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**Characteristics associated with feeding organic foods during complementary feeding:
the nationwide ELFE birth cohort**

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Short title

Organic foods during complementary feeding

Keywords

infant, organic foods, birth cohort, complementary feeding

Abstract

Organic food consumption and its effects on health remain understudied in adults and in children. The aim of this study was to describe family characteristics associated with feeding infants organic foods during the complementary feeding (CF) period. The analysis included 9,764 children from the French ELFE birth cohort. In addition to telephone interviews conducted at 2, 12 and 24 months, a monthly questionnaire about milk feeding and CF (including organic foods) was completed by parents between 3 and 10 months. Associations between family characteristics and feeding with organic foods during CF were analyzed by multivariable multinomial logistic regression. Overall, 51% of infants never consumed organic food during the CF period (up to 10 months), 24% sometimes, 15% often and 9% always or almost always. As compared with infants never fed organic foods during CF, those “often” or “always” fed organic foods were born to older mothers, with higher education level or family income, and lower pre-pregnancy body mass index. As compared with never-smoking women, women who had stopped smoking before pregnancy were more likely to feed their infant organic foods during CF. Feeding with organic foods during CF was also related to long breastfeeding duration and later introduction to complementary foods. To conclude, associations between feeding with organic foods and family socioeconomic position as well as infant feeding practices need to be considered when studying the impact of organic foods on children’s health and development.

Introduction

Organic foods, acclaimed for environmental benefits related to their production ⁽¹⁾, are also perceived as having beneficial effects on health ^(2; 3; 4; 5) because they contain fewer pesticide residues as compared with conventionally grown foods ⁽⁶⁾. European rules imposed a very low common limit for all pesticides on all baby foodstuffs ⁽⁷⁾. whatever the mode of agricultural production. Studies examining the consumption of organic foods during pregnancy have reported a protective effect on some birth outcomes, such as pre-eclampsia, hypospadias, and cryptorchidism ^(8; 9), as well as a child's later health, such as atopic diseases ^(10; 11; 12; 13). However, the evidence remains sparse and controversial ⁽¹⁴⁾. Despite the complexity of characterizing organic food consumers ⁽⁵⁾, their profiles have been reported in numerous studies mainly in adulthood. Such consumers tend to be older and female, have a high education level, have children, and follow an overall healthy lifestyle (compliance with dietary recommendations and regular physical activity, no smoking) ^(2; 5). Except for a previous study of pregnant women ⁽¹⁵⁾, little is known about consuming organic foods in the perinatal period and the associated family characteristics. This previous study showed that socioeconomic characteristics related to frequent consumption of organic foods during pregnancy were not just those usually related to healthier behaviors: women with both low and high education and in the lowest income group were more likely to eat organic foods than other women. Infant feeding practices are known to affect numerous aspects of health in later life ^(16; 17; 18; 19; 20). However, several aspects of feeding practices such as breastfeeding duration, age at complementary feeding (CF) introduction, and type of foods used in infancy are interrelated ⁽²¹⁾ and known to be associated with family characteristics and the health status of the infant ^(21; 22; 23). Organic food consumption is associated with a healthy lifestyle ⁽¹¹⁾, so we should examine the links between feeding organic foods during CF and other feeding practices.

The aim of the present study was to describe the choice of organic foods for CF in a large nationwide birth cohort and its association with family characteristics and other infant feeding practices.

Materials and methods

Study population

The present analysis was based on data from the Étude Longitudinale Française depuis l'Enfance (ELFE) study, a multidisciplinary, nationally representative birth cohort that included 18,329 children born in a random sample of 349 maternity units in France in 2011⁽²⁴⁾. From April 2011, inclusion took place during 25 selected recruitment days over four waves of 4 to 8 days each and covering all four seasons. Inclusion criteria were birth after 33 weeks' gestation to mothers aged 18 years or older who were not planning to move outside of metropolitan France in the following 3 years. Data were collected in standardized interviews conducted by trained interviewers and self-completed questionnaires.

Mothers were interviewed in the maternity ward for medical information about their pregnancy and their newborn, sociodemographic and lifestyle-related characteristics, and eating habits during pregnancy. Additional information was collected from obstetric and paediatric medical files. At 2, 12 and 24 months post-partum, telephone interviews with mothers and fathers collected data on infant feeding and more details on demographic and socioeconomic characteristics. From 3 to 10 months after delivery, families were asked to complete a monthly questionnaire via the Internet (70%) or by paper that asked about the infant's diet (feeding methods, food and beverage introduction).

Ethical approval

Participating mothers provided written consent for themselves and their child. When present at inclusion, fathers signed the consent form for the child's participation or were informed about their right to oppose it. The ELFE study received approvals from the Advisory

Committee for the Treatment of Information on Health Research (Comité Consultatif sur le Traitement des Informations pour la Recherche en Santé), the National Agency Regulating Data Protection (Commission Nationale Informatique et Libertés), and the National Statistics Council.

Family characteristics assessment

Parental socio-demographic characteristics of interest were maternal migration status (migrant, descendant of migrant, majority population), age at delivery (18-25, 25-29, 30-34, ≥ 35 years), number of older children in the household (ELFE child is the first child, one older child, at least two older children), single parenthood, maternal education level (up to lower secondary, upper secondary, intermediate, 3-y university degree, at least 5-y university degree), monthly family income per consumption unit ⁽²⁵⁾ (\leq € 750, € 751-1,111, € 1,112-1,500, € 1,501-1,944, € 1,945-2,500, $>$ € 2,500), employment status during pregnancy (employed, unemployed, out of the labor force [housewife/student/retired/disabled]), and motives for choice of feeding method (breast or formula milk) at birth: child's health or well-being/practical reasons/interaction with infant/usual feeding method/other or unknown. Maternal health characteristics included self-reported height and pre-pregnancy weight, maternal smoking during pregnancy (never smoker, smoker only before pregnancy, smoker in early pregnancy and smoker throughout pregnancy). During the hospital stay, the recruited women (n = 18,042) were asked to complete a self-administered food-frequency questionnaire to describe their dietary intake over the last 3 months of their pregnancy ⁽²⁶⁾. A diet quality score, based on consumption of the main food groups, was calculated by using 17 quantitative benchmarks as previously described ⁽²⁷⁾.

116 *Infant characteristics*

117 Newborn characteristics were collected from the medical record: sex, twin birth, gestational
118 age and birth weight. Medical diagnosis of the infant's allergy to cow's milk protein was also
119 collected from the parents with the 2-month questionnaire.

120 *Infant feeding*

121 Details on milk feeding practices were collected monthly from 2 to 10 months and then at 12
122 and 24 months. From these data, any breastfeeding duration and age at infant formula
123 introduction were calculated as previously described ⁽²⁸⁾.

124 Details on CF practices were collected monthly from 3 to 10 months. We calculated the age
125 of introduction of 13 food groups (fruits, vegetables, potatoes, water, fruit juice, infant
126 cereals, meat, fish, eggs, bread and pasta, dairy products, cow's milk and dessert), along with
127 the age of introduction of unmixed meat and crushed vegetables and fruits, as previously
128 defined ⁽²²⁾. Each month, the parents reported the frequency of use of organic foods to feed
129 their infant (0-never, 1-sometimes, 2-often, 3-always or almost always), as well as the
130 frequency of use of ready-prepared baby foods to feed their infant. The frequency of feeding
131 with organic foods during CF was individually summarized as the median frequency of
132 feeding with organic foods reported between the age of introduction to CF and age 10 months.
133 The frequency of feeding with ready-prepared baby foods during CF was individually
134 summarized as the median frequency of feeding with ready-prepared baby foods reported
135 between the age of introduction to CF and age 10 months. Among families completing the 3-
136 to 10-month questionnaires, 86% of children had at least 5 collection points for organic foods.

137 *Sample selection*

138 Children whose parents withdrew consent (n=57) were excluded from the study. We
139 randomly selected one twin of two (n=287) to avoid family clusters. We excluded children
140 whose frequency of consumption of organic foods was missing, as they did not complete the

3-10-month questionnaire or did not provide enough information to summarize intake during complementary feeding (n=6,899), which left 11,086 children to compute national statistics on feeding with organic foods during CF.

To analyze the associations between familial/infant characteristics and frequency of feeding with organic foods during CF, we excluded children with a medical diagnosis of allergy to cow's milk protein reported at the 2-month follow-up (n=144) because it might deeply affect infant feeding. After excluding children with missing data on family or infant characteristics (n=1,180), the complete-cases analysis was based on 9,762 children. The analyses accounting for maternal diet quality during pregnancy involved 8,985 children, and those accounting for other feeding practices involved 8,588 children.

As compared with the 9,762 included children, excluded children often had younger mothers (30.2 ± 5.6 vs 31.3 ± 4.6 years, $p < 0.0001$) with lower education level (14.7% vs 23.5% with a Master's degree, $p < 0.0001$) and lower income (mean € 1,423 \pm 1,033 vs € 1,751 \pm 979 per consumption unit, $p < 0.0001$). They more frequently had two or more siblings (22.7% vs 16.5%, $p < 0.0001$), an immigrant mother (15.9% vs 6.5%, $p < 0.0001$), and a mother who smoked throughout pregnancy (21.0% vs 12.4%, $p < 0.0001$).

Statistical analyses

To provide representative descriptive statistics of births in 2011 in metropolitan France, the data (rates of choosing organic food) were weighted to take into account the inclusion procedure and biases related to non-consent⁽²⁹⁾. Weighting also included calibration on margins from the state register's statistical data and the 2010 French National Perinatal study⁽³⁰⁾ on the following variables: age, region, marital status, migration status, level of education, and primiparity. This weighting was calculated for the subsample that completed the questionnaire on infant diet at least once from 3 to 10 months.

Bivariate associations between family characteristics and frequency of feeding with organic foods during CF were analyzed with chi-square tests and those between infant feeding practices and frequency of feeding with organic foods during CF with ANOVA. Multivariable associations between familial or infant characteristics and frequency of feeding with organic foods during CF (never, sometimes, often, always or almost always) were assessed by multinomial logistic regression, simultaneously including the family characteristics presented previously and additionally adjusted for variables related to study design (mother's region of residence, size of maternity unit and wave of recruitment). Not feeding with organic foods during CF was considered the reference category. Analyses were conducted with a three-step approach. First, only maternal sociodemographic characteristics were considered: age, education level, migration status, single motherhood, number of children in the household, employment during pregnancy, and household income. In addition to sociodemographic characteristics, analyses included maternal health and health-related behaviors: smoking status during pregnancy, pre-pregnancy body mass index (BMI), diet quality during pregnancy, and motives for choice of initial feeding method. In a final model, infant characteristics and infant feeding practices were considered: sex, birth weight-for-gestational-age, any breastfeeding duration, age at complementary feeding introduction and frequency of feeding with ready-prepared baby foods during CF.

To deal with selection and attrition bias, we performed a sensitivity analysis with weighted data according to the weighting described previously on the complete-cases sample. Because the main analyses were based on the complete-cases sample, we also performed a sensitivity analysis using multiple imputation to deal with missing data on family characteristics. We assumed that data were missing at random and generated five independent datasets with the fully conditional specification method (SAS software: MI procedure, FCS statement, NIMPUTE option) and then calculated pooled effect estimates (SAS software: MIANALYSE

procedure). In imputation models, we included all variables of interest after ranking them in ascending order of missing data. Categorical variables were imputed with a multinomial model, ordinal or binary variables with logistic regression, and continuous variables with linear regression. These sensitivity analyses involved data for all participants with data on organic foods choice for CF (n=10,945). All analyses involved using SAS V9.4 (SAS, Cary, NC).

Results

Descriptive statistics

For the 11,086 infants with data on organic foods, the weighted frequencies of feeding with organic foods between CF introduction and 10 months were : never 51.3% (95% CI: 50.1, 52.6%), sometimes 24.0% (22.9, 25.0%), often 15.2% (14.4, 16.1%), and always or almost always 9.5% (8.8, 10.1%).

Maternal sociodemographic and socioeconomic characteristics

Family and infant characteristics were compared by frequency of feeding with organic foods during complementary feeding (Table 1).

On multivariable analysis (Table 2), as compared with no feeding with organic foods, the frequency of feeding with organic foods during CF was positively associated with maternal age, education level, and household income. Immigrant women were more likely to feed their infant organic foods during CF, but the association was only statistically significant for “sometimes” and “often” categories. Unemployed mothers were more likely to always feed their infant organic foods when adjusted for family income and other characteristics. Single parenthood and maternal return to work at 2 months were not associated with frequency of feeding with organic foods during CF. Finally, families with older siblings were less likely to feed their infant organic foods often or always.

214 *Health, motives and health-related behaviors*

215 As compared with women who never smoked, those who stopped smoking before pregnancy
 216 or in early pregnancy were more likely to always feed their child organic foods during CF
 217 (Table 3, model 2). Children born to mothers with overweight or obesity were less likely to be
 218 fed organic foods than those born to women with normal weight. Likelihood of feeding with
 219 organic foods was associated with maternal diet quality during pregnancy. Finally, likelihood
 220 of feeding with organic foods was reduced for children of women who initially chose their
 221 infant feeding method (breast or formula feeding) for practical or “other reasons” rather than
 222 for their child’s health or well-being.

223 *Infant characteristics and infant feeding practices*

224 The model further accounting for infant characteristics is shown in Table 3 (Model 3). Girls
 225 were less likely to almost always be fed organic foods during CF than boys but not
 226 significantly ($p=0.08$, Table 3). Infants born small-for-gestational-age were less likely to be
 227 fed “sometimes” or “often” with organic foods than their adequate-for-gestational-age
 228 counterparts. The frequency of feeding with organic foods was strongly and positively related
 229 to any breastfeeding duration and was positively related to age at complementary foods
 230 introduction, especially introduction to CF after age 6 months. Infant fed with ready-prepared
 231 baby foods were more likely to be fed with organic foods than infant never fed with ready-
 232 prepared baby foods, but the association between ready-prepared baby foods and organic
 233 foods was quite complex. In fact, the association was stronger infants consuming ready-
 234 prepared baby food “sometimes” or “often” than “almost always”. Moreover, within each
 235 frequency of feeding with ready-prepared baby foods, the association was stronger for
 236 intermediate frequency of feeding with organic foods than for high frequency.

237 *Sensitivity analyses*

238 Findings were similar in analyses based on weighted data or with multiple imputations of
239 missing data (Supplementary tables 1 and 2).

240 **Discussion**

241 To our knowledge, this study is the first to characterize feeding with organic foods during CF
242 and the associated family characteristics or feeding practices during the first year of life.
243 Beyond its positive association with several indicators of socioeconomic position, the
244 frequency of feeding with organic foods was strongly related to other infant feeding practices
245 such as long breastfeeding duration and introduction to CF after age 6 months. Furthermore,
246 feeding the child organic foods during CF was related to maternal health concerns such as
247 smoking cessation before pregnancy.

248 *Frequency of feeding with organic foods during CF*

249 Published data on the consumption of organic foods in the perinatal period are sparse. The
250 prevalence of organic foods consumption by infants born in 2011 in the ELFE study is
251 consistent with that found in literature (although the data collection methods are different),
252 with half of infants never fed organic foods and 25% often or always fed organic foods. Only
253 one study provided statistics on organic food consumption in the first years of life: in the
254 KOALA Birth Cohort study (beginning in 2000), 16% of infants consumed a diet with at least
255 50% organic foods in their first 2 years of life ⁽¹⁰⁾. More data are available on organic foods
256 consumption during pregnancy. In the KOALA Birth Cohort study, many pregnant women
257 (86%) consumed a diet based on conventional foods and 14% a diet with at least 50% organic
258 foods ⁽¹⁰⁾. In the Norwegian Mother and Child Cohort Study (MoBa, recruitment from 1999
259 through 2008), about half of women never/seldom ate organic foods during pregnancy as
260 compared with 16% who often ate organic foods ⁽⁹⁾. In the Danish National Birth Cohort

(recruitment between 1996 and 2002), an estimated 56% of pregnant women were non- or low organic-food consumers and 7% frequent consumers ⁽³¹⁾.

Sociodemographic characteristics and feeding with organic foods during CF

The frequency of feeding with organic foods during CF has never been described. Therefore, we compared our findings to correlates and motives reported in adult populations (including pregnant women). Consistent with the literature, feeding with organic foods was related to increased maternal age ^(31; 32; 33) and education level ^(34; 35) and related to increased household income, even if the association with income and organic foods could be stronger for some food groups (e.g., vegetables) than others (e.g., milk) ⁽³⁴⁾. However, in the MoBa study, the consumption of organic foods during pregnancy was related to both younger and older age as well as low education level and low household income ⁽³¹⁾. In the Elfe study, after adjustment for education level and family income, maternal employment was negatively related to feeding with organic foods.

Households with children seemed more likely to purchase organic foods than those without children ⁽³²⁾, but in the ELFE study, parents with older children less likely fed their infant organic foods during CF as compared with those without older children. In the MoBa study, pregnant women with an older child were more likely to consume organic foods than primiparous women, whereas those with at least two previous children were less likely to consume organic foods ⁽³¹⁾, which suggests that the association between parity and choice of organic foods is complex and depends on the population.

The accessibility and availability of organic foods is strongly associated with organic foods consumption ^(32; 36; 37; 38; 39), but unfortunately such an information was not available in the ELFE study.

Maternal health and health-related behaviors and feeding with organic foods during CF

In the ELFE study, frequent feeding with organic foods during CF was related to maternal health and health behaviors, assessed by maternal weight status, smoking cessation, and health concerns such as motives for choice of initial infant feeding method. In the literature, the inverse association between BMI and consumption of organic foods was consistent across studies^(15; 31; 33; 35; 40). The association with smoking seems complex: some studies highlighted higher consumption of organic foods among former or current smokers than non-smokers^(15; 33) but not all⁽⁴⁰⁾. In the last study, with about 5% women smoking during pregnancy, no association was found with active smoking; but women consuming organic foods were less likely to be exposed to passive smoking than women consuming conventional foods⁽⁴⁰⁾. In the MoBa study, occasional smokers were more likely to consume organic foods during pregnancy than were non-smokers, but the reverse was found for regular smokers⁽³¹⁾. Stronger health concerns were often observed among organic food consumers than others^(4; 5; 32; 36; 39; 41; 42; 43). High diet quality was also related to increased likelihood of organic food consumption^(2; 31; 33; 35; 44; 45; 46; 47; 48; 49). Overall these aspects suggested a cluster of healthy behaviors.

Organic foods and infant feeding during the first year of life

Organic food consumers appeared to have a diet more in line with nutritional guidelines⁽³³⁾ and high awareness for some nutritional guidelines⁽²⁾. Moreover, consumers of organic foods are more likely to have a healthy lifestyle^(2; 31; 33; 47; 48; 49; 50). These findings in adults appeared consistent with the associations between extended breastfeeding (recommended by international societies^(51; 52)) or low likelihood of early CF introduction (<4 months) and feeding with organic foods during CF. However, feeding with organic foods during CF was also related to late CF introduction (>6 months), which is not recommended by international societies.

Strengths and limitations

The ELFE cohort is a nationwide study of birth in 2011 in metropolitan France (excluding very premature babies). The main analyses were conducted on a complete-cases sample. However, when missing data on family characteristics were addressed by the multiple imputation method, results remained consistent. Moreover, the sample considered for the present analysis was based on more advantaged families than the initial ELFE sample, which limits the generalizability of our results. However, sensitivity analysis based on weighted data, which deals with part of the selection and attrition biases, provided similar findings, which suggests that these biases had limited impact on our results. The main strengths of the ELFE study include the large sample and the wide range of sociodemographic and socioeconomic variables and profiles. Moreover, data collection was repeated and prospective throughout infancy, thus limiting the memory bias regarding infant diet. Consumption of organic foods during CF was assessed with only one item, repeated each month from 3 to 10 months, and based only on feeding at home, which allowed for only a quantitative assessment of infant exposure. However, this is the first study with data on organic-food consumption during CF, and the frequency of consumption of organic foods was consistent with previous studies in the perinatal period ^(10; 31; 53).

Conclusion

About a quarter of infants were fed organic foods (often or always) during the CF period in France in 2011-2012, as assessed by the ELFE data. Beyond the positive association of organic food feeding and several indicators of the family socioeconomic position, organic food feeding was strongly associated with infant feeding practices, in particular long breastfeeding duration and introduction to complementary foods beyond 6 months. All these characteristics need to be carefully considered when studying the potential role of organic food consumption on children's subsequent health and development.

334

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358 ***Conflict of interest***

The authors had no conflict of interest relevant to this article to disclose.

Authorship

BLG and FG conceptualized and designed the work, conducted the statistical analyses, drafted the initial manuscript, and approved the final manuscript as submitted.

AC and CDP conducted part of the statistical analyses, critically reviewed the manuscript, and approved the final manuscript as submitted.

BLG, SL, SN and MAC designed nutritional data collection instruments, supervised their data collection and data management, critically reviewed the manuscript, and approved the final manuscript as submitted.

MAC coordinated the Elfe cohort management team.

EKG conceptualized and designed the work, contributed to the interpretation of the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

Conflict of interest

The authors had no conflict of interest relevant to this article to disclose.

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Table 1. Family and infant characteristics by choice of organic foods for complementary feeding (n=9,762)

	Choice of organic foods for complementary feeding				P value
	Never (n=4731)	Sometimes (n=2333)	Often (n=1614)	Almost always (n=1084)	
Family characteristics					
Maternal age at delivery (years)	30.6 (4.6)	31.5 (4.4)	32.1 (4.3)	32.5 (4.4)	<0.0001
Maternal education level					<0.0001
Up to lower secondary	3.1% (145)	2.4% (56)	1.5% (25)	1.0% (11)	
Upper secondary	36.1% (1707)	25.5% (595)	19.6% (317)	13.0% (141)	
Intermediate	27.2% (1285)	24.3% (568)	23.7% (383)	20.7% (224)	
3-year university degree	17.6% (832)	22.5% (525)	22.2% (358)	26.8% (291)	
At least 5-year university degree	16.1% (762)	25.2% (589)	32.9% (531)	38.5% (417)	
Maternal migration status					<.0001
Immigrant	5.0% (235)	7.5% (176)	9.1% (147)	7.5% (81)	
Descendant of at least one immigrant	8.7% (410)	8.9% (208)	9.4% (151)	8.9% (96)	
Rest of population	86.4% (4086)	83.5% (1949)	81.5% (1316)	83.7% (907)	
Parents living with the child					0.2
Both parents	97.4% (4607)	98% (2286)	98.1% (1583)	98.0% (1062)	
Single parenthood	2.6% (124)	2.0% (47)	1.9% (31)	2.0% (22)	
Older children in household					0.003
No sibling	44.6% (2110)	44.0% (1026)	47.5% (766)	50.3% (545)	
One sibling	38.7% (1832)	38.0% (887)	37.0% (597)	35.7% (387)	
At least 2 siblings	16.7% (789)	18.0% (420)	15.6% (251)	14.0% (152)	
Maternal employment during pregnancy					0.028
Employed	77.3% (3655)	80.1% (1868)	80.9% (1305)	79.5% (862)	
Unemployed	11.1% (526)	9.3% (218)	9.0% (145)	9.8% (106)	
Other (housewife, retired, student, retired etc.)	11.6% (550)	10.6% (247)	10.2% (164)	10.7% (116)	
Household income	1620 (1003)	1776 (785)	1933 (917)	2000 (1216)	<0.0001

(€/month/CU)

Maternal return to work at 2 months					0.15
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No returned to work	94.4% (4464)	95.6% (2231)	94.9% (1531)	95.0% (1030)
Returned to work	5.6% (267)	4.4% (102)	5.1% (83)	5.0% (54)

Maternal health and health-related behaviors

Smoking during pregnancy					<0.0001
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Never smoker	57.5% (2718)	57.9% (1351)	58.4% (943)	58.7% (636)
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Smoker only before pregnancy	24.6% (1164)	26.9% (628)	28.5% (460)	28.4% (308)
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Smoker only in early pregnancy	3.6% (170)	3.6% (85)	3.2% (51)	3.9% (42)
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Smoker throughout pregnancy	14.4% (679)	11.5% (269)	9.9% (160)	9.0% (98)
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Pre-pregnancy BMI (kg/m ²)	23.8 (4.8)	23.2 (4.6)	22.7 (4.2)	22.3 (3.9)	<0.0001
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Maternal diet quality (0-17 score)	12.6 (1.2)	12.9 (1.2)	13.1 (1.2)	13.3 (1.2)	<0.0001
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Initial feeding method choice					<0.0001
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Health, well-being	35.6% (1685)	41.2% (961)	42.8% (690)	48.1% (521)
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Practical reasons	14.1% (666)	10.0% (233)	9.1% (147)	5.4% (59)
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Other/unknown	30.1% (1422)	26.5% (619)	25.0% (403)	22.1% (240)
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Interaction with infant	6.3% (296)	7.8% (183)	7.9% (127)	7.8% (85)
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Usual feeding method	14.0% (662)	14.4% (337)	15.3% (247)	16.5% (179)
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Infant characteristics and feeding practices

Child sex					0.047
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Boy	49.9% (2362)	52.3% (1221)	53.5% (864)	51.9% (563)
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Girl	50.1% (2369)	47.7% (1112)	46.5% (750)	48.1% (521)
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Any breastfeeding duration (months)	1.6 (2.9)	2.2 (3.2)	2.6 (3.8)	4.0 (4.8)	<0.0001
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Age at infant formula introduction (months)	2.8 (4.4)	4.0 (5.3)	5.0 (6.1)	7.0 (7.1)	<0.0001
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Age at complementary foods introduction (months)	5.2 (1.2)	5.4 (1.1)	5.5 (1.1)	5.8 (1.0)	<0.0001
Use of ready-prepared baby foods					<0.0001
Never	28.0% (1278)	16.7% (371)	17.9% (275)	25.0% (254)	
Sometimes	28.3% (1290)	36.7% (814)	36.7% (563)	38.8% (395)	
Often	24.1% (1098)	29.0% (642)	32.7% (502)	22.7% (231)	
Almost always	19.7% (899)	17.6% (389)	12.7% (195)	13.5% (137)	

514 Data are mean (SD), unless otherwise indicated

Table 2. Multivariate associations between family characteristics and feeding with organic foods during complementary feeding (CF) (n=9,762)

	Organic foods during CF (ref=never)			P value
	Sometimes	Often	Almost always	
Model 1				
Maternal age at delivery (years)				<0.0001
< 25	0.83 [0.65, 1.05]	0.71 [0.51, 0.97]	0.79 [0.53, 1.19]	
25-29	1 [Ref]	1 [Ref]	1 [Ref]	
30-34	1.22 [1.08, 1.39]	1.40 [1.20, 1.62]	1.62 [1.35, 1.94]	
≥ 35	1.22 [1.05, 1.43]	1.68 [1.41, 2.01]	2.36 [1.92, 2.91]	
Maternal education level				<0.0001
Up to lower secondary	0.67 [0.47, 0.94]	0.41 [0.26, 0.64]	0.19 [0.10, 0.36]	
Upper secondary	0.60 [0.51, 0.71]	0.43 [0.35, 0.52]	0.21 [0.17, 0.27]	
Intermediate	0.68 [0.58, 0.80]	0.57 [0.48, 0.68]	0.41 [0.33, 0.50]	
3-year university degree	0.92 [0.78, 1.08]	0.75 [0.63, 0.89]	0.75 [0.62, 0.91]	
At least 5-year university degree	1 [Ref]	1 [Ref]	1 [Ref]	
Maternal migration status				0.0002
Migrant	1.40 [1.13, 1.73]	1.78 [1.42, 2.25]	1.24 [0.93, 1.64]	
Descendant of migrant	1.02 [0.85, 1.22]	1.13 [0.92, 1.38]	1.05 [0.82, 1.34]	
Majority population	1 [Ref]	1 [Ref]	1 [Ref]	
Parents living with the child				1
Both parents	1 [Ref]	1 [Ref]	1 [Ref]	
Single parenthood	0.91 [0.64, 1.30]	0.99 [0.65, 1.51]	0.98 [0.60, 1.60]	
Older children in household				<0.0001
ELFE child is the first child	1 [Ref]	1 [Ref]	1 [Ref]	

One older child	0.97 [0.86, 1.09]	0.84 [0.74, 0.97]	0.71 [0.61, 0.83]	
At least 2 older children	1.10 [0.93, 1.29]	0.84 [0.69, 1.01]	0.62 [0.50, 0.78]	
Maternal employment during pregnancy				0.2
Employed	1 [Ref]	1 [Ref]	1 [Ref]	
Unemployed	1.01 [0.85, 1.21]	1.14 [0.92, 1.41]	1.33 [1.05, 1.70]	
Not in the labor force	1.00 [0.84, 1.20]	1.12 [0.91, 1.37]	1.27 [1.00, 1.61]	
Household income (/month)				<0.0001
≤ € 750 ^a	0.99 [0.76, 1.29]	0.78 [0.55, 1.10]	1.04 [0.69, 1.57]	
€ 751–1,111 ^b	0.92 [0.76, 1.11]	0.83 [0.65, 1.05]	1.24 [0.95, 1.63]	
€ 1,112–1,500 ^c	1 [Ref]	1 [Ref]	1 [Ref]	
€ 1,501–1,944 ^d	1.06 [0.92, 1.22]	1.09 [0.93, 1.29]	1.01 [0.82, 1.23]	
€ 1,945–2,500 ^e	1.25 [1.06, 1.48]	1.41 [1.17, 1.70]	1.38 [1.11, 1.71]	
> € 2,500 ^f	1.40 [1.13, 1.73]	1.82 [1.45, 2.29]	1.43 [1.10, 1.86]	
Maternal return to work at 2 months				0.2
Not working at 2 months	1 [Ref]	1 [Ref]	1 [Ref]	
Working at 2 months	0.77 [0.61, 0.98]	0.90 [0.69, 1.17]	0.88 [0.64, 1.20]	

517 Data are odds ratios (ORs) [95% confidence intervals (CIs)] from multivariable multinomial

518 logistic regression also adjusted for variables related to study design (region, maternity unit

519 size and wave of recruitment). ^a corresponding to (in US\$) ≤ \$815/month; ^b corresponding to

520 \$816–1,207/month; ^c corresponding to \$1,208–1,630/month; ^d corresponding to \$1,631–

521 2,113/month; ^e corresponding to \$2,114–2,717/month; ^f corresponding to > \$2,717/month.

Table 3. Multivariable associations between maternal health and health-related behaviors (model 2) or infant characteristics and feeding practices (model 3) and feeding with organic foods during CF

	Organic foods during CF (ref=Never)			
	Sometimes	Often	Almost always	
Model 2 (n=8,985)				
Smoking during pregnancy				0.01
Never smoker	1 [Ref]	1 [Ref]	1 [Ref]	
Smoker only before pregnancy	1.15 [1.01, 1.30]	1.30 [1.13, 1.50]	1.31 [1.10, 1.55]	
Smoker only in early pregnancy	1.14 [0.85, 1.53]	1.19 [0.84, 1.69]	1.49 [1.01, 2.20]	
Smoker throughout pregnancy	1.13 [0.95, 1.34]	1.14 [0.92, 1.40]	1.26 [0.97, 1.63]	
Pre-pregnancy BMI (kg/m ²)				<0.0001
<18.5	1.08 [0.87, 1.34]	1.11 [0.87, 1.41]	1.16 [0.88, 1.53]	
18.5-24.9	1 [Ref]	1 [Ref]	1 [Ref]	
25-29.9	0.79 [0.68, 0.91]	0.72 [0.60, 0.86]	0.62 [0.50, 0.78]	
≥ 30	0.83 [0.69, 1.00]	0.77 [0.61, 0.97]	0.61 [0.45, 0.84]	
Maternal diet quality	1.15 [1.10, 1.20]	1.29 [1.23, 1.37]	1.49 [1.39, 1.59]	<0.0001
Initial feeding method choice				<0.0001
Health, well-being	1 [Ref]	1 [Ref]	1 [Ref]	
Practical reasons	0.70 [0.58, 0.84]	0.65 [0.52, 0.81]	0.35 [0.26, 0.48]	
Other	0.71 [0.60, 0.85]	0.62 [0.50, 0.77]	0.43 [0.32, 0.57]	
Interaction with infant	1.16 [0.94, 1.43]	1.10 [0.86, 1.41]	0.96 [0.72, 1.28]	
Usual feeding method	0.90 [0.76, 1.06]	0.95 [0.79, 1.14]	0.99 [0.81, 1.23]	
Model 3 (n=8,588)				
Child sex				0.05
Boy	1 [Ref]	1 [Ref]	1 [Ref]	
Girl	0.90 [0.81 ; 1.01]	0.87 [0.76 ; 0.99]	0.85 [0.73 ; 0.99]	
Child birthweight				0.07
Small weight for GA	0.80 [0.65 ; 0.97]	0.72 [0.57 ; 0.92]	0.98 [0.75 ; 1.27]	

Adequate weight for GA	1 [Ref]	1 [Ref]	1 [Ref]	
Large weight for GA	0.93 [0.78 ; 1.12]	1.07 [0.87 ; 1.31]	1.01 [0.78 ; 1.30]	
Any breastfeeding duration (months)				<0.0001
Never	1 [Ref]	1 [Ref]	1 [Ref]	
<1	1.20 [0.99 ; 1.46]	1.30 [1.02 ; 1.65]	1.77 [1.25 ; 2.50]	
1 to <3	1.44 [1.17 ; 1.76]	1.41 [1.10 ; 1.81]	2.33 [1.65 ; 3.29]	
3 to <6	1.39 [1.13 ; 1.70]	1.79 [1.41 ; 2.27]	3.20 [2.30 ; 4.44]	
≥ 6	2.00 [1.64 ; 2.45]	2.93 [2.32 ; 3.72]	7.47 [5.44 ; 10.26]	
Age at complementary foods introduction (months)				0.001
<4	0.91 [0.74 ; 1.11]	0.97 [0.76 ; 1.24]	0.65 [0.45 ; 0.93]	
4-6	1 [Ref]	1 [Ref]	1 [Ref]	
>6	1.11 [0.92 ; 1.34]	1.20 [0.98 ; 1.48]	1.53 [1.23 ; 1.9]	
Feeding with ready-prepared baby foods during CF				<0.0001
Never	1 [Ref]	1 [Ref]	1 [Ref]	
Sometimes	2.13 [1.82 ; 2.49]	1.98 [1.66 ; 2.37]	1.60 [1.31 ; 1.96]	
Often	2.15 [1.82 ; 2.53]	2.37 [1.97 ; 2.86]	1.40 [1.12 ; 1.74]	
Almost always	1.77 [1.48 ; 2.12]	1.30 [1.04 ; 1.62]	1.28 [1.00 ; 1.66]	

Data are odds ratios (ORs) [95% confidence intervals (CIs)] from multivariable multinomial logistic regressions also adjusted in model 2 and 3 for family characteristics (maternal age, education level, migration status, employment during pregnancy, return to work at 2 months, single parenthood, number of children in the household, household income) and variables related to study design (region, maternity size and wave of recruitment)., and in model 3 for maternal health and health-related behaviors (smoking during pregnancy, pre-pregnancy BMI, diet quality during pregnancy, motives for feeding method).

Figure 1. Flow chart

