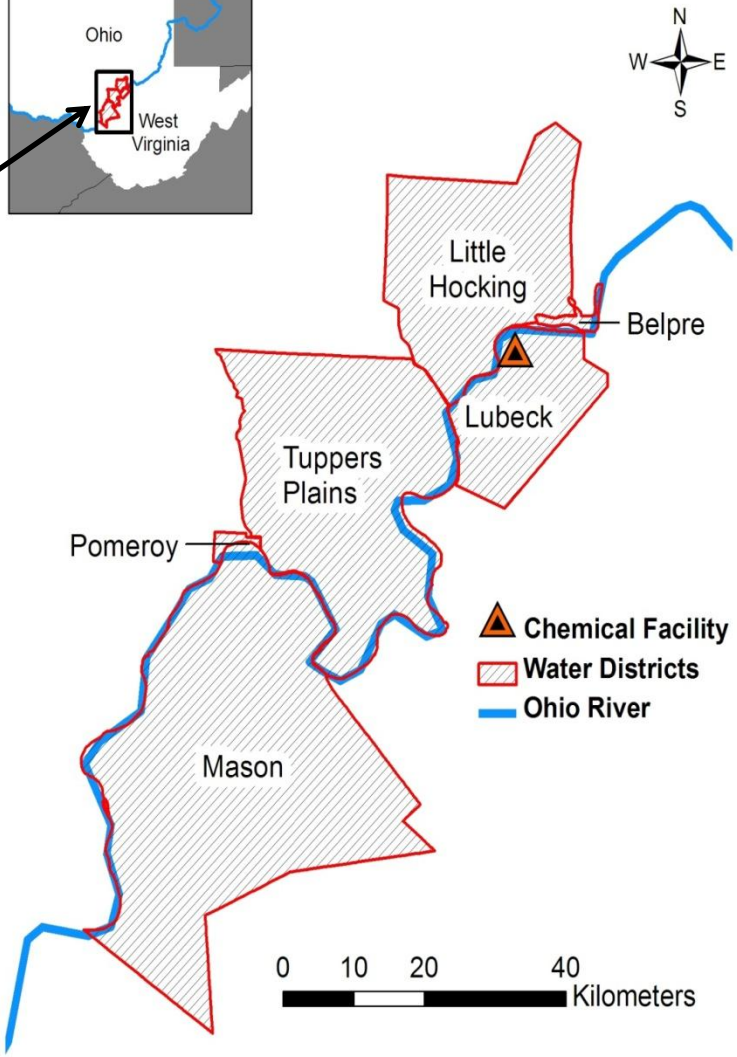
Debapriya Mondal,[1,2] Rosana Hernandez Weldon,[3] Ben G. Armstrong,[1] Lorna J. Gibson,[1] Maria-Jose Lopez-Espinosa,[1,4] Hyeong-Moo Shin,[5] and Tony Fletcher[1]

[1]London School of Hygiene & Tropical Medicine, London, United Kingdom; [2]School of Environment and Life Sciences, University of Salford, Salford, United Kingdom; [3]Center for Environmental Research and Children's Health, University of California, Berkeley, Berkeley, California, USA; [4]Spanish Consortium for Research on Epidemiology and Public Health (CIBERESP) and Center for Public Health Research (CSISP), Valencia, Spain; [5]School of Social Ecology, University of California, Irvine, Irvine, California, USA

Study population

- West Virginia/Ohio





C8 health project data included biomarkers in blood and questionnaire data for 69030 people in 2005-06. 10 perfluorochemicals measured.

Highest was PFOA (mean 82.9 ng/mL), then PFOS (mean 23.3)

Table 3. Continued

Age/sex	Measure	PFHxA[a]	PFHxA[b]	PFHS	PFHpA[a]	PFHpA[b]	PFOA	PFOS	PFNA	PFDA[a]	PFDA[b]
Total population											
Female	Mean	0.8	1.4	4.3	0.6	1.2	68.8	20.7	1.5	0.5	0.8
	Median	0.5	1.0	2.7	0.3	0.8	23.6	17.6	1.3	0.3	0.7
	Geometric mean	0.5	1.1	2.8	0.4	1.0	27.9	17.0	1.3	0.4	0.7
	SD	1.0	1.1	6.2	0.8	1.2	190.6	14.1	0.8	0.4	0.4
Male	Mean	0.9	1.4	5.9	0.7	1.3	98.2	26.0	1.7	0.5	0.8
	Median	0.6	1.0	3.8	0.3	0.9	33.7	22.9	1.5	0.3	0.7
	Geometric mean	0.6	1.2	4.0	0.4	1.0	39.4	21.9	1.5	0.4	0.7
	SD	1.2	1.4	12.8	0.9	1.3	284.3	16.5	0.9	0.6	0.8
Total	Mean	0.9	1.4	5.1	0.6	1.2	82.9	23.3	1.6	0.5	0.8
	Median	0.5	1.0	3.2	0.3	0.9	28.2	20.2	1.4	0.3	0.7
	Geometric mean	0.6	1.1	3.3	0.4	1.0	32.9	19.2	1.4	0.4	0.7
	SD	1.1	1.3	10.0	0.9	1.2	240.8	15.6	0.9	0.5	0.7

Frisbee et al Environ Health Perspect. 2009 Dec;117(12):1873-1882

PFOA and PFOS in serum

Table 6. Median (range) concentration of selected perfluorinated compounds in human plasma and serum of non-occupationally popula

Concentration (μg/l)			n^a	Age (years)	Year	Country
PFOS	PFOA	PFHxS				
North America						
28.4[g] (6.7–81.5)	6.4[g] (<5–35.2)	6.6[g] (<2.0–21.4)	65	–	–	USA, tissue banks
36.9[g] (2.8–57.9)	2.2[g] (0.5–5.5)	–	23[j]	–F	1994–2001	Northwest Territories, Canada
28.8[g] (3.7–65.1)	3.0[g] (<1.2–7.2)	–	56	<20	2002	Ottawa, Canada
35.8 (<4.3–1656)	4.7 (<1.9–52.3)	1.5 (<1.4–66.3)	645	20–69	2000–2001	USA, blood donors, 6 cities
30.2 (<3.4–175)	4.2 (<1.4–16.7)	2.3 (<1.4–40.3)	238	65–96	2000	Seattle, USA
(<1.3–164)[d]	(<3–88)[d]	(<0.4–32)[d]	175	17–72	2000–2002	4 cities in USA
36.7 (6.7–515)	5.1 (1.9–56.1)	3.8 (<1.4–712)	598	2–12	1994–1995	23 cities in USA
29.5	2.3	1.6	178	30–60	1974	Maryland, USA
34.7	5.6	2.4	178	39–65	1989	Maryland, USA
55.8[g] (3.6–164)	4.9[g] (0.2–10.4)	3.9[g] (0.4–11.2)	20	23–67	2003	Atlanta, USA
30.2	5.1	2.1	1562	12–>60	1999–2000	USA, NHANES study
31.1	11.6	2.0	23[j]	–	1990–2002	USA
24.0[g]	4.0[g]	4.3[g]	54[j]	12–>60 F	2001–2002	USA, NHANES study
40.2[g]	7.0[g]			12–>60 M		
15.8 (6.6–36.9)	2.4 (<1.0–4.7)	–	40	–	2005	St. Paul, USA

Perfluorinated compounds – Exposure assessment for the general population in western countries

Hermann Fromme[a,*], Sheryl A. Tittlemier[b], Wolfgang Völkel[a], Michael Wilhelm[c], Dorothee Twardella[a]

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17.2 (4.5–27)	4.1 (1.1–12.8)	1.3 (1.1–1.4)	20	19–63	1998, 2000	Belgium
3.5 (2.5–8.0)	(<3)	1.3 (1.3–1.4)	8	20–59 F[b]	2001	Siena, Italy
4.2 (1.0–10.3)	(<3)	1.7 (1.3–2.1)	42	20–59 M[c]	2001	Siena, Italy
(16–116)[d]	(9.7–40)[d]	(<0.4–2.6)[d]	25	35–58	2003	Poland
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22.3 (6.2–131)	6.8 (1.7–39.3)	–	105	5–84	2005	Northern Bavaria, Germany
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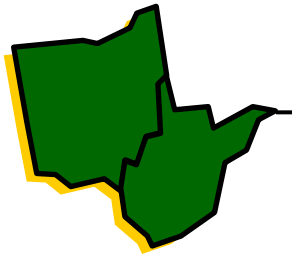

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	SD	1.0	1.1	6.2	0.8	1.2	190.6	14.1	0.8	0.4	0.4
Male	Mean	0.9	1.4	5.9	0.7	1.3	98.2	26.0	1.7	0.5	0.8
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	Geometric mean	0.6	1.2	4.0	0.4	1.0	39.4	21.9	1.5	0.4	0.7
	SD	1.2	1.4	12.8	0.9	1.3	284.3	16.5	0.9	0.6	0.8
Total	Mean	0.9	1.4	5.1	0.6	1.2	82.9	23.3	1.6	0.5	0.8
	Median	0.5	1.0	3.2	0.3	0.9	28.2	20.2	1.4	0.3	0.7
	Geometric mean	0.6	1.1	3.3	0.4	1.0	32.9	19.2	1.4	0.4	0.7
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Objectives

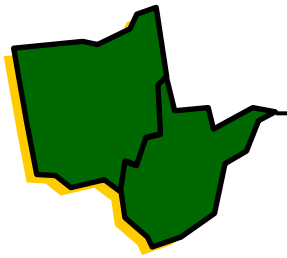
- Investigate the impact of breast-feeding on maternal serum PFAA concentrations

- Investigate the impact of breast-feeding on infant PFAA serum concentrations

Study method

- Longitudinal study- repeated measure of contaminants in the serum of mother and child and/or in breast milk

- This was NOT the method



Participants

C8 Health Project female study population with measure of PFAAs (N=35,788)

•Pregnancy information (N=23,815)

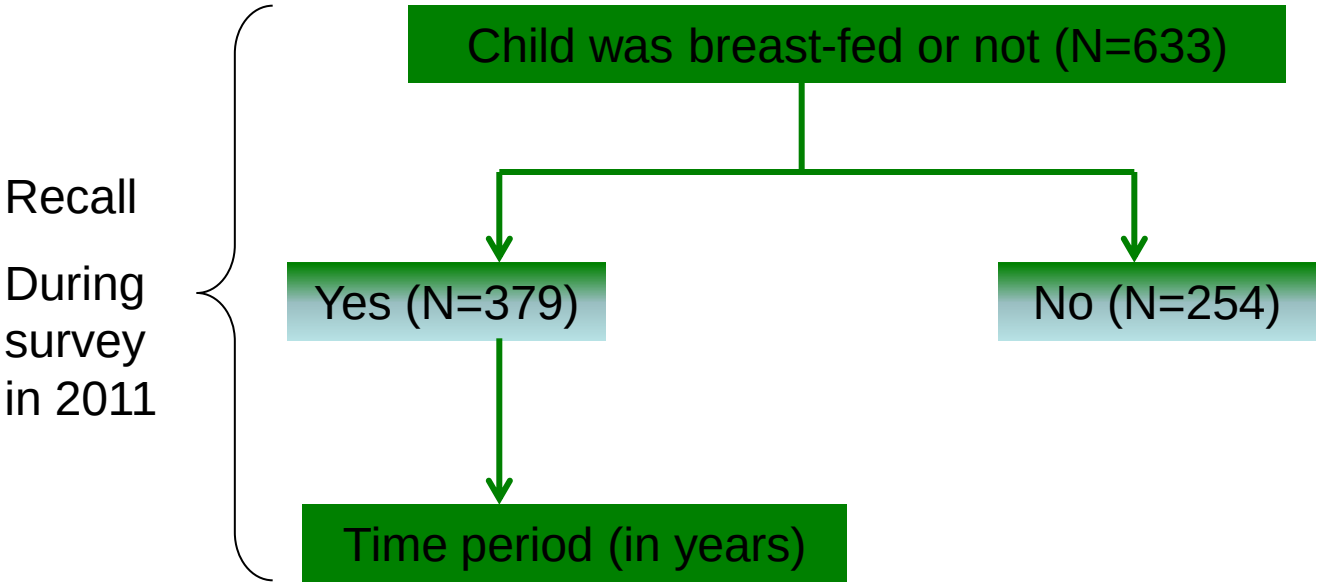
•Consented for further studies
•Resident in west Virginia or Ohio
•Interviewed in 2011 about breast-feeding information of the child in concern

Who had given birth within 42 months from 2005-6 survey (**N=633**)

analyse the serum PFAAs from 8% of these infants.

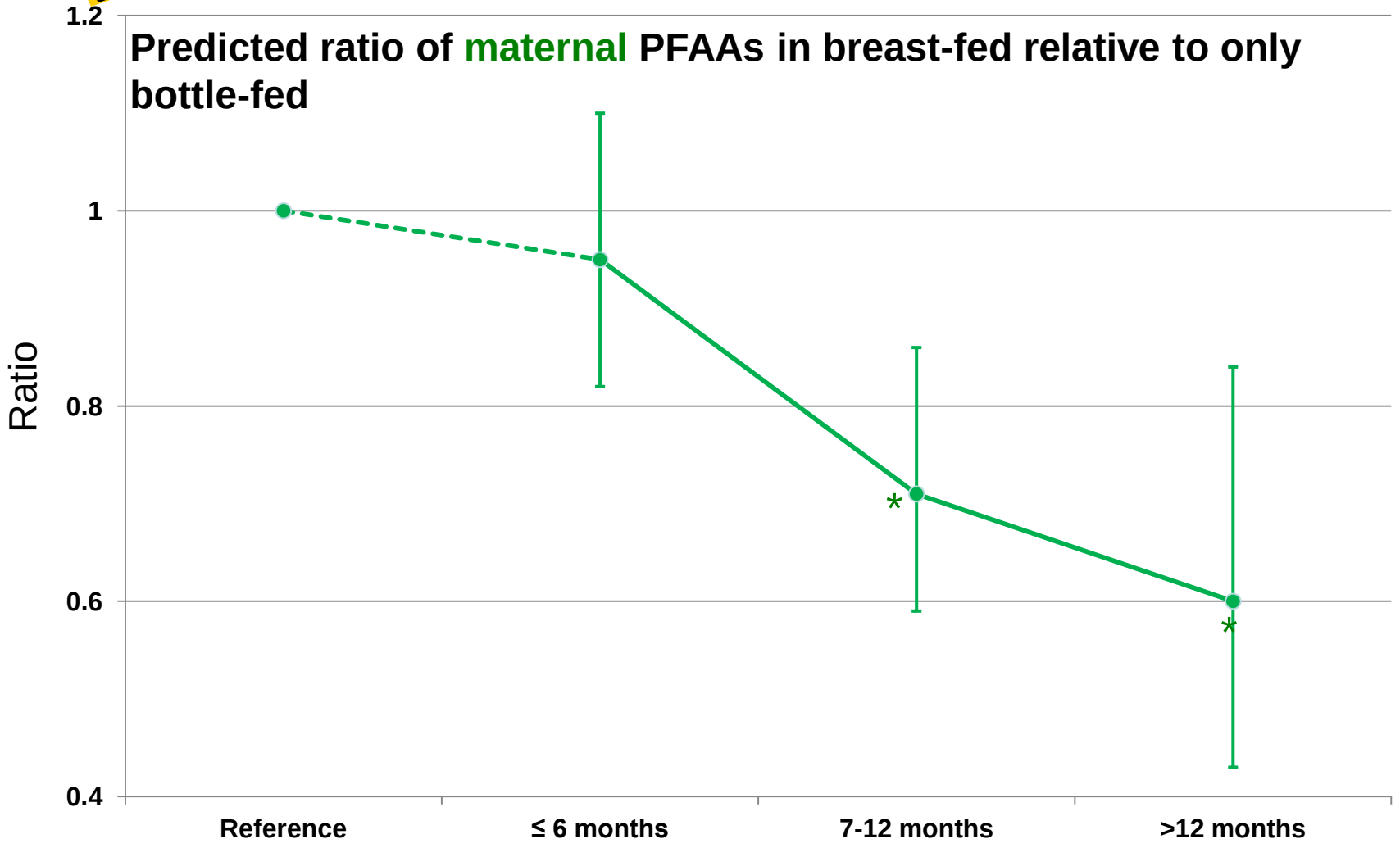
Infants **(N=49)**

Lactational effect-method



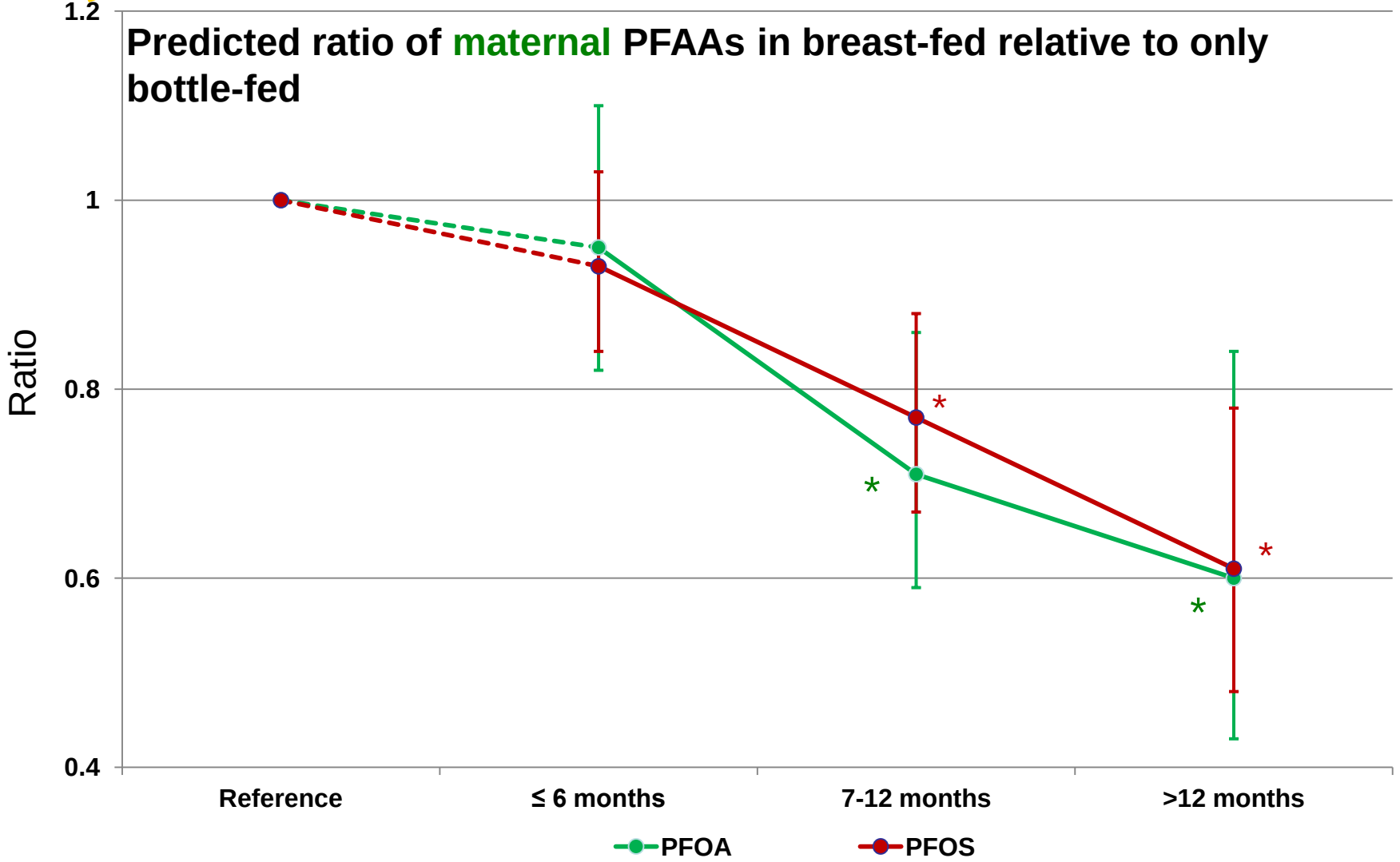
- Impact on mothers (N=633)
  - –Regression analysis with measured PFAA (natural log transformed to normalise) as the outcome and the duration of breast-feeding as the predictor

Lactational effect-Results



The exponentiated regression coefficient from a model of ln PFAA in the mothers adjusted for parity, maternal age(categorical with 5 years interval) and child age (categorical with 6 months interval),and for water district only for PFOA

Lactational effect-Results



The exponentiated regression coefficient from a model of ln PFAA in the mothers adjusted for parity, maternal age(categorical with 5 years interval) and child age (categorical with 6 months interval),and for water district only for PFOA

Lactational Effect-Results

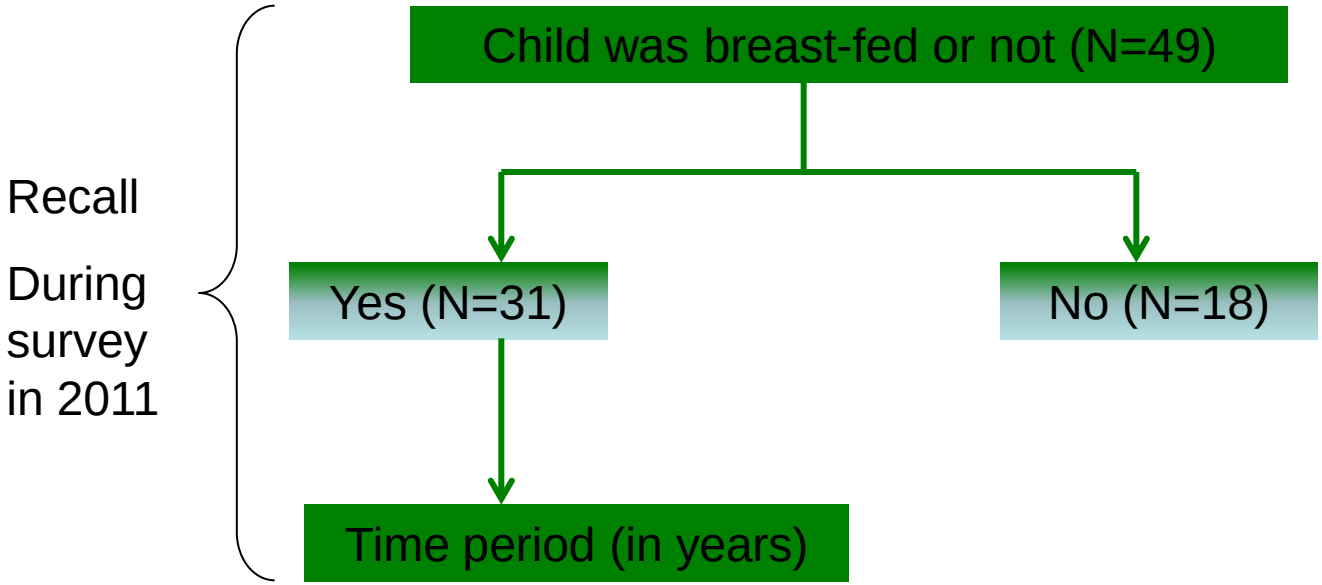
Association between maternal PFAA concentrations and duration of breast-feeding (per twelve months)

PFAAs	Coefficient	95% CI	p
PFOA	0.66	(0.56-0.77)	0.000
PFOS	0.74	(0.66-0.84)	0.000

Coefficient is the predicted ratio of PFAAs: the exponentiated regression coefficient from a model of ln PFAA in the mother with duration of breast-feeding(per twelve months). The model is also adjusted for parity, maternal age (categorical with 5 years interval) and child age (categorical with 6 months interval) and water district only for PFOA.

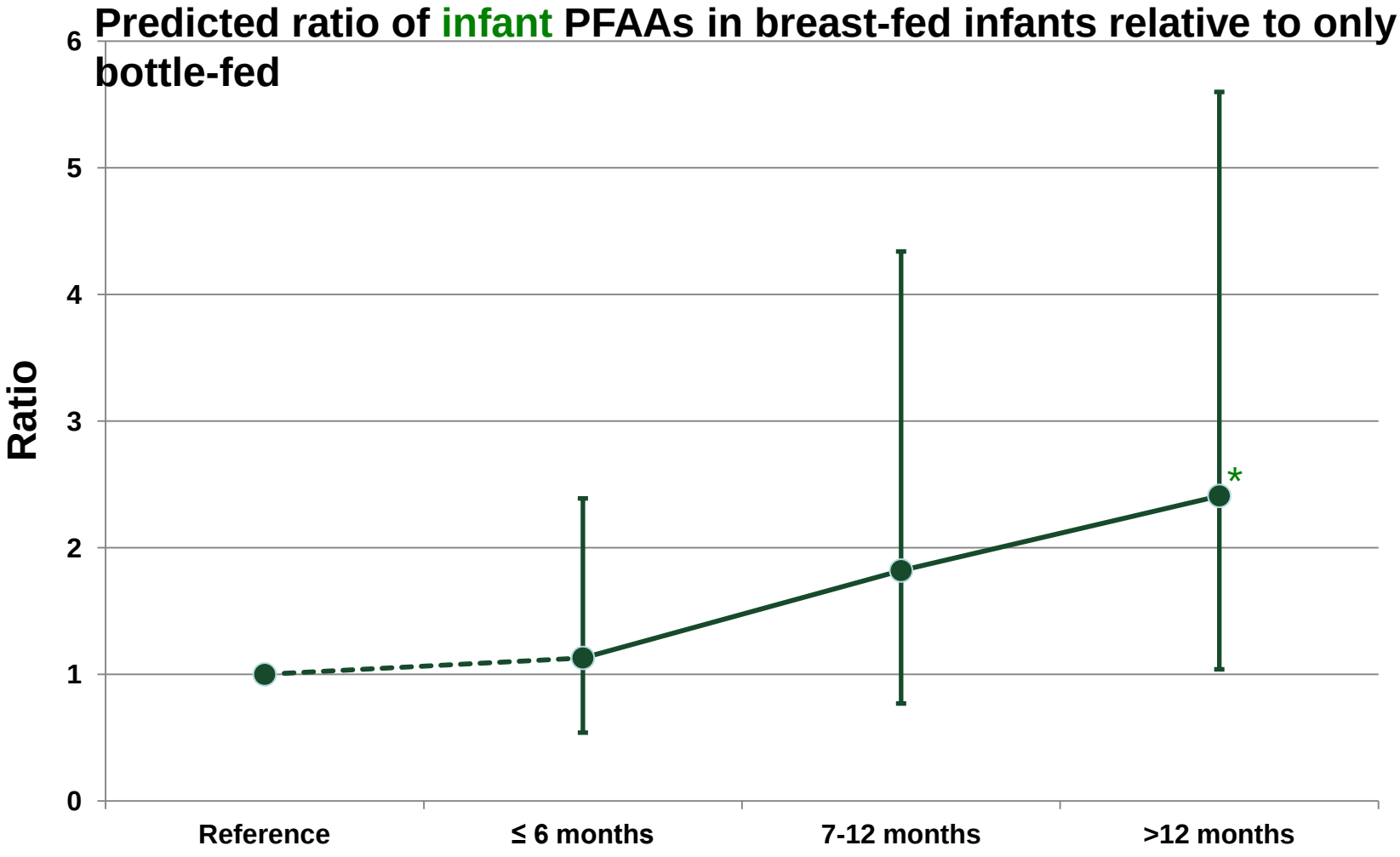
- We observed **34%** (95%CI: 23%,44%) and **26%** (95%CI: 16%,34%) decrease in PFOA and PFOS concentrations respectively per 12 months breast-feeding.

Uptake by infants-method



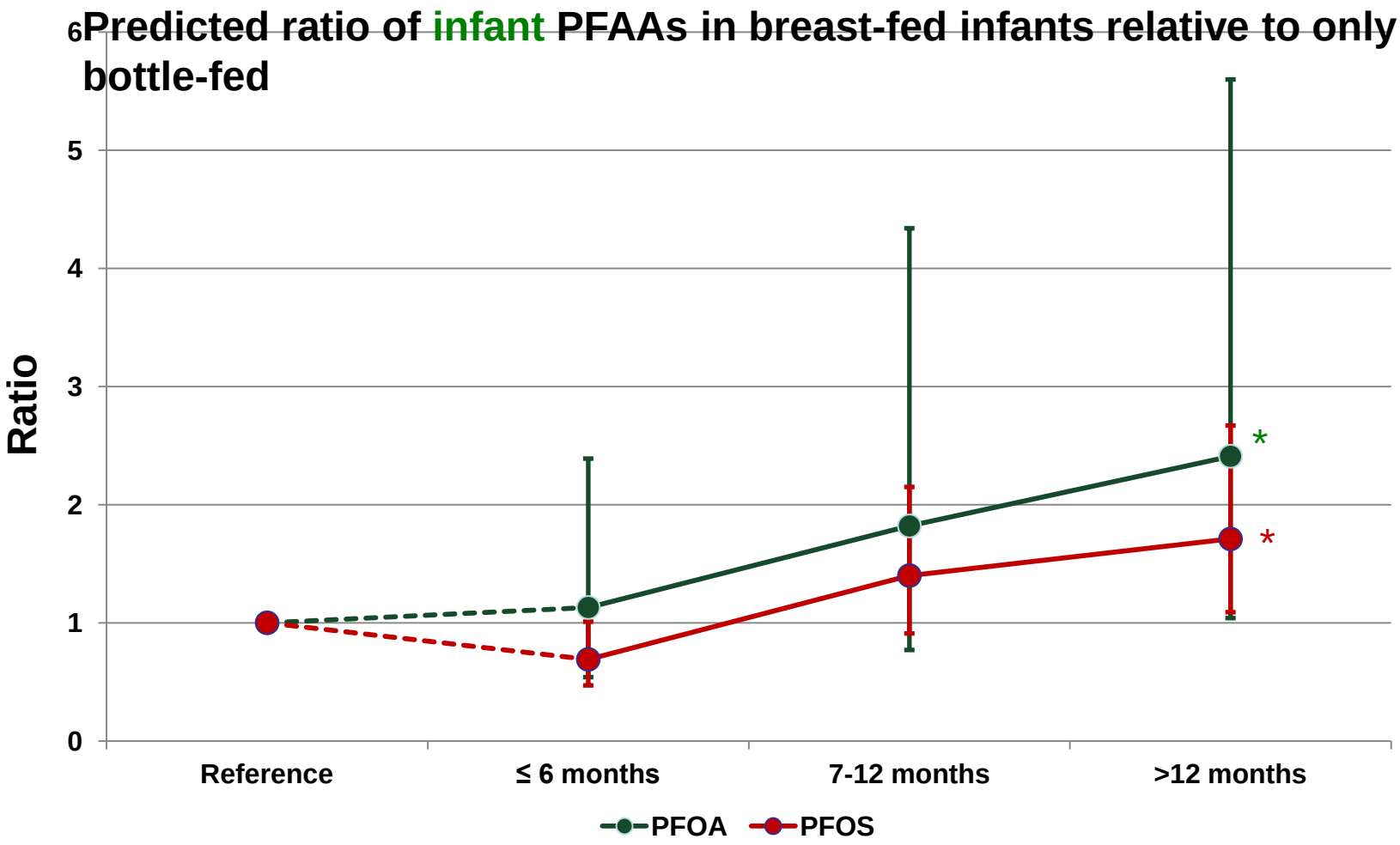
- Impact on infants (N=49)
  - –regression analyses similar to those of the mothers to investigate duration of breast-feeding as predictor

Uptake by infants-Results



The exponentiated regression coefficient from a model of lnPFAA in the children adjusted for child age(categorical with 6 months interval), and water district for PFOA only

Uptake by infants-Results



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A Blue Whale calf drinks about 400 litres of mother's milk each day

Journal of Dairy Science Volume 76, Issue 10, 1993, 3234–3246
The Adaptation of Milk Secretion to the Constraints of Fasting in Bears, Seals, and Baleen Whales

Lactational effect-Results

Association between maternal PFOA concentration and duration of breast-feeding (per twelve months), stratified by the level of exposure

Exposure category	N	Coefficient	95% CI	p
No background exposure (0 µg/year)	107	0.40	(0.22-0.73)	0.003
Low (1-50 µg/year)	299	0.65	(0.54-0.79)	0.000
Medium (51-1000 µg/year)	136	0.82	(0.60-1.13)	0.225
High (>1000 µg/year)	91	0.70	(0.43-1.15)	0.163

coefficient is the predicted ratio of PFOA: the exponentiated regression coefficient from a model of ln PFOA in the mother with duration of breast-feeding (per twelve months). The model is also adjusted for maternal age (categorical with 5 years interval) and child age (categorical with 6 months interval) and water district

Conclusions

- We observed 34% and 26%, annual decrease in PFOA and PFOS, concentrations respectively, in mothers associated with breast-feeding

Conclusions

- Concentrations tended to be higher in infants who were breast-fed, significantly: by 141% increase for PFOA and 71% increase for PFOS with a year of breast-feeding.

I know
what's best
for my baby.

Breastfeeding.

"Perception of risk is for the most part, in the eye of the beholder"

anonymous

University of Salford MANCHESTER

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Thank you

More details at:

www.c8sciencepanel.org

http://www.seek.salford.ac.uk/profiles/DMondal.jsp