



Statement on paper investigating links between IQ and breastfeeding (von Stumm and Plomin, 2015)

A recent paper was published by von Stumm and Plomin (2015) in the open access PLOS One journal, entitled '*Breastfeeding and IQ growth from toddlerhood through adolescence*'¹. The findings of this paper were widely reported in the popular press, with headlines such as:

'Breast is NOT best when it comes to IQ' Daily Mail, September 23rd 2015

'Breastfeeding does not improve IQ' Daily Telegraph, September 23rd 2015.

'Breast-fed babies are not more clever than bottle-fed' Daily Express, September 23rd 2015.

In addition it has been reported that the headlines were repeated in other newspapers around the world, highlighting the importance of headline writers and journalists taking advice before they report information that may be detrimental to public health. Even if a paper is published in a peer reviewed journal this does not mean the data is accurate, or that there were not flaws in the way the data was collected or analysed. Reviewers and editors in one subject area (in this case psychology) may not understand the relevance of accurate data collection around breastfeeding experience for example.

The first author of this paper confirmed that a simplistic yes/no variable to describe any breastfeeding of the twin pair was used in this study, but continues to maintain that:

*'the empirical evidence suggests no meaningful relationship between breastfeeding and IQ'*².

NHS Choices did a '*Behind the Headlines*' feature on this paper on Thursday September 24th³, and concluded that there were a number of flaws in the tests used to measure IQ and that there was a lack of other explanatory variables used in analyses which can impact on IQ. They however failed to comment on the inadequate measurement of breastfeeding used.

What data did the study use?

The data used in the analysis for this paper was taken from an on-going 'twins study', with 15,000 families with twins initially recruited to the study between 1994 and 1996. The population used for this study included 11,582 children who the authors claimed were representative of the whole population despite significant differences in socioeconomic status (which were not reported).

What did they measure?

Intelligence (IQ) was measured at 2, 3, 4, 7, 9, 10, 12, 14 and 16 years using a mixture of parent administered, web based and telephone based tests. IQ gain was the variable modelled. They measured breastfeeding by asking the mothers when the twins were 18 months of age whether they had been breastfed and for how long in days. The question was asked for both twins together,

¹ Von Stumm S, Plomin R (2015) Breastfeeding and IQ growth from toddlerhood through adolescence.

<http://www.plosone.org/article/fetchObject.action?uri=info:doi/10.1371/journal.pone.0138676&representation=PDF>

² Personal communication, Helen Crawley and Sophie von Stumm.

³ <http://www.nhs.uk/news/2015/09September/Pages/No-significant-link-between-breastfeeding-and-higher-IQ.aspx>

not for each twin separately. Additional information was available to the authors on maternal age, gestational age and socioeconomic status (SES) based on parental education and job status.

How was the data analysed

Statistical models were used to predict relationships between the simple breastfeeding yes/no variable and variance in IQ gains, using mother's age, gestational age and SES as covariates.

What did the authors conclude?

The authors concluded that *'Breastfeeding has little benefit to early life intelligence and cognitive growth from toddlerhood through adolescence.'*

Why this study is flawed in its methods, analysis and conclusion:

Data used in this study	Why this data is flawed or inadequate
1. A sub-sample of a larger study group.	The authors state that the sub-sample population (77% of original cohort) used for this analysis varied significantly in mean SES status compared to the original population.
2. Background explanatory variables about the cohort.	Only maternal age, gestational age and SES were used as explanatory variables to describe lifestyle factors which might impact on IQ gain of children. It is known that a large number of factors will impact on child IQ over time, including maternal and paternal lifestyle (including their body mass index), maternal and paternal IQ, education and early diet experiences (such as early introduction of solids). The explanatory variables used in the statistical model were therefore inadequate.
3. Measurements of IQ gain.	The study measured IQ gain, not IQ. This means that if babies had benefited from any early life factors which increased IQ <i>before</i> the first measurement at age 2, and maintained this advantage, then there would be no 'IQ gain'.
4. The study asked mothers about their breastfeeding experience 18 months after their babies were born.	It has been reported that breastfeeding recall is often weak. A study of maternal recall of breastfeeding experience reported that this was inaccurate even within 48h, and even more so after longer periods, ⁴ and it has also been reported that breastfeeding duration among short-term breastfeeders tends to be overestimated when measured 1-3.5 year post birth ⁵ - It is unlikely that the mothers of twins in the study were able to recall their breastfeeding experience with accuracy.

⁴ Bland RM et al (2003) Maternal recall of exclusive breastfeeding, *Arch Dis Child*, 88, 778-783

⁵ Gillespie et al (2006) Recall of breastfeeding and other weaning variables.
<http://www.internationalbreastfeedingjournal.com/content/1/1/4>

Data used in this study	Why this data is flawed or inadequate
5. Twins were not treated separately in terms of their breastfeeding experience.	There may have been differences in feeding experience by each twin, and twins may have experienced different early life experiences e.g. length of stay in hospital related to birthweight. It is established that the results of twin studies may not be applicable to single births.
6. The study used sibling-pairs.	Studies which use sibling-pairs produce inconsistent results when investigating impacts of breastfeeding on outcomes. ⁶
7. The twins in this study were born between 1994-1996 but no information is given on population breastfeeding rates at this time.	<p>In 1995 fewer than 60% of babies were breastfed at 1-2 weeks and it is likely that the 60% of mothers of twins who reported breastfeeding in this study were referring to very early, or ever breastfeeding, experience.</p> <p>The National Infant Feeding Survey reported that 40% of breastfed babies in hospital in 1995 were given bottles of formula milk.⁷</p> <p>Mothers in this study reported their average duration of breastfeeding was '4 months'. In 1995 about 30% of babies were breastfed at 4 months of age, suggesting that this data may have been remembered inaccurately.</p>
8. Any breastfeeding (yes/no) was used as the only explanatory variable to describe breastfeeding experience.	<p>The study does not explore differences between exclusive breastfeeding, and any breastfeeding, despite evidence that it is exclusive breastfeeding that is linked to higher IQ.⁸</p> <p>Data on feeding twins and multiple births was not reported in infant feeding surveys 1995-2005, but were reported in 2010 and it is likely that this would have been a similar pattern in 1995:</p> <p>'Most mothers of multiple births had introduced formula by the time their baby was a week old (78% for first born and 72% for second born babies). This compares with 52% of all Stage 3 mothers, suggesting that mothers of multiple births introduce formula at an earlier stage'.⁹</p>
9. Some of the tests used to measure IQ in this study were carried out by parents at home.	Some of the results of IQ testing relied on parents observations about the child rather than an objective test of ability. The home testing was used when children were 2, 3 and 4 years of age. Testing was done by telephone at age 7, by mail at age 9 and subsequently by web-based testing. Methods were therefore inconsistent across the time period.

⁶ <http://archpedi.jamanetwork.com/article.aspx?articleID=2319109>

⁷ <http://www.esds.ac.uk/doc/4746/mrdoc/pdf/4746userguide.pdf>

⁸ <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3747316/>

⁹ <http://www.hscic.gov.uk/catalogue/PUB08694/Infant-Feeding-Survey-2010-Consolidated-Report.pdf>

The study conclusions are not consistent with other findings	What do we know from other data?
<p>10. Other well conducted studies and review have found consistent links between IQ and breastfeeding.</p>	<p>Previous research, including two randomised trials, has shown clear associations between breastfeeding and child intelligence ^{10,11}.</p> <p>Scientific literature shows that even after controlling for home environment or stimulation, breastfed subjects have improved performance in cognitive tests, thus suggesting that breastmilk itself has a programming effect on intelligence. ¹²</p> <p>Some evidence suggests the presence of long-term effects on adult intelligence and school achievement, ¹³ and a recent study from Brazil reported that breastfeeding is associated with improved performance in intelligence tests 30 years later by increasing educational attainment and income in adulthood. ¹⁴</p> <p>A new systematic review included 17 studies with 18 estimates of the relationship between breastfeeding and performance in intelligence tests. In a random-effects model, breastfed subjects achieved a higher IQ with no evidence of publication bias. ¹⁵</p>

The main author of this paper, Sophie von Stumm was quoted in the press as saying: *‘mothers should be aware that they are not harming their child if they chose not to, or cannot, breastfeed’.*

Dr von Stumm, a psychologist, was asked if she would issue a statement clarifying that this study was not able to accurately measure the impact of breastfeeding on IQ, and that breastfeeding remained unequivocally the best method of feeding an infant, but declined to do so. The authors have not stated any competing interests in funding of this study.

We believe that the findings of this study should be excluded in any future reviews of evidence linking breastfeeding to IQ.

¹⁰ Kramer MS, Aboud F, Mironova E, et al. Breastfeeding and child cognitive development: new evidence from a large randomized trial. *Arch Gen Psychiatry* 2008; **65**: 578–84.

¹¹ Lucas A, Morley R, Cole TJ, Lister G, Leeson-Payne C. Breast milk and subsequent intelligence quotient in children born preterm. *Lancet* 1992; **339**: 261–64

¹² Horta BL, Victora CG. (2013) Long-term effects of breastfeeding: a systematic review. Geneva: World Health Organization.

¹³ Richards M, Hardy R, Wadsworth ME. Long-term effects of breast-feeding in a national birth cohort: educational attainment and midlife cognitive function. *Public Health Nutr* 2002; **5**: 631–35

¹⁴ Victora et al (2015) Association between breastfeeding and intelligence, educational attainment, and income at 30 years of age: a prospective birth cohort study from Brazil <http://press.thelancet.com/breastfeedingIQ.pdf>

¹⁵ Horta BL et al (2015) Breastfeeding and intelligence: systematic review and meta-analysis, *Acta Paediatrica*. DOI: 10.1111/apa.13139 <http://onlinelibrary.wiley.com/doi/10.1111/apa.13139/abstract>