



## Research report

# Eating a Rainbow. Introducing vegetables in the first years of life in 3 European countries <sup>☆</sup>



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## ABSTRACT

Low vegetable consumption in children is a concern in many EU countries, fewer than one fifth of children in Europe consume the WHO recommended amounts. Systematic studies demonstrate that experience with a variety of vegetables early in childhood can promote later consumption as early dietary habits often track into adulthood. This study examined pre-school children's experience with vegetables across three European countries in order to assess cultural differences, effects of age and culinary practices. Mothers of pre-school children ( $N = 234$ ) in the UK ( $N = 71$ ), Denmark ( $N = 93$ ) and France ( $N = 70$ ) completed a survey assessing parental and infant familiarity, frequency of offering and liking for 56 vegetables as well as preparation techniques for these vegetables. Analyses revealed that although children aged 25–36 months had been introduced to the greatest number of vegetables, children aged 6–12 months were offered vegetables more frequently and had a higher reported liking for these vegetables. UK children's liking was related to frequency of maternal intake and frequency of offering. Denmark had introduced the greatest number of vegetables and offered vegetables more frequently than both the UK and France. Choice of preparation methods differed between countries while choice of seasonings was similar. Results suggest increasing variety and frequency of vegetable offering between 6 and 12 months, when children are most receptive, may promote vegetable consumption in children.

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## Introduction

The World Health Organisation (WHO) suggests that inadequate fruit and vegetable consumption can account for up to 2.8% of deaths worldwide making it a significant risk factor for 'attributable mortality' (WHO, 2002). Low fruit and vegetable consumption has been linked to a greater risk of developing certain cancers and cardiovascular disease as well as increasing the risk of stroke, obesity and obesity related illnesses such as diabetes (Hung et al., 2004; World Cancer Research Fund. Food & Physical Activity, 2007). Current recommendations are to consume 400 g of fruits and vegetables per day (World Health Organisation, 2002) and in recent years many governments have made the promotion of fruit and vegetable intake a priority.

In the UK guidelines suggest a minimum of five portions of fruit and vegetables a day (Department of Health, 2003) with no specific recommendations for what proportion of these should be vegetables, only that they should be different fruits and vegetables. Guidelines in other countries such as Australia and the US, advise that adults consume a minimum of seven and nine portions of fruits and vegetables respectively with at least five of these portions (or two and a half cups) being vegetables (Go for 2&5, 2011; Centers for Disease Control, 2011). Vegetable intake in the UK is well below all of these recommendations with few adults and children reaching the five combined fruit and vegetable portions (National Obesity Observatory (NOO), 2012). Only 20% of 5–15 year old children are consuming the recommended amounts of fruits and vegetables every day and when fruit intake is discounted vegetable intake is particularly low with an average of one portion of vegetables being consumed every day (NOO, 2012). Interestingly, a recent study into the diets of very young children suggests that vegetable intake is greater in younger children aged between 6 and 11 months of age consuming on average 79–84 g per day, approximately two portions of vegetables for children of this age compared to just 53 g per day in the 18–36 m age group (Department of Health, 2011).

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In France the recommendation is also to consume five portions of fruits and vegetables per day, for a total of 400 g (INPES, 2004). This target is not being reached by a large proportion of the population and the intake of children is particularly low (LioRET et al., 2010). In Denmark the recommendation for intake is higher with a suggested minimum for anyone over the age of 10 years of 600 g of fruits and vegetables per day (“6 om dagen”; promoting 6 portions of fruit and vegetables per day). Despite this higher recommendation only 10% of Danish children aged 11–15 years reach this intake according to the Danish Health Agency (2008).

Overall, there appears to be relatively low fruit and vegetable consumption amongst children across European countries with between 76% and 94% of European 11 year olds failing to meet recommendations (Klepp et al., 2005; Vereecken, De Henauw, & Maes, 2005; Yngve et al., 2005). As children’s eating habits often persist into later life (Nicklaus, Boggio, Chabanet, & Issanchou, 2004, 2005; Nicklaus, Boggio, & Issanchou, 2005), this presents many possible negative health consequences for most European children.

Studies examining vegetable consumption in children have suggested several reasons for low intake including strong reported dislike for vegetables coupled with low energy density (Gibson & Wardle, 2003; Nicklaus, Boggio, Chabanet, et al., 2005; Nicklaus, Boggio, & Issanchou, 2005). Also vegetables are disliked in part because of texture and this is in turn influenced by how they are prepared (Zeinstra, Koelen, Kok, & De Graaf, 2010). Children’s liking of a food is a strong predictor of how much of it they consume (Gibson, Wardle, & Watts, 1998), suggesting that it is necessary to increase children’s liking for vegetables in order to increase consumption. Experience with foods is an important factor in developing food preferences and repeated exposure to the flavours of a new or disliked food such as vegetables has been found to increase both liking and intake of these foods in children (Forestell & Mennella, 2007; Maier, Chabanet, Schaal, Issanchou, & Leathwood, 2007; Wardle & Cooke, 2008). Maternal food choices and eating habits also shape food-related behaviours of children and the importance of the maternal diet has been highlighted for several reasons (Fisk et al., 2010). At the most basic level mothers are less likely to make available foods that they themselves dislike or do not eat therefore reducing the chances of their children being exposed to these foods. In addition maternal diet is often predictive of familial diet and children’s vegetable intake has been found to be positively related to maternal vegetable consumption (Hart, Raynor, Jelalian, & Drotar, 2010). Experience with vegetables in early development, however, might be hindered by the onset of neophobia. This phenomenon of rejecting previously liked foods and novel foods peaks at around 2–3 years (Cooke, Wardle, & Gibson, 2003), thus experience *per se* might be insufficient as a predictor of liking in children aged 2 and above.

The present study examined UK pre-school children’s familiarity and exposure to a wide range of commonly eaten vegetables before exploring identical data collected in two further European countries; Denmark and France. On the basis of previous research it was predicted that familiarity would correlate with liking; that there would be a significant age effect with older children being more experienced with vegetables but not necessarily liking them more than younger children and that differences by nationality would emerge reflecting cultural differences in vegetable liking, familiarity and preparation.

## Method

### Design

The study used a cross-sectional survey design to examine age and cultural differences in vegetable consumption and liking of British, Danish and French pre-school children.

### Participants

Children were aged between 6 and 36 months. Two hundred and seventy-seven mothers with pre-school age children were recruited in the UK ( $n = 101$ ), Denmark ( $n = 98$ ) and France ( $n = 78$ ) and were sent questionnaires. All participants gave informed consent prior to inclusion in the study.

### Procedure

Recruitment took place through local nurseries, daycares and mothers’ circles and in the UK via websites targeted at mothers (<http://www.mumsnet.com/>; <http://www.netmums.com/>). Questionnaires were distributed by then returned to these child care facilities where they were collected by researchers or sent directly to mothers and returned to researchers by post. In Denmark questionnaires were also completed via telephone interview.

### Vegetable questionnaire

Participants in all countries received questionnaires with an identical format and featuring a variety of vegetables (UK 54, Denmark 41 and France 52). The original list of vegetables was taken from a previous questionnaire used to assess children’s food preferences (Nicklaus et al., 2004) which was distributed to the three institutions taking part; INRA, France, University of Leeds, UK and University of Copenhagen, Denmark. Researchers then edited this list, retaining only those vegetables that were available for sale in the supermarkets and main grocery stores in each location. Where commonly eaten vegetables were not on the list these were added in and the lists for each country were finalised. Thirty-six of the vegetables were common to all versions of the questionnaire.

Mothers were asked to indicate: (a) whether they were familiar with each vegetable (‘Yes’, ‘No’), (b) whether they have ever offered it to their child (‘Yes’, ‘No’), (c) how often they offered the vegetable to their child (‘everyday or almost’ (coded 4), ‘1–3 times per week’ (3), ‘1–3 times per month’ (2), ‘less than once per month’ (1)), and (d) how much their child likes it (‘strongly dislikes’ (coded 1), ‘dislikes’ (2), ‘neutral’ (3), ‘likes’ (4), ‘strongly likes’ (5)) by ticking the appropriate box. Mothers were also asked how they would usually prepare each vegetable (‘raw’, ‘boiled’, ‘steamed’, ‘stewed’, ‘pureed’, ‘in a sauce’, ‘roasted’, ‘fried’, ‘other’ – \*UK only) and how they would normally season this vegetable (open ended question). The UK questionnaire also included a question of how often mothers consumed each vegetable (‘everyday or almost’, ‘1–3 times per week’, ‘1–3 times per month’, ‘less than once per month’). A variety of socio-demographic information was collected within each country; for example, gender of the child, the precise age in months and maternal education.

### Statistical analysis

Data are presented as means  $\pm$  SEM and all analysis was performed using SPSS version 18.0 (SPSS Inc. Chicago, IL, USA).

Separate analyses were conducted on the UK data for all 54 vegetables included in the UK survey before comparative analyses were undertaken for the 36 vegetables common to all versions of the questionnaire.

Associations between frequency of maternal intake, how often vegetables were offered to children and mothers’ reports of child’s liking were evaluated using Spearman’s rank order coefficient (UK data only). The same analyses were used to examine the relationship between how frequently children were offered vegetables, the number of vegetables introduced and mother’s reports of child’s liking on data from all three countries.

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