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Maternity or parental leave and breastfeeding duration: Results from the ELFE cohort

Blandine de Lauzon-guillain, Xavier Thierry, Corinne Bois, Marie Bournez,
Camille Davaisse-paturet, Marie-Noëlle Dufourg, Claire Kersuzan, Eléa
Ksiazek, Sophie Nicklaus, Hélène Vicaire, et al.

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2 **Associations between maternity or parental leave and breastfeeding duration:**
3 **results from the ELFE cohort**

4
5 Blandine de Lauzon-Guillain ¹, Xavier Thierry ², Corinne Bois ^{2,3}, Marie Bournez ^{4,5}, Camille
6 Davisse-Paturet ¹, Marie-Noëlle Dufourg ², Claire Kersuzan ⁶, Eléa Ksiazek ⁴, Sophie Nicklaus ⁴,
7 Hélène Vicaire ², Sandra Wagner ¹, Sandrine Lioret ¹, Marie Aline Charles ¹

8
9 **Affiliations**

10 ¹ Université de Paris, CRESS, INSERM, INRA, F-75004 Paris, France

11 ² Unité mixte INSERM-INED-EFS ELFE, INED, Paris, France

12 ³ Service départemental de PMI, Conseil départemental des Hauts-de-Seine, Nanterre, France

13 ⁴ Centre des Sciences du Goût et de l'Alimentation, AgroSup Dijon, CNRS, INRA, Univ.
14 Bourgogne Franche-Comté, Dijon, France

15 ⁵ Centre Hospitalier Universitaire de Dijon, Hôpital d'Enfants, Pediatrics, Dijon, France

16 ⁶ ALISS UR1303, INRA, Université Paris-Saclay, Ivry-sur-Seine, France

17 **Corresponding author**

18 Blandine de Lauzon-Guillain

19 INSERM CRESS Eq 6 EARoH

20 Hopital Paul Brousse, Batiment 15/16

21 16 av. Paul Vaillant Couturier

22 94807 Villejuif Cedex, FRANCE

23 Tel: +33145595019; Fax: +33147269454; E-mail: blandine.delauzon@inserm.fr

24 **Running head**

25 Maternity leave and breastfeeding in France

26 **Significance**

27 Our study provides original insight into the influence of maternity or parental leave on the initiation
28 and duration of breastfeeding among women who worked during pregnancy in France. French
29 regulations regarding maternity and parental leave differ according to occupational status, multiple
30 or single birth, parity, and gestational age. Our findings highlighted that in the context of statutory
31 postnatal maternity leave of around 10 weeks, postponing maternal return to work and reducing
32 working time during the first year postpartum was related to higher initiation rates and longer
33 duration of breastfeeding.

34 **Word count**

35 Abstract: 242 words

36 Main text: 4935 words (from introduction to conclusion)

37

39 **Ethics approval and consent to participate**

40 Participating mothers signed a consent form for themselves and for their child. Fathers signed the
41 consent form for the child's participation when present on inclusion days, or were otherwise
42 informed about their right to object.

43 The ELFE study was approved by the Advisory Committee for Treatment of Health Research
44 Information (CCTIRS, Comité Consultatif sur le Traitement des Informations pour la Recherche en
45 Santé), the National Data Protection Authority (CNIL, Commission National Informatique et
46 Libertés), and the National Statistics Council (CNIS).

47 **Consent for publication**

48 Not applicable

49 **Availability of data and materials**

50 The data underlying the findings cannot be made freely available because of ethical and legal
51 restrictions. This is because the present study includes an important number of variables that,
52 together, could be used to re-identify the participants based on a few key characteristics and then be
53 used to have access to other personal data. Therefore, the French ethical authority strictly forbids
54 making such data freely available. However, they can be obtained upon request from the ELFE
55 principal investigator. Readers may contact marie-aline.charles@inserm.fr to request the data.

56 **Competing interests**

57 The authors declare that they have no competing interests

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62 the National Institute of Health and Medical Research (INSERM), in partnership with the French
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64 National Institute for Statistics and Economic Studies (INSEE), the Direction générale de la santé
65 (DGS, part of the Ministry of Health and Social Affairs), the Direction générale de la prévention
66 des risques (DGPR, Ministry for the Environment), the Direction de la recherche, des études, de
67 l'évaluation et des statistiques (DREES, Ministry of Health and Social Affairs), the Département
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73

74 **Authors' contribution**

75 Drs de Lauzon-Guillain and Thierry conceptualized and designed the study, conducted the
76 statistical analyses, interpreted the results and drafted the initial manuscript. Drs Kersuzan, and
77 Wagner, Mrs Ksiazek and Vicaire contributed to the statistical analyses, the interpretation of the
78 results and critically reviewed the manuscript. Drs Bournez, Nicklaus and Lioret and Mrs DAVISSE-
79 Paturet contributed to the interpretation of the results and critically reviewed the manuscript. Drs
80 Bois and Dufourg designed the data collection instruments, supervised data collection and data
81 management and critically reviewed the manuscript. Dr Charles conceptualized and designed the
82 study, contributed to the interpretation of the results, reviewed and revised the manuscript.
83 All authors approved the final manuscript as submitted and agree to be accountable for all aspects
84 of the work.

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90 coordination team as well as the families that gave their time for the study.

91

93 **ABSTRACT**

94 Previous studies have shown a high level of noncompliance with recommendations on
95 breastfeeding duration, especially in France. The objective was to describe the association between
96 breastfeeding initiation and duration and the statutory duration of postnatal maternity leave, the gap
97 between the end of legal maternity leave and the mother's return to work, and maternal working
98 time during the first year postpartum. Analyses were based on 8,009 infants from the French
99 nationwide ELFE cohort. We assessed the association with breastfeeding initiation by using logistic
100 regression and, among breastfeeding women, with categories of breastfeeding duration by using
101 multinomial logistic regression. Among primiparous women, both postponing return to work for at
102 least 3 weeks after statutory postnatal maternity leave (as compared with returning to work at the
103 end of the statutory period) and working less than full-time at 1 year postpartum (as compared with
104 full-time) were related to higher prevalence of breastfeeding initiation. Among women giving birth
105 to their first or second child, postponing the return to work until at least 15 weeks was related to a
106 higher prevalence of long breastfeeding duration (at least 6 months) as compared with intermediate
107 duration (3 to <6 months). Working part-time was also positively related to breastfeeding duration.
108 Among women giving birth to their third child or more, working characteristics were less strongly
109 related to breastfeeding duration. These results support extending maternity leave or working time
110 arrangements to encourage initiation and longer duration of breastfeeding.

111 **Keywords**

112 maternity leave, breastfeeding, cohort, longitudinal, epidemiology

113 **KEY MESSAGES**

114 Our study provides insights into the influence of maternity or parental leave on the initiation and
115 duration of breastfeeding among French women who worked during pregnancy. French regulations
116 regarding maternity and parental leave differ by occupational status, multiple or single birth, parity,

117 and gestational age. Our findings highlight that in the context of statutory postnatal maternity leave
118 of about 10 weeks, postponing the maternal return to work and reducing working time to part-time
119 during the first year postpartum is related to higher initiation prevalence and longer duration of
120 breastfeeding.

121

123 Introduction

124 Most international pediatric societies recommend exclusively breastfeeding until a child reaches 6
125 months of age (Agostoni et al., 2009, Section on Breastfeeding, 2012, World Health Organization,
126 2002), and the WHO recommends also continuation of breastfeeding for at least 2 years (World
127 Health Organization, 2002). However, results from various studies of infant feeding practices have
128 shown a high level of noncompliance with these recommendations. For instance, the prevalence of
129 any breastfeeding initiation (defined as the infant receiving any amount of breast milk) was 83% in
130 the United States (2018, Rossen et al., 2015) for babies born in 2015, 81% in the United Kingdom
131 (McAndrew et al., 2012) for babies born in 2010 but only 70% in France (Kersuzan et al., 2014b)
132 for babies born in 2011. Furthermore, the prevalence of any breastfeeding declined rapidly with
133 infant age, and at 6 months, the prevalence of any breastfeeding decreased to 58% in the United
134 States, 34% in the United Kingdom and only 19% in France (Rossen et al., 2015, Wagner et al.,
135 2015b, McAndrew et al., 2012).

136 Several studies have tried to identify the factors that could explain low breastfeeding rates in
137 France (Bonet et al., 2013, Kersuzan et al., 2014a, Salanave et al., 2012, Wagner et al., 2015a,
138 Wagner et al., 2019). In particular, we recently highlighted that previous experience with
139 breastfeeding was strongly associated with breastfeeding initiation (Wagner et al., 2019). Although
140 having been breastfed as an infant was a key factor in breastfeeding initiation among primiparous
141 mothers, having breastfed previous children was the most significant predictor among multiparous
142 mothers. However, the relationship between previous breastfeeding experience and subsequent
143 breastfeeding behavior was not as strong for breastfeeding duration. One factor commonly
144 suggested to explain why women did not breastfeed for as long as recommended is the difficulty to
145 combine breastfeeding and working, especially in France, where maternal employment is relatively
146 frequent (Baranowska-Rataj & Matysiak, 2016). In France, few studies have investigated the
147 association between maternity leave policies and breastfeeding practices. Scarce available studies

148 have yielded mixed results (Bonet et al., 2013, Wallace et al., 2013). Furthermore, none has
149 investigated the complexity and also the flexibility of the French maternal leave policy (Pénet,
150 2006) in association with breastfeeding practices. In fact, for a single birth, women covered by the
151 general health insurance system are entitled to a maximum of 16 weeks (6 weeks before and 10
152 weeks after delivery) of fully paid maternity leave (Gouvernement français, in force in 2011a). For
153 women with two previous children, this duration is extended to 26 weeks (8 for prenatal and 18 for
154 postnatal leave) (Gouvernement français, in force in 2011a). Upon medical agreement, the starting
155 date of fully paid prenatal leave can be shifted up to 3 weeks to extend fully paid postnatal leave
156 (Gouvernement français, in force in 2011a). This fully paid maternity leave may be extended by a
157 parental leave (Gouvernement français, in force in 2011c), partially paid for 6 months for
158 primiparous women or up to the child's first 3 years for multiparous women, that can be used to
159 postpone the return to work or to reduce working time to part-time. The length of maternity or
160 parental leave does not depend on maternal working time during pregnancy, but the amount of the
161 compensation that should be paid during maternity or parental leave is proportional to the salary
162 before pregnancy. For self-employed women (covered by the health insurance system for self-
163 employed people), the total duration of paid maternity leave is limited to 8 weeks.

164 Studies of the relationship between maternity leave, employment and breastfeeding practices
165 conducted in other high-income countries have produced mixed results. In fact, the maternal plan to
166 work full-time postpartum has been related to a lower likelihood to initiate breastfeeding (Mandal et
167 al., 2010, Kurinij et al., 1989, Fein & Roe, 1998). Similarly, women who planned to return to work
168 before 6 weeks postpartum (Noble, 2001) or before 1 month postpartum (Chuang et al., 2010) were
169 less likely to initiate breastfeeding, but planning to go back to work within 6 months postpartum
170 was not related to breastfeeding initiation. Furthermore, a later return to work appeared positively
171 related to breastfeeding duration whatever the child's age considered: 2-3 months (Bai et al., 2015,
172 Gielen et al., 1991), 6-7 months (Kurinij et al., 1989, Chuang et al., 2010), or 1 year (Visness &
173 Kennedy, 1997) but not in all studies (Logan et al., 2016). In a US study, total maternity leave

174 available (summing fully paid, partially paid and unpaid) was not clearly related to breastfeeding
175 initiation or duration, but maternal return to work before 12 weeks (partially or full-time) or full-
176 time after 12 weeks was related to reduced breastfeeding duration (Mandal et al., 2010). However, a
177 recent review highlighted that the level of evidence for the association between early cessation of
178 breastfeeding and a return to work within 12 weeks post-birth is low (Mangrio et al., 2017). Data
179 from the UK Millennium cohort study (Hawkins et al., 2007b, Hawkins et al., 2007a) found that
180 mothers who were employed full-time were less likely to initiate breastfeeding than were women
181 who were students or not employed. Among employed mothers, those who returned to work within
182 the first 4 months postpartum or for financial reasons were less likely to initiate breastfeeding.
183 Significant variation in how the maternity leave policy is structured across high-income countries
184 and methodological heterogeneity could explain differences in results across studies. In fact, legal
185 maternity leave duration varies greatly in Europe, from 14 weeks in Germany or Sweden to 52
186 weeks in the United Kingdom, and only some countries allow maternity leave to be followed by
187 parental leave (International Labour Organization, 2010).

188 Despite the country's rather favorable maternal leave policy, in France, the prevalence of
189 breastfeeding initiation and duration of breastfeeding remain low as compared with other European
190 countries (Ibanez et al., 2012). In this context, our aim was to describe the association between the
191 initiation or duration of any breastfeeding and several work-related characteristics among women
192 who worked during pregnancy: the statutory duration of postnatal maternity leave, postponing the
193 return to work until after the statutory period of maternity leave, and maternal working time during
194 the first year postpartum (and change as compared with the mother's prenatal situation, e.g., from
195 full- to part-time). Because rules for maternity or parental leave differ by parity, we separately
196 analyzed data for mothers who gave birth to their first child, second child or third (or more) child.
197 Understanding how the relationships between work transition pattern and breastfeeding practices
198 vary according to birth order is of great importance in a country with one of the highest fertility
199 rates in Europe. This analysis could also help governments in designing policies and programs to

200 improve breastfeeding practices, taking into consideration that mothers could need varying support
201 depending on their number of children to meet the conflicting demands of employment and
202 motherhood.

203 **Material and methods**

204 ***Study population***

205 The present analysis was based on data from the ELFE (Etude Longitudinale Française depuis
206 l'Enfance) study, a multidisciplinary, nationally representative birth cohort including 18,258
207 children born in a random sample of 349 maternity units in France in 2011 (Vandentorren et al.,
208 2009). Beginning in April 2011, recruitment for the study took place during 25 selected enrollment
209 days, with 4 waves of 4 to 8 days spanning each season of the year. Inclusion criteria were children
210 born after 33 weeks' gestation whose mothers were aged 18 years or older and were not planning to
211 move outside metropolitan France in the following 3 years. Participating mothers signed a consent
212 form for themselves and for their child. Fathers signed the consent form for the child's participation
213 when present on inclusion days or were otherwise informed about their right to object.

214 Mothers were interviewed at the maternity ward to obtain medical information concerning
215 their pregnancy and their newborn, their demographic and socioeconomic characteristics, and their
216 eating habits. Information was completed by using records from obstetric and pediatric medical
217 files. At 2 and 12 months postpartum, telephone interviews with mothers and fathers included more
218 detailed questions about 1) demographic and socioeconomic variables, such as country of birth,
219 education level, employment, monthly income, and number of family members; 2) health variables
220 concerning both children and their parents, such as parents' asthma and eczema, mother's
221 psychological difficulties, and children's birth weight and height; and 3) feeding practices during
222 the first 2 months. From 3 to 10 months after delivery, families were asked to complete a monthly
223 questionnaire on their infant's diet, either online or in writing (regarding feeding methods and
224 introduction of food and beverages).

225 The ELFE study was approved by the Advisory Committee for Treatment of Health
226 Research Information (CCTIRS, Comité Consultatif sur le Traitement des Informations pour la
227 Recherche en Santé), the National Data Protection Authority (CNIL, Commission National
228 Informatique et Libertés), and the National Statistics Council (CNIS, Conseil National de
229 l'information statistique).

230 ***Infant feeding***

231 During each follow-up wave, the infant's feeding method was recorded: solely breast milk, solely
232 infant formula, both breast milk and formula (including plant-based infant formula), animal milk, or
233 plant-based beverage. If the mother had stopped breastfeeding, the exact age of the child when
234 breastfeeding ended was obtained, along with the child's age when formula was introduced.

235 Longitudinal follow-up of the children allowed for ensuring that the feeding methods reported each
236 month were compatible (i.e., the mother could not breastfeed at month X+1 if she had not breastfed
237 at all during month X). The duration of any breastfeeding (defined as the infant receiving any
238 amount of breast milk) was calculated. If the information needed to calculate duration was only
239 partially available for a certain infant, we attributed to that infant the median breastfeeding duration
240 of infants with the same dietary profile (e.g., still breastfed at month X but receiving only formula
241 at month Y). This situation concerned 15% of infants included in the ELFE cohort but less than 5%
242 of infants considered in the present study. If no information was available concerning breastfeeding,
243 no imputation was performed.

244 Because of the very short breastfeeding duration in France, breastfeeding was considered as a four-
245 category variable to limit misunderstanding the findings. The cut-offs were defined to have both a
246 homogeneous sample size in each category and a meaningful value. For instance, the value of 1
247 month corresponds to the median duration of predominant breastfeeding among all women; the
248 value of 3 months is close to the end of the legal maternity leave for most women; and the value of
249 6 months corresponds to the recommended duration for exclusive breastfeeding.

250 ***Maternity leave and return to work***

251 The duration of a given statutory maternity leave period was derived by using the woman's
252 professional status during pregnancy, infant's gestational age, infant birth order (the order in which
253 they were born with respect to their maternal siblings), and prenatal leave duration. Because this
254 variable was not normally distributed, it was considered as a four-category variable. Self-employed
255 women were considered in a specific category because their maternity leave was very short (<10
256 weeks category). Then, women who were able to shift 1 to 3 weeks of prenatal maternity leave to
257 postnatal maternity leave (11-12 weeks and 13 weeks categories) were distinguished from those
258 with a postnatal maternity leave of 10 weeks. These categories were similar for women having a
259 first or second child and for those having at least a third child; a similar reasoning was applied to a
260 legal duration of 18 weeks.

261 The difference between the legal end of postnatal maternity leave and the mother's return to
262 work was then calculated to identify women who returned to work before the end of the statutory
263 maternity leave and those who postponed their return to work after the statutory maternity leave
264 period; this variable was labeled "Time of return to work". Because this variable was not normally
265 distributed, it was considered as a five-category variable. A first category defined as "legal duration
266 \pm 6 days" was defined to account for small discrepancies between the date of pregnancy start
267 recorded in the obstetrical record and the date transmitted by women to health authorities to
268 calculate the maternity leave period. Women who returned to work before the legal end of
269 maternity leave were then identified in the category "at least 1 week before legal end". For women
270 who postponed a return to work, three different categories were considered: "1-2 weeks after legal
271 end," to identify women using usual holidays rather than parental leave to postpone a return to
272 work; "at least 15 weeks after legal time," corresponding to the infant's age just below 6 months at
273 maternal return to work for women having a first or second child and allowing to identify women
274 using completely parental leave; and the in-between category "3-14 weeks after legal time".

275 Because maternity leave may be extended by a partially-paid parental leave (either not
276 working or working part-time), we assessed the potential change in maternal working time from
277 pregnancy to 1 year postpartum (already part-time in pregnancy; full-time in pregnancy and part-
278 time at 1 year; full-time in pregnancy and not working at 1 year; full-time both in pregnancy and at
279 1 year); this variable was labeled “Maternal working time.” All women who worked part-time
280 during pregnancy were considered together, whatever their working time when the child turned 1
281 year old, because most of them (84%) also worked part-time at this time.

282 ***Infant and parental characteristics***

283 Because more comprehensive family data were collected during the 2-month interview than the
284 maternity interview and because family sociodemographic characteristics evolved only marginally
285 during these 2 months, we used the data collected at 2 months in our analyses. Sociodemographic
286 characteristics collected during the maternity stay were used only in the case of missing values at 2
287 months.

288 Parental sociodemographic characteristics included in the analyses were maternal country of
289 birth (France vs. another country), maternal age at the birth of her first child (18-24, 25-29, 30-34,
290 ≥ 35 years), family composition (traditional, stepfamily, one-parent family), birth order of the ELFE
291 child (first, second, third, fourth or more), maternal education level (below secondary school,
292 secondary school, high school, 2-year university degree, 3-year university degree, at least 5-year
293 university degree), parental age difference (younger father, father 0-1 years older, father 2-3 years
294 older, father 4-7 years older, father at least 8 years older), maternal region of residence, and
295 monthly family income per consumption unit ($\leq 1,500$ €, 1,501-2,300 €, 2,301-3,000 €, 3,001-4,000
296 €, 4,001-5,000 €, $> 5,000$ €). Paternal presence at delivery (yes/no) was considered an indicator of
297 paternal involvement in pregnancy. Among multiparous women, previous breastfeeding experience
298 of the mother (breastfed all previous children, breastfed some but not all previous children,
299 breastfed no previous children) was also considered.

300 Parental health-related characteristics included reported maternal height and weight before
301 pregnancy, maternal smoking status during pregnancy (never smoked, smoker only before
302 pregnancy, smoker only in early pregnancy, smoker during the whole pregnancy). Newborn
303 characteristics were collected from medical records: sex, twin birth, birth weight, and gestational
304 age.

305 ***Sample selection***

306 For the 18,329 infants recruited, 56 parents withdrew consent within the first year. Infants for
307 whom eligibility criteria could not be verified because of missing data were also excluded ($n=422$).
308 Therefore, 17,851 infants were eligible. Because they define a specific context for breastfeeding,
309 twin births ($n=554$) and preterm births ($n=757$) were excluded from our analyses. Also, because we
310 examined the effect of maternity leave on breastfeeding among working women, we excluded
311 women without data on infant feeding or maternal work ($n=283$) and women who did not work
312 during pregnancy ($n=4,808$), which left a sample of 11,449 mother–child pairs. Finally, we
313 excluded mother–child pairs without any data at the 2-month or 1-year follow-up and those with
314 missing data on employment status at 1 year or on potential confounding factors (see details in
315 Figure 1). Then, the complete-case analysis involved 8,009 mother–child pairs.

316 The sample selection is described in **Figure 1**. [Figure 1]

317 ***Statistical analyses***

318 Bivariate analyses involved using chi-square test or Student t test.

319 Associations between working characteristics and any breastfeeding initiation (yes vs. no)
320 were tested by multivariate logistic regression. Among breastfeeding women, associations between
321 working characteristics and the duration of any breastfeeding (<1 month, 1 to <3 months, 3 to <6
322 months, 6 to <9 months, at least 9 months) were tested by multivariate multinomial logistic
323 regression. Because the duration of any breastfeeding was an ordered outcome, ordinal logistic
324 regression was first considered. However, the proportional-odds assumption was not verified
325 ($p<0.0001$ for all analyses), so we used a less restrictive model, multinomial logistic regression. All

326 models were adjusted for infant characteristics (sex, birth weight), maternal characteristics (age at
327 first child's birth, country of birth, education level, pre-pregnancy body mass index, smoking
328 status), paternal characteristics (age difference with mother, presence at delivery), household
329 income or characteristics related to study design (maternal region of residence, size of maternity
330 unit, and recruitment wave). Among multiparous women, models were also adjusted for previous
331 breastfeeding experience.

332 Given that the duration of maternity leave and the possibility to postpone a return to work or
333 modify the working time depending on the child's birth order, all analyses were stratified by the
334 child's birth order. For women giving birth to their first child, models were not adjusted on
335 maternal previous breastfeeding experience.

336 To assess the potential impact of missing measurements on confounding variables, we
337 performed multiple imputations as a sensitivity analysis with the SAS software. We assumed that
338 data were missing at random and generated five independent datasets by using the fully conditional
339 specification method (MI procedure, FCS statement, NIMPUTE option, Yuan 2000), then
340 calculated pooled effect estimates (MIANALYSE procedure). These sensitivity analyses involved
341 data for all women who worked during pregnancy (n=11,435).

342 All analyses involved using SAS v9.4 (SAS, Cary, NC).

343 **Results**

344 The comparison of women who worked during pregnancy to other women included in the ELFE
345 study is presented in **Supplementary Table 1**. Among women who worked during pregnancy,
346 some were excluded from the analyses because of missing data, and these women were compared to
347 the women included in the analyses in **Supplementary Table 1** as well. Women excluded due to
348 missing data were younger than women included in the present analyses, had a lower education
349 level, and were more likely to be born in a country other than France and to be obese.

350 The sample characteristics and breastfeeding duration are described by infant birth order in
351 **Table 1.** [Table 1] Bivariate analyses between working characteristics and any breastfeeding are
352 detailed in **Supplementary Table 2.**

353 In the whole sample (n=8,009), older infant age at maternal return to work was related to
354 greater likelihood to initiate breastfeeding and longer breastfeeding duration among breastfeeding
355 mothers (**Table 2**).

356 ***Breastfeeding initiation***

357 Among women with a first or second child, the legal duration of maternity leave was not related to
358 breastfeeding initiation (**Table 3**). [Table 3] Among women with a third child or more, the legal
359 duration of maternity leave was related to breastfeeding initiation but not with a linear trend.
360 Among women with a first child, those who postponed their return to work until at least 3 weeks
361 after the legal period were more likely to initiate breastfeeding. Reduction of working time in the
362 first year postpartum was also positively associated with breastfeeding initiation.

363 ***Breastfeeding duration***

364 Among women with a first child, a longer legal duration of postnatal maternity leave (at least 13
365 weeks) was associated with reduced likelihood of short breastfeeding duration (<3 months), as
366 compared to an intermediate duration (3 to <6 months) (**Figure 2** and details in Supplementary
367 table 3) [Figure 2]; a short duration of postnatal maternity leave (<10 weeks) was related to greater
368 likelihood of short breastfeeding duration (1 to <3 months) as compared with an intermediate
369 duration (3 to <6 months). Mothers who postponed their return to work until at least 15 weeks after
370 the legal period were more likely to breastfeed for at least 6 months as compared with an
371 intermediate duration (3 to <6 months). Women who worked part-time during pregnancy were less
372 likely to breastfeed for a short duration (1 to <3 months), and a decrease in working time in the first
373 year postpartum was related to greater likelihood of breastfeeding for at least 9 months as compared
374 with an intermediate duration (3 to <6 months).

375 Among women with a second child, the duration of postnatal maternity leave was not
376 clearly related to breastfeeding duration. Postponing the maternal return to work until at least 15
377 weeks was associated with longer breastfeeding duration, whereas a return to work before the end
378 of the legal period was related to greater likelihood of breastfeeding for a short duration (1 to <3
379 months) as compared with an intermediate duration (3 to <6 months). Women who worked part-
380 time during pregnancy or who did not return to work within the first year were more likely to
381 breastfeed for at least 9 months as compared with an intermediate duration (3 to <6 months) than
382 were those who worked full-time in pregnancy and at 1 year postpartum.

383 Among women with a third child or more (with longer legal maternity leave), postponing a
384 return to work until at least 15 weeks after the legal period was positively related to longer
385 breastfeeding duration (at least 9 months) as compared with an intermediate duration (3 to <6
386 months). Not working full-time at 1 year postpartum was related to longer breastfeeding duration.

387 ***Sensitivity analyses***

388 In analyses based on multiple imputations of missing data, for women giving birth to their first
389 child, we found similar positive associations between legal duration of postnatal maternity leave,
390 time of a return to work and working time and initiation or duration of breastfeeding
391 (**Supplementary Table 4**) as well as a higher likelihood to breastfeed for a short duration among
392 women with a return to work before the legal time. For women having a second child, we found no
393 association with breastfeeding initiation; the association between time of return to work and
394 breastfeeding duration remained similar, but the association between maternal working time and
395 breastfeeding duration was less consistent. Finally, for women having a third child, we found a
396 positive link only between a mother delaying her return to work until at least 15 weeks after the
397 legal period and breastfeeding initiation or duration.

Discussion

Main findings

400 Among primiparous women, both postponing a return to work for at least 3 weeks after legal
401 postnatal maternity leave and not working full-time at 1 year postpartum were related to higher
402 prevalence of breastfeeding initiation. Among women giving birth to their first or second child
403 (with a legal postnatal maternity leave of about 10 weeks), those with a return to work before the
404 legal period were more likely to breastfeed for a shorter duration, whereas those who delayed a
405 return to work until at least 15 weeks were more likely to breastfeed for a longer duration. Working
406 part-time also related positively to breastfeeding duration, especially among primiparous women.
407 Among women giving birth to their third child or more (with a legal postnatal maternity leave of
408 about 18 weeks), working characteristics were less related to breastfeeding duration, except
409 working time.

Maternal return to work

411 In the ELFE study, women who postponed their return to work until at least 15 weeks after the end
412 of legal maternity leave were more likely to initiate breastfeeding. Likewise, in the ALSPAC study
413 in the United Kingdom, the timing of a mother's return to work seemed of great importance, with
414 higher breastfeeding initiation prevalence among those who did not return before 6 weeks
415 postpartum (Noble, 2001); in the US National Survey of Family Growth, paid maternity leave for at
416 least 12 weeks was associated with greater breastfeeding initiation (Mirkovic et al., 2016); in the
417 UK Millennium cohort study (Hawkins et al., 2007b), employed mothers who returned to work
418 within the first 4 months postpartum were less likely to initiate breastfeeding.

419 Also, in the ELFE study, women who postponed their return to work by at least 15 weeks
420 after the end of legal maternity leave were more likely to breastfeed for a long duration. Similarly,
421 returning to work earlier has been associated with shorter breastfeeding duration in previous studies
422 (Hawkins et al., 2007a, Skafida, 2012, Mandal et al., 2010, Robert et al., 2014, Bonet et al., 2013).
423 Some studies specifically investigated the effect of paid maternity leave on breastfeeding duration.

424 In the US National Survey of Family Growth, paid maternity leave for at least 12 weeks was
425 associated with greater breastfeeding prevalence at 6 months postpartum (Mirkovic et al., 2016). In
426 Canada, the length of paid maternity leave was extended from 6 months to 1 year in 2001. Studies
427 were conducted to assess the effect of this policy on breastfeeding: the increase in length of
428 maternity leave was followed by increase in breastfeeding duration by more than 1 month (Baker &
429 Milligan, 2008).

430 The negative association between maternal employment and breastfeeding duration could be
431 due to the difficulty in managing both breastfeeding and employment commitments. French law
432 states that breastfeeding mothers are allowed to use 1 hour of their working time to pump milk or to
433 breastfeed their child (Gouvernement français, in force in 2011b). Because few workplaces actually
434 provide in situ child care arrangements or lactation rooms for pumping breast milk, this limited
435 amount of time allotted for breastfeeding during working hours could be insufficient to allow
436 mothers to maintain an adequate level of lactation or comfortable working conditions. Previous
437 studies underlined the importance of workplace accommodations to support breastfeeding after the
438 mother's return to work (Kozhimannil et al., 2016).

439 ***Working time***

440 In France, a decrease in working time is promoted during parental leave, because reduced wages are
441 partially compensated by financial social assistance. We found that a decrease in working time
442 during the first year postpartum was associated with longer breastfeeding duration. In line with
443 these results, several studies underlined that working part-time was related to greater breastfeeding
444 initiation (Mandal et al., 2010) and later breastfeeding cessation (Hawkins et al., 2007b, Skafida,
445 2012, Xiang et al., 2016). We hypothesized that some women may prepare for parenthood by
446 planning to reduce their working time and as a consequence are in better conditions for
447 breastfeeding, but others may wish to breastfeed and consequently decide to adjust their working
448 time for this purpose. Moreover, managing both breastfeeding and occupational constraints could
449 be easier with part-time work. However, we did not collect relevant data to test these hypotheses.

450 ***Discrepancies according to birth order***

451 As noted previously, in France, the statutory duration of postnatal maternity leave is shorter for
452 primiparous women or those with a second child than women with three children or more. Among
453 women with a first or second child, postponing a return to work by at least 15 weeks after the legal
454 period was related to greater prevalence of long breastfeeding duration (at least 6 months). To a
455 lesser extent, extending this legal duration from 10 weeks to at least 13 weeks (by postponing the
456 beginning of prenatal leave) was also positively related to breastfeeding duration. Among women
457 with a third child (therefore a longer legal duration of postnatal maternity leave), the most important
458 factor related to breastfeeding duration was the decrease in working time allowed by the parental
459 leave; however, this was not related to breastfeeding initiation. For women with a third child,
460 previous breastfeeding experience may be the major determinant of breastfeeding initiation or the
461 intention to breastfeed (Moimaz et al., 2017), and thus factors related to breastfeeding duration may
462 encompass breastfeeding facilities and support. Unfortunately, in our analyses, we could not
463 distinguish whether women who are more inclined to breastfeed used these facilities to favor
464 breastfeeding success or whether the facilities encouraged women to initiate and extend the duration
465 of their breastfeeding.

466 ***Strengths and limitations***

467 We must acknowledge the inability to study exclusive breastfeeding according to the WHO
468 definition with the ELFE study data, given that information on the use of water, water-based drinks,
469 and fruit juice during the period from 0 to 2 months was not collected in the ELFE study. The ELFE
470 study provides a unique opportunity to report data concerning a large sample of births in
471 metropolitan France. Data were collected each month from 2 to 12 months to reduce the risk of
472 memory bias regarding infant diet. Our sensitivity analyses, based on multiple imputations of
473 missing data, provided consistent findings except for those on maternal working time among
474 women giving birth to their third child or more. The large data collection within the ELFE study
475 allows us to account for the main risk factors in our analyses. We attempted to distinguish between

476 the different aspects of public policies surrounding a child's birth and their potential influence on
477 breastfeeding. Unfortunately, we did not have data concerning women's breastfeeding facilities or
478 places for breast milk pumping at work and were thus unable to assess the impact of these policies
479 on breastfeeding duration among women returning to work in the early postpartum period.
480 Moreover, because of their strong association with our variables of interest, we were not able to
481 consider other characteristics of maternal employment, such as socio-professional category or type
482 of contract.

483 **Conclusion**

484 From a large national cohort study, we highlighted the positive association between the duration of
485 legal maternity leave and duration of any breastfeeding. We also established that extending a
486 mother's return to work beyond the legal maternity leave period, regardless of the infant's birth
487 order, or decreasing a mother's working time in the first year postpartum for women with three
488 children or more were related to greater prevalence of breastfeeding initiation and longer
489 breastfeeding duration. These results support extending maternity leave or promoting different
490 working time arrangements to encourage a longer period of breastfeeding.

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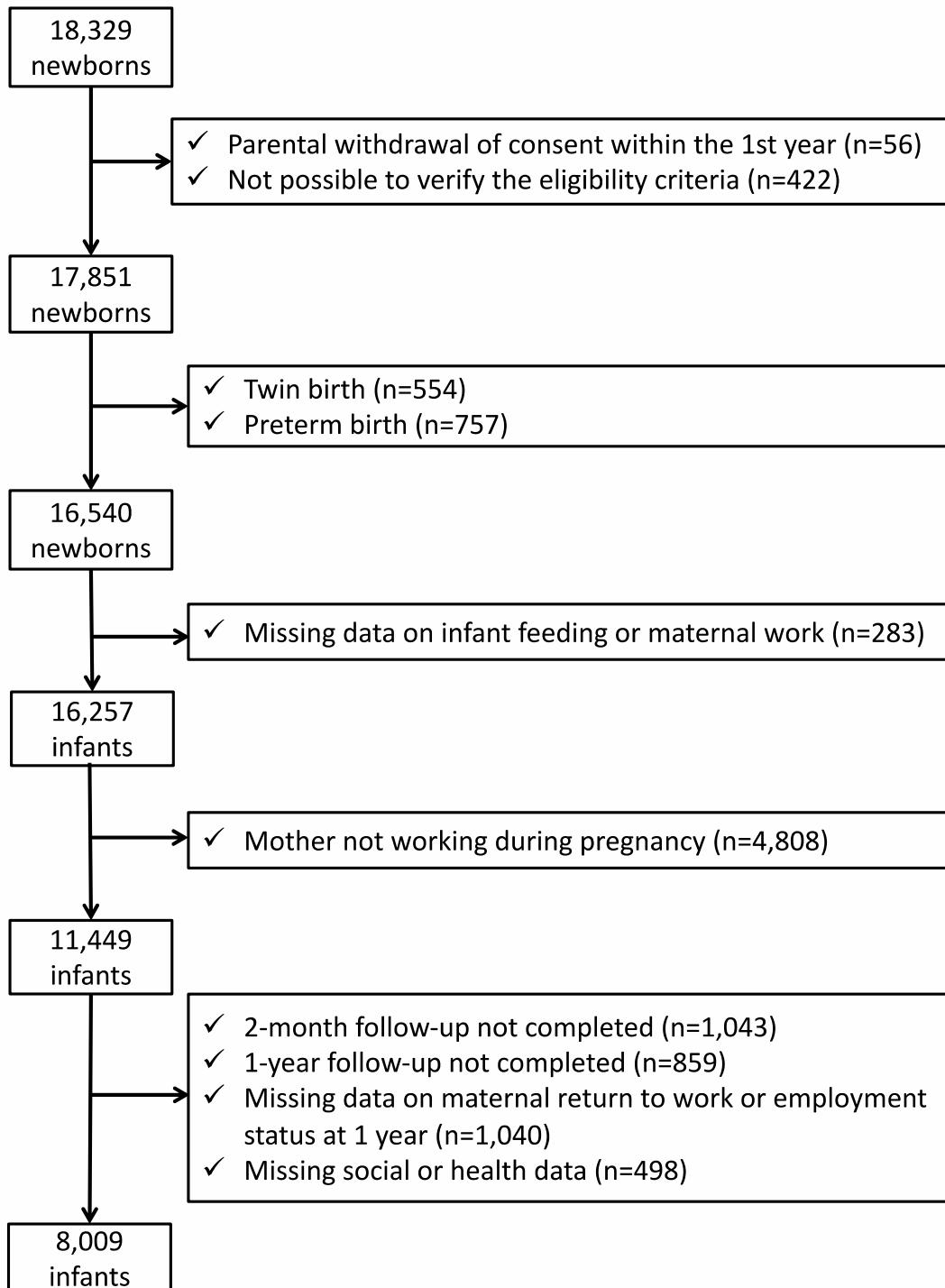
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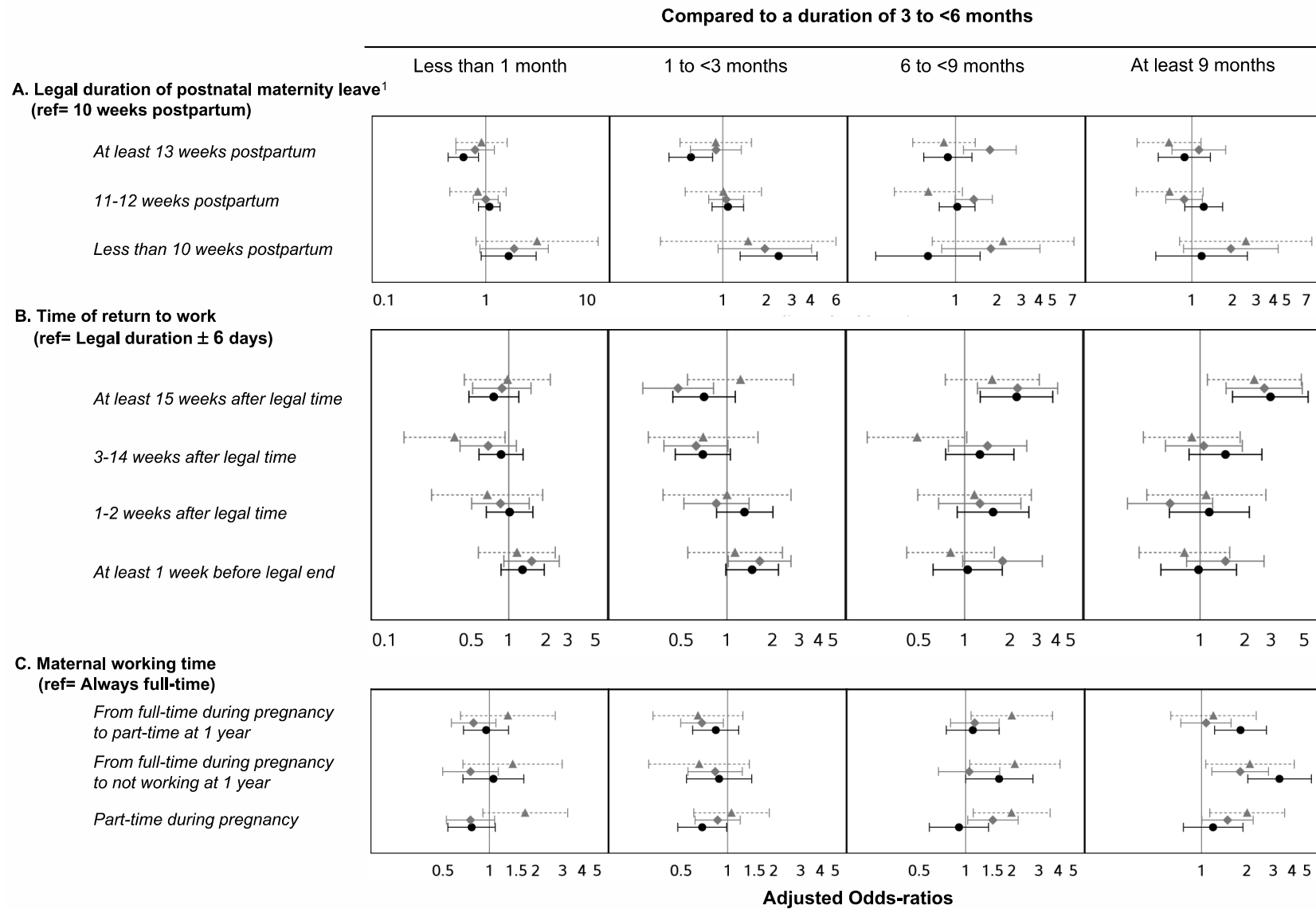
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651 **Figure 2.** Association between work-related variables and duration of any breastfeeding among breastfeeding mothers (n=5,983)



653 ¹ In the third-child sample, thresholds were <18, 18, 19, and at least 20 weeks. Values are multivariable odds ratios, also adjusted for infant
654 characteristics (sex, birth weight), maternal characteristics (age at first child's birth, country of birth, education level, pre-pregnancy body mass index,
655 smoking status), paternal characteristics (age difference with mother, presence at delivery), family income, family type (traditional, step-family, single
656 parenthood), or study design-related characteristics (maternal region of residence, size of maternity unit, recruitment wave). In the second- and third-
657 child samples, models were also adjusted on previous maternal breastfeeding experience. Black circle/solid line: first child; grey diamond/solid line:
658 second child; grey triangle/dashed line: third child or more.

659 **Table 1. Sample characteristics according to child birth order (n=8,009)**

	First child (n=3,677)	Second child (n=3,100)	Third child or more (n=1,232)
Child's characteristics			
Boys	50.9% (1869)	52.0% (1610)	51.4% (632)
Birth weight (g)	3309 (423)	3433 (439)	3437 (463)
Gestational age (weeks)	39.5 (1.1)	39.5 (1.1)	39.3 (1.2)
Family characteristics			
Type of family			
Traditional	96.1% (3534)	93.1% (2887)	79.9% (984)
Single parenthood	1.3% (49)	0.6% (20)	1.5% (18)
Step family	2.6% (94)	6.2% (193)	18.7% (230)
Maternal age at first child (years)	29.3 (4.2)	28.3 (3.8)	26.1 (3.8)
< 25	10.6% (388)	14.3% (444)	32.4% (399)
25-29	44.7% (1644)	50.5% (1565)	50.4% (621)
30-34	33.2% (1222)	29.3% (909)	15.4% (190)
35 or more	11.5% (423)	5.9% (182)	1.8% (22)
Mother born abroad	5.7% (210)	5.8% (180)	8.8% (109)
Difference between parental ages			
Younger father	19.5% (718)	18.4% (570)	20.1% (248)
Same age	14.4% (529)	14.0% (435)	12.8% (158)
Father 1-2 years older	27.8% (1024)	27.1% (841)	25.4% (313)
Father 3-4 years older	23.0% (847)	24.9% (772)	23.0% (283)
Father at least 5 years older	15.2% (559)	15.5% (482)	18.7% (230)
Paternal presence at delivery	89.3% (3285)	88.6% (2747)	86.3% (1063)
Family income per consumption unit (€)	1980 (968)	1889 (2036)	1654 (1222)
Maternal education level			
Below secondary school	2.0% (74)	2.2% (69)	5.2% (64)
Secondary school	7.8% (288)	7.9% (246)	12.7% (156)
High school	15.1% (557)	15.4% (478)	17.4% (214)
2-year university degree	26.4% (970)	26.6% (826)	24.5% (302)
3-year university degree	22.0% (809)	23.2% (719)	19.6% (241)
At least 5-year university degree	26.6% (979)	24.6% (762)	20.7% (255)
Maternal body mass index (kg/m ²)	22.9 (4.3)	23.2 (4.4)	23.6 (4.4)
Maternal smoking			
Never smoker	57.2% (2102)	59.2% (1834)	61.8% (761)
Smoker only before pregnancy	27.2% (999)	25.7% (797)	22.7% (280)
Smoker only in early pregnancy	4.4% (163)	3.3% (101)	2.2% (27)
Smoker throughout pregnancy	11.2% (413)	11.9% (368)	13.3% (164)
Previous breastfeeding experience			
None		26.4% (818)	23.5% (290)
Yes, all children		73.6% (2282)	64.9% (800)
Yes, but not all			11.5% (142)
Any breastfeeding duration			
Never	25.2% (927)	25.7% (796)	24.6% (303)
<1 month	19.0% (699)	15.2% (471)	12.3% (151)

1 to <3 months	17.9% (660)	16.3% (504)	11.5% (142)
3 to <6 months	19.9% (733)	20.5% (636)	19% (234)
6 to <9 months	9.6% (354)	11.0% (342)	16.2% (200)
At least 9 months	8.3% (304)	11.3% (351)	16.4% (202)
Maternal type of employment			
Socioprofessional category			
Farmer, trader, artisan	3.5% (130)	3.5% (110)	3.2% (40)
Manager	23.8% (874)	23.6% (733)	19.5% (240)
Intermediate profession	29.2% (1074)	30.3% (938)	30.0% (369)
Employee	42.4% (1560)	41.4% (1282)	45.0% (554)
Worker	1.1% (39)	1.2% (37)	2.4% (29)
Tye of contract			
Non-permanent position	7.7% (265)	4.8% (139)	6.9% (79)
Permanent position	92.3% (3185)	95.2% (2779)	93.1% (1074)
Maternal return to work			
Infant age at maternal return to work			
< 10 weeks	22.2% (815)	19.1% (592)	3.7% (45)
10-13 weeks	45.9% (1689)	41.0% (1271)	4.8% (59)
14 weeks to <6 months	16.9% (620)	17.1% (529)	63.1% (777)
≥ 6 months	15.0% (553)	22.8% (708)	28.5% (351)
Infant age at the end of legal maternity leave*			
< 10 weeks	3.7% (135)	3.2% (99)	4.4% (54)
10 weeks	40.4% (1487)	39.2% (1214)	37.6% (463)
11-12 weeks	39.9% (1466)	43.3% (1343)	26.7% (329)
≥ 13 weeks	16.0% (589)	14.3% (444)	31.3% (386)
Time of return to work			
At least 1 week before legal end	29.3% (1076)	26.0% (806)	36.7% (452)
Legal duration ± 6 days	10.9% (401)	9.0% (278)	14.9% (183)
1-2 weeks after legal time	22.5% (826)	19.9% (618)	10.1% (125)
3-14 weeks after legal time	22.9% (841)	23.6% (731)	15.0% (185)
At least 15 weeks after legal time	14.5% (533)	21.5% (667)	23.3% (287)
Maternal working time			
Part-time in pregnancy	11.6% (428)	23.0% (714)	36.3% (447)
Full-time in pregnancy and not working at 1year	7.4% (271)	15.8% (489)	19.2% (236)
Full-time in pregnancy and part-time	11.7% (430)	25.4% (786)	18.3% (226)
Full-time in pregnancy and at 1year	69.3% (2548)	35.8% (1111)	26.2% (323)

660 ¹ In the third-child sample, thresholds were <18, 18, 19, and at least 20 weeks because the fully paid

661 postnatal maternity leave is 18 weeks in this group.

Table 2. Multivariate associations between infant's age at maternal return to work and breastfeeding initiation or duration (n=8,009)

	Initiation	Duration among breastfeeding women (ref: 3 to <6 months)			
		<1 month	1 to <3 months	6 to <9 months	≥ 9 months
Infant age at maternal return to work					
< 10 weeks	0.84 [0.71–0.98]	1.49 [1.20–1.86]	1.28 [1.03–1.59]	1.22 [0.92–1.61]	1.48 [1.10–1.98]
10-13 weeks	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]	1 [Ref]
14 weeks to <6 months	1.52 [1.26–1.82]	0.70 [0.56–0.87]	0.49 [0.39–0.61]	1.16 [0.92–1.46]	1.32 [1.02–1.70]
≥ 6 months	1.85 [1.54–2.22]	0.87 [0.69–1.08]	0.59 [0.47–0.74]	2.03 [1.61–2.57]	3.49 [2.75–4.44]

Values are multivariable odds ratios (95% confidence intervals), also adjusted for infant characteristics (sex, birth weight, birth order), maternal characteristics (age at first child's birth, parity, country of birth, education level, pre-pregnancy BMI, smoking status), paternal characteristics (age difference with mother, presence at delivery), family type (traditional, step-family, single parenthood), family income, previous maternal breastfeeding experience or study design-related characteristics (maternal region of residence, size of maternity unit, recruitment wave).

Table 3. Association between work-related variables, considered simultaneously, and initiation of any breastfeeding according to child birth order (n=8,009)

	First child (n=3,677)	Second child (n=3,100)	Third child or more (n=1,232)
Infant age at the end of legal maternity leave*	0.2	0.8	0.02
< 10 weeks	0.79 [0.5–1.23]	0.89 [0.45–1.80]	0.27 [0.10–0.70]
10 weeks	1 [Ref]	1 [Ref]	1 [Ref]
11-12 weeks	0.84 [0.70–1.00]	0.98 [0.76–1.25]	0.59 [0.34–1.00]
≥ 13 weeks	0.99 [0.76–1.27]	0.98 [0.68–1.42]	0.84 [0.51–1.38]
Time of return to work	<0.0001	0.09	0.03
At least 1 week before legal end	0.98 [0.75–1.29]	1.02 [0.67–1.56]	0.75 [0.41–1.36]
Legal duration ± 6 days	1 [Ref]	1 [Ref]	1 [Ref]
1-2 weeks after legal time	1.07 [0.80–1.43]	1.09 [0.69–1.72]	1.71 [0.73–4.02]
3-14 weeks after legal time	1.76 [1.30–2.38]	1.42 [0.91–2.22]	1.02 [0.49–2.14]
At least 15 weeks after legal time	2.16 [1.53–3.04]	1.49 [0.94–2.37]	1.67 [0.86–3.25]
Maternal working time	0.0006	0.05	0.8

Part-time in pregnancy	1.22 [0.94–1.59]	1.40 [1.02–1.90]	1.26 [0.76–2.09]
Full-time in pregnancy and not working at 1 year	1.20 [0.87–1.65]	1.58 [1.10–2.27]	1.04 [0.58–1.87]
Full-time in pregnancy and part-time	1.77 [1.34–2.35]	1.19 [0.89–1.58]	1.07 [0.59–1.96]
Full-time in pregnancy and at 1 year	1 [Ref]	1 [Ref]	1 [Ref]

¹ In the third-child sample, thresholds were <18, 18, 19, and at least 20 weeks. Values are multivariable odds ratios (95% confidence intervals), also adjusted for infant characteristics (sex, birth weight), maternal characteristics (age at first child’s birth, country of birth, education level, pre-pregnancy BMI, smoking status), paternal characteristics (age difference with mother, presence at delivery), family type (traditional, step-family, single parenthood), family income or study design-related characteristics (maternal region of residence, size of maternity unit, recruitment wave). In the second-child and third-child samples, models were also adjusted on previous maternal breastfeeding experience.