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Blandine de Lauzon-Guillain, Camille Davaisse-Paturet, Sandrine Lioret, Eléa Ksiazek, Corinne Bois, Marie-Noëlle Dufourg, Marie Bournez, Sophie Nicklaus, Sandra Wagner, Marie A. Charles

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1 **Use of infant formula in the ELFE study: the association with social and health-related**  
2 **factors**

3 **Authors :**

4 Blandine de Lauzon-Guillain<sup>1,2</sup>\*, Camille Davaisse-Paturet<sup>1,2</sup>\*, Sandrine Lioret<sup>1,2</sup>, Eléa Ksiazek<sup>3</sup>,  
5 Corinne Bois<sup>4,5</sup>, Marie-Noëlle Dufourg<sup>4</sup>, Marie Bournez<sup>3</sup>, Sophie Nicklaus<sup>3</sup>, Sandra Wagner<sup>1</sup>,  
6 Marie Aline Charles<sup>1,2,4</sup>

7 \* B de Lauzon-Guillain and C Davaisse-Paturet contributed equally to this work

8 **Author affiliations**

9 <sup>1</sup> INSERM, UMR1153 Epidemiology and Biostatistics Sorbonne Paris Cité Center (CRESS),  
10 Early Origin of Child Health and Development Team (ORCHAD), Paris, F-75014 France;

11 <sup>2</sup> Paris Descartes University, France;

12 <sup>3</sup> Centre des Sciences du Goût et de l'Alimentation, CNRS, INRA, Univ. Bourgogne Franche-  
13 Comté, F-21000 Dijon, France;

14 <sup>4</sup> Unité mixte Inserm-Ined-EFS Elfe, Ined, Paris, France;

15 <sup>5</sup> Service départemental de PMI, Conseil départemental des Hauts-de-Seine, Nanterre, France

16 **Author's last names**

17 de Lauzon-Guillain, Davaisse-Paturet, Lioret, Ksiazek, Bois, Dufourg, Bournez, Nicklaus,  
18 Wagner, Charles

19 **Corresponding author**

20 Blandine de Lauzon-Guillain, INSERM CRESS Eq ORCHAD, 15-16 av. Paul Vaillant  
21 Couturier, 94807 Villejuif Cedex, FRANCE; blandine.delauzon@inserm.fr; Tel: +33145595019;  
22 Fax: +33147269454.

23

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## 28 **Short running title**

29 Infant formula use and associated factors

## 30 **Abbreviations**

31 CMPA: allergy to cow's milk proteins

32 ELFE: Etude Longitudinale Française depuis l'Enfance

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### 60 **Contributors' Statements:**

61 Dr. de Lauzon-Guillain and Mrs Davisse-Paturet conceptualized and designed the study,  
62 conducted part of the statistical analyses, drafted the initial manuscript, and approved the final  
63 manuscript as submitted.

64 Mrs Ksaziek, Drs Lioret, Bois, Dufour, Bournez and Nicklaus designed the data collection  
65 instruments, and supervised data collection and data management, critically reviewed the  
66 manuscript, and approved the final manuscript as submitted.

67 Drs. Wagner and Charles conceptualized and designed the study, contributed the interpretation  
68 of the study, reviewed and revised the manuscript, and approved the final manuscript as  
69 submitted.

70

71 **Abstract**

72 Breastfeeding is recommended until six months of age but a wide range of infant formula is  
73 available for non or partially breastfed infants. Our aim was to describe infant formula selection  
74 and to examine social and health-related factors related to this selection.

75 Analyses were based on 13,291 infants from the French national birth cohort ELFE. Infant diet  
76 was assessed at month 2 by phone interview and monthly from month 3 to month 10 via  
77 internet/paper questionnaires. Infant formulas were categorized in 6 groups: extensively or  
78 partially hydrolyzed, regular with or without pre/probiotics, thickened with or without  
79 pre/probiotics. Associations between type of infant formula used at 2 months and family or  
80 infant characteristics were assessed by multinomial logistic regressions.

81 At month 2, 58.1% of formula-fed infants were fed with formula enriched in pre/probiotics,  
82 31.5% with thickened formula and 1.4% with extensively hydrolyzed formula. The proportion of  
83 formula-fed infants increased regularly but the type of infant formula used was fairly stable  
84 between 2 and 10 months. At month 2, extensively hydrolyzed formulas were more likely to be  
85 used in infants with diarrhea or regurgitation problems. Partially hydrolyzed formulas were more  
86 often used in families with high incomes, with a history of allergy or with infants with  
87 regurgitation issues. Thickened formulas were used more with boys, preterm children, children  
88 with regurgitation issues or in cases of early maternal return to work.

89 The main factors related to the selection of infant formula were family and infant health-related  
90 ones.

91 **Keywords**

92 infancy, formula milk, birth cohort, socio-demographic factors, health-related factors

93 **Introduction**

94 Currently, the international pediatric societies recommend exclusive breastfeeding until 6  
95 months of age (Agostoni et al., 2009; Kramer & Kakuma, 2001; Section on Breastfeeding,

96 2012). Most professional and national organizations recommend the introduction of  
97 complementary foods at around 6 months of age (Fewtrell et al., 2017). Results from various  
98 studies on infant feeding practices have shown high levels of non-compliance with these  
99 recommendations (Fein, Labiner-Wolfe, Scanlon, & Grummer-Strawn, 2008; Salanave, de  
100 Launay, Boudet-Berquier, & Castetbon, 2014; Schiess et al., 2010; Scott, Binns, Graham, &  
101 Oddy, 2009). For instance, in 2010-2011, the breastfeeding initiation rate was 79% in the U.S  
102 (Rossen, Simon, & Herrick, 2015), 70% in France (Kersuzan et al., 2014) and 81% in the U.K  
103 (McAndrew et al., 2012). Then, breastfeeding rates rapidly declined with age, as 51% of infants  
104 in France and 55% in the U.K. were still breastfed at 6 weeks (McAndrew et al., 2012; Rossen et  
105 al., 2015; Wagner et al., 2015). At 6 months, breastfeeding rates were 49% in the U.S., 19% in  
106 France and 34% in the U.K. At 1 year, 27% of infants were breastfed in the US, but only 5% in  
107 France. The majority of mothers are therefore using some quantity of formula in the first year  
108 postpartum.

109 In literature, formula-fed infants are considered as a homogeneous group compared to breastfed  
110 infants (McAndrew et al., 2012). However, a large variety of infant formulas are available and  
111 their nutritional composition could impact child's health and development, as highlighted for  
112 protein content in the CHOP trial (B. Koletzko et al., 2009). Formulas with extensively  
113 hydrolyzed cow milk proteins have proven efficacy in the treatment of cow's milk protein allergy  
114 (CMPA) in non-breastfed infants (S. Koletzko et al., 2012) and are accessible only under  
115 medical prescription. Recent evidence suggests that the use of this kind of formula could impact  
116 early growth (Mennella, Ventura, & Beauchamp, 2011) and cognitive development (Mennella,  
117 Trabulsi, & Papas, 2016). The other formula types are available without prescription in  
118 drugstores or regular retail shops. The main characteristics claimed by industry are: partially  
119 hydrolyzed protein to prevent the risk of cow's milk protein allergy (CMPA) in infants at high-  
120 risk (Muraro et al., 2014; Tey et al., 2014); enrichment with starch or carob to thicken the

121 formula and to limit regurgitation (Chao & Vandenplas, 2007; Horvath, Dziechciarz, &  
122 Szajewska, 2008); enrichment with long chain polyunsaturated fatty acids, useful for brain and  
123 retinal maturation (B. Koletzko et al., 2008); enrichment with probiotics, to influence  
124 microorganisms in infant's intestinal flora (Brunser et al., 2006; Chrzanowska-Liszewska,  
125 Seliga-Siwecka, & Kornacka, 2012), or with prebiotics, non-digestible saccharide substrates for  
126 the growth of specific intestinal microorganisms (Vandenplas, Zakharova, & Dmitrieva, 2015).  
127 The long-term effects of these nutritional characteristics on infant's health and development are,  
128 however, not well established (Cuello-Garcia et al., 2015; Mugambi, Musekiwa, Lombard,  
129 Young, & Blaauw, 2012; Osborn & Sinn, 2006).

130 As suggested in the review of Victora et al. on breastfeeding, discrepancies across studies about  
131 benefits of breastfeeding on health outcomes such as obesity could be partially explained by the  
132 diet of infants who are not breastfed. Formula milk consumed by the infant is part of this diet  
133 (Victora et al., 2016). Despite the wide variety in nutritional composition of infant or follow-up  
134 formulas, to our knowledge, the different types of formula used have only been described using  
135 the NHANES dataset, which is representative of infants residing in the U.S. (Rossen et al.,  
136 2015). Then, it appears important to better understand the factors associated with the selection of  
137 formula type, especially among datasets representative of other populations and countries where  
138 breastfeeding rates are below recommended levels. Therefore, the aim of the present study was  
139 to describe the type of formula used during the first year of life, using data from the first large  
140 nationally representative French birth cohort, and to examine whether the selection of different  
141 types of infant formulas varied according to family characteristics, physician or the parental  
142 report of infant's health-related factors.

143 **Subjects and methods**

144 *Population study*

145 The present analysis was based on data from the ELFE (Etude Longitudinale Française depuis  
146 l'Enfance) study, a multidisciplinary, nationally representative, birth cohort, which included  
147 18,258 children born in a random sample of 349 maternity units in France in 2011 (Vandentorren  
148 et al., 2009). From April 2011, inclusion took place during 25 selected recruitment days over  
149 four waves comprising four to eight days each, and covering all four seasons. Inclusion criteria  
150 were as follows: children born after 33 weeks of gestation, to mothers aged 18 years or older and  
151 who were not planning to move outside of Metropolitan France in the following 3 years. Foreign  
152 families could also participate in the study, if mothers were able to read French, Arabic, Turkish  
153 or English. Among the 349 selected maternity units, 320 agreed to participate. Participating  
154 mothers had to sign consent for themselves and their child. Fathers signed the consent for the  
155 child participation when present on inclusion days or were informed about their rights to oppose.  
156 Fifty-one percent of contacted parents agreed to the child participation. Data was collected in  
157 standardized interviews conducted by trained interviewers and by self-completed questionnaires.  
158 Mothers were interviewed at the maternity ward for medical information about their pregnancy  
159 and their newborn, their general characteristics and their eating habits. Information was  
160 completed with records from obstetric and pediatric medical files. Two months post-partum,  
161 telephone interviews with mothers and fathers took place and included different types of  
162 questions, in particular: 1. Demographic and socioeconomic variables such as country of birth,  
163 educational level, employment, monthly income and number of family members 2. Health  
164 variables of both children and parents: parental asthma and eczema, mother's psychological  
165 difficulties and children's birth weight and height 3. Feeding practices during the first two  
166 months. A similar telephone interview was conducted one year after birth. Otherwise, from 3 to

167 10 months after delivery, families were asked to complete a monthly questionnaire on the  
168 infant's diet via the internet or by paper (feeding methods, food and beverage introduction).  
169 . All data was anonymized for reporting. The ELFE study received approvals from the Advisory  
170 Committee for the Treatment of Information on Health Research (Comité Consultatif sur le  
171 Traitement des Informations pour la Recherche en Santé), the National Agency Regulating Data  
172 Protection (Commission National Informatique et Libertés) and the National Statistics Council.

### 173 ***Infant feeding***

174 During each follow-up step, the infant feeding method was collected: breast milk only, infant  
175 formula only, both breast milk and formula milk (including plant-based infant formula), animal  
176 milk (including cow) or plant-based beverages. If the mother had stopped breastfeeding, the  
177 exact age of the child when breastfeeding ended was asked, along with the age of introduction of  
178 formula milk. Parents were asked monthly to report the brand and name (if any) of the milk they  
179 mostly used for their child during the month. As parents reported their child feeding method each  
180 month from 2 to 10 months, longitudinal consistency was used to correct obvious reporting  
181 errors (e.g. an infant exclusively formula-fed from birth to 5 months as well as then after 7  
182 months but fully breastfed at 6 months was considered formula-fed at 6 months). Duration of  
183 breastfeeding (any and predominant) was calculated. An infant was defined as predominantly  
184 breastfed if the only milk received was breast milk. If information to calculate the duration was  
185 only partially available for one infant, we attributed the median duration of breastfeeding of  
186 infants with the same dietary profile (e.g. still breastfed at month X but receiving only formula  
187 milk at month Y). If no information was available about breastfeeding, no imputation was  
188 performed.

189 From the brand and name of formula reported each month by parents, we listed all infant  
190 formulas used within the ELFE cohort. A senior researcher supervised a dietician who classified  
191 all these infant formulas based upon their nutritional characteristics (ingredient list, nutritional

192 composition). Formulas were first classified according to 5 criteria, corresponding to the main  
193 claims: protein characteristics, thickening properties, use of pre/pro-biotics, enrichment in long  
194 chain fatty acids, lactose content. As most formula designed for 0-6 month-old infants were  
195 enriched in long chain fatty acids, this criterion was not examined further in the present analysis.  
196 Moreover, as almost all lactose-free formulas also contained extensively hydrolysed proteins,  
197 lactose-free formulas were not examined as a specific group. To ensure that each formula was  
198 assigned to a single category, we further defined the following classification: 1. extensively  
199 hydrolyzed protein or soya/rice proteins, labeled “Extensively hydrolyzed formula”, 2/ partially  
200 hydrolyzed proteins, labeled “Partially hydrolyzed formula”, 3. regular cow milk proteins, with  
201 starch or carob and pre/pro-biotics, labeled “Thickened with pre/pro-biotic formula”, 4. regular  
202 cow milk proteins, with starch or carob but no pre/pro-biotic, labeled “Thickened formula”, 5.  
203 regular cow milk proteins, with pre/pro-biotics but no starch or carob, labeled “Pre/pro-biotic  
204 formula”, 6. regular cow milk proteins, without pre/pro-biotic, starch and carob, labeled  
205 “Regular formula”.

### 206 *Infant and parental characteristics*

207 As family data was more comprehensively collected during the 2-month interview than during  
208 the maternity interview and as family socio-demographic characteristics only marginally evolved  
209 within two months, we considered data collected two months post-partum in our analyses. Socio-  
210 demographic characteristics collected during the maternity stay were used only in case of  
211 missing values at 2 months.

212 Parental socio-demographic characteristics studied were: maternal country of birth (France vs.  
213 another country), maternal age at delivery (<25 y, 25-29 y, 30-34 y, ≥35 y), birth rank (first born,  
214 second, third, fourth or more), maternal marital status (married/civil union, cohabiting, single),  
215 maternal education attainment (Below high school, High school, 2 years after high school, 3  
216 years after high school, At least 5 years after high school), parental age difference (younger

217 father, father 0-1 y older, father 2-3 y older, father 4-7 y older, father at least 8 y older), maternal  
218 return to work at 2 months (yes/no/not applicable, if mother did not work before maternity  
219 leave), maternal region of residence and family monthly income ( $\leq$ €1500, €1501-2300 €2301-  
220 3000, €3001-4000, €4001-5000 , > €5000).

221 Parental health-related factors included reported maternal height and weight prior to pregnancy,  
222 maternal smoking status during pregnancy (never smoked, smoker only before pregnancy,  
223 smoker during pregnancy), attendance to birth preparation courses (None, 1-6 sessions, 6  
224 sessions or more), parental and sibling atopy (at least one 1<sup>st</sup> degree relative with a history of  
225 allergies, or no history of allergies).

226 Newborn characteristics were collected from the medical records: sex, twin birth, birth weight  
227 and gestational age. Infant health-related factors were collected during the 2-month interview:  
228 medical diagnosis of cow milk allergy (yes/no), parental concern about infant weight (yes/no),  
229 diarrhea (yes/no), constipation (yes/no) and regurgitation (yes/no), type of physician first  
230 consulted between birth and two months (paediatrician, other child doctor, general practitioner,  
231 other including emergency).

### 232 *Sample selection*

233 Infants whose parents withdrew consent within the first year (n=52) or for whom it was not  
234 possible to verify the eligibility criteria due to missing data (n=351) were excluded from the  
235 study, resulting in 17,855 eligible infants. We randomly selected one twin in twin pregnancies  
236 (n=277 exclusions) to avoid family clusters. We excluded infants who did not reply at the 2-  
237 month follow-up (n=2223), as well as those without any data on infant feeding from 2 to 10  
238 months (n=64).

239 For descriptive statistics of the type of infant formula used, we restricted analyses to infants  
240 receiving formula, with sufficient details about the formula name to classify the formula  
241 (n=10,293 at 2 months, 7,318 at 3 months, 8,325 at 4 months, 8,787 at 5 months, 8,546 at 6

242 months, 8,186 at 7 months, 8,009 at 8 months, 7,898 at 9 months and 7,672 at 10 months).

243 Finally, for the multivariate analyses on factors related to the use of infant formula at 2 months,  
244 we excluded infants with CMPA medical diagnosis reported at 2 months, given that their choice  
245 of formula is very limited (n=188), as well as infants with missing values on socio-demographic  
246 or parental report of health-related factors (n=1240). Multivariate analyses were then conducted  
247 in 8865 infants. The detailed flow chart for analyses conducted at 2 months is presented in

248 **Supplemental Figure 1.**

#### 249 *Statistical analyses*

250 In order to provide representative descriptive statistics of births in 2011 in France, the  
251 descriptive data (rates) were weighted to take into account the inclusion procedure and biases  
252 related to non-consent. Weighting also included calibration on margins from the state register's  
253 statistical data and the 2010 French National Perinatal study (Blondel, Lelong, Kermarrec,  
254 Goffinet, & National Coordination Group of the National Perinatal, 2012) on the following  
255 variables: age, region, marital status, migration status, level of education and primiparity. This  
256 weighting was calculated for the sample follow-up at 2 months, as well as for the subsample that  
257 completed the questionnaire on infant diet, at least once from 3 to 10 months.

258 Associations between socio-demographic, socio-economic and parental report of health-related  
259 factors and the type of formula used were assessed at 2 months by multinomial multivariate  
260 logistic regression, including all variables of interest and additionally adjusted for the mother's  
261 region of residence, size of maternity unit and wave of recruitment. Regular formulas were used  
262 as the reference category. As exclusively breastfed infants were not included in these analyses,  
263 we used inverse probability weighting to limit selection bias.

264 All analyses were carried out using SAS V9.3 (SAS, Cary, NC).

265 **Results**

266 The characteristics of the sample at 2 months are described in **Table 1**. The following section  
267 will be dedicated to the presentation of results from the multinomial multivariate logistic  
268 regression.

269 ***Type of infant formula used***

270 The rate of infants fed with “Extensively hydrolyzed formula,” including formula based on rice  
271 and soya proteins, remained low over the studied period (around 2%) (**Figure 1**). The use of  
272 “Partially hydrolyzed formula” was also stable until 6 months but then decreased regularly, from  
273 6.5% to 3.6% at 10 months. At 2 months, 35% of infants received thickened formulas, mostly  
274 enriched in pre/probiotics, this rate being quite stable from 2 to 10 months. Pre- and probiotics  
275 were widely used as another quarter of the infants received non-thickened formula enriched in  
276 pre and/or probiotics over the same period.

277 Bivariate associations between social or health-related factors and the different types of infant  
278 formula are presented in **Supplemental Table 1**.

279 ***Factor associated with the use of partially hydrolyzed formula at two months***

280 As expected, a family history of allergy (**Table 2**) was related to higher odds of using “Partially  
281 hydrolyzed formula” as compared to regular formula (OR = 1.79 [1.45 – 2.20] for parental  
282 history of allergy and OR = 1.67 [1.21 – 2.32] for at least one sibling with allergy history). When  
283 mothers had returned to work at 2 months or when return to work was not applicable, mothers  
284 were less likely to use “Partially hydrolyzed formula” than regular formula (OR = 0.65 [0.43 –  
285 0.98], OR = 0.67 [0.48 – 0.95], respectively). Family income above €5,000€ per month, parental  
286 report of concern about regurgitation and consultation of a pediatrician were associated with  
287 higher use of “Partially hydrolyzed formulas” compared to regular formula (OR = 1.73 [1.15 –  
288 2.61], OR = 2.35 [1.71 – 3.24], OR = 1.31 [1.03 – 1.67], respectively).

289 ***Factors associated with the use of extensively hydrolyzed formula at two months***

290 A family history of allergy was also related to higher odds of using “extensively or partially  
291 hydrolyzed formula” rather than regular formula (**Table 2**). Having siblings, especially those  
292 with a history of allergies, was strongly associated with higher use of “extensively hydrolyzed  
293 formula” (OR = 2.83 [1.47 – 5.46], OR = 3.73 [1.59 – 8.73], respectively). Parental concern  
294 related to infant digestive problems, such as regurgitation and diarrhea, were associated with a  
295 more frequent use of “Extensively hydrolysed formula” compared to regular formula (OR = 2.45  
296 [1.23 – 4.88], OR = 3.38 [1.52 – 7.53], respectively). An infant was more likely to receive  
297 extensively hydrolyzed formula at 2 months when the first physician consulted was not a general  
298 practitioner..

299 ***Factors associated with the use of thickened formula at two months***

300 Female sex and family income below €1,500 per month were both associated with a lower  
301 likelihood of use of thickened formula (non-enriched in pre/probiotics) compared with regular  
302 formula (OR = 0.71 [0.57 – 0.88], OR = 0.62 [0.39 – 0.99], respectively). Preterm birth and early  
303 maternal return to work were associated with a more frequent use of thickened formula (non-  
304 enriched in pre/probiotics) (OR = 2.68 [1.60 – 4.49], OR = 1.49 [1.03 – 2.17], respectively).  
305 Parental concern related to child’s regurgitation and having at least one sibling with allergy was  
306 related to more frequent use of thickened formula, enriched in pre/probiotics or not. Infants of  
307 mothers with the lowest education attainment were more likely to receive thickened formula,  
308 enriched in pre/probiotics or not, than regular formula. Longer predominant breastfeeding  
309 duration was related to lower likelihood of use of thickened formulas (OR [95%CI]: 0.45 [0.32-  
310 0.62] for non-enriched thickened formula; 0.31 [0.25-0.37] for thickened formula enriched in  
311 pre/probiotics]. Thickened formula enriched in pre/probiotics were more frequently used when  
312 the first doctor consulted was a pediatrician (OR = 1.32 [1.14 – 1.54]).

313 ***Factors associated with the use of formula enriched in pre/probiotics***

314 Longer predominant breastfeeding duration and family income below €1,500 per month, were  
315 both negatively associated with the use of formula enriched in pre/probiotics (OR = 0.66 [0.57 –  
316 0.77] for long predominant breastfeeding and OR = 0.77 [0.60 – 0.98] for low family income).  
317 Other variables were not related to the use of formula enriched in pre/probiotics

318 **Discussion**

319 ***Main findings***

320 This is the first study to describe formula use in France, based on a representative sample. At the  
321 age of two months, more than 50 % of the French formula-fed infants are now receiving formula  
322 enriched in pre or probiotics but there are very few factors that inform the criteria for the choice  
323 of this type of formula. Concerning extensively and partially hydrolysed formula, a family  
324 history of allergies and parental concern related to digestive symptoms are the main factors  
325 related to their use. Apart from infant regurgitation, thickened formula appeared to be used for  
326 comfort purposes. The use of different types of infant formula was stable overall between 2 and  
327 10 months, except in the case of partially hydrolyzed formulas, for which a reduction of use after  
328 the age of 6 months was highlighted. The selection of the different types of infant formula was  
329 mostly related to an infant's health-related factors and a family history of allergies.

330 ***Thickened formula***

331 Nearly 12% of parents reported concerns about their infant's regurgitation. A strong link  
332 between parental concern about infant regurgitation and the selection of thickened formulas was  
333 found, consistent with recommended usage. In fact, infant regurgitation is a current and transient  
334 phenomenon and thickened formula is the first treatment used in such cases (Vandenplas et al.,  
335 2009). A meta-analysis of randomized controlled trials concluded that thickeners have a positive  
336 impact on episodes of regurgitation and vomiting even without significant impact on reflux  
337 index (Horvath et al., 2008).

338 ***Extensively hydrolyzed formula***

339 After medical diagnosis of an allergy to cow milk proteins, when the mother is not exclusively  
340 breastfeeding, guidelines recommend the use of substitute formulas, with extensively hydrolyzed  
341 proteins or amino-acids (S. Koletzko et al., 2012; Vandenplas et al., 2007; Venter & Arshad,  
342 2012). Clinical trials have demonstrated the safety and efficacy of extensively hydrolyzed cow  
343 protein-based formulas (Niggemann et al., 2008; Rzehak et al., 2011; Terheggen-Lagro, Khouw,  
344 Schaafsma, & Wauters, 2002) or formulas with amino acid mixture (Kanny et al., 2002).  
345 Extensively hydrolyzed rice protein-based formula could also be proposed for infants with a  
346 diagnosed allergy to cow milk protein (Girardet et al., 2013; Reche et al., 2010; Vandenplas, De  
347 Greef, Hauser, Paradise Study, & Paradise Study, 2014). Before the exclusion of infants with  
348 cow's milk protein allergy, diagnosed at 2 months, an allergy to cow's milk protein was the main  
349 factor related to the use of extensively hydrolyzed protein formula (data not shown). The strong  
350 association between access to a pediatrician or emergency doctors and the use of "extensively  
351 hydrolyzed formulas" might be explained by high suspicion of CMPA, which was not formally  
352 diagnosed. Finally, because frequent regurgitations or digestive problems are considered a  
353 symptom of CMPA (Vandenplas et al., 2007), extensively hydrolyzed formulas could be  
354 prescribed when thickened formulae are not sufficient (Vandenplas, De Greef, & group, 2014).

355 ***Partially hydrolyzed formula***

356 The proportion of infant consuming partially hydrolyzed formula appeared to be quite similar in  
357 our study to that reported in the NHANES study (Rossen et al., 2015). However, contrary to  
358 results from the NHANES (Rossen et al., 2015), we did not find a positive gradient of use with  
359 maternal education attainment, but we found higher use among high income families. For the  
360 primary prevention of allergies, the use of partially hydrolyzed formula did not appear to be  
361 more efficient than exclusive breastfeeding, but could be useful in at-risk infants when infant  
362 formula has to be introduced (Osborn & Sinn, 2006). Of note, the European Agency of Allergy

363 on Clinical Immunology recommends to use such formula with documented effect among non-  
364 breastfed infant at high-risk (Muraro et al., 2014), which may explain the positive association  
365 between family history of allergies and use of partially hydrolyzed formulas observed here. If  
366 partially hydrolysed infant formulas are efficient for primary prevention of allergies in non-  
367 breastfed at-risk infants, the positive gradient between their use and the familial socioeconomic  
368 position could contribute to social inequalities in health. The consequences on child's health of  
369 the use of these formulas for infants without familial history of allergy still remain to be further  
370 documented.

### 371 *Pre and probiotics*

372 Many infant formulas are now enriched with probiotics or prebiotics. In the ELFE study, more  
373 than half of formula-fed infants received formula enriched in pre or probiotics. If systematic  
374 reviews were not conclusive on the benefits of pre or probiotics on infant health (Anabrees,  
375 Indrio, Paes, & AlFaleh, 2013; Mugambi et al., 2012; Osborn & Sinn, 2007, 2013), recent  
376 clinical trials have shown a positive influence of several probiotics on colic, constipation or  
377 regurgitation (Indrio et al., 2014; Savino et al., 2015). In our results, no clear association was  
378 found between an infant's health-related factors and the selection of formulas enriched in pre or  
379 probiotics. The large use of infant formula enriched in pre or probiotics, despite a recent  
380 introduction on the market and inconclusive results on health benefits highlighted the need of  
381 more guidelines on their use, for both parents and physicians.

### 382 *Strengths and limitations*

383 The ELFE study provides us with a unique opportunity to report data from a broad representative  
384 sample of births in metropolitan France, ensuring a good statistical power. Data collection from  
385 2 to 10 months was prospective to limit the memory bias regarding infant diet. Thanks to the  
386 collection of the full name of the infant formula, a dietician was able to detail their composition  
387 and ingredient list, in order to base the classification on objective criteria. The change in data

388 collection between 2 months (phone interview) and 3 to 10 months (paper or internet  
389 questionnaire) induced a decrease in sample size as well as an increase in missing data.  
390 However, weights were calculated to correct for non-consent and loss of follow-up information  
391 and to produce accurate national statistics.

### 392 **Conclusion**

393 The pattern of infant formula selection in French infants remained stable from 2 to 10 months.  
394 At 2 months, the selection of a type of infant formula appeared to be related to parental report of  
395 infant and family health-related factors rather than to socio-demographic determinants. Even if  
396 the literature on the health benefits of formula enriched in pre or probiotic is not conclusive, a  
397 large part of the population used these types of formula. The current findings on factors  
398 statistically related to formula selection are of great value for future analyses on the influence of  
399 the type of milk consumed in early years on a child's health and growth.

400

## 401 **Key messages**

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- 402       • A wide variety of infant formula is available on the market but factors associated with  
403       parents' selection are not well identified.
- 404       • The distribution into different types of infant formula used remained very stable whatever  
405       the infant age between 2 and 10 months.
- 406       • The use of a specific infant formula was related to infant and familial health-related  
407       factors and, to a lesser extent, to socio-demographic factors.

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**Table 1. Sample characteristics at 2 months (n=10,293)**

	Weighted <sup>1</sup> % (n)
Boys	51.5% (5283)
Twin birth	2.1% (218)
Preterm birth	5.6% (579)
Maternal age	
< 25 y	34.9% (2800)
25-29 y	38.7% (4240)
30-34 y	20% (2351)
35 y or more	6.4% (755)
Mother born in France	84.1% (9302)
Maternal education attainment	
Below high school	38.1% (2678)
High school	19.4% (2080)
2 years after high school	18.8% (2336)
3 years after high school	11.8% (1483)
At least 5 years after high school	11.9% (1716)
Maternal return to work at 2m	6.9% (794)
Single motherhood	9.2% (554)
Maternal BMI	
< 18.5 kg/m <sup>2</sup>	7.9% (806)
18.5-24.9 kg/m <sup>2</sup>	59.8% (6359)
25.0-29.9 kg/m <sup>2</sup>	19.4% (1854)
30.0 kg/m <sup>2</sup> or more	12.8% (1134)
Maternal smoking during pregnancy	25.7% (2343)
Parental age difference	
Younger father	0
Father 0-1 year older	23.9% (2630)
Father 2-3 year older	21.2% (2268)
Father 4-7 year older	22.9% (2204)
Father at least 8 y older	13.7% (1085)
Paternal presence at delivery	76.8% (8303)
Family income	
€ 1500 euros or less	16.7% (1084)
€ 1501-2300	19.3% (1615)
€ 2301-3000	29.1% (2943)
€ 3001-4000	21.3% (2499)
€ 4001-5000	7.8% (990)
€ 5000 or more	5.8% (784)
Parental atopy	33.2% (3495)
Sibling atopy	
No sibling	43.4% (4817)
At least one sibling with allergy history	14.1% (1360)
Sibling(s) without allergy history	42.5% (4116)

Cow milk allergy reported at 2 mo	1.8% (188)
Parental concern at 2 mo related to:	
Weight problems	6.8% (716)
Colic	20.6% (2227)
Diarrhea	4.7% (465)
Constipation	16.5% (1667)
Regurgitation	12.2% (1304)
First physician consulted after hospital discharge	
Pediatrician	32.1% (3621)
Other child doctor	17.5% (1426)
General practitioner	44.5% (4630)
Other (including emergency)	5.9% (558)
Predominant breastfeeding duration	
Never	48.2% (4809)
<1 month	34.9% (3597)
≥ 1 month	16.9% (1887)

<sup>1</sup> weighting tool taking into account factors related to inclusion procedure, non-consent as well as attrition between birth and 2 months and included calibration on margins from national statistics data.

<sup>2</sup> from maternity unit or from child and maternal protection centers

**Table 2. Socio-demographic characteristics, infant health and type of infant formula used at 2 months, in reference to regular formula.****n=8865**

	Extensively hydrolyzed	Partially hydrolyzed	Thickened	Thickened + pre/probiotics	Enriched in pre/Probiotics	p-value
Sex (Girls vs Boys)	0.87 [0.52 - 1.48]	0.83 [0.67 - 1.02]	<b>0.71 [0.57 - 0.88]</b>	0.93 [0.82 - 1.05]	0.98 [0.87 - 1.11]	0.03
Twin birth	0.81 [0.11 - 6.03]	0.45 [0.16 - 1.25]	0.56 [0.21 - 1.48]	0.99 [0.60 - 1.64]	0.77 [0.47 - 1.28]	0.5
Gestational age						0.02
< 37 wk	1.48 [0.42 - 5.22]	1.27 [0.71 - 2.28]	<b>2.68 [1.60 - 4.49]</b>	1.40 [0.98 - 1.99]	1.12 [0.79 - 1.58]	
37-39 wk	0.70 [0.40 - 1.23]	1.16 [0.93 - 1.44]	1.09 [0.86 - 1.38]	1.11 [0.97 - 1.27]	1.01 [0.89 - 1.14]	
40 wk or more	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
Birth weight						0.8
< 2500 g	1.78 [0.48 - 6.68]	1.33 [0.75 - 2.36]	0.80 [0.43 - 1.46]	1.08 [0.75 - 1.54]	1.02 [0.72 - 1.45]	
2500-3999 g	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
4000 g or more	0.66 [0.22 - 2.03]	1.19 [0.81 - 1.74]	0.83 [0.53 - 1.30]	1.02 [0.8 - 1.31]	0.90 [0.71 - 1.13]	
Maternal age						0.7
< 25 y	0.54 [0.22 - 1.37]	1.13 [0.79 - 1.63]	1.24 [0.85 - 1.81]	1.08 [0.87 - 1.34]	1.10 [0.89 - 1.34]	
25-29 y	0.62 [0.34 - 1.15]	1.05 [0.81 - 1.36]	1.15 [0.85 - 1.56]	0.99 [0.84 - 1.16]	1.02 [0.88 - 1.19]	
30-34 y	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
35 y or more	0.41 [0.12 - 1.45]	1.29 [0.87 - 1.92]	1.30 [0.82 - 2.07]	0.87 [0.66 - 1.15]	1.01 [0.79 - 1.29]	
Mother born abroad	0.40 [0.13 - 1.25]	0.96 [0.65 - 1.43]	0.90 [0.60 - 1.35]	0.84 [0.66 - 1.06]	1.10 [0.90 - 1.36]	0.2
Maternal education attainment						0.04
Below high school	0.49 [0.14 - 1.72]	1.22 [0.79 - 1.86]	<b>2.09 [1.35 - 3.25]</b>	<b>1.44 [1.11 - 1.86]</b>	1.12 [0.89 - 1.41]	
High school	1.10 [0.44 - 2.74]	1.20 [0.82 - 1.74]	1.43 [0.93 - 2.17]	<b>1.37 [1.08 - 1.73]</b>	0.91 [0.74 - 1.13]	
2 years after high school	0.93 [0.43 - 2.05]	1.23 [0.89 - 1.70]	1.29 [0.88 - 1.90]	<b>1.34 [1.09 - 1.66]</b>	1.02 [0.85 - 1.24]	
3 years after high school	0.95 [0.43 - 2.13]	1.25 [0.90 - 1.74]	1.37 [0.92 - 2.05]	<b>1.39 [1.12 - 1.73]</b>	1.11 [0.91 - 1.35]	
At least 5 years after high school	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
Maternal return to work at 2m						0.06
No	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
Yes	0.79 [0.28 - 2.22]	<b>0.65 [0.43 - 0.98]</b>	<b>1.49 [1.03 - 2.17]</b>	0.94 [0.73 - 1.20]	0.99 [0.80 - 1.23]	

Not applicable	1.48 [0.68 - 3.21]	<b>0.67 [0.48 - 0.95]</b>	0.99 [0.72 - 1.35]	0.88 [0.73 - 1.06]	0.94 [0.79 - 1.11]	
Matrimonial status						0.3
Married/Civil union	1 [Ref]					
Cohabiting	0.87 [0.47 - 1.61]	0.84 [0.66 - 1.06]	0.96 [0.74 - 1.23]	1.02 [0.89 - 1.18]	1.10 [0.97 - 1.26]	
Single	1.91 [0.42 - 8.73]	0.52 [0.22 - 1.24]	1.41 [0.78 - 2.55]	1.11 [0.76 - 1.62]	1.22 [0.86 - 1.73]	
Maternal BMI						0.6
< 18.5 kg/m <sup>2</sup>	0.30 [0.06 - 1.42]	0.96 [0.65 - 1.42]	0.79 [0.51 - 1.22]	0.79 [0.62 - 1.01]	0.99 [0.79 - 1.23]	
18.5-24.9 kg/m <sup>2</sup>	1 [Ref]					
25-29.9 kg/m <sup>2</sup>	0.84 [0.40 - 1.74]	1.16 [0.88 - 1.53]	1.04 [0.78 - 1.39]	0.93 [0.78 - 1.11]	1.04 [0.89 - 1.22]	
30 kg/m <sup>2</sup> or more	0.61 [0.20 - 1.86]	0.76 [0.50 - 1.14]	0.89 [0.61 - 1.31]	0.90 [0.72 - 1.12]	1.02 [0.83 - 1.26]	
Maternal smoking						0.2
Never smoker	1 [Ref]					
Previous smoker	1.44 [0.79 - 2.62]	1.11 [0.87 - 1.42]	0.87 [0.66 - 1.16]	1.13 [0.96 - 1.32]	1.06 [0.92 - 1.22]	
Current smoker	1.29 [0.59 - 2.83]	1.32 [0.98 - 1.77]	1.15 [0.86 - 1.55]	<b>1.29 [1.08 - 1.54]</b>	1.06 [0.90 - 1.26]	
Attendance to birth preparation courses						0.4
None	1 [Ref]					
1-5 classes	1.35 [0.64 - 2.85]	1.11 [0.82 - 1.51]	0.89 [0.64 - 1.23]	1.06 [0.88 - 1.27]	0.88 [0.74 - 1.05]	
6 classes or more	1.69 [0.82 - 3.46]	1.28 [0.96 - 1.72]	1.08 [0.79 - 1.47]	1.03 [0.86 - 1.24]	0.95 [0.80 - 1.12]	
Parental age difference						0.7
Younger father	1.17 [0.53 - 2.60]	0.96 [0.70 - 1.31]	1.22 [0.87 - 1.70]	1.04 [0.86 - 1.26]	1.16 [0.97 - 1.39]	
Father 0-1 year older	1 [Ref]					
Father 2-3 year older	1.20 [0.57 - 2.51]	1.03 [0.77 - 1.36]	1.02 [0.74 - 1.41]	0.89 [0.74 - 1.07]	1.01 [0.86 - 1.20]	
Father 4-7 year older	0.81 [0.35 - 1.88]	0.86 [0.63 - 1.16]	1.15 [0.84 - 1.59]	0.92 [0.77 - 1.11]	1.04 [0.87 - 1.23]	
Father at least 8 y older	<b>2.35 [1.00 - 5.54]</b>	0.88 [0.59 - 1.32]	1.05 [0.70 - 1.58]	0.89 [0.70 - 1.14]	1.05 [0.85 - 1.31]	
Paternal absence at delivery	0.82 [0.37 - 1.85]	1.12 [0.83 - 1.52]	1.12 [0.83 - 1.51]	1.06 [0.88 - 1.27]	1.08 [0.91 - 1.28]	0.9
Family income						0.02
€ 1500 euros or less	0.64 [0.14 - 2.97]	0.65 [0.39 - 1.07]	<b>0.62 [0.39 - 0.99]</b>	0.82 [0.63 - 1.07]	<b>0.77 [0.60 - 0.98]</b>	
€ 1501-2300	1.51 [0.58 - 3.91]	0.77 [0.53 - 1.11]	0.89 [0.63 - 1.26]	0.89 [0.72 - 1.09]	1.00 [0.82 - 1.21]	
€ 2301-3000	1 [Ref]					
€ 3001-4000	<b>2.31 [1.10 - 4.85]</b>	1.04 [0.78 - 1.37]	1.01 [0.74 - 1.36]	0.98 [0.83 - 1.17]	0.91 [0.78 - 1.08]	

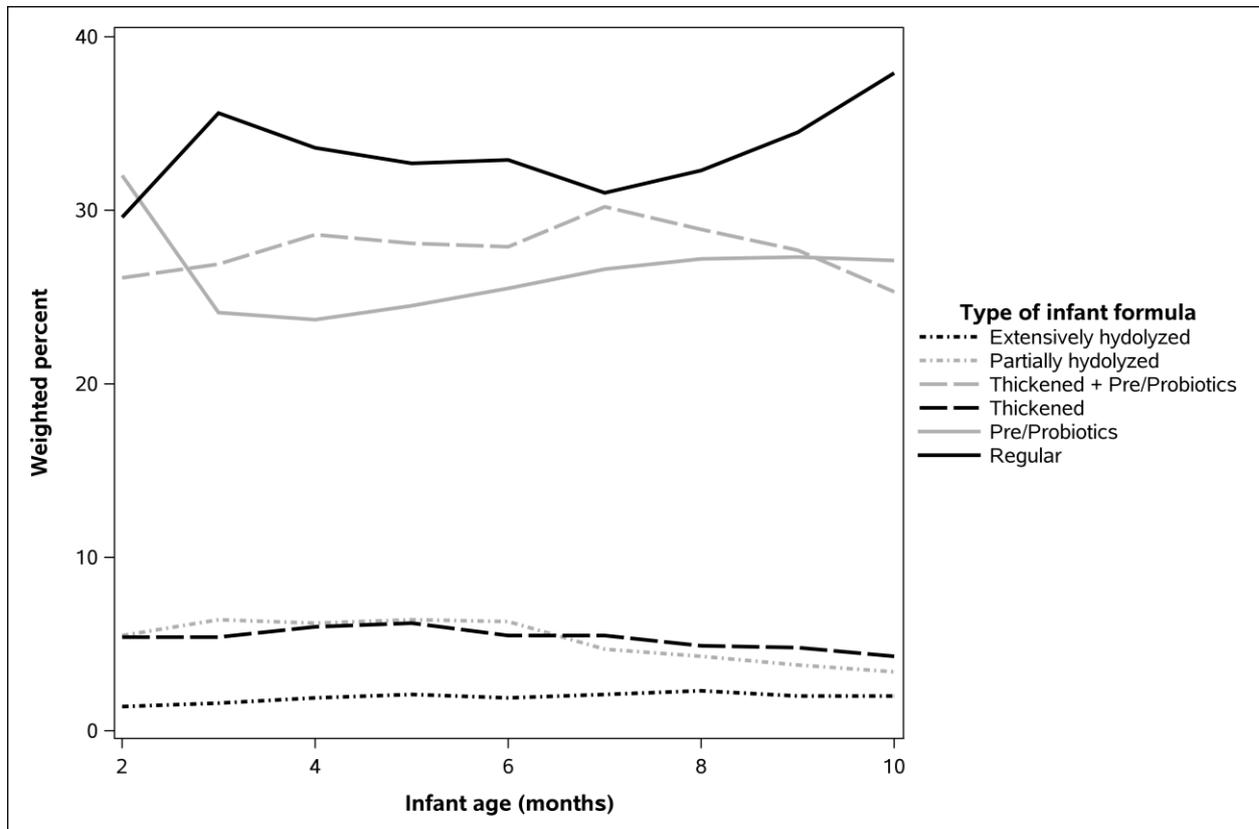
€ 4001-5000	0.83 [0.26 - 2.62]	1.36 [0.95 - 1.97]	1.18 [0.77 - 1.80]	0.94 [0.73 - 1.20]	1.10 [0.88 - 1.37]	
€ 5000 or more	1.46 [0.46 - 4.59]	<b>1.73 [1.15 - 2.61]</b>	1.39 [0.85 - 2.27]	1.19 [0.90 - 1.58]	<b>1.33 [1.03 - 1.71]</b>	
Parental atopy	1.10 [0.64 - 1.92]	<b>1.79 [1.45 - 2.20]</b>	1.02 [0.81 - 1.29]	1.04 [0.91 - 1.19]	1.10 [0.97 - 1.25]	<0.0001
Sibling atopy						0.0001
No sibling	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
At least one sibling with allergy history	<b>3.73 [1.59 - 8.73]</b>	<b>1.67 [1.21 - 2.32]</b>	<b>1.71 [1.19 - 2.45]</b>	<b>1.40 [1.12 - 1.75]</b>	1.14 [0.92 - 1.40]	
Sibling(s) without allergy history	<b>2.83 [1.47 - 5.46]</b>	0.91 [0.70 - 1.18]	1.23 [0.93 - 1.63]	1.16 [0.99 - 1.36]	1.02 [0.88 - 1.19]	
Parental concern at 2 mo related to:						
Weight problems	0.97 [0.41 - 2.28]	0.78 [0.51 - 1.19]	1.09 [0.72 - 1.65]	0.84 [0.65 - 1.10]	1.04 [0.81 - 1.34]	0.5
Colic	1.62 [0.83 - 3.16]	1.30 [0.98 - 1.71]	0.94 [0.70 - 1.28]	<b>1.23 [1.03 - 1.47]</b>	0.93 [0.78 - 1.11]	0.01
Diarrhea	<b>3.38 [1.52 - 7.53]</b>	0.99 [0.60 - 1.65]	0.95 [0.55 - 1.61]	1.01 [0.73 - 1.38]	0.90 [0.65 - 1.24]	0.06
Constipation	1.83 [0.90 - 3.75]	0.97 [0.71 - 1.34]	1.10 [0.79 - 1.54]	1.14 [0.93 - 1.39]	1.08 [0.89 - 1.31]	0.5
Regurgitation	<b>2.45 [1.23 - 4.88]</b>	<b>2.35 [1.71 - 3.24]</b>	<b>2.85 [2.04 - 3.98]</b>	<b>2.70 [2.18 - 3.34]</b>	0.79 [0.62 - 1.01]	<0.0001
Type of physician						0.005
Pediatrician	<b>2.97 [1.47 - 6.00]</b>	<b>1.31 [1.03 - 1.67]</b>	0.93 [0.72 - 1.21]	<b>1.32 [1.14 - 1.54]</b>	1.11 [0.96 - 1.27]	
Other child doctor	<b>3.16 [1.33 - 7.53]</b>	1.10 [0.78 - 1.54]	0.80 [0.56 - 1.14]	1.11 [0.90 - 1.35]	0.98 [0.81 - 1.18]	
General practitioner	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
Other (including emergency)	<b>3.75 [1.35 - 10.41]</b>	1.48 [0.94 - 2.33]	0.80 [0.46 - 1.38]	<b>1.37 [1.02 - 1.83]</b>	1.14 [0.86 - 1.51]	
Predominant breastfeeding duration						<0.0001
Never	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	
<1 month	1.04 [0.58 - 1.86]	0.90 [0.71 - 1.15]	<b>0.72 [0.56 - 0.92]</b>	<b>0.69 [0.60 - 0.80]</b>	<b>0.74 [0.64 - 0.84]</b>	
1 month or more	0.48 [0.22 - 1.06]	0.83 [0.64 - 1.09]	<b>0.45 [0.32 - 0.62]</b>	<b>0.31 [0.25 - 0.37]</b>	<b>0.66 [0.57 - 0.77]</b>	

Multinomial adjusted OR [95% CI], with regular formula as the reference category, also adjusted for maternal region of residence, recruitment

wave and size of maternity unit. Inverse probability weighting was used to limit selection bias. Significant associations (p<0.05) were highlighted

in bold. <sup>1</sup> from maternity unit or from child and maternal protection centers

**Figure 1. Description of types of infant formulas used from 2 to 10 months among formula-fed infants.**

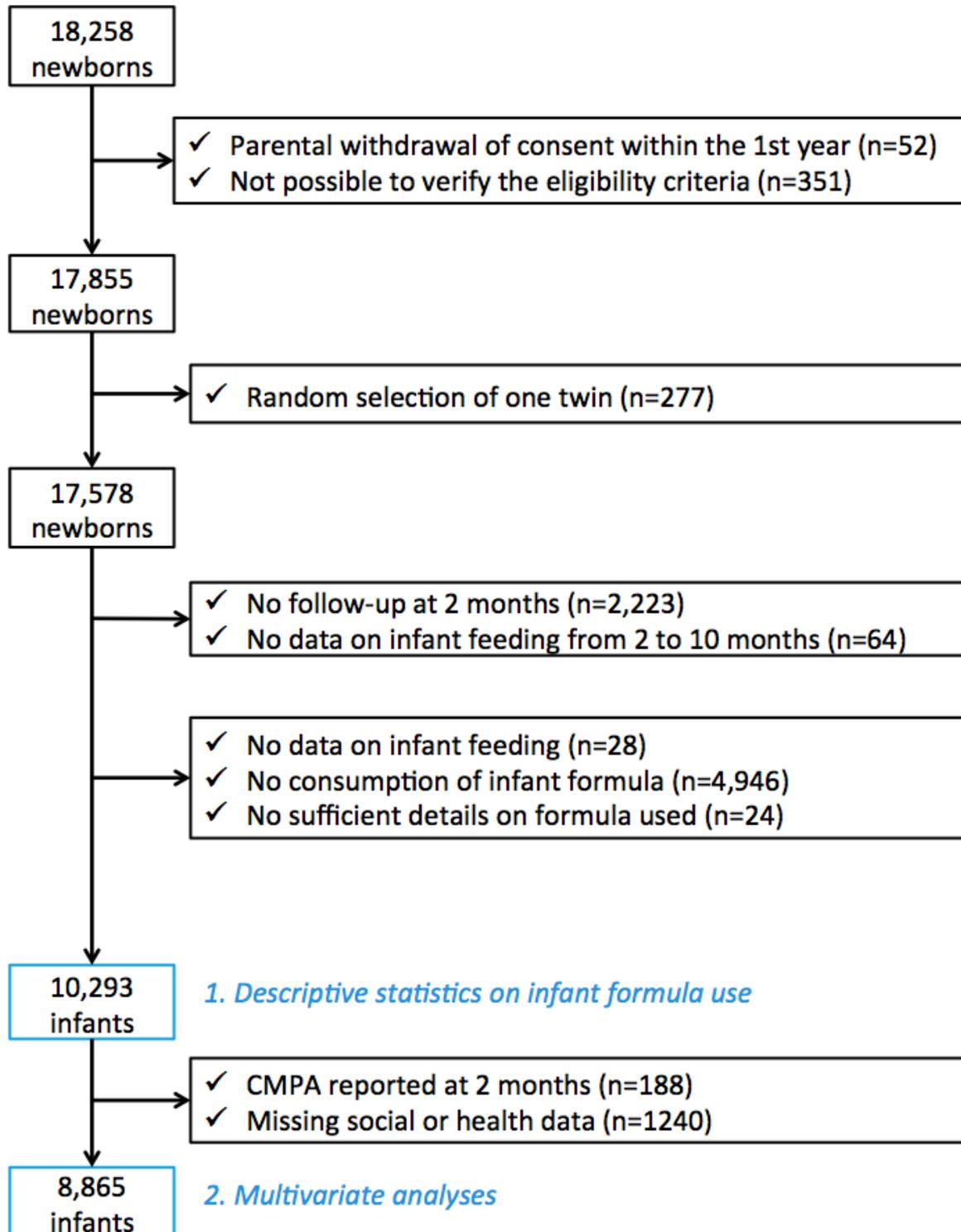


### **Legend**

The weighting calculated for the sample follow-up at 2 months was used for descriptive statistics at 2 months, whereas the weighting calculated for the subsample that completed the questionnaire on infant diet, at least once from 3 to 10 months, was used for descriptive statistics from 3 to 10 months.

## Online Supporting Material

Supplemental Figure 1. Flow chart



**Supplemental Table 1. Bivariate associations between socio-demographic characteristics, infant health and type of infant formula used at 2 months, n=8865**

	Extensively hydrolyzed	Partially hydrolyzed	Thickened	Thickened + pre/probiotics	Enriched in pre/Probiotics	Regular
<b>Sex</b>						
Boys	48.7% (38)	54.3% (304)	59.7% (287)	51.4% (1200)	51.2% (1416)	50.7% (1321)
Girls	51.3% (32)	45.7% (243)	40.3% (202)	48.6% (1098)	48.8% (1403)	49.3% (1321)
Twin birth	3.8% (2)	1% (7)	2.4% (9)	2.7% (64)	1.9% (52)	2.4% (55)
<b>Birth rank</b>						
First born	30.4% (24)	46.4% (273)	35.3% (199)	42.8% (1034)	44% (1341)	44.6% (1303)
Second	53.2% (33)	35.6% (193)	37.7% (184)	36.6% (862)	34.9% (979)	34.6% (910)
Third	8.5% (8)	13.1% (58)	17.6% (73)	14.2% (289)	14.1% (359)	14.7% (319)
Fourth or more	7.9% (5)	5% (23)	9.4% (33)	6.5% (113)	7.1% (140)	6% (110)
<b>Gestational age</b>						
< 37 wk	9% (6)	3.8% (27)	10.7% (45)	6.1% (144)	5.1% (141)	4.6% (118)
37-39 wk	40.4% (29)	54.8% (278)	48.8% (238)	51.9% (1182)	49.1% (1375)	51.5% (1278)
40 wk or more	50.6% (35)	41.4% (242)	40.5% (206)	42% (972)	45.8% (1303)	43.9% (1246)
<b>Birth weight</b>						
< 2500 g	8.2% (5)	6.4% (27)	6.6% (25)	5.6% (131)	4.8% (131)	4.9% (114)
2500-3999 g	88% (61)	86.4% (474)	86.5% (433)	87.4% (1999)	88.2% (2496)	87.7% (2329)
4000 g or more	3.8% (4)	7.3% (46)	6.9% (31)	7% (168)	7% (192)	7.3% (199)
<b>Maternal age</b>						
< 25 y	25% (12)	26.8% (119)	41.1% (162)	35.7% (673)	35.1% (778)	32.1% (671)
25-29 y	39.9% (29)	43% (243)	37.3% (204)	39.3% (966)	38.6% (1169)	41.2% (1144)
30-34 y	30% (25)	22.2% (136)	15.7% (89)	19.5% (519)	19.5% (658)	21.1% (638)
35 y or more	5.2% (4)	8% (49)	5.9% (34)	5.5% (140)	6.8% (214)	5.7% (189)
<b>Maternal country of birth</b>						
France	92.6% (67)	90% (510)	89% (451)	88.6% (2130)	85.7% (2560)	84.3% (2400)

Abroad	7.4% (3)	10% (37)	11% (38)	11.4% (168)	14.3% (259)	15.7% (242)
Maternal education attainment						
Below high school	20% (7)	26.9% (98)	45.8% (166)	37.7% (599)	37.4% (722)	32.8% (593)
High school	24.4% (15)	18.4% (104)	18.4% (100)	19.2% (488)	17.5% (521)	21.3% (556)
2 years after high school	24.5% (19)	22.5% (136)	17.1% (100)	19.7% (545)	19.6% (648)	19.8% (619)
3 years after high school	15.3% (13)	17.2% (98)	10.1% (63)	13.2% (347)	12% (419)	12.4% (384)
At least 5 years after high school	15.8% (16)	15.1% (111)	8.6% (60)	10.3% (319)	13.5% (509)	13.6% (490)
Maternal return to work at 2m						
No	67.3% (52)	76.9% (441)	60.1% (327)	66.2% (1680)	65.9% (2039)	64.9% (1899)
Yes	9.7% (5)	6.7% (35)	9% (47)	6% (158)	6.6% (217)	7.3% (219)
Not applicable	23.1% (13)	16.4% (71)	31% (115)	27.7% (460)	27.5% (563)	27.9% (524)
Matrimonial status						
Married/Civil union	65.6% (47)	61.1% (358)	49.4% (279)	52.1% (1311)	51.3% (1597)	54.8% (1566)
Cohabiting	26.8% (20)	37.3% (181)	41.4% (186)	41.1% (900)	42.9% (1121)	39.7% (984)
Single	7.6% (3)	1.6% (8)	9.1% (24)	6.8% (87)	5.8% (101)	5.5% (92)
Maternal BMI						
< 18.5 kg/m <sup>2</sup>	1.9% (2)	7.8% (44)	6.7% (34)	7.4% (164)	8% (234)	8.2% (217)
18.5-24.9 kg/m <sup>2</sup>	77.2% (51)	62.9% (350)	59.9% (303)	59.9% (1463)	59.9% (1753)	60.4% (1668)
25.0-29.9 kg/m <sup>2</sup>	14.7% (12)	21.8% (112)	20.2% (97)	19.8% (413)	19.7% (517)	18.7% (470)
30.0 kg/m <sup>2</sup> or more	6.2% (5)	7.6% (41)	13.2% (55)	12.8% (258)	12.4% (315)	12.8% (287)
Maternal smoking						
Never smoker	48.6% (34)	50.8% (288)	52.8% (259)	48.2% (1139)	52.5% (1507)	55.5% (1460)
Previous smoker	33.5% (23)	24.5% (146)	17.5% (98)	21.9% (567)	21.4% (684)	23% (639)
Current smoker	17.9% (13)	24.7% (113)	29.7% (132)	30% (592)	26.1% (628)	21.6% (543)
Attendance to birth preparation courses						
None	49.1% (26)	43.9% (195)	62.4% (249)	55% (1050)	54.6% (1278)	53.2% (1106)
1-5 classes	17.6% (16)	20.5% (122)	14.6% (88)	18.6% (503)	18.2% (552)	18.2% (563)
6 classes or more	33.3% (28)	35.7% (230)	23% (152)	26.4% (745)	27.2% (989)	28.6% (973)
Parental age difference						
Younger father	17% (13)	18.8% (102)	22.2% (98)	19.3% (445)	18.6% (554)	17.1% (470)

Father 0-1 year older	23.8% (18)	27.7% (157)	21.7% (116)	26% (630)	22.8% (711)	24.2% (704)
Father 2-3 year older	22.3% (17)	23.4% (137)	19.8% (106)	20% (499)	21.9% (624)	22.6% (615)
Father 4-7 year older	15.5% (11)	18.2% (104)	25% (116)	22.7% (499)	23.5% (630)	22.4% (571)
Father at least 8 y older	21.4% (11)	11.8% (47)	11.4% (53)	12% (225)	13.3% (300)	13.8% (282)
Paternal presence at delivery	84% (60)	82.7% (466)	74.9% (394)	80.2% (1912)	80.8% (2351)	80.5% (2236)
Family income						
€ 1500 euros or less	11.2% (3)	8.9% (33)	15.2% (49)	14.9% (231)	13.7% (262)	16.6% (283)
€ 1501-2300	13.5% (10)	13.3% (62)	20.3% (88)	19.3% (359)	20.8% (486)	18.3% (420)
€ 2301-3000	22.5% (12)	30.9% (164)	31.9% (156)	30.6% (709)	30.2% (850)	28.4% (777)
€ 3001-4000	35.5% (32)	27% (154)	19.9% (117)	22.2% (615)	20.9% (679)	23.6% (713)
€ 4001-5000	8.2% (6)	11.1% (73)	7.4% (45)	8% (210)	8% (295)	7.8% (262)
€ 5000 or more	9% (7)	8.7% (61)	5.3% (34)	5% (174)	6.4% (247)	5.3% (187)
Parental atopy	38.3% (27)	45% (253)	32.9% (158)	32.6% (765)	33.4% (944)	30.2% (838)
Sibling atopy						
No sibling	30.4% (24)	46.4% (273)	35.3% (199)	42.8% (1034)	44% (1341)	44.6% (1303)
At least one sibling with allergy history	20.8% (13)	19.4% (99)	19.6% (83)	14.5% (327)	13.6% (352)	12% (289)
Sibling(s) without allergy history	48.8% (33)	34.2% (175)	45.1% (207)	42.7% (937)	42.4% (1126)	43.4% (1050)
Parental concern at 2 mo related to:						
Weight problems	14% (8)	6.1% (39)	7.6% (42)	8% (175)	5.9% (173)	6.4% (172)
Colic	36.9% (28)	24.6% (151)	24.9% (116)	26.9% (645)	16.7% (488)	18% (493)
Diarrhea	15.9% (11)	4.4% (25)	5.1% (25)	5.9% (131)	3.7% (95)	3.8% (97)
Constipation	27.9% (18)	15.1% (92)	20.3% (94)	18.9% (445)	15.3% (408)	14% (365)
Regurgitation	31.7% (19)	19% (103)	18.9% (96)	20.4% (485)	7.1% (182)	7.5% (213)
Type of physician						
Pediatrician	52% (36)	35.3% (213)	26.7% (149)	34.9% (855)	32.8% (1006)	31.1% (889)
Other child doctor	19.7% (13)	13.6% (63)	14.7% (60)	15% (303)	16.8% (374)	18.4% (373)
General practitioner	16.9% (13)	46% (239)	54.6% (259)	43.9% (1000)	45.1% (1296)	45.3% (1252)
Other (including emergency)	11.4% (8)	5.2% (32)	3.9% (21)	6.2% (140)	5.3% (143)	5.1% (128)
Predominant breastfeeding duration						
Never	44.2% (31)	41.7% (228)	54.6% (257)	56.5% (1253)	49.1% (1346)	40.6% (1023)

<1 month	44.6% (29)	36.3% (191)	31.4% (162)	34.6% (807)	32.9% (925)	36.7% (964)
1 month or more	11.2% (10)	22% (128)	14% (70)	8.9% (238)	18.1% (548)	22.7% (655)

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All Chi-2 tests were significant with a p-value <0.0001. <sup>1</sup> from maternity unit or from child and maternal protection centers