



RESEARCH SUMMARY

Obesity in Infants

Kim, J., Peterson, K.E. (2008) Association of infant child care with infant feeding practices and weight gain among US infants. Archives of Pediatric and Adolescent Medicine, 162(7), 627-633.

Hawkins, S.S. et al. (2008) Maternal employment and early childhood overweight: findings from the UK Millennium Cohort Study. International Journal of Obesity, 32, 30-38.

Stettler, N. (2007) Nature and strength of epidemiological evidence for origins of childhood and adult obesity in the first year of life. International Journal of Obesity, 31, 1035-1043.

Obesity has received much press comment with respect to health and its cost to national economies. Nevertheless, it must be borne in mind that the benefits of sufficient weight gain during infancy are crucial for infant development and to reduce infant mortality, abnormal neurological problems, coronary heart disease and stroke. On the other hand, overweight in infancy is associated with asthma, hyperlipidemia, high blood pressure and type 2 diabetes mellitus. The ideal is to have a diet and lifestyle that places the infant within the optimal range of appropriate food intake and exercise.

The papers by Kim & Peterson (2008) and Hawkins et al. (2008) are drawn from large-scale statistical studies of 8,150 and 13,113 infants respectively from the US and UK; both papers derive their data from recent cohort studies. The US study examines infant weight data from children in daycare centres compared with children cared for in the parental home. The UK study focuses on the influence of maternal employment on infant weight data with the assumption that the child is looked after by someone other than the mother whilst she is in employment. A third paper by Stettler (2007) is an extensive review article that focuses on whether childhood and adult obesity could have their origins in infancy.

In the introduction of the paper by Kim & Peterson (2008), the authors point out the well known observation that breastfeeding can lower the risks of infant overweight; they surmise that if the mother returns to work soon after the infant's birth, there will be less chance for breastfeeding and this could be a contributory factor in infant overweight. Furthermore, analysis of the energy content of lunch at child day-care centres for infants and toddlers shows an average of 332kcal compared with 281kcal for those infants that eat at home. As a result of these observations, this study set out to analyze whether

- a) early non-parental childcare could decrease breastfeeding rate,
- b) that in turn could lead to early introduction of solid foods,
- c) infants in childcare have a greater rate of weight gain than those in parental care.

The statistical analysis used a birth cohort group (ECLS-B) and sampled infants aged 9 months. The primary outcome variable was weight gain between birth and 9 months.

At the 9 month point, 50% of US infants continued with parental childcare. Once in childcare, the majority (26% of all infants) received their care from another relative; this left approximately 24% of infants having non-parental and non-relative childcare. 22% of US infants began their childcare before 3 months of age.

With regard to breastfeeding, those infants that started childcare before 3 months of age had mothers with an odds ratio of 0.58 for breast feeding initiation (i.e. less likely to have been breastfed) compared with 0.99 for mothers who undertook parental care for longer than the first 6 months after

the infant's birth. The odds ratio is a statistical measure used for two binary data values; it is defined as the ratio of the odds of an event occurring in one group to the odds of it occurring in another group.

With regard to the introduction of solid foods, infants starting childcare before 3 months had 1.73 times higher odds (i.e. nearly twice as likely) for receiving an early introduction of solid foods than those infants in parental care.

At 9 months, the infants who received parental care showed significantly less weight gain (6001g) compared with non-parental care (6163g) and were less overweight than those in childcare.

The authors conclude that childcare factors are associated with unfavourable infant feeding practices that generate more weight gain in infants. The early introduction of solid foods is a risk factor for weight gain.

The UK study of Hawkins et al. (2008) uses the Millennium Cohort data for 13,113 infants born in the UK between 2000 and 2002. The aims of this study differ significantly from those summarized in the previous US paper. During the last decade in the UK, the percentage of overweight boys aged 2-5 years has risen from 17% to 22%, there has been a similar rise for girls from 20% to 25%. In the period from 1984-2004 the percentage of women with children under 5 years and in employment has risen from 27% to 59% of married/cohabiting women. During that period, employment rates for men remained stable. The focus of the study is on the population of overweight children aged 3 years and seeks:

- a) to examine the relationship between maternal (and partner) employment and overweight of the children
- b) to investigate other factors related to overweight in children amongst mothers in employment.

The primary outcome variable was childhood overweight at age 3 years. The definitions of overweight and obesity were taken from the International Obesity Task Force Standard Cut-off Data for body mass index (BMI). BMI is an index (weight/height², units of kg/m²) that makes an adjustment for height discrepancies; this is particularly important in children where there is a wide variation in relative heights. For boys and girls aged 3 years the BMI overweight cut-off values are 17.9 and 17.6 respectively. Obesity was not considered as a specific sub-category of overweight in this study.

A huge array of parameters were considered in the study: maternal ethnic group, maternal socioeconomic circumstances, household income, highest academic qualification, lone motherhood status, number of children in the household, maternal pre-pregnancy body size, smoking during pregnancy, birth-weight, breast feeding factors, daily television viewing, regularity of meal times, who cooks the main meal, type of daycare, working atypical hours, and finally a question about whether the mother 'thought that she was not able to spend enough time with her child because of work.'

The mean age of the mothers at birth was 29 years and their partner was 32 years. After the birth of their child, 41% of mothers did not work compared with 3% of their partners. The partners who were employed worked an average of 40 hours per week. Working mothers spent on average 22 hours per week at work and for 27 months during the 3 year period after the child was born. Of all the children in the survey, 23% of children aged 3 years were overweight (data not split by gender).

If the mothers had a pre-pregnancy BMI that was categorized as overweight, 31.1% of the children were overweight compared with 19.7% for mothers categorized with normal pre-pregnancy weight. This was the largest percentage difference of overweight children for any category in the analysis. Mothers who claimed that they were not able to spend enough time with their child because of work, showed 28.6% overweight children. 25.5% of children of employed mothers were overweight if there was a pattern of informal daycare. Mothers with poor academic qualifications (GCSE grades D-G or lower) had 25.1% overweight children. Patterns of breastfeeding also showed clear differences: only 20.4% of children were overweight from mothers who breastfed for more than 4 months compared with 25.5% of overweight children from mothers who never breastfed. Similarly the introduction of solid food within 4 months of birth led to overweight in 25.7% of children compared to 21.6% when solid food was introduced after 4 months. The mother's television viewing habits correlated with

overweight children, the percentage of overweight children rising from 21.1% with less than 1 hour viewing per day for the mother to 24.8% overweight with more than 3 hours viewing.

The effect of household income on children's overweight was only significant for households with annual incomes greater than £33,000 where overweight rates were 21.1%. However, in a more complex analysis of this income group, after taking into account compounding factors, children were more likely to be increasingly overweight for every 10 hours per week that the mother worked. No relationship was found between overweight and the number of hours that the mother's partner worked. These findings are broadly similar to those obtained in school-aged children from studies in the US and Canada.

The authors conclude that 'Policies in the UK promoting work-life balance may help protect parents' time to provide opportunities for their children to access healthy foods and physical activity.'

The review paper by Stettler (2007) critically appraises the notion of the origins of obesity in the first year of life. The idea that chronic conditions can originate from stimuli during critical periods in early life is known as programming. This concept is well established in psychology and developmental biology. Stettler's paper is a timely review and introduces a note of caution to temper newspaper headlines that perhaps overstate the evidence for obesity having its origins in the first 12 months of our life.

The atomic physicist Lord Rutherford once said: 'If your result needs a statistician then you should design a better experiment.' That may be good advice in the physical sciences but does not hold in epidemiology where the number of factors in the analysis may be vast and often confounding or mediating; in that case the devil is in the detail. Two interesting hypotheses are reviewed here:

a) that rapid weight gain in infancy is a risk factor for later obesity (21 studies, the largest study having 19,000 infants).

b) that breastfeeding is protective against later obesity (28 studies, having a total of 300,000 subjects pooled in a meta-analysis, and with the BMI analysis having 36 studies with 355,000 people).

In carefully designed animal experiments it has been shown that rapid weight gain in infancy is a risk factor for later obesity. However, for ethical reasons, analogous experiments cannot be performed in man. Therefore statistical analyses have to be performed from epidemiological studies. It had been claimed from detailed analysis of 21 separate studies that there was strong evidence for an association between rapid weight gain in infancy and later obesity. This apparent association was weakened when confounding factors were taken into account. Only 6/10 criteria for study design and for causality support the proposition in humans that rapid infancy weight gain is a risk factor in childhood and adult obesity.

In the previous two summaries for infancy overweight data, breastfeeding appeared to be an important factor in mitigating against infancy overweight. Despite there being 17 observational studies and 36 BMI studies that appear to support the idea that breastfeeding decreases the risk of overweight in later life, of the 10 criteria mentioned in the previous paragraph only 5 are fulfilled.

The US and UK cohort studies (already summarized above and covering a large sample size of 21,265 children in total) show that overweight in childhood is associated with non-maternal childcare in infancy and furthermore that breastfeeding is protective against overweight in infancy. Stettler's view is that more research is needed before a definite link can be demonstrated between infant overweight and future adult obesity.