

## Original Article

# An online survey of knowledge of the weaning guidelines, advice from health visitors and other factors that influence weaning timing in UK mothers

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## Abstract

The UK weaning guidelines recommend the introduction of solid food at or around 6 months. The evidence suggests that knowledge of the guidelines is high, although only a small minority of parents wait until 6 months to wean. The aim of this study was to assess understanding of the UK weaning guidelines in a sample of UK parents and investigate the associations of this understanding with weaning timing, and in comparison to other influencing factors. This study conducted an online survey of UK parents. Eligible participants had weaned a child since the introduction of the current guidelines. Of 3607 participants, 86% accurately understood the guidelines. Eighty-seven per cent of health visitors were reported to have advised weaning at or around 6 months. Knowledge of the guidelines was associated with later weaning (independently of demographic factors) ( $P < 0.001$ ) but did not ensure compliance: 80% of mothers who weaned before 24 weeks and 65% who weaned before 17 weeks were aware of the guidelines. Younger mothers ( $P < 0.001$ ), those receiving benefits ( $P < 0.001$ ), those educated only to 16 ( $P < 0.001$ ) and minority ethnic groups ( $P < 0.001$ ) had lower levels of awareness. Poor understanding of the guidelines was the most reliable predictor of early weaning ( $P = 0.021$ ) together with young maternal age ( $P = 0.014$ ). Following the baby-led weaning approach was the most reliable predictor of those weaning at 26 weeks, together with the Internet being the most influential source of advice. Understanding of the current weaning guidelines is high and is a key independent predictor of weaning age in this population.

**Keywords:** weaning, complementary feeding, introduction of solids, UK weaning guidelines.

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## Introduction

The timing of the introduction of solid food to an infant's diet is important both nutritionally and developmentally (More *et al.* 2010). In 2003, the UK Department of Health (DH) adopted the World Health Organization (WHO) guidelines for exclusive breastfeeding, and the introduction of solid foods to infants at 6 months (Department of Health 2003) and the current DH literature suggests weaning at *around*

6 months in response to developmental signs from the infant (Department of Health and UNICEF 2008). The UK Scientific Advisory Committee on Nutrition (SACN) acknowledged the need for flexibility in applying these guidelines as 'mothers may introduce complementary foods earlier than this for personal, social and economic reasons. However solid foods should not be introduced before the end of four months (17 weeks)' (Scientific Advisory Committee on Nutrition 2001).

The DH has suggested that knowledge of the weaning guidelines is high (Department of Health 2010); however, the most recent UK-wide study of weaning practice in 2005 (Bolling *et al.* 2007) showed that while the mean weaning age had increased since the 2000 survey, only 2% of parents had waited until 6 months (26 weeks) to wean. The introduction of solid foods is influenced by a range of social and psychological factors (Anderson *et al.* 2001; Scientific Advisory Committee on Nutrition 2001); maternal education, age and socio-economic status have been associated with weaning timing (Alder *et al.* 2004; Bolling *et al.* 2007; White 2009); in addition, the baby's size, weight and gender, formula-feeding (Wright *et al.* 2004) and antenatal perceptions (Tarrant *et al.* 2010) are also influences. Perceived signals from the baby are a major trigger for mothers to commence weaning (Anderson *et al.* 2001; Bolling *et al.* 2007; Arden 2010) and many parents believe their infant shows signs of being ready to wean earlier than 6 months (Bolling *et al.* 2007). There has been suggestion that the current guidelines, based on a generic age, are too rigid and can create conflict when mothers are also trying to respond to developmental signals (Arden 2010).

External advice, both professional and informal, is also important for informing weaning behaviours (Alder *et al.* 2004; Bolling *et al.* 2007; Tarrant *et al.* 2010). In a recent consumer report, the DH acknowledged that there may be a lack of consistency of weaning advice from health visitors (Department of Health 2010), and a recent qualitative study suggested that health visitors may suggest weaning earlier than 6 months (Arden 2010).

It is important to understand what weaning advice mothers are being given, what their information sources are and how this knowledge shapes their weaning behaviour in the context of other influences. The current study was designed to assess awareness of the weaning guidelines in a sample of UK parents, reported weaning advice from health professionals, and to ascertain how knowledge of the guidelines, together with other influencing factors, may shape weaning behaviour. In particular, the factors that predict those who wean in line with the guidelines (around 6 months) and those who wean early (before 17 weeks) are explored in this context, including demographics, sources of information, professional advice received, triggers to begin weaning and perceptions of the weaning process.

## Materials and methods

### Design

A survey of UK parents was performed. The survey was approved and conducted in accordance with the ethical standards of Kings College London Research and Ethics Committee (Ref: BDM09/10-61).

### Recruitment of sample

An opportunistic, self-selected sample of UK parents was recruited. A variety of parenting support organisations and online forums were approached and those who agreed to distribute or advertise the study either hosted a link to the electronic survey or sent an email

### Key messages

- Understanding of the weaning guidelines is high across all demographic groups; younger mothers, those in receipt of benefits, those educated only to 16 and mothers from minority ethnic groups are less likely to correctly understand the guidelines.
- Knowledge of the guidelines is associated with later weaning age but not does ensure compliance.
- The majority of reported health visitor advice is in line with the guidelines.
- Mothers weaning before 17 weeks are predominantly influenced by advice from the older generation (mother or grandmother).
- Mothers weaning between 4 and 6 months are predominantly influenced by previous experience of weaning.
- Mothers weaning at or around 6 months are most reliant on advice from the Internet and the health visitor.

invitation to their members (see the Appendix). The host organisations were National Child-birth Trust (NCT), Families-On-Line, Netmums, Mumsnet and Millpond Sleep Clinic.

Eligible participants were resident in the UK and had weaned a child since the introduction of the current guidelines. Eligibility was confirmed by answers to explicit selection questions within the survey; non-UK residents and those that had a baby but had not yet weaned their child, together with those who weaned early or late for medical reasons, were excluded from the analysis.

The survey took approximately 10 min to complete and was conducted over a 3-week period in June 2010. Participation was anonymous and voluntary; no incentives were offered for participation.

### Survey design

The survey was designed and accessed using an online survey tool ('SurveyMonkey'; Portland, OR, USA). The survey consisted of 21 questions with multiple choice, 'yes/no' or Likert scale responses. The questions were divided into themed sections covering: the age of weaning of the most recent child; understanding of the current weaning guidelines; factors influencing the timing of weaning; sources of information about when to wean; antenatal care; feeding choices during the first 6 months; and feelings about the weaning process. In addition, basic demographic data were collected (survey available upon request from the authors). No identifiable information was collected from the respondents to ensure anonymity; explicit consent was collected.

The questionnaire was piloted among a small group ( $n = 25$ ) of UK parents prior to distribution for consistency, comprehension and ambiguity. Minor changes were made to the wording of two questions before the survey was distributed nationally.

### Statistical analysis

Data were analysed using SPSS 19.0 (SPSS Inc., Chicago, IL, USA). Non-parametric analyses were performed throughout due to the data distribution. Incomplete questionnaires were included in the

analysis when the appropriate questions had been answered; therefore, the responses are reported as valid percentages. Analysis was carried out to confirm the effects of missing data on key findings. In all instances,  $P > 0.05$  (data not shown), leading us to conclude that our conclusions are robust, despite missing data.

Bivariate analyses to investigate associations between weaning age and factors that may influence weaning were carried out using chi-squared and Kruskal–Wallis tests. Influential factors were further investigated for associations with weaning timing, by linear modelling [analysis of variance (ANOVA)] performed on the ranked weaning age due to the ordinal and categorical nature of the data. The factors explored were demographic characteristics (maternal age, receipt of benefits, marital status, ethnicity and education); understanding of the weaning guidelines [knowledge of the current weaning guidelines was deemed as accurate if stated as 6 months (26 weeks) or around 6 months, reflecting definitions given in DH guidelines and DH consumer leaflet, respectively]; maternal factors (having exclusively breastfed 0–8 weeks, parity, having attended antenatal classes); triggers to begin weaning [external advice from health visitors or family and friends, baby waking at night, showing developmental signs (as listed in the Department of Health 2008 weaning leaflet); baby reaching the recommended age]. Although it was not listed as a multiple-choice option, 6% of the respondents chose to list the baby showing signs of hunger or not being satisfied by a milk-feed, as a free-text option, therefore this was also coded and included as a variable in the model; perceptions of the weaning process were included (confident, confused, anxious, had conflicting advice, did not have enough advice); first foods (baby-led weaning/finger foods, spoon-fed purees, spoon-fed baby rice, rusks); finally most influential source of weaning advice (Internet, books, health visitor, friends and family, leaflets). Each group of factors was explored in a separate model and adjusted for the listed demographic factors.

In order to assess the main predictors of whether a mother weans early ( $\leq 17$  weeks), 18–23 weeks, weans just before 6 months (24–25 weeks) or weans at 6 months or later (26+ weeks), a binary logistic regres-

sion model was fitted with the terms previously used in the ANOVA model. A separate logistic regression model was used for each weaning category. Following a stepwise approach, non-significant terms were removed from the final analysis. When stated, confidence intervals are 95%. The Wald statistics is reported to indicate reliability of each predictive factor, in addition to the odds ratio. The odds ratio statistics is reported in relation to a reference category, as indicated in Tables 2–5.

## Results

A total of 3607 eligible participants responded to the survey, 1% of these responses were partially completed. Ninety-nine per cent of the respondents were

the child's mother and 46% were primiparous. The majority of respondents were Caucasian (91%), 2% were black Caribbean, 1% black African, 4% South Asian and 2% mixed races. Eighty-eight per cent of the responses were from England, 1% from Ireland, 3% from Wales and 7% from Scotland. Thirty-five per cent of participants had a child under 1 year and 57% had a child of 1–3 years. All participants had weaned a child since the introduction of the latest guideline; 16% had also weaned a previous child prior to the 2003 guideline change. Thirteen per cent of babies were weaned  $\leq 17$  weeks, 37% 18–23 weeks, 25% 24–25 weeks and 25% at  $\geq 26$  weeks [mean 23, standard deviation (SD) 4, median 24 weeks] (Table 1). We explored the potential for recall bias by analysing whether there was a relationship between the age of

**Table 1.** Characteristics of participants and comparative weaning ages

| Characteristics of sample<br>( <i>n</i> = 3607) | Weaning age (weeks)       |      |     |                 |                           |
|---|---------------------------|------|-----|-----------------|---------------------------|
|   | <i>n</i> (%) <sup>‡</sup> | Mean | SD  | Median          | <i>P</i> (Kruskal–Wallis) |
| Maternal age (mean 33.0, SD 5.0 years)          |                           |      |     |                 | <0.001                    |
| $\leq 25$                                       | 243 (7)                   | 21   | 5.0 | 21*             |                           |
| 26–33   | 1689 (48)                 | 23   | 4.5 | 24*             |                           |
| 34–38   | 1135 (33)                 | 23   | 3.9 | 24*             |                           |
| 39+   | 485 (14)                  | 23   | 4.0 | 24*             |                           |
| In receipt of benefits                          |                           |      |     |                 | 0.005                     |
| No  | 2887 (90)                 | 23   | 4.2 | 24              |                           |
| Yes   | 305 (10)                  | 22   | 5.3 | 23              |                           |
| Marital status                                  |                           |      |     |                 | 0.007                     |
| Single  | 160 (5)                   | 22   | 5.6 | 22 <sup>†</sup> |                           |
| Co-habiting                                     | 531 (16)                  | 22   | 4.6 | 23 <sup>†</sup> |                           |
| Married   | 2632 (78)                 | 23   | 4.2 | 24 <sup>†</sup> |                           |
| Divorced  | 35 (1)                    | 23   | 3.9 | 24 <sup>†</sup> |                           |
| Educational attainment                          |                           |      |     |                 | <0.001                    |
| To 16   | 277 (8)                   | 22   | 4.8 | 22 <sup>‡</sup> |                           |
| To 18 (HND/HNC or equiv)                        | 397 (12)                  | 21   | 4.7 | 22 <sup>‡</sup> |                           |
| To 18 (A level)                                 | 398 (12)                  | 22   | 4.8 | 23 <sup>‡</sup> |                           |
| Degree+/equivalent                              | 2220 (67)                 | 23   | 4.0 | 24 <sup>‡</sup> |                           |
| Antenatal classes                               |                           |      |     |                 | <0.001                    |
| Have never attended                             | 383 (11)                  | 22   | 4.2 | 22              |                           |
| Have previously attended                        | 3078 (89)                 | 23   | 5.3 | 24              |                           |
| Feeding method 0–8 weeks                        |                           |      |     |                 | <0.001                    |
| Exclusive breastfeeding                         | 2436 (72)                 | 23   | 4.0 | 24 <sup>§</sup> |                           |
| Formula milk only                               | 461 (14)                  | 20   | 4.5 | 20 <sup>§</sup> |                           |
| Mixed feeding (breast/formula)                  | 497 (15)                  | 22   | 4.2 | 22 <sup>§</sup> |                           |

HNC, Higher National Certificate; HND, Higher National Diploma; SD, standard deviation. \*No significant difference between 26–33 and 34–38 years, <25 and 26–33, <25 and 34–38, <25 and 39+ ( $P < 0.001$ ); 26–33 and 39+ ( $P = 0.002$ ); 34–38 and 39+ ( $P = 0.006$ ). <sup>†</sup>Significant differences between single and co-habiting ( $P = 0.035$ ), and single and married ( $P = 0.001$ ). <sup>‡</sup>Significant differences between General Certificate of Secondary Education (GCSE) and degree+, HND (or equiv) and degree+, degree and A level  $P < 0.001$ ; HND (or equivalent) and A level  $P = 0.015$ . <sup>§</sup>Significant differences between all groups ( $P < 0.001$ ). <sup>‡</sup>Valid percentages shown throughout.

the child at the time of participating in the survey and reported age of weaning and found no difference in weaning age between those with a recently weaned child (under 1 year, mean weaning age  $22.6 \pm 4.0$  weeks) and those with older children (1–3 years, meaning weaning age  $22.8 \pm 4.3$  weeks; and 4–6 years, meaning weaning age  $22.5 \pm 5.5$  weeks,  $P = 0.222$ ).

### Understanding of the weaning guidelines

Eighty-six per cent of the respondents understood the weaning guidelines to be to start weaning *at or around* 6 months. Seven per cent understood the guidelines to be to start weaning between 4 and 6 months, 6% to start when your baby shows signs of being ready. One per cent were either not aware of the weaning guidelines or had a different understanding.

Across all demographic groups, at least 70% of the respondents had an accurate understanding of the guidelines and there was an association between accurately understanding the guidelines and maternal age [ $\chi^2(2, n = 3487) = 35.6, P < 0.001$ ], education [ $\chi^2(3, n = 3262) = 97.1, P < 0.001$ ], ethnicity [ $\chi^2(3, n = 3262) = 97.1, P < 0.001$ ] and being in receipt of benefits [ $\chi^2(1, n = 3162) = 34.2, P < 0.001$ ], with younger mothers, those educated to 16, those belonging to ethnic minority groups and those in receipt of benefits being significantly less likely to be accurately aware. ANOVA modelling explored the interaction between demographic factors (in receipt of benefits, educational attainment, maternal age and ethnicity), weaning timing and knowledge of the guidelines. While a knowledge of the weaning guidelines was associated with significantly later weaning, it did not assure compliance as 80% ( $n = 1220$ ) of mothers who weaned before 24 weeks and 65% ( $n = 250$ ) of mothers who weaned before 17 weeks had a correct understanding of the guidelines. Knowledge of the guidelines was associated with later weaning, independently of socio-demographic factors [ $F_{(1, 2124)} = 135.4, P < 0.001$ ]; however, there was a significant interaction effect between educational attainment [ $F_{(2, 2124)} = 4.1, P = 0.017$ ] and knowledge of the guidelines, with a later weaning age in the lower educational attainment groups, when the mother is aware of the guidelines compared to when she is not ( $R^2 = 0.08$ ).

### Advice given by health visitors

Sixty-eight per cent of the respondents received weaning advice from a health visitor and there was no association between socio-demographic status and the likelihood of receiving health visitor advice. Fifty-four per cent of the respondents indicated that their health visitors advised them to wean *around* 6 months, 33% *at* 6 months, 7% between 4 and 6 months, and 5% after 17 weeks when the infant showed signs of being ready. The mean age at which weaning advice was received was 14.8 (SD 6.1) weeks; 61% received weaning advice before their baby was 4 months old. Thirty-nine per cent said it was health visitor advice that most influenced their weaning decisions.

### Factors associated with weaning timing

The following demographic factors were associated with weaning before 17 weeks ('early weaning'): young maternal age [ $F_{(1, 2545)} = 22.6, P < 0.001$ ] finishing education at 16 [ $F_{(3, 2545)} = 19.3, P < 0.001$ ] for education and being a single mother [ $F_{(1, 2545)} = 4.5, P = 0.034$ ] ( $R^2 = 0.04$ ). Later weaning was associated with attendance at antenatal education [ $F_{(1, 2339)} = 3.9, P = 0.050$ ] and having exclusively breastfed from birth to 8 weeks [ $F_{(2, 2339)} = 68.2, P < 0.001$ ] ( $R^2 = 0.1$ ) as well as knowledge of the guidelines.

Mothers were asked to indicate the factors that were important in influencing their decision to begin weaning. Eighty-eight per cent indicated the importance of developmental signs in the baby; 77% indicated the baby 'reaching the recommended age'; 42% indicated advice from friends and family; 37% indicated health visitor influence; and 28% the baby waking at night. Signs of faltering weight gain and the infant not being satisfied by a milk-feed were added to the final analysis, as 6% of the respondents listed it as a major influence in free-text responses. After adjusting for demographic factors, earlier weaning was associated with the influence of the baby waking at night [ $F_{(1, 1887)} = 162.9, P < 0.001$ ], not being satisfied by milk [ $F_{(1, 1887)} = 33.1, P < 0.001$ ], and advice from family and friends [ $F_{(1, 1887)} = 3.14, P = 0.001$ ] ( $R^2 = 0.3$ ). There was an association between weaning

**Table 2.** Logistic regression analysis for predictors of weaning behaviour; the dependent variable is whether the infant was introduced to solids  $\leq 17$  weeks or  $\geq 17$  weeks ( $n = 2217$ ) (Cox & Snell  $R^2 = 0.17$ )

| Predictive factors       |   | $n^{\ddagger}$ | %    | Wald  | d.f.         | $P$              | OR         | 95% CI     |
|--------------------------|---|----------------|------|-------|--------------|------------------|------------|------------|
| Maternal Characteristics | Maternal age                                |                |      | 6.55  | 1            | <b>0.011</b>     | 0.96       | 0.93, 0.99 |
|                          | Exclusively breastfed (0–8 weeks)           |                |      | 6.02  | 1            | <b>0.014</b>     | 0.69       | 0.51, 0.93 |
|                          | Attended antenatal classes                  |                |      | 7.99  | 1            | <b>0.005</b>     | 0.59       | 0.40, 0.85 |
|                          | Weaned previous child prior to 2003         |                |      | 14.91 | 1            | <b>&lt;0.001</b> | 2.07       | 1.43, 2.99 |
|                          | Followed a baby-led weaning approach        |                |      | 16.63 | 1            | <b>&lt;0.001</b> | 0.09       | 0.03, 0.28 |
| Guidelines               | Understanding of the weaning guidelines     |                |      | 54.89 | 4            | <b>&lt;0.001</b> |            |            |
|                          | When baby shows signs <sup>†</sup>          | 81             | 4    |       |              |                  | 1.00       |            |
|                          | At 6 months                                 | 525            | 23   | 3.74  | 1            | 0.053            | 0.54       | 0.29, 1.01 |
|                          | 4–6 months                                  | 137            | 6    | 1.39  | 1            | 0.239            | 1.50       | 0.77, 2.92 |
|                          | After 17 weeks, when show signs             | 62             | 3    | 5.32  | 1            | <b>0.021</b>     | 2.52       | 1.15, 5.52 |
| Triggers and perceptions | Around 6 months                             | 1412           | 64   | 6.49  | 1            | <b>0.011</b>     | 0.46       | 0.26, 0.84 |
|                          | Influences on the decision to begin weaning |                |      |       |              |                  |            |            |
|                          | Baby waking at night                        |                |      | 31.73 | 1            | <b>&lt;0.001</b> | 2.28       | 1.72, 3.05 |
|                          | Baby the recommended age                    |                |      | 25.96 | 1            | <b>&lt;0.001</b> | 0.46       | 0.24, 0.62 |
|                          | Baby not satisfied by milk-feed             |                |      | 15.32 | 1            | <b>&lt;0.001</b> | 2.49       | 1.60, 3.89 |
|                          | Source of most influential advice*          |                |      | 33.66 | 6            | <b>&lt;0.001</b> |            |            |
|                          | Friends <sup>‡</sup>                        | 132            | 6    |       |              |                  | 1.00       |            |
|                          | Health visitor                              | 441            | 20   | 0.38  | 1            | 0.538            | 0.81       | 0.40, 1.61 |
| Internet                 | 364   | 16             | 0.45 | 1     | 0.503        | 0.76             | 0.35, 1.68 |            |
| Mother/grandmother       | 159   | 7              | 8.82 | 1     | <b>0.003</b> | 2.87             | 1.43, 5.76 |            |

CI, confidence interval; d.f., degrees of freedom; OR, odds ratio. \*Books ( $n = 238$ ), leaflets ( $n = 57$ ), previous experience ( $n = 826$ ) were included in the analysis but results are not shown as were not significant in any weaning category. <sup>†</sup>Denotes reference category. <sup>‡</sup>Number used in the regression analysis.

timing and the most influential source of advice [ $F_{(6, 2412)} = 32.5$ ,  $P < 0.001$ ] ( $R^2 = 0.1$ ), with those weaning earlier being most influenced by previous experience and advice from friends and family and those weaning latest being most influenced by the Internet. Furthermore, those who did not rate the health visitor as influential were also more likely to wean earlier [ $F_{(1, 1887)} = 6.6$ ,  $P = 0.010$ ] ( $R^2 = 0.3$ ).

The majority of mothers felt confident about when to wean (81%); however, 54% said they received conflicting advice and 16% that they were confused; being confused was associated with weaning earlier [ $F_{(1, 2701)} = 41.1$ ,  $P < 0.00$ ] ( $R^2 = 0.07$ ).

### Predictors of weaning behaviour

Logistic regression was used to investigate the factors that were independently predictive of whether weaning was 'early' ( $\leq 17$  weeks), in line with previous guidelines (4–6 months; 18–23 weeks) or in line with current guidelines (around 6 months; 24–25 weeks and at 6 months;  $\geq 26$  weeks).

### Early weaners ( $\leq 17$ weeks)

Poor understanding of the weaning guidelines was the most reliable independent predictor of weaning early, with those understanding the guidelines being to wean 'from 17 weeks' being more likely to wean  $\leq 17$  weeks, compared to those who believe the guidelines to be to wean *at* or *around* 6 months. Mothers who had weaned a previous child pre-2003, who had therefore experienced the former guidelines, were also more likely to wean  $\leq 17$  weeks. This effect was distinct from being multiparous, which was not associated with weaning early (Table 2).

Young maternal age was also a predictor of weaning before 17 weeks, a 20-year-old being 66% more likely to wean early than a 30-year-old. Early weaners were also less likely to have attended antenatal classes, breastfed exclusively for 0–8 weeks and were more likely to spoon-feed purees and baby rice rather than follow the baby-led weaning philosophy. Triggers to commence weaning in this group were that the baby was waking at night or perceptions that the

**Table 3.** Logistic regression analysis for predictors of weaning behaviour; the dependent variable is whether the infant was introduced to solids 18–23 weeks compared to later or earlier ( $n = 1881$ ) (Cox & Snell  $R^2 = 0.11$ )

| Predictive factors                          | $n^{\ddagger}$ | %  | Wald | d.f. | $P$    | OR   | 95% CI     |
|---|----------------|----|------|------|--------|------|------------|
| Maternal characteristics                    |                |    |      |      |        |      |            |
| Exclusively breastfed (0–8 weeks)           |                |    | 12.3 | 1    | <0.001 | 0.70 | 0.58, 0.86 |
| Attended antenatal classes                  |                |    | 12.1 | 1    | 0.001  | 1.72 | 1.27, 2.34 |
| Weaned previous child prior to 2003         |                |    | 7.0  | 1    | 0.008  | 0.70 | 0.53, 0.91 |
| Followed a baby-led weaning approach        |                |    | 66.7 | 1    | <0.001 | 0.27 | 0.20, 0.37 |
| Triggers and perceptions                    |                |    |      |      |        |      |            |
| Source of most influential advice*          |                |    | 25.6 | 6    | <0.001 |      |            |
| Friends <sup>†</sup>                        | 136            | 7  |      |      |        | 1.00 |            |
| Health visitor                              | 457            | 24 | 1.4  | 1    | 0.243  | 0.78 | 0.52, 1.18 |
| Internet                                    | 379            | 20 | 8.6  | 1    | 0.003  | 0.51 | 0.33, 0.80 |
| Mother/grandmother                          | 170            | 9  | 1.9  | 1    | 0.166  | 0.71 | 0.43, 1.16 |
| Influences on the decision to begin weaning |                |    |      |      |        |      |            |
| Baby waking at night                        |                |    | 25.1 | 1    | <0.001 | 1.66 | 1.36, 2.03 |
| Perceptions                                 |                |    |      |      |        |      |            |
| Confused                                    |                |    | 13.8 | 1    | <0.001 | 1.58 | 1.24, 2.01 |

CI, confidence interval; d.f., degrees of freedom; OR, odds ratio. \*Books ( $n = 255$ ), leaflets ( $n = 59$ ), previous experience ( $n = 864$ ) were included in the analysis but results are not shown as were not significant in any weaning category. <sup>†</sup>Denotes reference category. <sup>‡</sup>Number used in the regression analysis.

baby was not satisfied by a milk-feed. Early weaning was also more likely when advice from an older generation (mother/grandmother) was most influential (Table 2).

#### 18–23 weeks

The most reliable independent predictor of weaning at 18–23 weeks was relying on previous experience to inform weaning practice. Understanding of the weaning guidelines was not a predictor of weaning at 18–23 weeks ( $P = 0.319$ ). The second most reliable predictor was the baby waking at night being a trigger to begin weaning. While having attended antenatal classes was an important distinguishing factor of this group, they were still more likely to be confused about the weaning process than those weaning at other ages (Table 3).

#### 24–25 weeks

Understanding of the guidelines was the most consistent independent predictor of weaning at this age, with understanding the guidelines being to wean ‘around 6 months’ increasing the likelihood, compared to ‘after 17 weeks’. This group was more likely to wean when their baby ‘reached the recommended

age’ and less likely to wean because their baby was waking at night or because the baby was not satisfied by a milk-feed. Mothers in this group were less likely to feel they received conflicting advice (Table 4).

#### Late weaners ( $\geq 26$ weeks)

Using a ‘baby-led’ or ‘finger foods’ weaning approach was the most reliable factor in predicting the probability of weaning at or later than 26 weeks, followed by reliance on advice from the Internet, followed by the health visitor. Mothers weaning at  $\geq 26$  weeks were less likely to begin weaning because their baby was not satisfied by milk or was waking at night and more by the baby reaching the recommended age for weaning. Understanding of the guidelines had an overall significant effect on the probability of weaning at  $\geq 26$  weeks. First-time mothers were more likely to wean  $\geq 26$  weeks, as were those who exclusively breastfeed (0–8 weeks) and older mothers. This group was also more likely to report feeling confident about the weaning process (Table 5).

## Discussion

This survey has recognised that the majority of participants in this study were aware of the weaning

**Table 4.** Logistic regression analysis for predictors of weaning behaviour; the dependent variable is whether the infant was introduced to solids 24–25 weeks compared to later or earlier ( $n = 2293$ ) (Cox & Snell  $R^2 = 0.07$ )

| Predictive factors       |   | $n^\dagger$ | %  | Wald | d.f. | $P$              | OR   | 95% CI     |
|--------------------------|---|-------------|----|------|------|------------------|------|------------|
| Maternal Characteristics | Exclusively breastfed (0–8 weeks)           |             |    | 5.9  | 1    | <b>0.015</b>     | 0.22 | 0.05, 1.00 |
|                          | Primiparous                                 |             |    | 6.1  | 1    | <b>0.013</b>     | 0.78 | 0.65, 0.95 |
| Guidelines               | Understanding of the weaning guidelines     |             |    | 28.1 | 4    | <b>&lt;0.001</b> |      |            |
|                          | When baby shows signs*                      | 85          | 4  |      |      |                  | 1.00 |            |
|                          | At 6 months                                 | 553         | 24 | 3.5  | 1    | 0.063            | 1.78 | 0.97, 3.29 |
|                          | 4–6 months                                  | 143         | 6  | 1.4  | 1    | 0.233            | 0.62 | 0.29, 1.36 |
|                          | After 17 weeks, when show signs             | 57          | 3  | 3.8  | 1    | <b>0.050</b>     | 0.22 | 0.46, 1.00 |
| Perception and triggers  | Around 6 months                             | 1455        | 63 | 4.6  | 1    | <b>0.033</b>     | 1.92 | 1.06, 3.48 |
|                          | Influences on the decision to begin weaning |             |    |      |      |                  |      |            |
|                          | Baby waking at night                        |             |    | 23.3 | 1    | <b>&lt;0.001</b> | 0.54 | 0.43, 0.69 |
|                          | Baby the right age                          |             |    | 23.7 | 1    | <b>&lt;0.001</b> | 1.92 | 1.48, 2.50 |
|                          | Baby hungry                                 |             |    | 3.9  | 1    | <b>0.049</b>     | 0.64 | 0.40, 0.99 |
|                          | Perceptions                                 |             |    |      |      |                  |      |            |
|                          | Received conflicting advice                 |             |    | 13.7 | 1    | <b>&lt;0.001</b> | 0.70 | 0.58, 0.85 |

CI, confidence interval; d.f., degrees of freedom; OR, odds ratio. \*Denotes reference category.  $^\dagger$ Number used in the regression analysis.

**Table 5.** Logistic regression analysis for predictors of weaning behaviour; the dependent variable is whether the infant was introduced to solids at 26 weeks or later ( $n = 1970$ ) (Cox & Snell  $R^2 = 0.17$ )

| Predictive factors       |   | $n^\ddagger$ | %   | Wald | d.f.  | $P$              | OR         | 95% CI     |
|--------------------------|---|--------------|-----|------|-------|------------------|------------|------------|
| Maternal Characteristics | Maternal Age                                |              |     | 5.0  | 1     | <b>0.025</b>     | 1.03       | 1.00, 1.06 |
|                          | Exclusively breastfed (0–8 weeks)           |              |     | 10.0 | 1     | <b>0.002</b>     | 1.61       | 1.20, 2.15 |
|                          | Primiparous                                 |              |     | 7.9  | 1     | <b>0.005</b>     | 1.55       | 1.14, 2.10 |
|                          | Followed a baby-led weaning approach        |              |     | 79.9 | 1     | <b>&lt;0.001</b> | 3.6        | 2.72, 4.77 |
| Guidelines               | Understanding of the weaning guidelines     |              |     | 9.8  | 4     | <b>0.044</b>     |            |            |
|                          | When baby shows signs $^\ddagger$           | 71           | 4   |      |       |                  | 1.00       |            |
|                          | At 6 months                                 | 459          | 23  | 0.3  | 1     | 0.854            | 1.07       | 0.50, 2.28 |
|                          | 4–6 months                                  | 120          | 6   | 3.3  | 1     | 0.071            | 0.37       | 0.13, 1.09 |
|                          | After 17 weeks, when show signs             | 48           | 2   | 3.3  | 1     | 0.069            | 1.40       | 0.02, 1.16 |
|                          | Around 6 months                             | 1267         | 65  | 0.0  | 1     | 0.888            | 0.95       | 0.46, 1.97 |
| Triggers and perceptions | Influences on the decision to begin weaning |              |     |      |       |                  |            |            |
|                          | Baby waking at night                        |              |     | 29.9 | 1     | <b>&lt;0.001</b> | 0.36       | 0.25, 0.52 |
|                          | Baby the right age                          |              |     | 6.0  | 1     | <b>0.015</b>     | 1.50       | 1.08, 2.08 |
|                          | Baby hungry                                 |              |     | 11.2 | 1     | <b>0.001</b>     | 0.23       | 0.94, 0.54 |
|                          | Perceptions                                 |              |     |      |       |                  |            |            |
|                          | Confident                                   |              |     | 4.1  | 1     | <b>0.043</b>     | 1.40       | 1.01, 1.95 |
|                          | Source of most influential advice*          |              |     | 32.0 | 6*    | <b>&lt;0.001</b> |            |            |
|                          | Friends $^\ddagger$                         | 131          | 7   |      |       |                  | 1.00       |            |
|                          | Health visitor                              | 418          | 21  | 6.6  | 1     | <b>0.010</b>     | 2.17       | 1.20, 3.92 |
|                          | Internet                                    | 354          | 18  | 9.9  | 1     | <b>0.002</b>     | 2.55       | 1.42, 4.57 |
| Mother/grandmother       | 155   | 8            | 0.0 | 1    | 0.925 | 0.96             | 0.43, 2.19 |            |

CI, confidence interval; d.f., degrees of freedom; OR, odds ratio. \*Books ( $n = 244$ ), leaflets ( $n = 57$ ), previous experience ( $n = 606$ ) were included in the analysis but results are not shown as were not significant in any weaning category.  $^\ddagger$ Denotes reference category.  $^\ddagger$ Number used in the regression analysis.



guidelines; furthermore, understanding of the guidelines was found to be one of the most reliable independent predictors of weaning timing: mothers who were aware of the guidelines were significantly less likely to wean before 17 weeks and more likely to wean from 24 weeks. In the current study, understanding of the guidelines was a more reliable predictor of weaning behaviour than educational attainment or being in receipt of benefits; furthermore, knowledge of the guidelines compensated for a tendency to wean earlier among those of a lower educational attainment. Maternal education is commonly reported as a factor associated with negative feeding practises (Fein *et al.* 2008) and the most recent DH Infant Feeding Study in 2005 showed that while the mean age for the introduction of solid food was becoming later, it was largely accounted for by a change in behaviour of those of higher educational and socio-economic status (Bolling *et al.* 2007).

It is acknowledged that the current survey has generally recruited a demographically biased sample of principally highly educated, affluent, white English mothers which are not nationally representative. However, it is a sizable sample and the median weaning age even among the early weaning groups, for example, those receiving income support benefits ( $n = 305$ ) and those of lowest educational attainment ( $n = 277$ ) shows a trend towards later weaning, which supports the findings of the latest DH Infant Feeding Survey (2005) (Bolling *et al.* 2007) showing a continuing trend towards later weaning (mean age 19 weeks in 2005 compared to 15 weeks in 2000).

Regardless of high awareness of the guidelines, the majority of mothers in this study chose to wean earlier than 6 months. A number of smaller studies have shown that there is a complexity of factors associated with early weaning such as maternal age, socio-economic status and educational attainment (Alder *et al.* 2004; Bolling *et al.* 2007; White 2009), being a single parent (White 2009), formula-feeding (Wright *et al.* 2004) and relying on advice from friends and family (Alder *et al.* 2004; Bolling *et al.* 2007; Tarrant *et al.* 2010). This study supported all these findings. In addition, we also found that lack of antenatal education was an independent predictive factor associated with weaning before 17 weeks and is one of the few

factors that is open to health care intervention. Non-attendance at antenatal classes was associated with low educational attainment and socio-economic status, as has been previously documented (Rowe & Garcia 2003); however, even among the most well-educated and those of higher socio-economic status, non-attendance was still associated with earlier weaning in this population. Reasons for not attending antenatal classes are numerous (Murphy Tighe 2010) and result in an enhanced exposure to informal infant care advice which is generally recognised to promote earlier weaning (Alder *et al.* 2004; Bolling *et al.* 2007).

Many parents consider that their infant shows signs of being ready to wean before 6 months (Bolling *et al.* 2007) and the range of putative signs parents consider is variable (Anderson *et al.* 2001; Platt 2009). In this study, those weaning before 24 weeks were most likely to begin weaning in response to their baby waking at night or not being satisfied by milk. Despite clear advice in DH literature, it is apparent that mothers still perceive the baby waking at night as an indication that they should begin to wean. This is particularly clear in those weaning before 17 weeks and suggests that further communication about the recognised signs of readiness may be necessary.

Being most influenced by the weaning advice from a health visitor was a reliable independent predictor of later weaning in general in this study and particularly weaning after 26 weeks. Health visitors have been acknowledged as a primary source of weaning advice (Gildea *et al.* 2009; White 2009); however, it has previously been reported that knowledge of the current guidelines may be inconsistent among health visitors and midwives (Wallace & Kosmala-Anderson 2007). In the current study, the majority of health visitors were reported to be promoting the current guidelines; however, there was an apparent degree of inconsistency in how flexibly the guidelines were interpreted by health visitors with some following a rigid approach to weaning from 6 months, while others promote weaning *around* this time in response to signs from the baby and some suggesting weaning much earlier. As this study considers *reported* health visitor advice, further analysis among health visitors would be valuable for confirmation of these findings. Approaching the guidelines with flexibility was rec-

ommended by SACN in 2001 (Scientific Advisory Committee on Nutrition 2001) and is how the British Dietetic Association suggests the guidelines should be interpreted by health professionals (More *et al.* 2010). While it is difficult to understand the precise detail of the advice given to mothers from a quantitative study like this, qualitative studies have suggested that having rigid guidelines surrounding what is essentially a developmental process can create conflict and confusion in the context of a child showing developmental signs of readiness (Anderson *et al.* 2001; Arden 2010) and this study suggests that those weaning earlier were more focused on putative signs of readiness, while those weaning later were more focused on the baby reaching the recommended age. It can be difficult for mothers when signs from the child suggest a readiness to wean earlier than the guidelines state but also for health visitors when they believe a child is ready or needing solids but the mother wants to wait until 6 months to comply with the guidelines (Arden 2010). Conflicting advice and confusion were highlighted concerns among mothers in this study. It is important that the guidelines are worded clearly and are practical for health professionals to promote consistently and in a way that also empowers the mother to respond to the needs of her child.

It is worth noting that using a 'finger foods' or 'baby-led' weaning approach was the most reliable predictor of weaning  $\geq 26$  weeks in this sample. Baby-led weaning promotes self-feeding and an introduction to solids as finger foods (Rapley & Murkett 2008) rather than spoon-feeding. However, the approach has been criticised due to the lack of evidence base (Reeves 2008). An increasing trend towards baby-led weaning, particularly among those of higher socio-demographic status and who exclusively breastfeed, has been recognised and is particularly associated with seeking weaning advice from the Internet (Brown & Lee 2011). Reliance on weaning information from the Internet was also an independent predictor of weaning  $\geq 26$  weeks, supporting findings from a recent qualitative study (Arden 2010). Internet forums provide UK mothers, from a diversity of backgrounds, with valuable support on a wide range of parenting issues (Russell 2006). It is important that the popularity of the internet is recognised in official

infant feeding communication and that health care professionals can direct mothers to web sites carrying up-to-date DH endorsed information.

The major limitations of the present study are acknowledged: the online parenting arena that was utilised for recruitment has presented a significantly skewed sample of self-selected predominantly well-educated, white mothers and is therefore unlikely to represent the general population or be comparable with the DH Infant Feeding Survey (Bolling *et al.* 2007). In the present sample, 76% of participants were aged 30 or older compared to 47% of participants in the DH survey; furthermore, 67% of our sample had higher education achievements compared to 38% of the DH survey population, thus demonstrating the older, well-educated characteristic of our sample. While our population appears to have a similar ethnic group representation to that of the general UK population (ONS 2005), we are not able and have made no attempt to describe the practices and influences of mothers from minority ethnic groups. Furthermore, we appreciate that paternal influences on weaning may be important: although the survey was open to paternal responses, the majority of respondents were mothers and therefore paternal influences, decisions and behaviours around weaning have not been captured. One of the major strengths of such methodology is the significant sample size that it promotes. The large sample in the present study has enabled us to robustly demonstrate some of the factors associated with weaning timing that have been suggested from smaller, regional studies. It is also the first study to associate precise understanding of the UK weaning guidelines and reported health professional advice, with weaning behaviour at an individual level, providing valuable information about the role that knowledge of the weaning guidelines has in shaping weaning behaviour. Weaning behaviour is reported retrospectively, and as such, results are subject to associated biases. In addition, as the majority of responses were collected online, the multiple-choice answers may be open to misinterpretation, which we are not aware of.

In this study, the majority of parents were aware of the current guidelines and interpreted them flexibly,

in the light of developmental signs from their child. Knowledge of the current guidelines to focus on weaning around 6 months appeared to reduce the likelihood of early weaning. However, young mothers are a key target for infant-feeding communication as they remain likely to wean early and be less influenced by professional advice. Further work would be valuable among health visitors to investigate understanding of the guidelines and ensure consistency of practise. This study also highlights the popularity of baby-led weaning and as such the need for peer-reviewed assessment of this approach.

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## Conflicts of interest

LMG and PM have no conflicts of interest to disclose. APM received a small bursary from the Organix Foundation.

## Contributions

APM and LMG were involved in the conception and study design, data analysis and interpretation, drafting and revising of the manuscript for final submission. PM was involved in data analysis and interpretation and revising of the manuscript for final submission.

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## Appendix

### Participant recruitment – web page advert

Have you had a baby since 2004? Have you weaned or are you in the process of weaning your child?

If so, can you help us by telling us about your experience, the advice you were given and what advice you found most useful? This research is being carried out by King's College London and is part of a UK-wide study.

The attached survey is anonymous and takes 5–10 min to complete.