

Age at introduction of solid foods and feeding difficulties in childhood: findings from the Southampton Women's Survey

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Note: for non-commercial purposes only

Introduction

- **Recommended age to introduce solid foods has changed over time**
 - *UK Infant feeding guidelines (2003)* → introduce solids at 6 months
 - Prior to 2003 → introduced solids 4-6 months
 - *Kramer & Kakuma systematic review for WHO*
- **Concerns expressed on appropriateness**
 - Critical windows → children receptive to *new flavours and textures*
 - Delayed introduction → aversions → feeding difficulties?

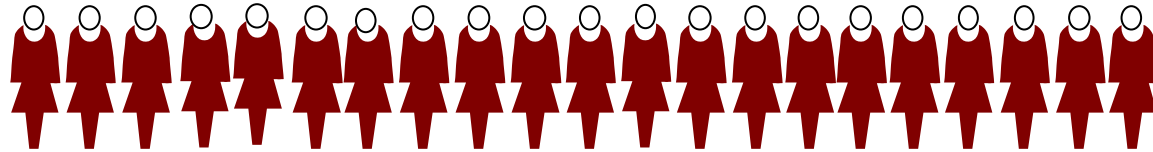


Aim

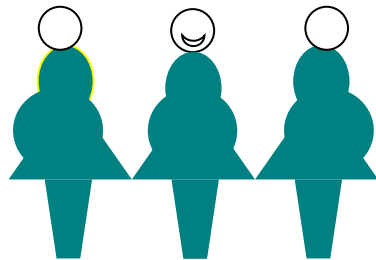
To determine whether **age at introduction of solid foods** is associated with **feeding difficulties** in children at 3 years of age.



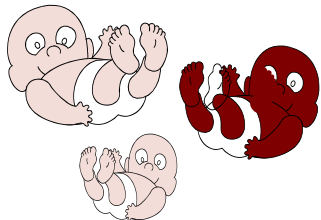
Methods



12, 583 non-pregnant Southampton women aged 20-34 years interviewed between 1998 and 2002.



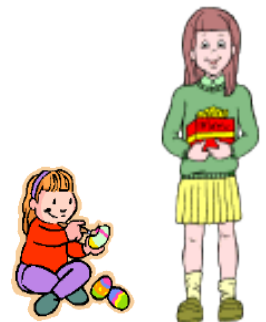
Subsequent pregnancies studied, ultrasound scans and interviews.



3158 births



Children followed-up at 6, 12, 24 & 36 months. Samples seen at 4, 6-7, 8-9 & 11-13 yrs.



Methods

2.3 * In the past three months do you feel that there have been difficulties feeding him/her?

- 0. No, no difficulty
- 1. Yes, occasional difficulty
- 2. Yes, some difficulty
- 3. Yes, great difficulty

2.4 * [In the past three months, has he/she at any time:-
(Circle number in one box on each line)

		No, did not happen	Yes, but did not worry me	Yes, worried me a bit	Yes, worried me greatly
1	Not eaten sufficient amount of food	0	1	2	3
2	Refused to eat the right food	0	1	2	3
3	Been choosy with food	0	1	2	3
4	Over-eaten	0	1	2	3
5	Been difficult to get into an eating routine	0	1	2	3

Methods

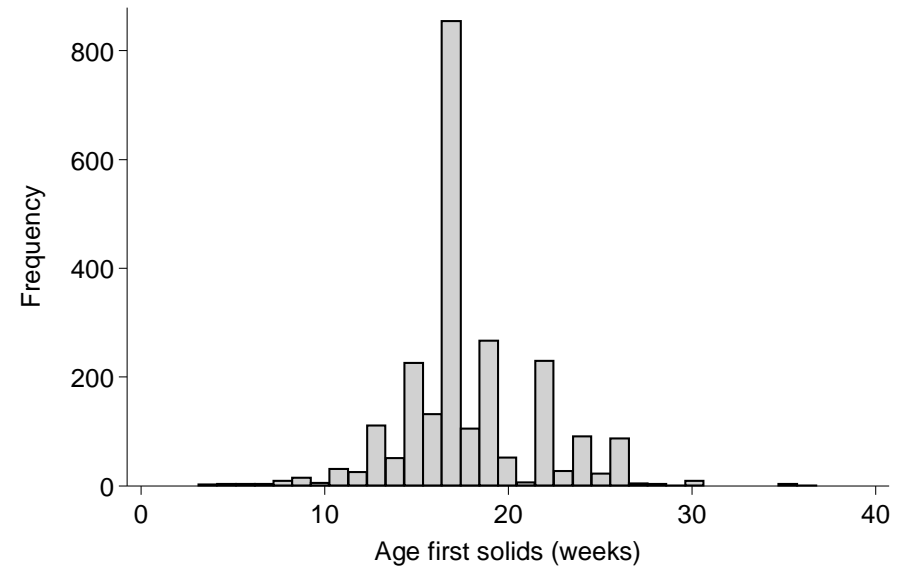
Statistical analysis:

- **Exposure:** age at introduction of solids
 - <4 months, ≥ 4 & <6 months (*reference group*), ≥ 6 months
- **Outcome:** 6 feeding difficulty questions (assessed separately)
 - Binary outcome \rightarrow presence or absence of feeding difficulty
- **Poisson Regression model to estimate prevalence rate ratios**
 - **Confounders:**
 - **Maternal:** parity, pre-pregnancy maternal BMI, maternal age, maternal education, maternal employment, parenting difficulties, maternal diet quality
 - **Child:** age last breastfed, child sex, gestation

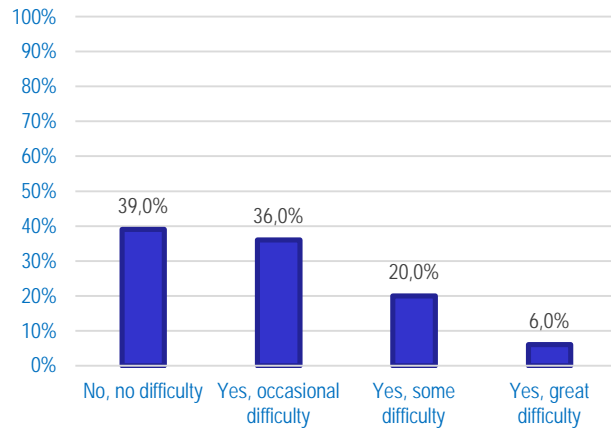
Results

- N = 2389 mother-child pairs

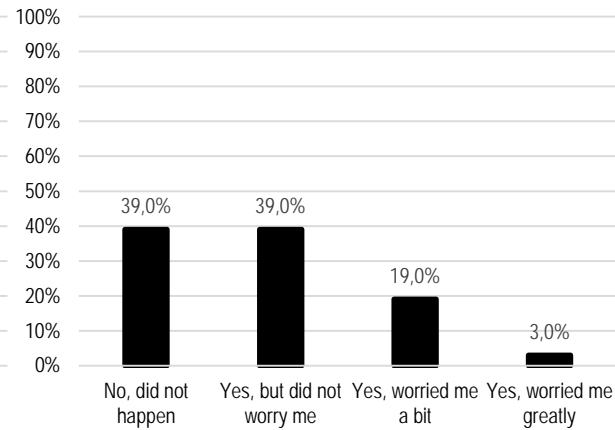
Age at introduction of solid foods		
< 4 months	≥4 & < 6 months	≥ 6 months
642 (27%)	1637 (69%)	110 (5%)



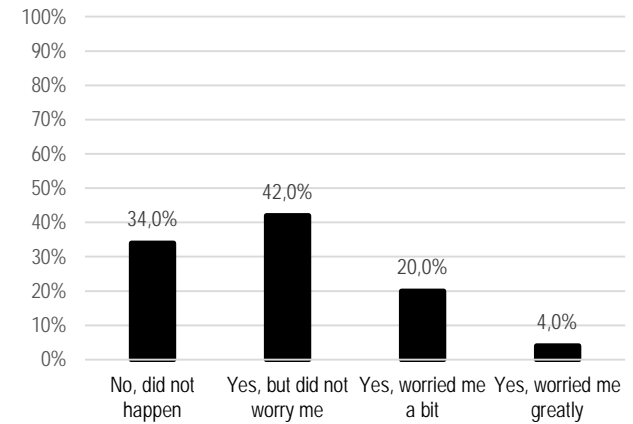
a) Feeding difficulties (general question)



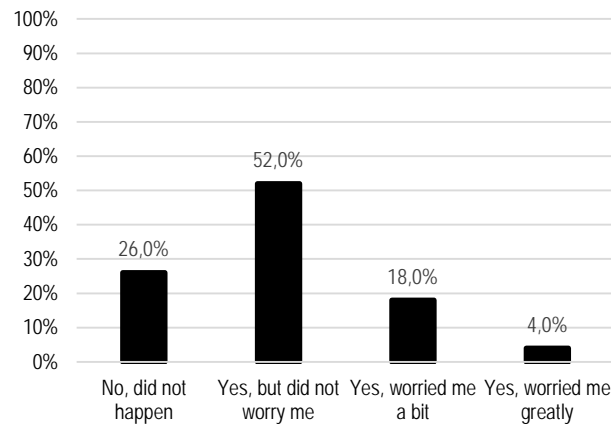
b) Not eaten sufficient amount of food



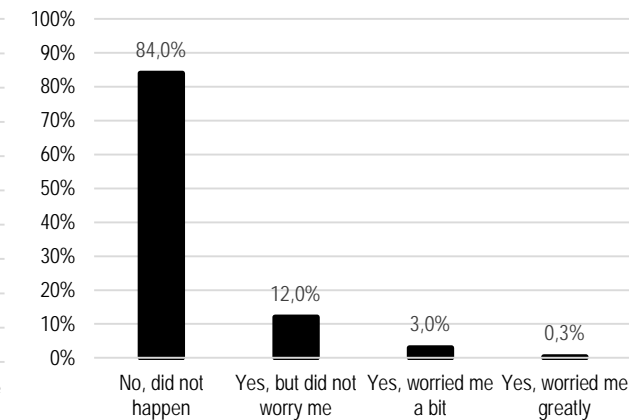
c) Refused to eat the right food



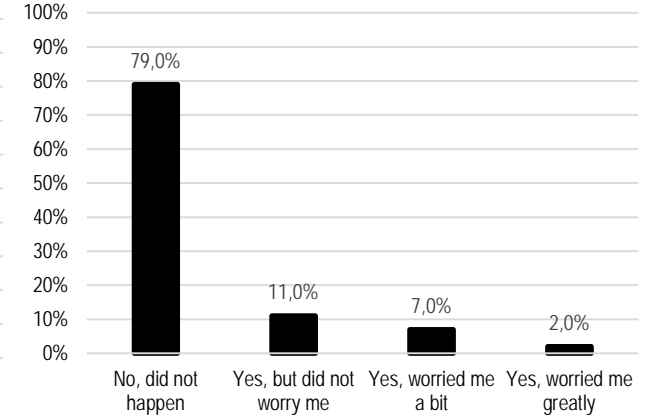
d) Been choosy with food



e) Over-eaten



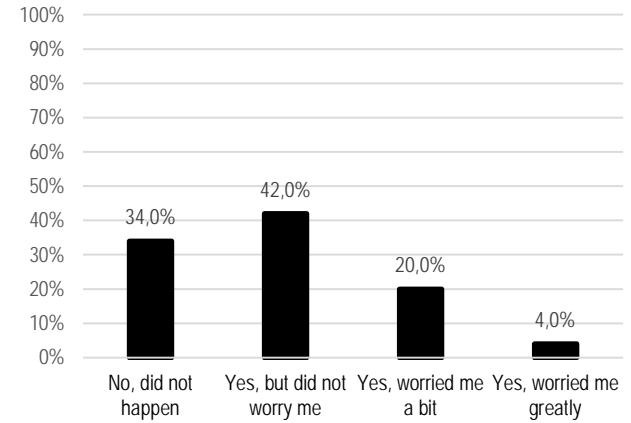
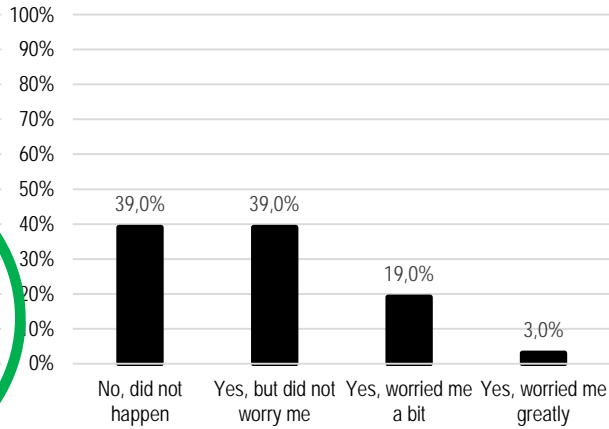
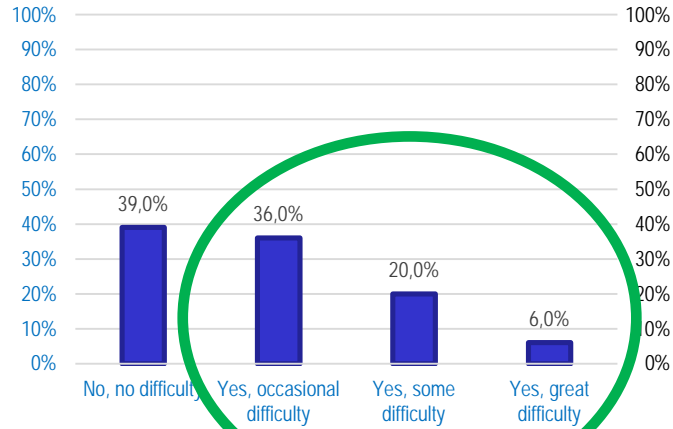
f) Been difficulty to get in to an eating routine



a) Feeding difficulties (general question)

b) Not eaten sufficient amount of food

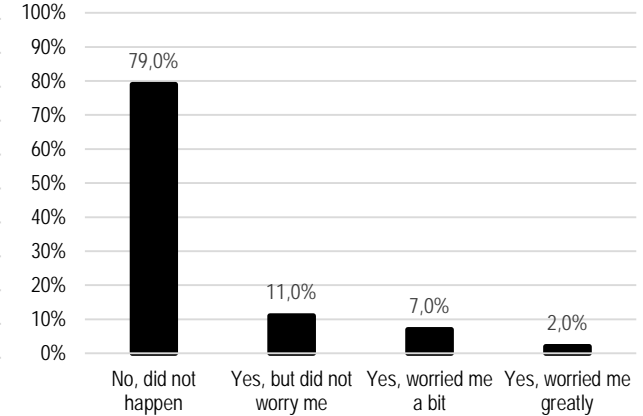
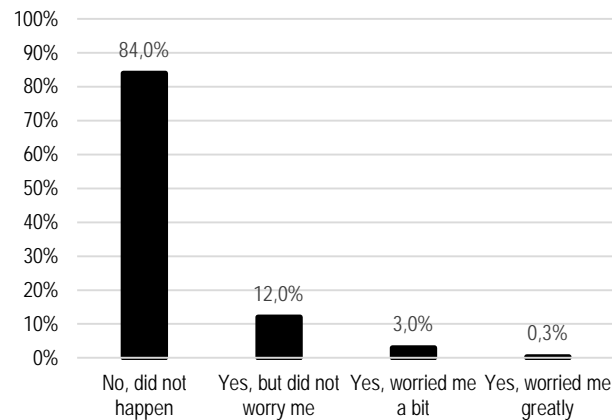
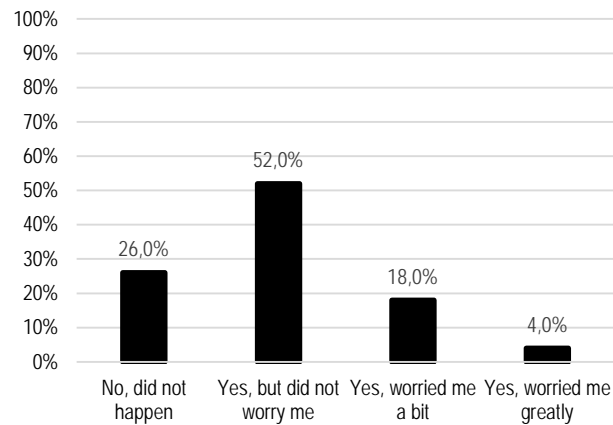
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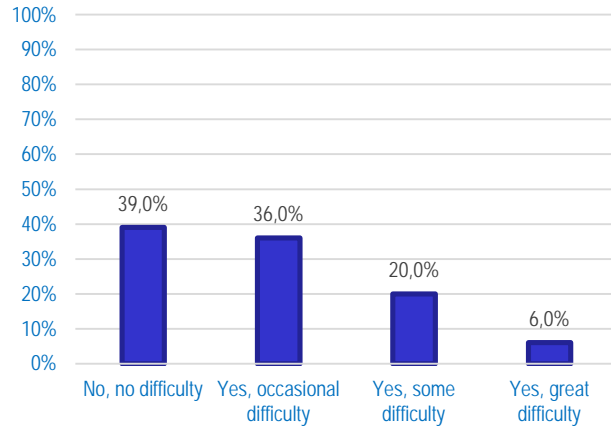
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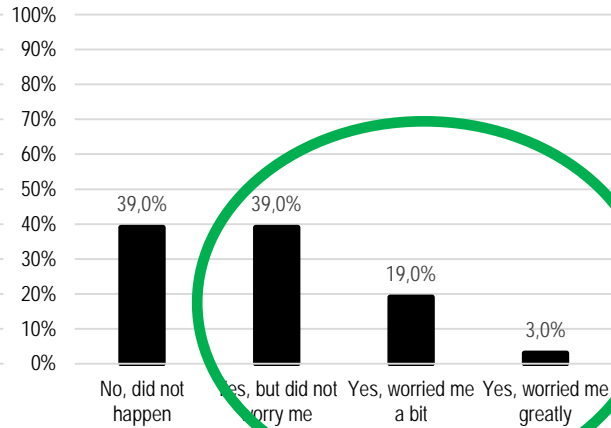
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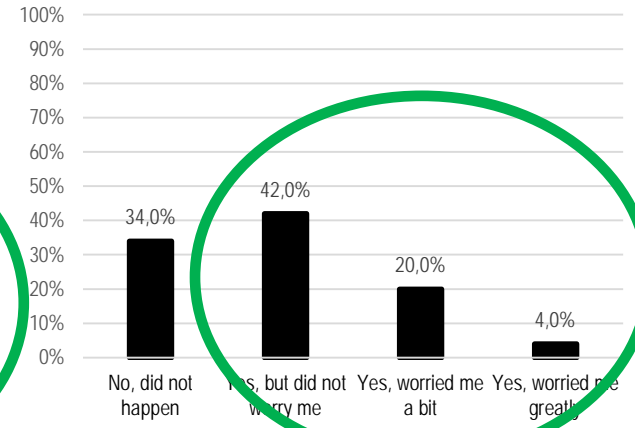
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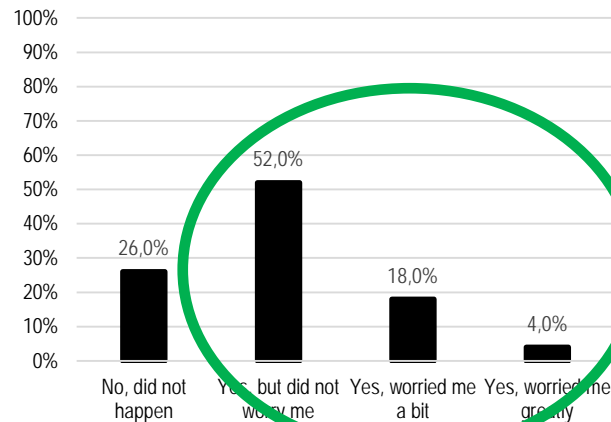
b) Not eaten sufficient amount of food



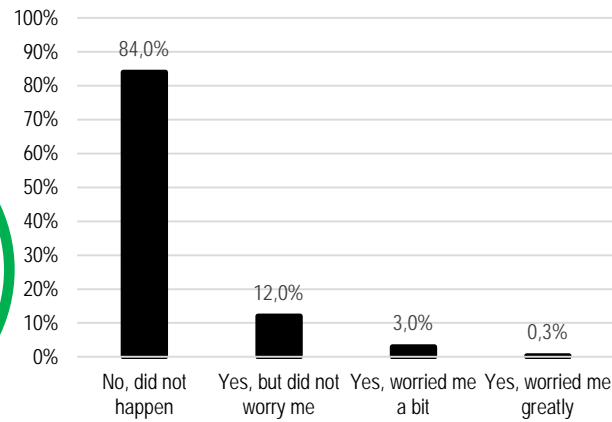
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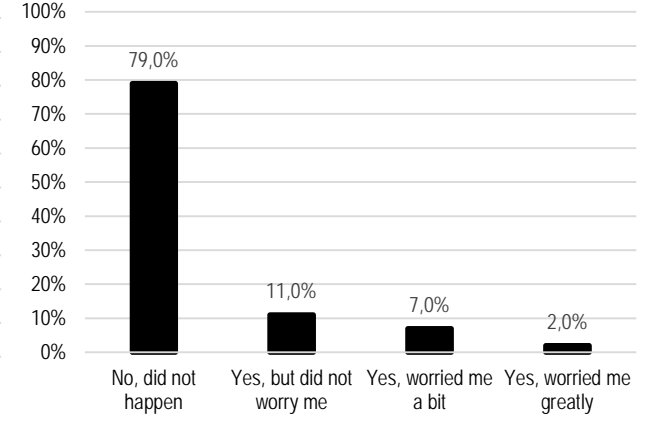
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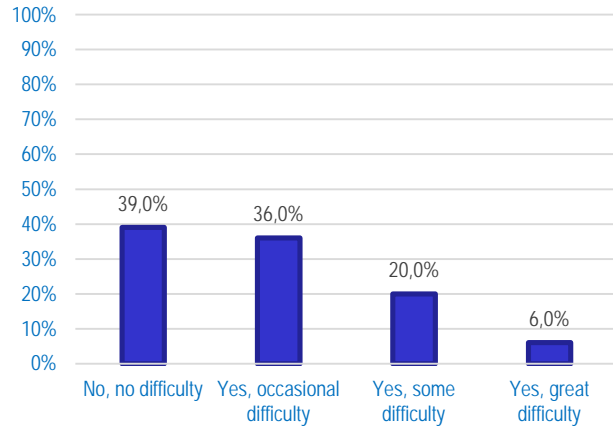
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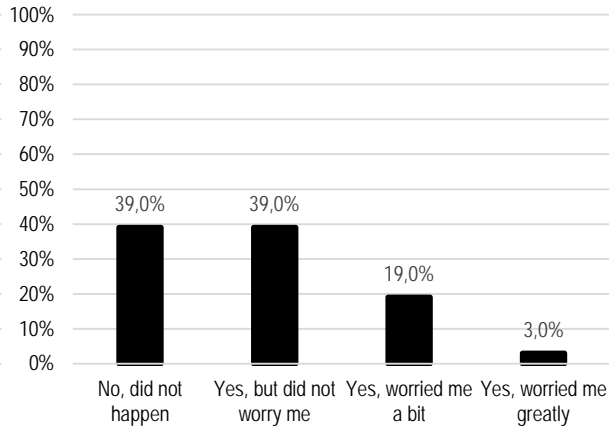
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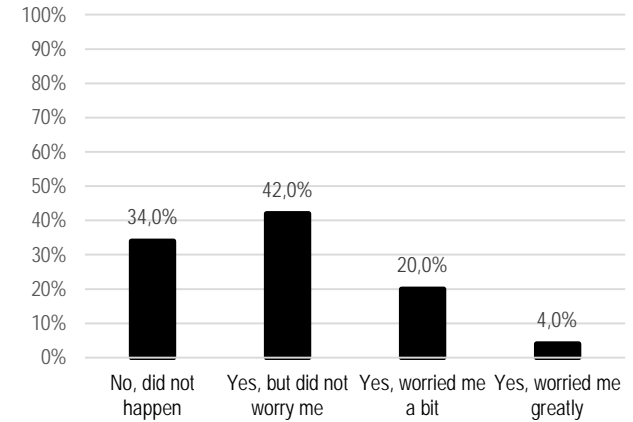
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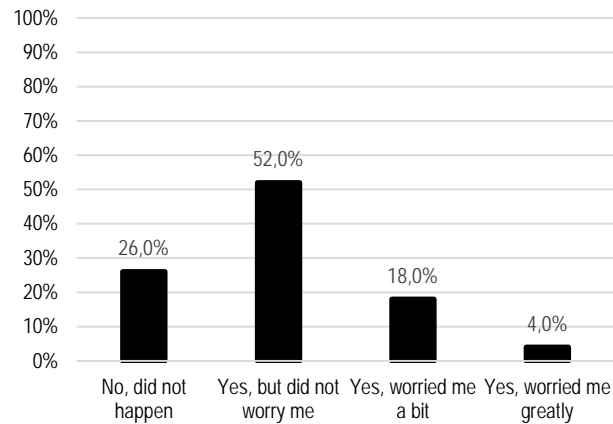
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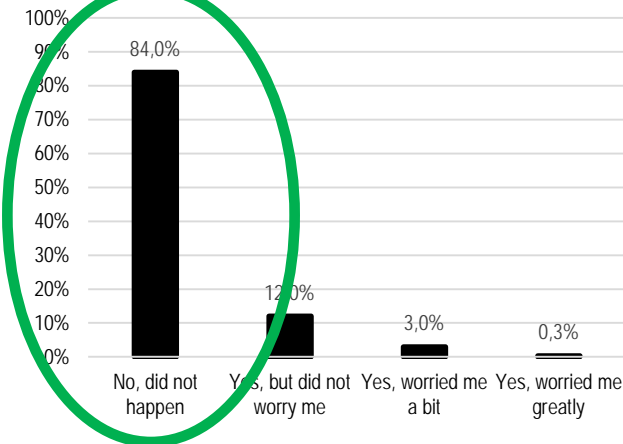
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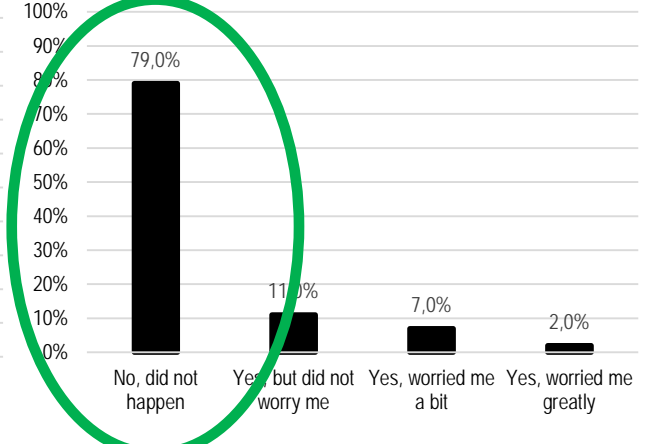
d) Been choosy with food



e) Over-eaten



f) Been difficulty to get in to an eating routine



Age at introduction of solid foods	Adjusted RR*	95% CI	P-value
Feeding difficulties			
<4 months	0.96	0.89, 1.04	0.36
≥4 & <6 months	1.00	-	-
≥6 months	0.73	0.59, 0.91	0.004

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Feeding difficulties			
<4 months	0.96	0.89, 1.04	0.36
≥4 & <6 months	1.00	-	-
≥6 months	0.73	0.59, 0.91	0.004
Not eaten sufficient amount of food			
<4 months	1.01	0.94, 1.10	0.72
≥4 & <6 months	1.00	-	-
≥6 months	0.90	0.75, 1.08	0.27
Refused to eat the right food			
<4 months	0.98	0.91, 1.05	0.61
≥4 & <6 months	1.00	-	-
≥6 months	0.96	0.83, 1.11	0.57
Been choosy with food			
<4 months	1.00	0.95, 1.06	0.90
≥4 & <6 months	1.00	-	-
≥6 months	0.91	0.80, 1.04	0.17
Over-eaten			
<4 months	1.13	0.91, 1.39	0.27
≥4 & <6 months	1.00	-	-
≥6 months	1.19	0.75, 1.87	0.46
Been difficult to get into an eating routine			
<4 months	1.12	0.94, 1.35	0.21
≥4 & <6 months	1.00	-	-
≥6 months	1.00	0.66, 1.52	0.99

Discussion

- **Few associations** found in SWS
 - **No evidence** that introducing solids ≥ 6 months is association with feeding difficulties
- Small proportion (5%, n=110) of children introduced to solids ≥ 6 months
- Observational study \rightarrow causal pathway
- Other **eating behaviour questionnaire** E.g. *Child Eating Behaviour Questionnaire*
- First analysis at 3y \rightarrow persistent at older ages in SWS?



Conclusion

- **Continued debate over the evidence** behind the revisions of the UK infant feeding recommendations in 2003
- **Few associations** between feeding difficulties and age at introduction of solid foods
- **General feeding difficulties less common** among infants introduced to solid foods ≥ 6 months of age



Acknowledgements and Questions

- Women of Southampton and their children and research nurses and staff
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 - **Endeavour Research Fellowship** (Australian Govt. Department of Education & Training)
 - **NIHR Southampton Biomedical Research Centre**
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- Hollis et al. **Age at Introduction of solid foods and feeding difficulties in childhood: findings from the Southampton Women's Survey.** *British Journal of Nutrition*, 2016; 116: 743-750.

Table 2. Characteristics of 2389 mother-child pairs according to age at introduction of solid foods in infancy.

	Age at introduction of solid food						P-value
	<4 months (n = 642)		≥ 4 & < 6 months (n = 1637)		≥ 6 months (n = 110)		
Mother							
Education (≥A-levels) (n, %)	349	54%	1038	64%	65	60%	<0.001
Primiparous (n, %)	277	43%	886	54%	68	62%	<0.001
Smoked in pregnancy (n, %)	124	20%	205	13%	5	5%	<0.001
Age at child's birth (years) (mean, SD)	29.7	3.8	31.0	3.7	32.8	3.8	<0.001
Pre-pregnancy BMI (kg/m²) (median, IQR)	24.8	22.4- 28.0	24.0	21.8-27.2	23.8	21.3-25.8	0.006
Child							
Birthweight (g) (mean, SD)	3587	503	3483	455	3382	445	<0.001
Male (n, %)	389	61%	791	48%	49	45%	<0.001
Breastfed for ≥ 4 months (n, %)	187	30%	725	46%	56	54%	<0.001
Overweight/obese, n (%)	103	17%	209	13%	10	10%	0.31
Meals per day at 3 years (median, IQR)	5	4-6	5	4-5	5	4-5.5	0.002
Prudent diet score at 3 years (mean, SD)	-0.21	1.0	0.12	0.96	0.39	0.86	<0.001

DAG output - Confounding variables

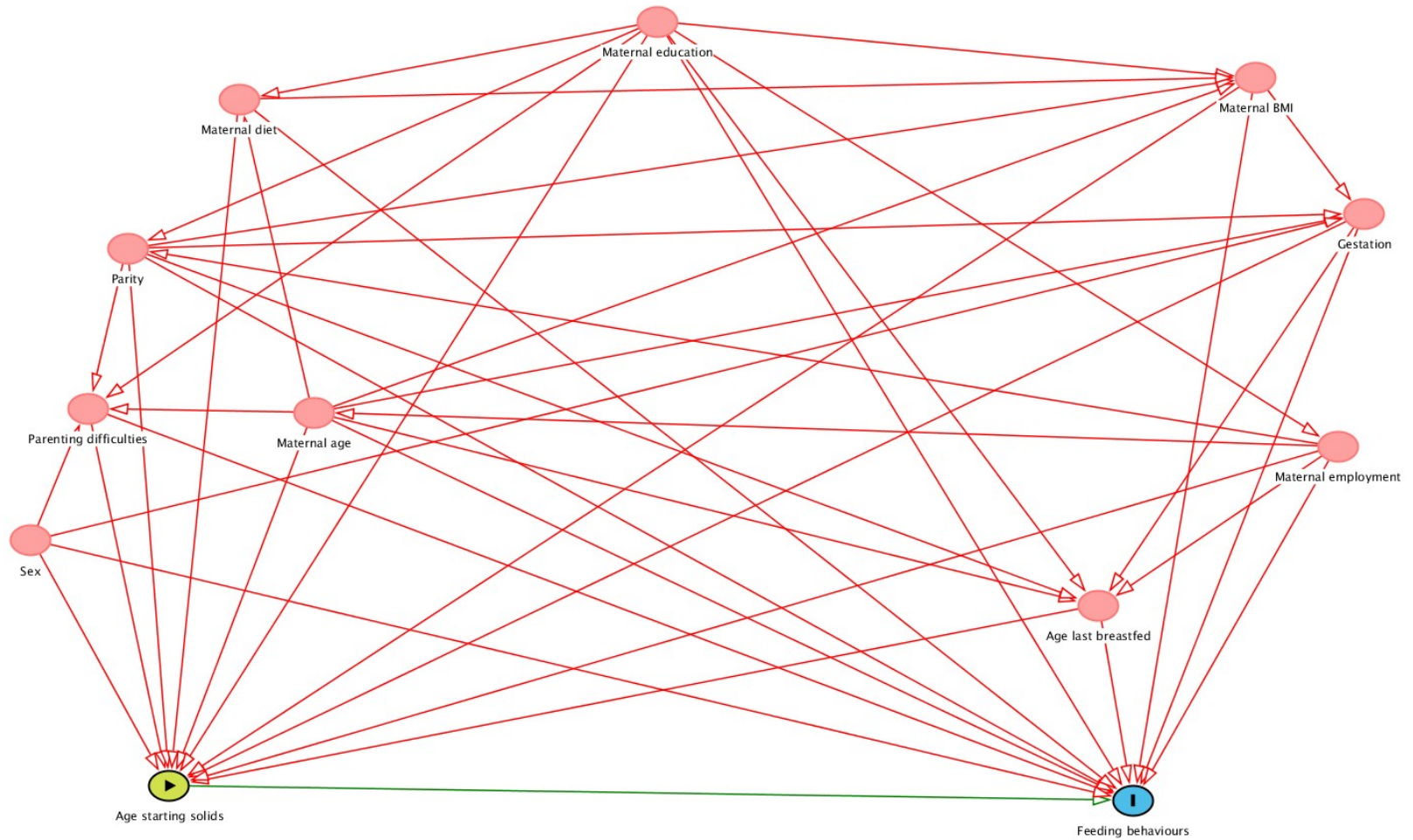


Table 1. Characteristics of mothers and children in study compared with term live singleton births not in study.

Characteristic	In study		P-value
	No (n = 554*)	Yes (n = 2389)	
Mother			
Education (\geqA-levels), n (%)	278 (51%)	1452 (61%)	<0.001
Primiparous, n (%)	251 (45%)	1231 (52%)	0.009
Smoking in pregnancy, n (%)	112 (23%)	334 (14%)	<0.001
Pre-pregnancy BMI, median (IQR)	24.1 (22.0-27.3)	24.2 (21.9-27.4)	0.87
Age at child's birth, years, mean (SD)	30.3 (4.0)	30.8 (3.8)	0.006
Child			
Birthweight, g, mean (SD)	3486 (487)	3506 (471)	0.35
Males, n (%)	265 (48%)	1160 (49%)	0.85
Breastfed for \geq 4 months, n (%)	120 (32%)	968 (42%)	<0.0001
Child at 3 years			
Height, cm, mean (SD)	95.2 (3.7)	95.8 (3.5)	0.16
Weight, kg, median (IQR)	14.8 (13.6-15.9)	14.9 (13.8-16.1)	0.70
Overweight/obese, n (%)	10 (14%)	322 (14%)	0.97
Meals per day, median (IQR)	5.0 (4.0-5.0)	5.0 (4.0-6.0)	0.61