

**National recommendations for infant and young child feeding
in the WHO European Region**

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Abstract

Objectives: Complementary feeding should provide a healthy diet with critical nutrients for growth and development. Information is limited on child and infant feeding recommendations within the World Health Organization (WHO) European Region.

Methods: The WHO Regional Office for Europe and the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) performed a survey of national recommendations on infant and young child nutrition aimed at national government departments of health and national paediatric experts. Questions addressed national recommendations on breastfeeding and complementary feeding.

Results: Information was available from 48 of the 53 Member States. Forty-five of 48 countries (94%) have national recommendations on infant and young child feeding, of which 41 are endorsed by official public health authorities. Regarding introduction of complementary feeding, 25 countries (out of 34, 74%) recommend 6 months of age as the ideal age. The earliest age of introduction recommended varies from 4-5 months in (31/38 countries, 82%) to six months (6/38, 16%) and seven months (1/38, 2.6%). The recommended meal composition varies widely; introduction of iron-rich foods (meat, fish, eggs) at the age of six months is recommended in 30 out of 43 countries, while 13 (30 %) recommend later introduction.

Conclusions: National infant feeding recommendations vary widely between studied countries and partly differ from international recommendations. Too early introduction of complementary feeding can reduce duration of exclusive breastfeeding (EBF). Too late introduction of iron-rich complementary foods might increase anemia risk and adversely

affect child development. A review and further harmonisation of national recommendations appears desirable.

Key words: infant and young child feeding, supplementary feeding, solid foods, weaning, infant feeding

What is known?

- The complementary feeding period requires particular attention due to the rapid growth and development and high susceptibility for nutrient deficiencies and excesses
- Information on current guidelines and recommendations on infant and young child feeding across the WHO European Region Member States is lacking

What is new?

- National recommendations on infant and young child feeding are established in 94 % of 48 countries in the WHO European region, but they vary widely and offer differ from international guidance
- Some 93% of countries recommend promotion and support of exclusive breastfeeding (EBF) for the first six months of life
- Seventy four percent of countries recommended an ideal age of 6 months for introducing complementary feeding, whereas 81% recommend for exclusively breastfed infants an earliest start of complementary feeding from about 4 months onwards, and 30 % recommend providing iron rich foods later than at 6 months
- The considerable heterogeneity between infant feeding recommendations of countries of the WHO European Region should be reduced and periodic updates of guidelines based on current evidence should be performed.

Abbreviations:

CF	Complementary Foods
EBF	Exclusive Breastfeeding
ESPGHAN	European Society for Paediatric Gastroenterology, Hepatology and Nutrition
FBDGs	Food Based Dietary Guidelines
IYCF	Infant and Young Child Feeding
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

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Introduction

The introduction of solid foods constitutes a crucial turning point in an infant's nutrition and development (1-4). The World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) recommend exclusive breastfeeding (EBF) for the first six months of life, followed by the introduction of complementary foods (CF) along with continued breastfeeding up to the age of two years and beyond (5). Scientific studies and systematic reviews showed several short and long-term benefits associated with breastfeeding, such as lower risk of death among breastfed children, protection against diarrhea, otitis media and respiratory infections, and lower odds of overweight and obesity, type-2 diabetes and high systolic blood pressure later in life (6-10). Thus, promoting, protecting and supporting breastfeeding is an important public health priority.

Adequate complementary feeding is critical due to the rapid growth and development of the infants and high susceptibility for nutrient deficiencies and excesses, while marked dietary changes occur with exposures to new foods, tastes, textures, and feeding experiences (1, 4). Therefore, the complementary feeding period requires particular attention for providing adequate nutrition. Recommended practices include the introduction of CF at about six months of age, sufficient meal frequency and portion sizes, dietary diversification, appropriate food texture, safety regarding preparation, storage and hygiene, and responsiveness to feeding cues (1, 3, 5, 11). It is of utmost importance to provide sources of critical nutrients such as iron and zinc with introducing CF (4, 12). This is especially important for exclusively breastfed infants whose iron stores become depleted in the first four to six months of life (13, 14), and during late infancy and toddlerhood when iron status continues to be critical for healthy brain development (15, 16).

In line with the WHO recommendations, the European Food Safety Authority (EFSA) and learned societies including the European Society for Paediatric Gastroenterology, Hepatology

and Nutrition (ESPGHAN) support EBF for the first six months as an ideal goal (17-19). For infants in Europe both ESPGHAN and EFSA suggested that CFs should not be introduced before the age of four months and not later than seven months (1, 2, 18, 19). ESPGHAN and EFSA define CFs as anything other than breast milk or formula, therefore, their recommendations are not directly comparable with those of WHO that categorizes formula as a CF.

There is broad literature on breastfeeding and formula feeding, whereas less attention has been devoted to the CF period and the protection of timely introduction to appropriate, nutritious and safe CF for infants and young children. Information on current guidelines and recommendations on infant and young child feeding (IYCF) across the WHO European Region Member States is lacking. This study aims to provide information from the WHO European Region on national recommendations on infant and young child nutrition and feeding practices.

Methods

Overview

A questionnaire of 32 questions (Supplementary Material, Annex 1, <http://links.lww.com/MPG/B942>) was sent to Counterparts of the WHO Regional Office for Europe in national government departments of health involved with infant nutrition and to national paediatric experts and members of ESPGHAN in the 53 Member States of the WHO European Region (Supplementary Material, Annex 2, <http://links.lww.com/MPG/B942>). The questionnaire was available for online completion and as a downloadable document in English and Russian to facilitate completion in all Member States. Data was collected between February 2016 and October 2017.

Questionnaire design

The questionnaire comprised single and multiple-choice questions and was developed, pilot tested and revised jointly by ESPGHAN and WHO. It was designed to obtain information about national IYCF recommendations, including timely introduction to appropriate, nutritious and safe CF. The questions were designed to explore national and/or regional actions within the following three areas:

1. **Guidelines on IYCF** questions addressed national and/or regional recommendations on nutrition and/or food-based dietary guidelines and bodies responsible for their implementation and review.
2. **Promotion and support of breastfeeding** questions addressed national and/or regional recommendations on exclusive and partial breastfeeding.
3. **Introduction to CF** questions addressed national and/or regional IYCF recommendations; age of introduction; first three foods (food groups sequentially added); introduction to meat and other iron-rich food sources; recommended drinks; frequency of meals consisting of solid foods (other than milk and other liquids).

Data analysis

Manually entered data were transferred and entered into the online version. Data submitted online were automatically extracted from the online platform *SurveyGizmo* using Microsoft Excel®. The WHO Regional Office for Europe carried out data cleaning and validation to ensure consistency with responses within a question and its sub-questions.

For analysis, countries for which no information was available for some questions or that responded “No” were identified separately and coded as “No guideline available”, “No information available”, or “Respondent unable to answer”. These were not included for the analysis in that corresponding question – hence reported percentages are “percentage

reporting out of the countries for which a response was available on this question”. Countries for which no responses were obtained to the survey were identified separately, coded as “Did not participate” and excluded from the main analysis. Hence, for each indicator different denominators are applied, according to the number of countries with data for that indicator.

Regarding the three food groups introduced to infants during CF, it was assumed that if a food group was recommended as first, it would also be recommended as second and third, to enable analysis of the diversity of the diet.

Results

Colleagues in 48 of 53 MS (91%) in the WHO European Region provided responses (Supplementary Material, Annex 2, <http://links.lww.com/MPG/B942>). The main IYCF findings are shown in Table 1.

3.1 Existence of national recommendations

Among the participating countries, the majority (45/48 countries; 94%) reported to have national recommendations on IYCF. Three countries (3/53; 6%) reported not to have recommendations on this topic. All national recommendations referred to in the survey were published between 2003 and 2017.

In most countries with national recommendations on IYCF, these were reported to be issued or endorsed by the government (41/45; 91%). In four countries (4/45; 9%) without formal governmental endorsement, professional bodies are responsible for the nationally used recommendations on IYCF.

Information on authorities responsible for implementation of recommendations was available for 44 of 45 countries. Seven countries (7/44; 16%) reported that the professional bodies are responsible for implementation, while 11 of 44 countries (25%) reported that their

governmental authorities are the only entity responsible. In more than half of the countries (26/44; 59%), governments and professional bodies are jointly responsible for the implementation of recommendations. The review of these recommendations is a governmental responsibility in 19 of 45 countries (42%) and a joint responsibility in 18 of 45 countries (40%). Eight of 45 countries (18%) rely solely on professional bodies for this review process.

3.2 Information on Promotion and Support of Breastfeeding and on Breast-milk

Substitutes

Forty-two of 45 countries (93%) with national recommendations reported that their nutrition recommendations and/or FBDGs for IYCF promote and support EBF for the first six months of life, while three countries (7%) promote and support EBF for four months. Twenty-nine of 45 countries (64%) promote and support continued breastfeeding up to two years of age and beyond, while 9 countries (20%) promote and support continued breastfeeding up to one year. The national recommendations include a direct reference to substitutes for breast-milk as an acceptable alternative in 23 of 44 countries (52%) that reported data on this topic for infant formula, 27 of 44 countries (61%) for follow-on formula and 18 of 44 countries (41%) for young child formula, respectively.

3.3 Age of introduction to CF

Data on the recommended age for introduction to CF was available for 34 among 45 countries with national recommendations for IYCF and unavailable for 9 countries. The ideal age for introducing CF was recommended to be six months in 25 of 34 countries (74%); four months in six countries (18%); and five months in three countries (9%) (Figure 1). The recommended earliest age for introducing CF varied, with 27 of 38 countries (71%) recommending four months, one country (2.6%) four-and-a-half months, three countries (8%) five months (i.e. 31

countries or 82% before the age of six months), six countries (16%) six months and one country (2.6%) seven months, whereas five countries did not report data on the earliest recommended age. Only 29 countries reported data on the recommended latest age to introduce CF, while no information was available for 14 of 43 (33%). The responses varied between five-and-a-half months (1/29; 3.5%) to nine months (1/29; 3.5%). The majority of countries recommended the latest introduction at six months (25/29; 86%). One country (3.5%) recommended the latest introduction at six-and-a-half months and another country (3.5%) at seven months.

Different age recommendations for introducing CF in breastfed and formula-fed infants were reported in six of 40 countries (15%) that responded to this question. Almost all of these countries recommended earlier introduction of CF for non-breastfed infants, generally starting around four months of age.

3.4 Recommendations on liquids other than water

Recommendations on liquids for IYCF exist in 44 of 45 countries (Suppl. Figure 1). Twenty-one of 44 countries (48%) recommend EBF (“breast-milk only”) up to six months of age, while 23 of 44 countries (52%) recommend breastfeeding together with other liquids during this period. Recommendations to provide juice increase with age - from 14 of 44 countries (32%) before 12 months to 18 countries (41%) before 2 years. Tea (including sweetened tea) is recommended in 12 of 44 countries (27%) before 2 years of age. Feeding of cows’ milk is recommended by five of 44 countries (11%) before 12 months of age.

3.5 First food groups

Forty-one countries reported data for this indicator. The main recommended first food groups are vegetables in 35 of 41 countries (85%), fruit (26 countries; 63%) and cereals (25

countries; 61%) (Figure 2). Fewer countries also recommended the introduction of meat (14 countries; 34%), rice (10 countries; 24%), fish (6 countries; 15%), egg (3 countries; 7%), dairy products (3 countries; 7%), bread (2 countries; 5%), and pasta (1 country; 2%), as a first food group.

As second food groups, more countries recommend meat (14/41; 34%), egg (13; 32%), bread (13; 32%), dairy products (12; 30%), cereals (11; 27%), fish (10; 24%), fruits (8; 20%), rice (8; 20%), pasta (8; 20%), and vegetables (4; 10%).

As third food groups, countries additionally recommended fish (12/41; 29%), egg (10; 24%), pasta (10; 24%), dairy products (9; 22%), meat (7; 17%), bread (6; 14%), rice (5; 12%), fruits (2; 5%), vegetables (1; 2%), and cereals (1; 2%).

Four countries do not provide information on which complementary food groups as first foods. Seven countries do not have information on second food groups and six countries do not provide information on introducing third food groups.

3.6 Age of introduction to meat and iron-rich foods

Forty-four countries reported information on the recommended age of introduction of meat and other iron-rich food sources, though one country did not specify the age and was not included in this analysis. Some 26 of 43 countries (61%) recommend the introduction of protein and iron-rich sources at six months, while four countries (9%) recommend an earlier introduction. Therefore, most countries recommend introduction of an iron-rich food source by the age of six months (30/43; 70%). However, 13 of 43 countries (30%) recommend a later introduction, at seven months in eight countries (19%), eight months in three countries (7%) and nine months in three countries (5%).

One third of countries (14/41; 34%) recommend introduction of an animal-source food (meat, fish or egg) in the first food group, 28 of 41 countries (68%) add this as a second food group,

and most countries (36/43; 88%) recommend introduction of an animal-source food by the time of introduction of the third food group (Figure 3).

3.7 Complementary food meals

Nearly one-third of countries with recommendations (12/41; 29%) recommend introducing CF by offering the infant 1-2 meals per day before the age of six months. One country (2%) recommends 4-5 meals per day for infants younger than six months.

For six to nine months old infants, 13 of 36 countries (36%) recommend 1-2 meals per day, while 17 countries (47%) recommend 2-3 meals per day; four countries (11%) 3-4 meals per day and two countries (6%) 4-5 meals per day.

For 9-12 months old infants, 11 of 37 countries (30%) recommend 1-3 meals; while half of the countries (19; 51%) recommend 3-4 meals per day and 7 countries (19%) 4-5 meals per day.

Only two of 36 countries (6%) recommended between 1-3 meals per day for children older than one year. Fifteen countries (42%) recommend 3-4 meals per day, while 11 countries (31%) recommend 4-5 meals per day. Nine countries (25%) recommend 5-6 meals per day.

Twenty-five of 45 countries (56%) include information on dietary reference intakes in their FBDGs for IYCF.

Discussion

The aim of this study is to provide information on national recommendations on IYCF practices in the WHO European Region. Respondents from 94% of the WHO European Region Member States reported data on IYCF practices. In most of the countries, the government endorses the IYCF recommendations, while in 9% of the countries professional

bodies are the responsible entities. Governments participate in the implementation of the IYCF recommendations in most countries, either alone or jointly with professional bodies. We consider it important that governments actively endorse the implementation of IYCF recommendations, which should increase the chances of effective implementation.

In the majority of countries in the European Region, IYCF recommendations differ from WHO guidelines. WHO recommends EBF for the first six months of life and, consequently, the introduction of CFs from six months onwards (5). Recommendations in 93% of countries state that they promote and support EBF for the first six months of life. However, 81% of the countries also provide a recommendation that infants who are non-exclusively breastfed should not start CFs before the age of four months, in line with the conclusions of ESPGHAN and EFSA who did not identify harmful effects of introducing CFs after around four months, alongside breast- or formula feeding (1, 2, 18, 19).

WHO and UNICEF recommend initiating CF at about six months of age (5) with adequate food sources, meal frequency, portion sizes, texture and hygiene (3, 5). Food groups recommended most frequently for consumption among the first foods include vegetables, cereals and fruits; followed by foods that are good iron-sources (meat, fish and egg), rice and dairy products, and lastly bread and pasta. Many countries also recommended that CF should be preferentially prepared at home with fresh ingredients. Some commercially available products have been considered problematic for child health, such as pureed, semiliquid foods for infants and young children packed in squeezable plastic pouches, which tend to be high in energy density and sugar content but low in contents of critical nutrients (20-22). The European Commission's Joint research centre found large variation of the contents of sugar, saturated fats and salt in a wide range of commercial CF marketed in Europe (23), often with undesirably high contents. The WHO Regional Office for Europe reported a poor nutritional

quality of many commercial baby foods in several European countries, often with high amounts of sugar and inappropriate nutrition claims (22).

Although 70% of the countries recommended the introduction of iron-rich food sources by the time the infant reaches the age of six months, 13 countries recommend later introduction, some only at nine months. It is essential to provide sources of iron with the introduction of CF, since iron deficiency continues to be the most common micronutrient deficiency in early childhood (24, 25), which induces anemia and can have adverse effects on brain development, with potentially lifelong sequelae (26-28). From the end of the first half-year of life onwards, infants require additional iron from CF naturally rich in iron or fortified with iron, to meet their needs (12). It is worrying that 13 countries recommend the introduction of iron-rich foods later and some considerably later than desirable.

A further concern is that the WHO Regional Office for Europe published the last guidelines on IYCF more than 15 years ago (29). Since then new information and new questions have arisen, for example new information on frequent gaps in meeting nutrient requirements in older infants and young children (24, 25) and relating to the impact of complementary feeding practices on the risk of developing celiac disease and allergies (1, 30, 31), and potential differences in needs among different groups of infants, for example with lower birthweights or with certain genetic polymorphisms relating to nutrient metabolism (12, 32). Moreover, the world has seen many changes such as a markedly increased prevalence of childhood overweight and obesity, a greater variety of commercial complementary food products, changing practices of food marketing, greater recognition of benefits of regional production and environmentally sustainable food choices, and other changes such as an increasing popularity of plant-based diets. It may be worthwhile to explore whether one global recommendation for IYCF or more differentiated recommendations adapted to the conditions

of different populations may be preferable. Updated guidelines for IYCF that take these aspects into account should be considered a priority for the WHO European Region.

Strengths of the current study are the inclusion of information from most countries in the WHO European Region, use of a standardized method of data collection, and the review of data from all participating countries by their respective public health authorities. Limitations are the reliance on data reporting by individual experts in the participating countries and some missing data. Although WHO, Codex Alimentarius and paediatric organisations established generally agreed definitions for key terms used in our questionnaires (e.g. follow-on formula, young child formula, iron-rich food sources, solid foods), those completing the questionnaires might at times have applied different definitions. The evaluation and reporting of the data collected in 2016-2017 was delayed due to interrupted employment of staff involved in data processing.

In conclusion, considerable heterogeneity between recommendations on IYCF exists among the countries of the WHO European Region. We consider several aspects not to be in line with current scientific evidence. We recommend efforts for periodic updates on IYCF guidelines notably by the WHO Regional Office for Europe, greater attention by governments on reviewing and updating their national guidelines in line with current evidence and recommendations, and regular national surveys on CF, in order to improve and monitor IYCF practices.

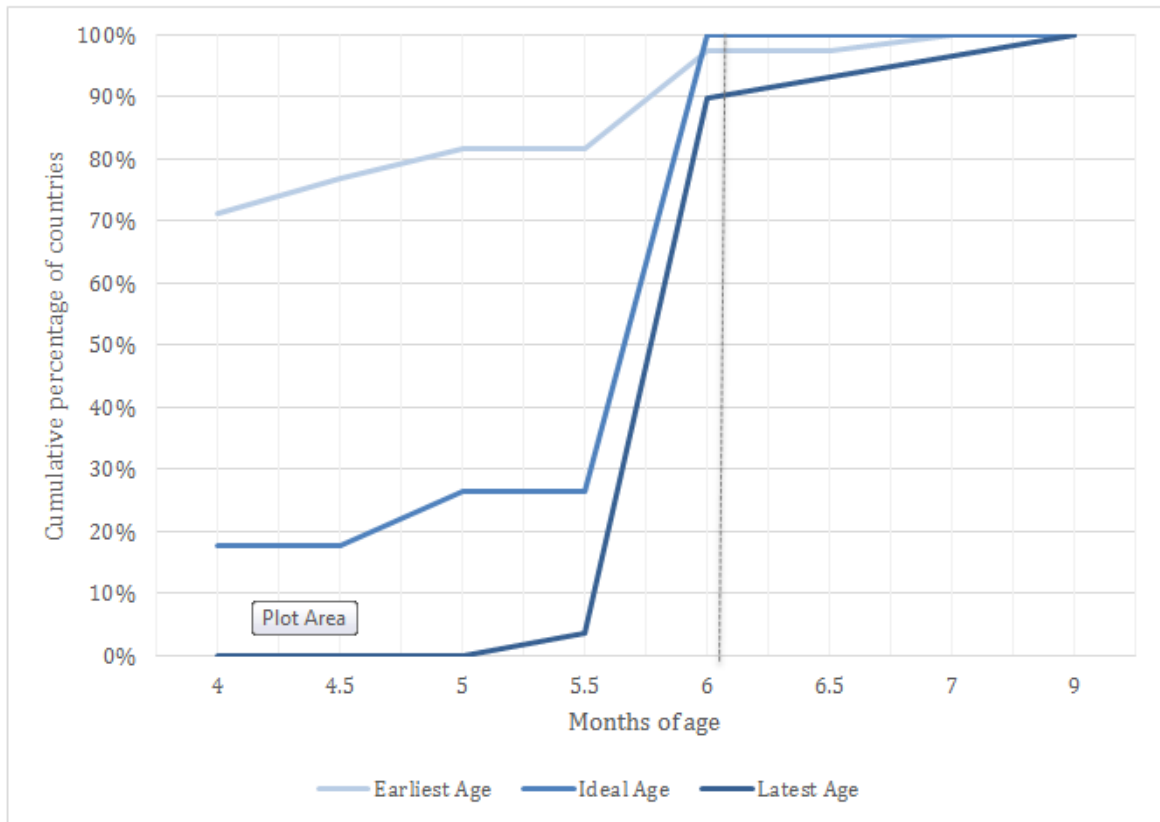
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References

- 1 ESPGHAN-Committee-on-Nutrition, Fewtrell M, Bronsky J, et al. Complementary Feeding: A Position Paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2017;64(1):119-32.
- 2 ESPGHAN-Committee-on-Nutrition, Agostoni C, Decsi T, et al. Complementary feeding: a commentary by the ESPGHAN Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2008;46(1):99-110.
- 3 Pan-American-Health-Organization. Guiding principles for complementary feeding of the breastfed child. Washington, DC 2003: Pan American Health Organization; 2003.
- 4 World-Health-Organisation Complementary Feeding. Report of the Global Consultation. Geneva, 10–13 December 2001. Summary of Guiding Principles. Geneva: World Health Organisation; 2002.
- 5 World-Health-Organisation Global Strategy for Infant and Young Child Feeding. Geneva: WHO; 2003.
- 6 Horta BL, Victora CG Short-term effects of breastfeeding: a systematic review of the benefits of breastfeeding on diarrhoea and pneumonia mortality. *World Health Organization*. 2013:54 p.
- 7 Horta BL, Victora CG Long-term effects of breastfeeding: a systematic review. *World Health Organization*. 2013:74 p.
- 8 Rito AI, Buoncristiano M, Spinelli A, et al. Association between Characteristics at Birth, Breastfeeding and Obesity in 22 Countries: The WHO European Childhood Obesity Surveillance Initiative – COSI 2015/2017. *Obesity Facts* 2019;12(2):226-43.
- 9 Prell C, Koletzko B Breastfeeding and complementary feeding - recommendations on infant nutrition. *Dtsch Arztebl Int* 2016;113(25):435-344.
- 10 Koletzko B. Why breastfeeding? . In: Family-Larsson-Rosenquist-Foundation ed. *Breastfeeding and Breast Milk - From Biochemistry to Impact*. Stuttgart: Thieme; 2018:78-89.
- 11 World-Health-Organisation Guiding principles for feeding non-breastfed children 6-24 months of age. Geneva: World Health Organization; 2015.
- 12 ESPGHAN-Committee-on-Nutrition, Domellof M, Braegger C, et al. Iron requirements of infants and toddlers. *J Pediatr Gastroenterol Nutr* 2014;58(1):119-29.
- 13 McCarthy PJ, Zundel HR, Johnson KR, et al. Impact of Growth Restriction and Other Prenatal Risk Factors on Cord Blood Iron Status in Prematurity. *Journal of Pediatric Hematology/Oncology* 2016;38(3):210-15.
- 14 Ziegler EE, Nelson SE, Jeter JM Iron Stores of Breastfed Infants during the First Year of Life. *Nutrients* 2014;6(5):2023-34.
- 15 Lozoff B, Beard J, Connor J, et al. Long-Lasting Neural and Behavioral Effects of Iron Deficiency in Infancy. *Nutrition Reviews* 2006;64(suppl_2):S34-S43.
- 16 Radlowski E, Johnson R Perinatal iron deficiency and neurocognitive development. *Frontiers in Human Neuroscience* 2013;7(585).
- 17 ESPGHAN-Committee-on-Nutrition, Agostoni C, Braegger C, et al. Breast-feeding: A commentary by the ESPGHAN Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2009;49(1):112-25.
- 18 EFSA-Panel-on-Dietetic-Products Scientific Opinion on the appropriate age of introduction of complementary feeding of infants. *EFSA Journal* 2009;7(1423).
- 19 European-Food-Safety-Authority, EFSA-Panel-on-Nutrition-Novel-Foods-and-Food-Allergens, Castenmiller J, et al. Appropriate age range for introduction of complementary feeding into an infant's diet. *EFSA Journal* 2019;16(9)(
- 20 Koletzko B, Lehmann Hirsch N, Jewell JM, et al. Pureed Fruit Pouches for Babies: Child Health Under Squeeze. *Journal of Pediatric Gastroenterology and Nutrition* 2018;67(5):561-63.
- 21 Koletzko B, Buhner C, Ensenaer R, et al. Complementary foods in baby food pouches: position statement from the Nutrition Commission of the German Society for Pediatrics and Adolescent Medicine (DGKJ, e.V.). *Mol Cell Pediatr* 2019;6(1):2.
- 22 WHO-Regional-Office-for-Europe. Ending inappropriate promotion of commercially available complementary foods for infants and young children between 6 and 36 months in Europe. Copenhagen: WHO Regional Office for Europe; 2019.

- 23 Grammatikaki E, Wollgast J, Caldeira S Feeding infants and young children. An analysis of national food-based dietary guidelines and specific products available in the EU market. Luxembourg Publications Ofce of the European Union 2018:182 p.
- 24 EFSA-Panel-on-Dietetic-Products Scientific Opinion on nutrient requirements and dietary intakes of infants and young children in the European Union. EFSA Journal 2013;11(10):3408.
- 25 Suthuvoravut U, Abiodun P, Chomtho S, et al. Composition of Follow-Up Formula for Young Children Aged 12-36 Months: Recommendations of an International Expert Group Coordinated by the Nutrition Association of Thailand and the Early Nutrition Academy. Ann Nutr Metab 2015;67(2):119-32
- 26 Berglund S, Domellöf M Meeting iron needs for infants and children. Current Opinion in Clinical Nutrition & Metabolic Care 2014;17(3):267-72.
- 27 Burke RM, Leon JS, Suchdev PS Identification, Prevention and Treatment of Iron Deficiency during the First 1000 Days. Nutrients 2014;6(10):4093-114.
- 28 Cao C, O'Brien KO Pregnancy and iron homeostasis: an update. Nutrition Reviews 2013;71(1):35-51.
- 29 Michaelsen K, Weaver L, Branca F, et al. Feeding and nutrition of infants and young children - Guidelines for the WHO European region with emphasis on the former Soviet countries. 2003:296 p. .
- 30 Szajewska H, Shamir R, Mearin L, et al. Gluten Introduction and the Risk of Coeliac Disease: A Position Paper by the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition. J Pediatr Gastroenterol Nutr 2016;62(3):507-13.
- 31 Ierodiakonou D, Garcia-Larsen V, Boyle RJ Allergenic Food Introduction and Childhood Risk of Allergic or Autoimmune Disease-Reply. JAMA 2017;317(1):87.
- 32 Koletzko B, Reischl E, Tanjung C, et al. FADS1 and FADS2 polymorphisms modulate fatty acid metabolism and dietary impact on health. Ann Rev Nutr 2019;39(Aug 21):21-44.

Figure 1: Cumulative percentage of recommended introduction to complementary feeding by age



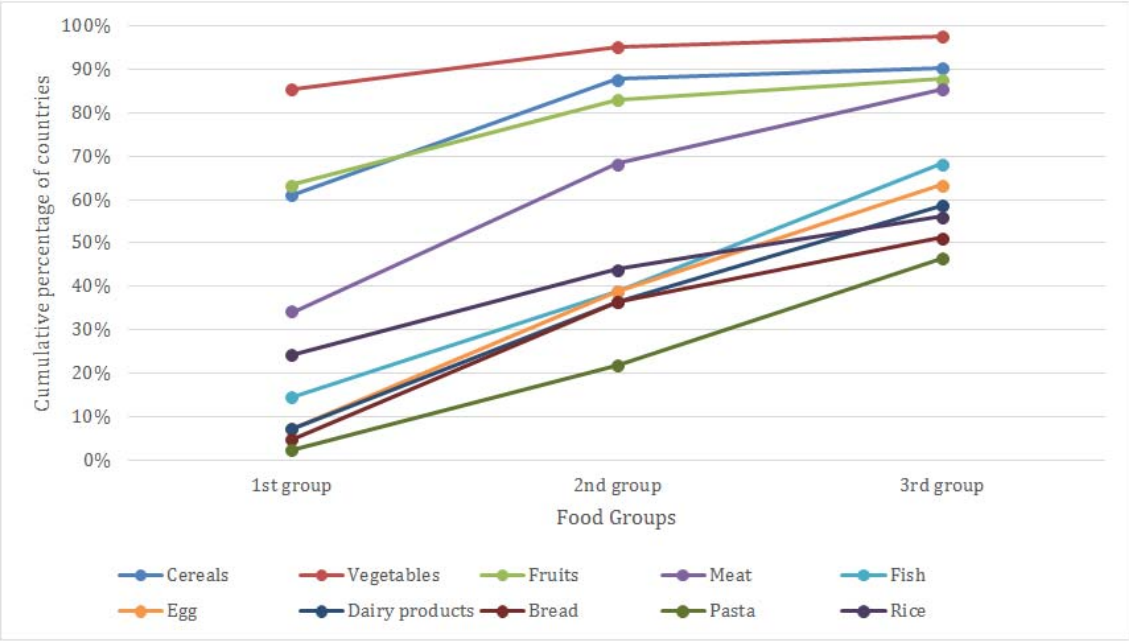
*Data reported by 43 countries

N (Earliest Age) = 38 countries

N (Ideal Age) = 34 countries

N (Latest Age) = 29 countries

Figure 2: Cumulative percentage of recommended complementary foods by food group

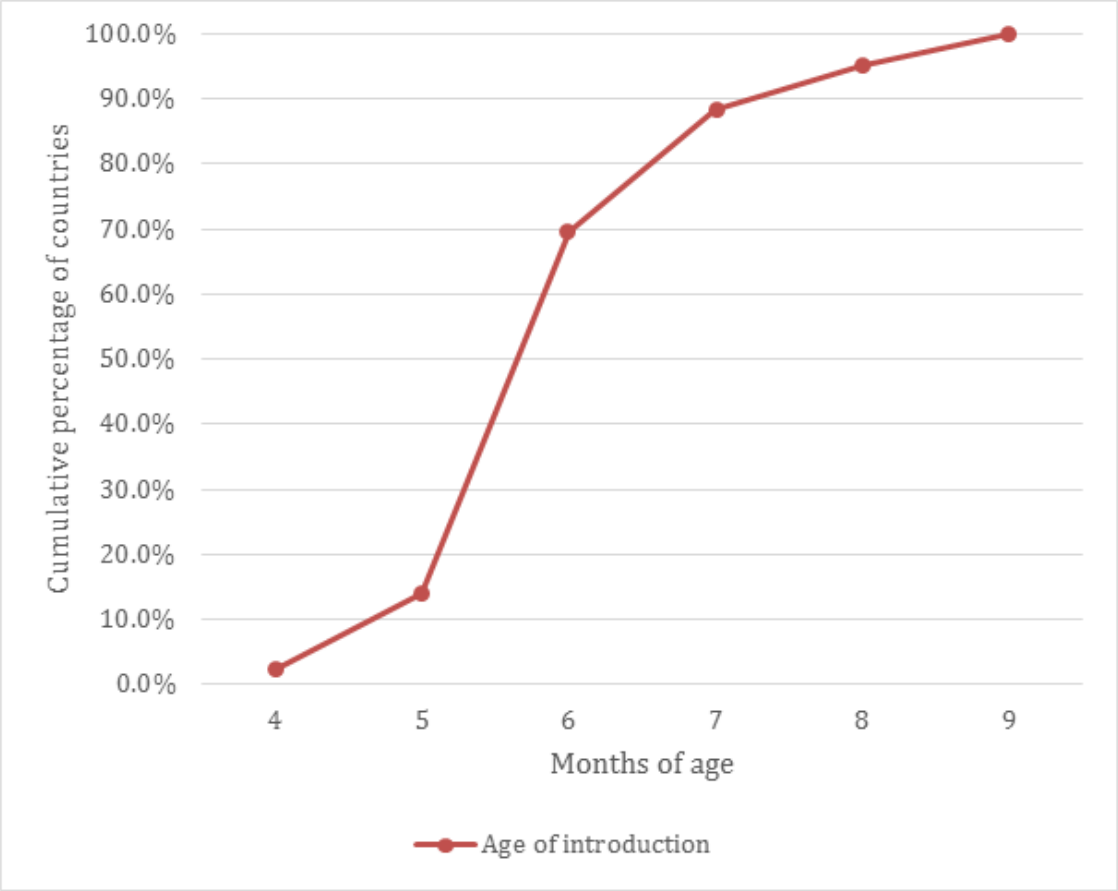


*Data reported for 41 countries

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Figure 3: Cumulative percentage of recommended age-specific introduction to iron-rich foods by age only and food groups

*Data reported for 43 countries.



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Table 1. Main findings on IYCF recommendations in WHO European Region countries

Recommendations	Percent of countries	Positive responses/ all countries providing this information
Infant and young child feeding		
Recommendations on infant and young child nutrition or feeding established	94	45/48
Dietary reference intake for infants and young children established	56	25/45
Promotion and support of breastfeeding		
Exclusive breastfeeding up to 6 months of age	93	42/45
Breastfeeding up to 2 years and beyond	64	29/45
Breast-milk substitutes/formula		
- Recommendations for using infant formula	52	23/44
- Recommendations for using follow-on formula	61	27/44
- Recommendations for using formula for young children (“Growing-up milk”)	41	18/44
Introduction to complementary foods		
Introduction before 6 months of age as earliest age	82	31/38

Introduction at 6 months of age as ideal age	74	25/34
Introduction after 6 months of age as latest age	10	3/29
Earlier introduction for non-breastfed infants	15	6/40
Recommendations on liquids (other than water)		
Breast-milk only up to 6 months of age	48	21/44
Breast-milk together with other options up to 6 months of age	52	23/44
Breast-milk together with other options up to 2 years of age or beyond	84	37/44
Tea (including sweetened tea) before 2 years of age	27	12/44
Juice before 12 months of age	32	14/44
Juice before 2 years of age	41	18/44
Age of introduction to meat or other iron-rich foods		
Introduction before 6 months of age	9	4/43
Introduction at 6 months of age	61	26/43
Introduction after 6 months of age	30	13/43