



**HAL**  
open science

# Association between planned mode of delivery and severe maternal morbidity in women with breech presentations: A secondary analysis of the PREMODA prospective general population study

Diane Korb, Thomas Schmitz, Sophie Alexander, Damien Subtil, Eric Verspyck, Catherine Deneux-Tharaux, François Goffinet

## ► To cite this version:

Diane Korb, Thomas Schmitz, Sophie Alexander, Damien Subtil, Eric Verspyck, et al.. Association between planned mode of delivery and severe maternal morbidity in women with breech presentations: A secondary analysis of the PREMODA prospective general population study. *Journal of Gynecology Obstetrics and Human Reproduction*, 2020, 49 (2), pp.101662. 10.1016/j.jogoh.2019.101662 . hal-03490114

**HAL Id: hal-03490114**

**<https://hal.science/hal-03490114>**

Submitted on 21 Jul 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

1 **Title:**

2 **Association between planned mode of delivery and severe maternal morbidity in women**  
3 **with breech presentations: a secondary analysis of the PREMODA prospective general**  
4 **population study**

5

6 Diane Korb<sup>1,2</sup>, Thomas Schmitz<sup>1,2</sup>, Sophie Alexander<sup>3</sup>, Damien Subtil<sup>4</sup>, Eric Verspyck<sup>5,6</sup>,  
7 Catherine Deneux-Tharaux<sup>1</sup>, François Goffinet<sup>1,7</sup>

8 **Author names and affiliations:**

9 <sup>1</sup> INSERM U1153, Obstetrical, Perinatal and Pediatric Epidemiology Research Team  
10 (EPOPé), Research Center for Epidemiology and Biostatistics Sorbonne Paris Cité (CRESS),  
11 Université de Paris, F-75014, France

12 <sup>2</sup> Department of Obstetrics and Gynecology, Robert Debré Hospital, APHP, Paris, France

13 <sup>3</sup> Perinatal Epidemiology and Reproductive Health Unit, Epidemiology, Biostatistics and  
14 Clinical Research Centre, Ecole de Santé Publique, Université Libre de Bruxelles, Brussels,  
15 Belgium

16 <sup>4</sup> Pôle Femme Mère nouveau-né, University Lille, CHU Lille, 59000 Lille, France;  
17 Épidémiologie et qualité des soins, University Lille, EA 2694, 59000 Lille, France

18 <sup>5</sup> Department of Obstetrics and Gynecology, Rouen University Hospital, Rouen, France

19 <sup>6</sup> Normandie University, UNIROUEN, EA "NeoVasc", Laboratory of Microvascular  
20 Endothelium and Neonate Brain Lesions, Rouen, France

21 <sup>7</sup> Port-Royal Maternity Unit, Cochin Hospital, APHP, Paris, France

22 **Corresponding author:** Diane Korb, [diane.korb@inserm.fr](mailto:diane.korb@inserm.fr)

23 **Disclosure of interests:**

24 The authors report no conflict of interest

25 **ABSTRACT**

26 **Background:** Neonatal morbidity among fetuses in breech presentation is not associated with  
27 planned mode of delivery in France. Data about consequences to these mothers are sparse.

28 **Methods:** The prospective PREMODA study took place in France and Belgium (2001-2002)  
29 in 138 maternity units and included all women with a singleton fetus in breech presentation  $\geq$   
30 37 weeks of gestation (n=8105). We excluded women with more than one previous cesarean  
31 delivery, an in utero fetal death, or for whom cesarean delivery or induction of labor was  
32 planned due to maternal disease. The composite variable "severe acute maternal morbidity"  
33 (SAMM) grouped severe events. Associations between planned modes of delivery and  
34 SAMM were estimated from multivariable Poisson regression models adjusted for potential  
35 confounders. A control group with fetuses in cephalic presentation enabled us to compare  
36 maternal complications by fetal presentation.

37 **Results:** Among the 7564 women included in the analysis, 5098 (67.4%) had a planned  
38 cesarean and 2466 (32.6%) a planned vaginal delivery; their SAMM rates did not differ:  
39 48/8098 (0.9%) versus 17/2466 (0.7%), respectively, with an adjusted risk ratio (aRR) of  
40 1.60, 95% confidence interval (95% CI) 0.81-3.15. The SAMM rate was significantly higher  
41 in the planned vaginal breech group than in the planned vaginal cephalic group: 17/2466  
42 (0.7%) versus 39/10156 (0.4%) (aRR 2.10, 95% CI 1.18-3.74).

43 **Conclusion:** In women with a fetus in breech presentation at term, the short-term risk of  
44 severe maternal morbidity did not differ significantly according to planned mode of delivery.

45

46 **KEYWORDS:**

47 breech, cesarean, severe maternal morbidity, planned vaginal delivery

48 **Introduction**

49 The debate about the mode of delivery for fetuses in breech presentation has focused  
50 principally on perinatal complications. An observational prospective study, PREMODA, [1]  
51 with high-quality data concerning obstetric practices in France and Belgium, showed that  
52 neonatal morbidity was not higher for women with a planned vaginal delivery (PVD)  
53 compared with a planned cesarean delivery (PCD) [1]. Nonetheless, in discussing the choice  
54 of mode of delivery with women whose fetus is in breech presentation, the benefits and risks  
55 of the alternatives must be assessed for the mother as well as her child. The literature about  
56 the assessment of maternal complications according to planned mode of delivery for these  
57 women is quite sparse. Moreover, the extrapolation of results found in populations in cephalic  
58 presentation is difficult because the indications for planned mode of delivery and the course  
59 of labor may have some specificities for breech presentations, such as a lower rate of maternal  
60 or obstetric disease among the planned cesareans, or a shorter labor in PVD.

61 The available data come principally from the international multicenter randomized controlled  
62 Term Breech Trial, which found no difference in maternal morbidity and mortality according  
63 to the planned mode of delivery [2]. The principal limitations of this secondary analysis of the  
64 Term Breech Trial were the small number of women included for estimating severe acute  
65 maternal morbidity (SAMM), the high rate of cesareans during labor, and a definition of  
66 maternal morbidity that combined events corresponding to very variable degrees of severity.  
67 Moreover, women were recruited primarily in middle-income countries. Data from  
68 observational studies also exist, with contradictory results and other limitations, including  
69 their retrospective nature, with a posteriori determinations of the planned mode of delivery,  
70 small numbers of subjects, and debatable definitions of maternal morbidity [3–13].

71 The main objective of this secondary analysis of the PREMODA cohort was to assess the  
72 association between maternal morbidity and planned mode of delivery in cases of breech

73 presentation. The constitution of a control group with fetuses in cephalic presentation also  
74 makes it possible to compare maternal complications in PVD according to fetal presentation.

### 75 **Material and methods:**

76 The population was that of the prospective PREMODA (PREsentation and MODE of  
77 delivery) study, which took place between June 1, 2001, and May 31, 2002, in 138 volunteer  
78 maternity units in France (including 232,999 births), and during the full year of 2002 in 36  
79 volunteer maternity units in Belgium (31,106 births). The PREMODA study enabled us to  
80 collect prospective data from a questionnaire specifically designed to assess the management  
81 of labor and delivery, neonatal health status, and maternal complications in pregnancies with a  
82 singleton fetus in breech presentation at term. The study included all women giving birth in  
83 one of the participating maternity units to a singleton fetus in breech presentation at term ( $\geq$   
84 37 weeks of gestation), alive or not (n=8105). The PCD group comprised the deliveries by  
85 cesareans performed before labor, cesareans that were planned but performed on an  
86 emergency basis after the onset of labor, and the vaginal deliveries performed even though a  
87 cesarean delivery had been planned. All other women were considered to belong to the PVD  
88 group.

89 To limit indication bias for this secondary analysis, we excluded the women for whom a  
90 cesarean or induction of labor took place because of maternal disease (n=285) (Figure 1).  
91 Moreover, we excluded women with a medically-indicated termination of pregnancy or in  
92 utero fetal death (n=20) and the women with more than one previous cesarean delivery  
93 (n=212). Finally, we excluded women with missing data for the principal endpoint (n=24).  
94 Accordingly the population study comprised 7564 women, 5098 (67.4%) in the PCD group  
95 and 2466 (32.6%) in the PVD group.

96 A control group included 11,310 singleton pregnancies in cephalic presentation at more than  
97 37 weeks, in the same units over the same period, who were assigned a delivery record

98 number that was a multiple of 20. This procedure provided a random selection of 5% of all  
99 the singleton cephalic term births (Figure 1). The same exclusion criteria were used for the  
100 fetuses in cephalic and in breech presentation. The comparison with the women with breech  
101 presentation only concerned the 10,156 women who had PVDs (Figure 1).

102 The principal endpoint of short-term severe acute maternal morbidity (SAMM) was a  
103 composite variable defined by the onset of at least one of the following events: maternal  
104 death, maternal transfer to intensive care, severe postpartum hemorrhage involving a blood  
105 transfusion (defined as the transfusion of at least one unit of packed red blood cells), a severe  
106 perineal complication associated with a transfusion (pelvic hematoma, major vaginal  
107 laceration), intraoperative complications of cesareans associated with a transfusion (uterine  
108 pedicle wound, hemostatic problems, bladder or ureteral wound), reoperation in surgical room  
109 with anesthesia whatever the mode of delivery, or pulmonary embolism.

110 Moreover, we used a composite criterion of less severe maternal morbidity which is a broader  
111 definition of severe maternal morbidity with a higher incidence and which closed to that used  
112 in the Term Breech Trial, which we call SAMM-TBT. It included the onset of at least one of  
113 the following events: maternal death, transfer to the ICU, fever lasting more than 48 hours or  
114 endometritis, postpartum hemorrhage or surgical blood loss of 1000 ml or more, abscess of  
115 the abdominal wall or episiotomy, pelvic hematoma (thrombus), major vaginal laceration,  
116 reoperation, deep phlebitis of the lower limbs, pulmonary embolism, intraoperative  
117 complications of a cesarean delivery (uterine pedicle wound, hemostatic difficulties, bladder  
118 or ureteral wound).

119 Among singleton pregnancies in breech presentation, we compared the characteristics of the  
120 women, pregnancies, neonates, and hospitals according to the planned mode of delivery,  
121 based on Chi<sup>2</sup> or Fisher's exact tests for categorical variables and Student's or Wilcoxon's  
122 rank sum tests for quantitative variables, as appropriate. To assess the association between the

123 planned mode of delivery and SAMM, while controlling for confounding by indication, we  
124 used multivariable Poisson regression modeling to estimate the risk ratios (RR) and 95%  
125 confidence intervals (95% CI) and to adjust for prognostic covariates, with a random intercept  
126 model to take variability between centers into account [14]. The reference group was the  
127 PVD. Potential confounders determined from previous literature included maternal country of  
128 birth (France, Belgium, other), maternal age (continuous variable), parity and previous  
129 cesarean delivery (nulliparous, parous without previous cesarean, parous with previous  
130 cesarean), birth weight (continuous variable), size of the maternity ward (<1000 deliveries per  
131 year, [1000-2000[, ≥2000). We also assessed the association between the actual mode of  
132 delivery and SAMM in women with PVD. The same analysis strategy was used to assess the  
133 association between fetal presentation and SAMM in women with PVD.

134 The proportion of women with missing data for each covariate ranged from 0% to 6%. Full  
135 data were available for 93% of women, and their characteristics were similar to those of the  
136 women with missing data. We used multiple imputation-chained equations to impute missing  
137 data and generated 7 independent imputation data sets.

138 All tests were two-sided with  $P$ -values  $\leq 0.05$  defined as statistically significant. STATA 13  
139 software (StataCorp LP, College Station, TX, USA) was used for the descriptive and  
140 multivariable analyses. The National Commission for Data Protection approved the study on  
141 May 9, 2001.

## 142 **Results :**

143 Among the 7564 women included, 5098 (67.4%) comprised the PCD group and 2466 (32.6%)  
144 the PVD group. Compared with the PCD group, women in the PVD group were more often  
145 born in France, had a lower educational level, were parous with no previous cesarean, had a  
146 fetus in frank breech presentation, were at a gestational age beyond 39 weeks, had a birth  
147 weight <90th percentile for gestational age and gave birth more often in maternity units

148 performing more than 2000 deliveries per year (Table 1). In the PVD group, the cesarean rate  
149 during labor was 711/2466 (28.8%), with their principal indication lack of progress in  
150 dilation. In the PCD group, the rate of cesareans during labor was 734/5098 (14.4%). The  
151 principal indications for planned cesareans were breech presentation (2043/5098; 47.1%),  
152 fetopelvic disproportion (900/5098; 20.7%), and maternal request (464/5098; 10.7%).

153 The SAMM rate was similar in the PCD and PVD groups in the univariate (respectively  
154 48/8098 (0.9%) and 17/2466 (0.7%);  $P=0.26$ ) and multivariable (aRR 1.60, 95% CI 0.81-  
155 3.15) analyses (Table 2). The principal maternal complication in both groups was reoperation:  
156 0.5% in the PCD group and 0.4% in the PVD group. Results were also similar with the  
157 SAMM-TBT outcome: 122/5098 (2.4%) in the PCD group versus 78/2466 (3.2%) in the PVD  
158 group ( $P= 0.0504$ ; adjusted RR: 0.77, 95% CI 0.53-1.12) (Appendix 2).

159 In the PVD group, the SAMM rate did not differ significantly between cesarean or vaginal  
160 deliveries: 1/711 (1.0%) versus 10/1755 (0.6%) respectively ( $P=0.26$ ; aRR: 1.14, 95% CI  
161 0.38-3.41). On the other hand, cesarean deliveries were significantly associated with an  
162 increased risk of SAMM-TBT compared with vaginal deliveries: 39/711 (5.5%) versus  
163 39/1755 (2.2%) respectively ( $P=0.001$ ). This significant difference persisted in the  
164 multivariable analysis (aRR 2.21, 95% CI 1.43-3.40).

165 Table 3 reports the general and obstetric characteristics of women with PVD according to  
166 fetal presentation. The cesarean rate was significantly higher in the group with breech than  
167 with cephalic presentations: 711/2466 (28.8%) versus 806/10156 (7.9%) ( $P < 0.001$ ). The  
168 characteristics of the maternity units did not differ between these groups. The SAMM rate  
169 was significantly higher in the breech than in the cephalic group: respectively, 17/2466 (0.7%)  
170 versus 39/10156 (0.4%) (cRR: 1.80, 95% CI 1.02-3.17). This significant difference persisted  
171 in the multivariable analysis (aRR: 2.10, 95% CI 1.18-3.74) (Table 4). In particular, the  
172 breech group underwent more reoperations than the cephalic group: 9/266 (0.4%) versus

173 11/10156 (0.1%). The SAMM rate for cesareans was low and similar in the breech and  
174 cephalic groups in PVD (1.0 vs 1.1% respectively,  $P=0.80$ ) (Appendix 3). Results were  
175 similar with the SAMM-TBT outcomes (Appendix 4).

176

## 177 **Discussion**

178 Among women with a fetus in breech presentation at term, the short-term risk of SAMM did  
179 not differ significantly according to the planned mode of delivery.

180 This result is consistent with those from the randomized Term Breech Trial [2]. Nonetheless  
181 its results were difficult to generalize. That is, besides the use of different obstetric practices  
182 during labor, the intrapartum cesarean rate in their PVD group was different from that  
183 observed in French practice (36.1% compared with 29.0% in PREMODA) [1, 2]. Another  
184 limitation of the Term Breech Trial was its definition of maternal morbidity to include events  
185 with varying degrees of severity; for example, it combined a *postpartum hemorrhage* >1 L  
186 and such wall complications as a simple scar dehiscence. In the retrospective studies  
187 published, planned mode of delivery was defined a posteriori, and the results are difficult to  
188 interpret because of the different definitions of maternal morbidity, the highly various  
189 obstetric practices with very different rates of PVD and actual vaginal delivery [3–13].

190 Among the women with PVD, we found no differences in SAMM between cesarean and  
191 vaginal deliveries, but this result must be interpreted with prudence, for this broad definition  
192 of maternal morbidity (SAMM-TBT) produces a significant excess of maternal complications  
193 in the women with cesareans.

194 Maternal morbidity according to planned mode of delivery for cephalic presentation has been  
195 extensively studied with results that are difficult to interpret because of potentially strong  
196 indication bias for the planned cesareans. Only a few studies have taken this indication bias  
197 into account to be able to provide high-quality data. A retrospective Chinese study that

198 compared PCDs for maternal convenience to PVDs did not find a difference in the onset of  
199 maternal morbidity events [17]. Nonetheless the generalization of these results was limited by  
200 the single-center nature of the study and the absence of information about the risk level of the  
201 study population. A Canadian study in the general population compared PCDs for breech  
202 presentation to PVDs, mostly of fetuses in cephalic presentation, after the exclusion of  
203 potential indication biases; it showed an excess risk of SAMM in the PCD group [15]. A  
204 French case-control study in the general population took indication bias into account by  
205 selection of the population and by a propensity score analysis. It reported an excess risk of  
206 SAMM for PCDs compared with PVDs among women aged 35 years and older [16].  
207 Accordingly, the data tend to indicate that PCD is associated with an excess rate of SAMM.  
208 Compared with the situation with cephalic presentations, the risk of SAMM according to  
209 planned mode of delivery for fetuses in breech presentation may be different. On the one  
210 hand, indications for PCDs are different than those in situations involving cephalic  
211 presentation and are often unrelated to maternal risks. On the other hand, in PVDs, the  
212 decisions and obstetric practices for breech and cephalic deliveries differ, such as those for the  
213 duration of the first and second stage of labor and for the risk of cesarean and operative  
214 vaginal deliveries. Accordingly, as for perinatal risk, knowledge of maternal risk specifically  
215 in the case of breech presentation is important to enable women to make their decisions about  
216 mode of delivery in this situation.

217 An excess of maternal complications in breech compared with cephalic presentations among  
218 women with PVD has also been reported in a retrospective hospital study in Norway with a  
219 rather small number of individuals [13]. The excess in the Danish study was explained by the  
220 higher frequency of cesareans for breech presentations and the higher risk of maternal  
221 morbidity in cesarean compared with vaginal deliveries, regardless of presentation. Our study  
222 reports similar results with, in addition for the PVDs, a risk of SAMM that, while not

223 significant, was twice as high in breech as in cephalic presentations. Other factors may help to  
224 explain the excess of SAMM in the cases of PVD for the breech deliveries. Accordingly,  
225 some risk factors for hemorrhage have been reported to be associated with breech  
226 presentation, such as fibroids or a low-lying placenta [18-21]. These results comparing  
227 SAMM according to fetal presentation must be explored in other databases with larger  
228 numbers of individuals. Finally, this excess maternal risk for breech compared with cephalic  
229 presentations is information that is difficult to integrate into the decision for mode of delivery  
230 specifically for breech because the alternative is not the presentation but the planned mode of  
231 delivery.

232 Our study has several strengths. Its prospective nature enabled a reliable characterization of  
233 the actual plans for delivery. The PREMODA general population study is representative of  
234 the population of French pregnant women except for the proportion of deliveries in private  
235 establishments [1]. The inclusion of all the pregnancies with a fetus in breech presentation in  
236 each maternity ward during the study period ensures that these results are representative of the  
237 obstetric practices of the participating maternity units and enabled the inclusion of enough  
238 women to provide a power of 78% to show a doubling of the risk of SAMM in the PCD group  
239 (with a risk of 0.7%). The definition of the SAMM takes into account only severe events that  
240 affect maternal health and that are simultaneously independent of obstetric practices. Finally,  
241 the indication bias was taken into account by excluding the situations at risk of SAMM and by  
242 adjusting for the available confounding factors.

243 This study has several limitations. The data are old, although we note that obstetric practices  
244 for breech presentation have changed little in France. Management of labor is probably the  
245 same, in the absence of new guidelines from CNGOF, and the cesarean rate for breech  
246 presentations has not changed over the past decade [28,29]. Inversely, practices during labor  
247 for cephalic presentations have changed, with longer durations of labor authorized, especially

248 in view of recent guidelines by the ACOG and the SMFM, as well as by the CNGOF and the  
249 CNSF [30,31]. We had only sparse specific data about maternal complications during  
250 pregnancy, although they might be a source of indication bias. Accordingly, our criteria for  
251 exclusion and for adjustment are limited. As the assessment of maternal morbidity was not the  
252 principal objective of the PREMODA study, some maternal morbidity events may not have  
253 been collected. Moreover, this data collection was limited to the immediate postpartum  
254 period. We were also unable to study SAMM with a validated definition, such as that  
255 resulting from the EPIMOMS Delphi process [32]. Finally our results can be extrapolated  
256 only to centers with similar obstetric practices.

257 The results we report are important in the debate about the mode of delivery for fetuses in  
258 breech presentation, in view both of the very sparse data reported in the literature about  
259 SAMM according to planned mode of delivery in this setting and of the improbability of new  
260 data from a new randomized trial or prospective study in the general population. Finally, in  
261 the PREMODA study, we found no association between planned mode of delivery and either  
262 maternal or neonatal short-term acute morbidity among breech presentations. Our results have  
263 implications for clinical practice and can be useful when discussing choices of planned mode  
264 of delivery with women.

265 **References**

- 266 [1] Goffinet F, Carayol M, Foidart J-M, Alexander S, Uzan S, Subtil D, et al. Is planned  
267 vaginal delivery for breech presentation at term still an option? Results of an observational  
268 prospective survey in France and Belgium. *Am J Obstet Gynecol* 2006;194(4):1002–11.  
269 <https://doi.org/10.1016/j.ajog.2005.10.817>
- 270 [2] Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR. Planned  
271 caesarean section versus planned vaginal birth for breech presentation at term: a randomised  
272 multicentre trial. Term Breech Trial Collaborative Group. *Lancet Lond Engl*  
273 2000;356(9239):1375–83. [https://doi.org/10.1016/S0140-6736\(00\)02840-3](https://doi.org/10.1016/S0140-6736(00)02840-3)
- 274 [3] Leiberman JR, Fraser D, Mazor M, Chaim W, Karplus M, Katz M, et al. Breech  
275 presentation and cesarean section in term nulliparous women. *Eur J Obstet Gynecol Reprod*  
276 *Biol*;61(2):111–5.
- 277 [4] Schiff E, Friedman SA, Mashiach S, Hart O, Barkai G, Sibai BM. Maternal and neonatal  
278 outcome of 846 term singleton breech deliveries: seven-year experience at a single center. *Am*  
279 *J Obstet Gynecol* 1996;175(1):18–23. [https://doi.org/10.1016/S0002-9378\(96\)70244-2](https://doi.org/10.1016/S0002-9378(96)70244-2)
- 280 [5] Irion O, Hirsbrunner Almagbaly P, Morabia A. Planned vaginal delivery versus elective  
281 caesarean section: a study of 705 singleton term breech presentations. *Br J Obstet Gynaecol*  
282 1998;105(7):710–7.
- 283 [6] Sanchez-Ramos L, Wells TL, Adair CD, Arcelin G, Kaunitz AM, Wells DS. Route of  
284 breech delivery and maternal and neonatal outcomes. *Int J Gynaecol Obstet Off Organ Int Fed*  
285 *Gynaecol Obstet* 2001;73(1):7–14. [https://doi.org/10.1016/S0020-7292\(00\)00384-2](https://doi.org/10.1016/S0020-7292(00)00384-2)
- 286 [7] Golfier F, Vaudoyer F, Ecochard R, Champion F, Audra P, Raudrant D. Planned vaginal  
287 delivery versus elective caesarean section in singleton term breech presentation: a study of  
288 1116 cases. *Eur J Obstet Gynecol Reprod Biol* 2001;98(2):186–92. [https://doi.org/](https://doi.org/10.1016/S0301-2115(01)00333-5)  
289 [10.1016/S0301-2115\(01\)00333-5](https://doi.org/10.1016/S0301-2115(01)00333-5)

- 290 [8] Kumari AS, Grundsell H. Mode of delivery for breech presentation in grandmultiparous  
291 women. *Int J Gynaecol Obstet Off Organ Int Fed Gynaecol Obstet* 2004;85(3):234–9.  
292 <https://doi.org/10.1016/j.ijgo.2003.11.017>
- 293 [9] Toivonen E, Palomäki O, Huhtala H, Uotila J. Selective vaginal breech delivery at term -  
294 still an option. *Acta Obstet Gynecol Scand* 2012;91(10):1177–83.  
295 <https://doi.org/10.1111/j.1600-0412.2012.01488.x>
- 296 [10] Gannard-Pechin E, Ramanah R, Desmarests M, Maillet R, Riethmuller D. Term breech  
297 presentations in singleton pregnancies: a continuous series of 418 cases. *J Gynecol Obstet*  
298 *Biol Reprod (Paris)* 2013;42(7):685–92. <https://doi.org/10.1016/j.jgyn.2013.01.001>
- 299 [11] Borbolla Foster A, Bagust A, Bisits A, Holland M, Welsh A. Lessons to be learnt in  
300 managing the breech presentation at term: an 11-year single-centre retrospective study. *Aust*  
301 *N Z J Obstet Gynaecol* 2014;54(4):333–9. <https://doi.org/10.1111/ajo.12208>
- 302 [12] Mattila M, Rautkorpi J, Heikkinen T. Pregnancy outcomes in breech presentation  
303 analyzed according to intended mode of delivery. *Acta Obstet Gynecol Scand*  
304 2015;94(10):1102–4. <https://doi.org/10.1111/aogs.12703>
- 305 [13] Belfrage P, Gjessing L. The term breech presentation. A retrospective study with regard  
306 to the planned mode of delivery. *Acta Obstet Gynecol Scand* 2002;81(6):544–50.  
307 <https://doi.org/10.1034/j.1600-0412.2002.810612.x>
- 308 [14] Zou G. A modified poisson regression approach to prospective studies with binary data.  
309 *Am J Epidemiol* 2004;159(7):702–6. <https://doi.org/10.1093/aje/kwh090>
- 310 [15] Liu S, Liston RM, Joseph KS, Heaman M, Sauve R, Kramer MS, et al. Maternal  
311 mortality and severe morbidity associated with low-risk planned cesarean delivery versus  
312 planned vaginal delivery at term. *CMAJ Can Med Assoc J J Assoc Medicale Can* 2007  
313 ;176(4):455–60. <https://doi.org/10.1503/cmaj.060870>

- 314 [16] Korb D, Goffinet F, Seco A, Chevret S, Deneux-Tharaux C. Risk of severe maternal  
315 morbidity associated with cesarean delivery and the role of maternal age: a population-based  
316 propensity score analysis. *Can Med Assoc J* 2019;191(13):E352–60.  
317 <https://doi.org/10.1503/cmaj.181067>
- 318 [17] Liu X, Landon MB, Cheng W, Chen Y. Cesarean delivery on maternal request in China:  
319 what are the risks and benefits? *Am J Obstet Gynecol* 2015;212(6):817.e1-9.  
320 <https://doi.org/10.1016/j.ajog.2015.01.043>
- 321 [18] Coronado GD, Marshall LM, Schwartz SM. Complications in pregnancy, labor, and  
322 delivery with uterine leiomyomas: a population-based study. *Obstet Gynecol* 2000;95(5):764–  
323 9.
- 324 [19] Stout MJ, Odibo AO, Graseck AS, Macones GA, Crane JP, Cahill AG. Leiomyomas at  
325 routine second-trimester ultrasound examination and adverse obstetric outcomes. *Obstet*  
326 *Gynecol* 2010;116(5):1056–63. <https://doi.org/10.1097/AOG.0b013e3181f7496d>
- 327 [20] Ford JB, Roberts CL, Nassar N, Giles W, Morris JM. Recurrence of breech presentation  
328 in consecutive pregnancies. *BJOG Int J Obstet Gynaecol* 2010;117(7):830–6.  
329 <https://doi.org/10.1111/j.1471-0528.2010.02576.x>
- 330 [21] Roberts CL, Algert CS, Peat B, Henderson-Smart D. Small fetal size: a risk factor for  
331 breech birth at term. *Int J Gynaecol Obstet Off Organ Int Fed Gynaecol Obstet* 1999;67(1):1–  
332 8. [https://doi.org/10.1016/S0020-7292\(99\)00116-2](https://doi.org/10.1016/S0020-7292(99)00116-2)
- 333 [22] Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, et al. Short-term and  
334 long-term effects of caesarean section on the health of women and children. *The Lancet*  
335 2018;392(10155):1349–57. [https://doi.org/10.1016/S0140-6736\(18\)31930-5](https://doi.org/10.1016/S0140-6736(18)31930-5)
- 336 [23] Keag OE, Norman JE, Stock SJ. Long-term risks and benefits associated with cesarean  
337 delivery for mother, baby, and subsequent pregnancies: Systematic review and meta-analysis.  
338 *PLoS Med* 2018;15(1):e1002494. <https://doi.org/10.1371/journal.pmed.1002494>

339 [24] Boujenah J, Fleury C, Bonneau C, Pharisien I, Tigaizin A, Carbillon L. Successful  
340 external cephalic version is an independent factor for caesarean section during trial of labor -  
341 a matched controlled study. *J Gynecol Obstet Hum Reprod* 2017;46(10):737–42.  
342 <https://doi.org/10.1016/j.jogoh.2017.09.001>

343 [25] Basu A, Flatley C, Kumar S. Intrapartum intervention rates and perinatal outcomes  
344 following successful external cephalic version. *J Perinatol Off J Calif Perinat Assoc*  
345 2016;36(6):439–42. <https://doi.org/10.1038/jp.2015.220>

346 [26] Chan LY, Tang JL, Tsoi KF, Fok WY, Chan LW, Lau TK. Intrapartum cesarean delivery  
347 after successful external cephalic version: a meta-analysis. *Obstet Gynecol* 2004;104(1):155–  
348 60. <https://doi.org/10.1097/01.AOG.0000129240.54949.d2>

349 [27] de Hundt M, Velzel J, de Groot CJ, Mol BW, Kok M. Mode of delivery after successful  
350 external cephalic version: a systematic review and meta-analysis. *Obstet Gynecol*  
351 2014;123(6):1327–34. <https://doi.org/10.1097/AOG.0000000000000295>

352 [28] Le Ray C, Prunet C, Deneux-Tharaux C, Goffinet F, Blondel B. Classification de  
353 Robson : un outil d'évaluation des pratiques de césarienne en France. *J Gynécologie*  
354 *Obstétrique Biol Reprod* 2015;44(7):605–13. <https://doi.org/10.1016/j.jgyn.2015.02.001>

355 [29] Blondel B, Coulm B, Bonnet C, Goffinet F, Le Ray C. Trends in perinatal health in  
356 metropolitan France from 1995 to 2016: Results from the French National Perinatal Surveys.  
357 *J Gynecol Obstet Hum Reprod* [Internet]. 2017 Oct [cited 2017 Dec 2]; Available from:  
358 <http://linkinghub.elsevier.com/retrieve/pii/S2468784717301848>

359 [30] American College of Obstetricians and Gynecologists, Society for Maternal-Fetal  
360 Medicine. Obstetric care consensus no. 1: safe prevention of the primary cesarean delivery.  
361 *Obstet Gynecol* 2014;123(3):693–711. <https://doi.org/10.1097/01.AOG.0000444441.04111.1d>

363 [31] Dupont C, Carayol M, Le Ray C, Deneux-Tharaux C, Riethmuller D, Clinical practice  
364 guidelines group. Oxytocin administration during spontaneous labor: Guidelines for clinical  
365 practice. Guidelines short text. J Gynecol Obstet Hum Reprod 2017;46(6):539–43.  
366 <https://doi.org/10.1016/j.jogoh.2017.04.010>

367 [32] Deneux-Tharaux C, Bouvier-Colle MH for the EPIMOMS study group. Severe acute  
368 maternal morbidity in France: the epimoms population-based study American Journal of  
369 Obstetrics & Gynecology, Vol. 216, Issue 1, S345–S346.

370 [33] Blomquist JL, Muñoz A, Carroll M, Handa VL. Association of Delivery Mode With  
371 Pelvic Floor Disorders After Childbirth. JAMA 2018;320(23):2438.  
372 <https://doi.org/10.1001/jama.2018.18315>

373 [34] Larsson C, Hedberg CL, Lundgren E, Söderström L, TunÖn K, Nordin P. Anal  
374 incontinence after caesarean and vaginal delivery in Sweden: a national population-based  
375 study. Lancet Lond Engl 2019;393(10177):1233–9. <https://doi.org/10.1016/S0140->  
376 [6736\(18\)32002-6](https://doi.org/10.1016/S0140-6736(18)32002-6)

377

378 **Acknowledgments**

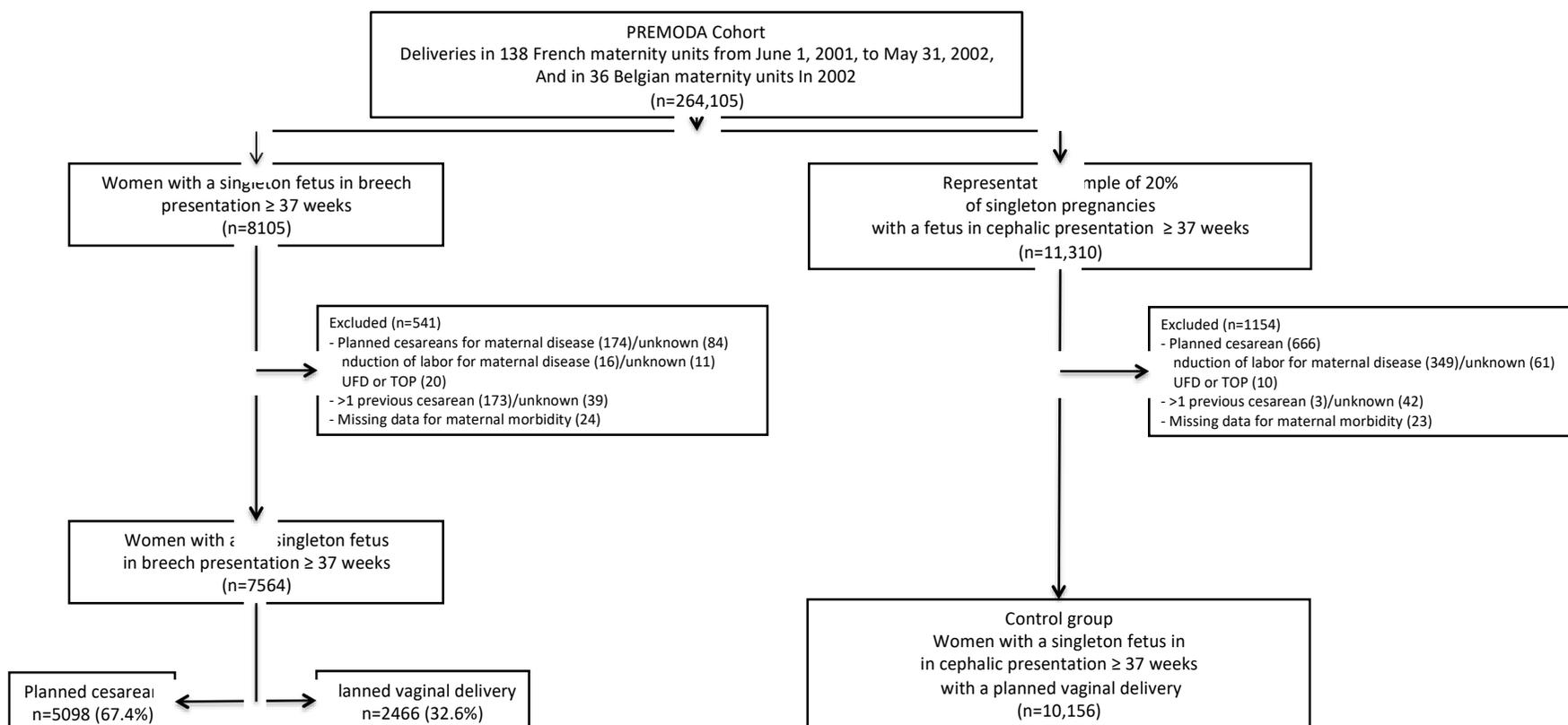
379 This study was mainly supported by two grants from the Ministry of Health [AOM01123  
380 (PH-RC 2001) and AOM03040 (PH- RC 2003)]. It was also partly funded by the French  
381 College of Gynecologists and Obstetricians, the French Society of Perinatal Medicine and the  
382 Belgian National Funds for Scientific Research. The funding sources had no role in the study  
383 design, data collection, data interpretation or the writing of the report.

384

385 **Funding**

386 Supported by 2 grants from the Ministry of Health (AOM01123 [PH-RC 2001] and  
387 AOM03040 [PH-RC 2003]). It was also partly funded by the French College of  
388 Gynecologists and Obstetricians, the French Society of Perinatal Medicine, and the Belgian  
389 National Funds for Scientific Research. The funding sources had no role in the study design,  
390 data collection, data interpretation, or the writing of the report.

**Figure 1: Study population**



**Table 1: Characteristics of mothers, pregnancies, deliveries, and newborns according to planned mode of delivery in women with breech pregnancy**

		Planned mode of delivery		<i>P</i>
		Planned caesarean N = 5098 n (%)	Planned vaginal N = 2466 n (%)	
Maternal age	mean +/- DS (years)	29.5+/-5.0	29.4+/-5.0	0.292
	<21 y	268 (5.3)	162 (6.7)	0.061
	22-34 y	3 990 (79.0)	1 895 (77.9)	
	≥35 y	794 (15.7)	375 (15.4)	
Geographic origin				<0.001
	French	3445 (61.4)	1766 (75.4)	
	Belgian	599 (12.4)	143 (6.1)	
	European	232 (4.8)	108 (4.6)	
	North African	291 (6.0)	182 (7.8)	
	Sub-Saharan African	109 (2.3)	57 (2.4)	
	Other	152 (3.2)	86 (3.7)	
Educational level				0.001
	Primary school or less	151 (3.0)	96 (3.9)	
	Middle school	805 (15.8)	445 (18.1)	
	Secondary school	852 (16.7)	348 (14.1)	
	Postsecondary	1685 (33.1)	842 (34.1)	
	Not specified	1605 (31.5)	735 (29.8)	
Parity and previous cesarean				<0.001
	Nulliparous	3083 (60.7)	1165 (47.3)	
	Parous without previous cesarean	1309 (25.8)	1256 (51.0)	
	Parous with previous cesarean	691 (13.6)	41 (1.7)	
Type of breech				<0.001
	Complete breech	1273 (30.3)	621 (26.3)	
	Frank breech	2808 (66.8)	1633 (69.1)	
	Unspecified	122 (2.9)	108 (4.6)	
Mode of delivery				<0.001
	Cesarean before labor	4339 (85.1)	0	
	Cesarean during labor	734 (14.4)	711 (28.8)	
	Vaginal delivery	25 (0.5)	1755 (71.2)	
Reasons for cesarean before labor				
	Breech	2043 (47.1)	0	
	Fetopelvic disproportion	900 (20.7)	0	
	Previous cesarean	398 (9.2)	0	
	Patient's request	464 (10.7)	0	
	Fetal condition	177 (4.1)	0	
	Maternal gestational disease	0	0	

	Other reasons	357 (8.3)	0	
Reasons for cesarean during labor				
	Planned cesarean section	734	0	
	Failure to progress	0	179 (25.4)	
	FHR anomalies	0	77 (11.4)	
	Failure to progress and FHR anomalies	0	100 (14.8)	
	Other reasons	0	321 (47.4)	
	Episiotomy, simple tear	42 (1.0)	1469 (62.8)	<0.001
	Repair of anal sphincter (partial or complete)	1 (0.02)	11 (0.5)	<0.001
Gestational age				
	<39 weeks	2476 (48.6)	759 (30.8)	
	39-40 weeks	2356 (46.3)	1377 (55.9)	
	≥41 weeks	260 (5.1)	329 (13.4)	
Birth weight for gestational age				
	mean +/- DS (grams)	3189 +/- 449	3149 +/- 429	<0.001
	<10th	212 (4.2)	145 (5.9)	
	≥10th and <90th	4197 (82.8)	2109 (86.1)	
	≥90th	657 (13.0)	196 (8.0)	
<b>Maternity hospital</b>				
Size of the maternity ward (births per y)				
	<1000	630 (12.4)	232 (9.4)	<0.001
	1000 and 2000	2241 (44.0)	1069 (43.4)	
	≥2000	2227 (43.7)	1165(47.2)	
Maternity level of care				
	I	810 (19.0)	417 (18.7)	0.218
	II	1980 (46.5)	1000 (44.7)	
	III	1468 (34.5)	819 (36.6)	

Table 2: Rate and components of severe acute maternal morbidity according to the planned mode of delivery in women with a fetus in breech presentation

	<b>Planned cesarean</b>	<b>Planned vaginal delivery</b>	<b>crude RR (95% CI)</b>	<b>adjusted RR:* (95% CI)</b>
	<b>n=5098</b>	<b>n= 2466</b>		
	<b>n (%)</b>	<b>n (%)</b>		
<b>Composite criterion of severe maternal morbidity and mortality</b>	48 (0,9)	17 (0,7)	1,37 (0,79-2,37)	1.60 (0.81-3.15)
Maternal death	0	0		
Transfer to the ICU	12 (0.2)	4 (0.2)		
Reoperation	24 (0.5)	9 (0.4)		
Postpartum hemorrhage and blood transfusion	10 (0.2)	5 (0.2)		
Intraoperative complications if cesarean and transfusion	14 (0.3)	2 (0.1)		
Severe perineal complications and transfusion	0	0		
Pulmonary embolism	4 (0.08)	1 (0.04)		

\*adjusted for geographic origin, maternal age, parity and previous cesarean, size of the maternity ward, birth weight

**Table 3: Characteristics of mothers, pregnancies, deliveries, and neonates according to fetal presentation in women with planned vaginal delivery**

	<b>Breech</b> <b>N = 2466</b> <b>n (%)</b>	<b>Cephalic</b> <b>N = 10,156</b> <b>n (%)</b>	<b>p</b>
Maternal age			
mean +/- DS	29.4+/-5.0	29.0 +/- 5.2	<0.001
<21 y	162 (6.7)	796 (7.9)	0.082
22-34 y	1895 (77.9)	7786 (77.5)	
≥35 y	375 (15.4)	1467 (14.6)	
Geographic origin			<0.001
French	1766 (72.4)	6728 (66.9)	
Belgian	143 (5.9)	766 (7.6)	
European	108 (4.4)	461 (4.6)	
North African	182 (7.5)	867 (8.6)	
Sub-Saharan African	57 (2.3)	347 (3.5)	
Other	86 (3.5)	399 (4.0)	
Unspecified	99 (4.1)	486 (4.8)	
Educational level			<0.001
Primary school or less	96 (3.9)	444 (4.4)	
Middle school	445 (18.1)	1785 (17.6)	
Secondary school	348 (14.1)	1458 (14.4)	
Postsecondary	842 (34.1)	2995 (29.5)	
Not specified	735 (29.8)	3474 (34.2)	
Parity and previous cesarean			<0.001
Nulliparous	1165 (47.3)	4452 (43.9)	
Parous without previous cesarean	1256 (51.0)	5143 (50.7)	
Parous with previous cesarean	41 (1.7)	540 (5.3)	
Gestational age			<0.001
<39 weeks	759 (30.8)	2074 (20.5)	
39-40 weeks	1377 (55.9)	6124 (60.6)	
≥41 weeks	329 (13.4)	1912 (18.9)	
Induction of labor	199 (8.1)	2095 (20.6)	<0.001
Rupture of membranes			<0.001
Premature	490 (21.3)	1608 (16.2)	
Spontaneous during labor	1203 (52.3)	2815 (28.3)	
Artificial during labor	525 (22.8)	5470 (55.1)	
During cesarean	84 (3.7)	41 (0.4)	
Lack of progress in dilatation			<0.001
None	1789 (79.5)	7775 (83.2)	
At least 1 failure to progress ≥1 h	221 (9.8)	701 (7.5)	
At least 1 failure to progress ≥2 h	208 (9.1)	681 (7.3)	
At least 2 episodes of failure to progress ≥1 h	35 (1.6)	190 (2.0)	
Oxytocin augmentation without labor induction	1272 (71.3)	5467 (65.4)	<0.001

Mode of delivery				<0.001
Cesarean during labor	711 (28.8)	806 (7.9)		
Vaginal delivery	1755 (71.2)	9350 (92.1)		
Cervical dilation of cesarean during labor	5.9	5.5		0.001
Reasons for cesarean during labor				<0.001
Failure to progress	179 (26.4)	258 (33.0)		
FHR anomalies	77 (11.4)	219 (28.0)		
Failure to progress and FHR anomalies	100 (14.8)	221 (28.3)		
Other reasons	321 (47.4)	84 (10.7)		
Birth weight for gestational age				
Mean +/- DS	3149 +/- 429	3352 +/- 442		<0.001
<10th	145 (5.9)	285 (2.6)		<0.001
≥10th and <90th	2 109 (86.1)	8 191 (81.2)		
≥90th	196 (8.0)	1 645 (16.3)		
<b>If vaginal delivery</b>				
Duration of first stage of labor between 5 and 10 cm dilation				0.026
<4h	1166 (81.3)	6880 (84.1)		
4-6 h	244 (17.0)	1170 (14.3)		
≥7 h	24 (1.7)	131 (1.6)		
Duration of passive phase of second stage of labor				<0.001
<30 min	1049 (63.5)	6102 (69.0)		
30-60 min	298 (18.0)	1342 (15.2)		
≥60 min	306 (18.5)	1396 (15.8)		
Duration of active phase of second stage of labor				<0.001
<30 min	1608 (93.9)	8167 (89.4)		
30-60 min	101 (5.9)	926 (10.1)		
≥60 min	4 (0.2)	43 (0.5)		
Episiotomy, simple perineal tear	1469 (62.8)	6097 (61.1)		0.136
Repair of anal sphincter (partial or complete)	11 (0.5)	86 (0.9)		0.054
<b>Maternity hospital</b>				
Size (births per y)				0.21
<1000	232 (9.4)	1039 (10.2)		
1000 and 2000	1069 (43.4)	4500 (44.3)		
≥2000	1165(47.2)	4617 (45.5)		
Maternity level of care				0.794
I	417 (18.7)	1624 (18.1)		
II	1000 (44.7)	4067 (45.4)		
III	819 (36.6)	3266 (36.5)		

\* Many teams have a set of maneuvers they use routinely for breech deliveries, even when no difficulties arise.

Table 4: Rate and components of severe acute maternal morbidity according to fetal presentation in women with planned vaginal delivery

	<b>Breech</b>	<b>Cephalic</b>	<b>Crude RR (95% CI)</b>	<b>Adjusted RR* (95% CI)</b>
	<b>n= 2466</b>	<b>n=10,156</b>		
	<b>n (%)</b>	<b>n (%)</b>		
<b>Composite criterion of severe maternal morbidity and mortality</b>	17 (0.7)	39 (0.4)	1.80 (1.02-3.17)	2.10 (1.18-3.74)
Maternal death	0	0		
Transfer to the ICU	4 (0.2)	16 (0.2)		
Reoperation	9 (0.4)	11 (0.2)		
Postpartum hemorrhage and blood transfusion	5 (0.2)	16 (0.2)		
Intraoperative complications and transfusion	2 (0.08)	3 (0.03)		
Severe perineal complications and transfusion	0	2 (0,02)		
Pulmonary embolism	1 (0.04)	0		

\*adjusted for geographic origin, maternal age, parity and previous cesarean, size of the maternity ward, birth weight

## **Appendix 1:**

### **1.A. PREMODA Study Group**

Writing Committee: F. Goffinet, M. Carayol, J. M. Foidart, G. Bréart.

Scientific Committee: F. Goffinet, S. Alexander, J. M. Foidart, S. Uzan, D. Subtil, G. Bréart.

Data Monitoring and Analysis Committee: M. Carayol, F. Goffinet, D. Subtil, S. Alexander, J. M. Foidart, G. Bréart. Independent Expert Committee: Pediatricians: Pr U Simeoni (TIMONE Hospital, Marseille, France); Pr JC Rozé (Mother and Children's Hospital, Nantes, France); Pr JB Gouyon (Dijon University Hospital, France); Pr P Lequien (Jeanne de Flandre Hospital, Lille, France); P.H. Jarreau (Port-Royal Maternity, Cochin Hospital, Paris, France); Pr D Haumont (Saint-Pierre University Hospital, Brussels, Belgium). Obstetricians: Pr F Puech (Jeanne de Flandre Hospital, Lille, France); Pr P Gaucherand (Croix-Rousse Hospital, Lyon, France)

### **1.B. List of 138 French maternity units participating in PREMODA study:**

Région Alsace: Coordinator: Pr Langer: CHU de Strasbourg (Pr Langer), CMCO de Schiltigheim (Dr Vayssiere), CHR de Haguenau (Dr Lehmann), CMC de Colmar (Dr Kutnahorsky), CHR de Mulhouse (Dr Wiedemann), Clinique Sainte Anne, Strasbourg (Dr Jeanmougin), Clinique Diaconat, Mulhouse (Dr Blum); Basse-Normandie: Coordinator: Pr Dreyfus: CHU de Caen (Pr Dreyfus/Dr Denoual-Ziad), CH de Cherbourg (Dr Ulmann), CH de Lisieux (Dr Zerger), CH de Saint Lo (Dr Refahi), CH de Flers (Dr André), CH de la Ferté Macé (Dr Nelle), Région Bretagne: Coordinator: Pr Grall: CHU de Brest (Pr Collet), CHU Hôtel Dieu, Rennes (Pr Poulain), CHU Hôpital Sud, Rennes (Mme Pérrigot), CH de Lorient (Dr Getin), Clinique mutualiste de la Sagesse, Rennes (Dr Aussel), CH de Saint Briec (Dr Giono-Renaud), CH de Saint Malo (Dr Weyl), CH de Vannes (Mme Pierson), CH de

Cornouaille (Dr Germain) Région Centre: Coordinator: Pr Perrotin: CHU Bretonneau, Tours (Dr Alonso), CHU Beffroi, Tours (Dr Rapp), CH de Blois (Dr Montmasson), CHR d'Orléans (Dr Ceccaldi), CHG de Chartres (Dr Guilbaud) Région Franche-Comté: Coordinator: Pr Schaal: CHU de Besançon (Dr Riethmuller), CHG de Montbéliard (Dr Zurlinden), CHG de Belfort (Dr Terzibachian) Région Haute-Normandie: Coordinator: Pr Verspyck: CHU de Rouen (Pr Verspyck), CH de Mont Saint Aignan (Dr Fournet), CH du Havre (Dr Degré), CH d'Elbeuf (Dr Paquet), CH de Dieppe (Dr Gandour), Clinique Saint- Romain, Rouen (Dr Thobois) Région Ile de France: Réseau Sud Ouest Francilien: Coordinator: Dr Audibert: CHU de Clamart (Dr Audibert), Clinique des Vallées, Châtenay-Malabry (Dr Proust), Clinique de Meudon la Forêt (Dr Chene), CH de Dourdan (Dr Lambert), CH Sud Francilien site d'Evry (Mme Lose), CH de Fontainebleau (Dr Fillippini), CH d'Orsay (Dr Devianne); Réseau Ile de France Port-Royal: Coordinator: Dr Harvey: CHU Cochin, Paris (Dr Kayem), CHU Saint Vincent de Paul, Paris (Pr Lepercq), CHU Saint Antoine, Paris (Pr Carbonne), CH Notre Dame de Bonsecours, Paris (Dr Grovangrandi), CHU Beaujon, Paris (Mme Grapin), CHU de Colombes (Dr Crenn-Hebert), CH de Neuilly sur Seine (Dr Galimard), CH de Saint Cloud (Mme Pecourt), Hôpital Militaire Begin, Saint Mandé (Dr Ponties), Clinique Armand Brillard, Nogent sur Marne (Dr Helvin), CH Les Diaconesses, Paris (Dr Harvey); Réseau de Poissy: Coordinator: Dr Rozenberg: CHI de Poissy-Saint Germain (Mme Bertaud); Réseau inter-maternités de Saint-Denis: Coordinator: Pr Uzan: CH de Bondy (Dr Seince), CHI de Montreuil (Dr Chitrit), CHI de Villepinte (Dr Debièvre), Clinique Vauban, Livry-Gardan (Dr Kamoun), Clinique du bois d'amour, Drancy (Dr Masson), CH de Montfermeil (Dr Ropert), CHG de Saint-Denis (Dr Ekoukou), Clinique de l'Estrée, Stains (Dr Franche); Réseau Tenon: Coordinators: Pr Uzan and Dr Berkane: CHU Tenon, Paris (Dr Berkane), CHU Bichat, Paris (Pr Mandelbrot); CHI de Créteil (Pr Haddad et Dr Touboul); CH de Saint Maurice (Dr Bardou) Région Limousin: Coordinator: Pr Philippe: CH de Brive (Mme Peron), CH de Tulle

(Mme Barbé), CHU de Limoges (Dr Eyraud), CH d'Ussel (Mme Leclerc) Région Lorraine: Coordinator: Pr Boutroy, Dr Thiebaugeorges: CHU de Nancy (Dr Thiebaugeorges), CH d'Epinal (Dr Scotton), CHR Bonsecours, Metz (Dr Lemarié), CH de Thionville (Dr Szwarcberg), CH Sainte Croix, Metz (Dr Ragage), Polyclinique Majorelle, Nancy (Dr Bey), Clinique Arc en Ciel, Epinal (Dr Gaillet-Schiochet), Clinique Claude Bernard, Metz (Dr Adami) Nord Pas de Calais: Coordinator: Pr Subtil: CH d'Arras (Mme Finet), CH de Béthune (Dr Hay), CH de Boulogne (Dr Churlet), Clinique Côte d'Opale, Saint Martin les Boulognes (Dr Renault), CH de Douai (Dr Dognin), Clinique Saint Amé, Lambre-lez- Douai (Dr Doutrelant), Clinique Vilette, Dunkerque (Mme Gosselin, Mme Deroose), CH de Maubeuge (Dr Hubert), CH de Roubaix (Dr Le Goueff), CH de Seclin (Dr Biauxque), CH de Valenciennes (Dr Massoni), CHU de Lille (Pr Subtil), Clinique Cotteel, Villeneuve d'Ascq (Mme Dumon) Région Pays de Loire: Coordinator: Dr Winer: CHD La Roche sur Yon (Dr Barreteau), CH de Saint Nazaire (Dr Gerard), Clinique du jardin des plantes, Saint Nazaire (Dr Rousseau), CH de Cholet (Dr Aireau), CHU de Nantes (Dr Winer), Maison de naissance, St Sébastien/Loire (Dr Berlivet), CHU d'Angers (Dr Gilard) Picardie: Coordinator: Pr Gondry: CHU d'Amiens (Pr Gondry), Clinique Sainte Claire, Amiens (Dr Degroote), CHG de Beauvais (Dr Manela), CHG de Creil (Dr Cesbron), CHG de Laon (Dr Boury), CHG de Saint Quentin (Dr Closset), CHG de Soissons (Dr Abboud) Région Poitou-Charentes: Coordinator: Pr Pierre: CHU de Poitiers (Pr Pierre), Clinique du Fief de Grimoire, Poitiers (Dr Bascou), CHG de Niort (Dr Breheret), CHG d'Angoulême (Dr Tariel), CHG de la Rochelle (Dr Quentin), Clinique Sainte Anne, Châtelleraut (Dr Boisselier), CHG de Châtelleraut (Dr Godard), CHG de Bressuire (Dr Villemonteix), CHG de Saintes (Dr Trousselle) Région Provence Alpes Côte d'Azur: Coordinator: Pr D'Ercole: CHU la Conception, Marseille (Dr Agostini), CHR de Draguignan (Dr Diquelou), CHR de Hyères (Dr Eymery), CHR de la Ciotat (Dr Pechikof), CHU Hôpital Nord, Marseille (Pr D'Ercole), CHR de Salon de

Provence (Dr Maldiney), CHR de la Seyne sur Mer (Dr Joly) Région Rhône-Alpes Lyon:  
Coordinator: Dr Vaudoyer: CHU l'Hôtel Dieu, Lyon (Dr Vaudoyer), CHU la Croix Rousse,  
Lyon (Pr Gaucherand), CHU Lyon Sud, Lyon (Dr Coste) Région Rhône-Alpes Grenoble:  
Coordinator: Dr Vendittelli: CHU Nord et Sud, Grenoble (Dr Venditelli), Clinique Belledone,  
Saint Martin d'Hères (Dr Benbassa), Clinique des Cédres, Grenoble (Dr Boschetto), Clinique  
Mutualiste, Grenoble (Dr Leger), CHU de Saint Etienne (Dr Collet), CH de Bourg en Bresse  
(Dr Frobert), CH d'Alberville (Dr Dardenne), CH de Chambéry (Dr Houman), CH d'Annecy  
(Dr Bernardi), CH de Valence (Dr Broussard), CH de Roanne (Dr Gaja), CH d'Evian les  
Bains et de Thonon les Bains (Dr They), CH de Saint Julien en Genevois (Dr Tognelli), CH  
de Firminy (Dr Albersammer).

### **1.C. List of 36 Belgian maternity units participating in PREMODA study:**

Belgium Coordinator: Pr Foidart: CH Luxembourg (Dr Arendt), Hôpital St Nikolaus Eupen  
(Dr Chantraine), Hôpital Ste Anne-St-Remi Bruxelles (Dr Befahy), CH Etterbeek-Ixelles (Dr  
Houben), Hôpital Braine l'Alleud Waterloo Lillois (Dr Busine), Hôpital St Elisabeth  
Bruxelles (Dr Depierreux), CHR War quignies Boussu (Dr Mathieu), IFAC Ste Thérèse  
Bastogne (Dr Colin), RHMS La Madeleine Ath (Dr Coulon), CHU Saint-Pierre Bruxelles (Dr  
Barlow), RHMS Tournai (Dr Delvoeye), CH Françoise Rabelais Cesar de Paepe Bruxelles (Dr  
Verougstraete), CH Peltzer La Tourelle Verviers (Dr Deville), Centre de Santé des Fagnes  
Chimay (Dr Dewille), CHR Namur (Dr D'Huslt), Hôpital St Joseph Mons (Dr du Bois  
d'Enghien), CHU Liège (Pr Foidart), CHU Tivoli La Louvère (Dr Francotte), CHR Haute  
Senne Soignies (Dr Gielen), IFAC Princesse Paola Marche (Dr Gilles), CHR Val de Sambre  
Auvélais (Dr Verheyen), Cliniques Universitaires St Luc Bruxelles (Pr Bernard, Pr Hubinont),  
CH Mouscron (Dr Jacob), Hôpital Reine Astrid Malmedy (Dr Lavalleye), CHU Brugmann  
Bruxelles (Pr Vokaer), Hôpital St Pierre Ottignies (Dr Longueville), CH Jolimont (Dr

Guilmot), CHU Erasme Bruxelles (Dr Kirkpatrick), CH Notre Dame Charleroi (Dr Sartenaer), CH Hornu-Frameries (Dr Semoulin), CHBA Seraing (Pr Van Cauwenberge), Hôpital St Jean Bruxelles (Dr Venderick), CH François Rabelais Français Reine Elisabeth Bruxelles (Dr Vermeulen), Hôpital Notre Dame des Bruyères Chenée (Dr Vigis), Hôpital Notre Dame Tournai (Dr Wauters), Hôpital Notre Dame Hermalle (Dr Romedenne).

**Appendix 2: Rate and components of acute maternal morbidity as defined in the Term Birth Trial, according to planned mode of delivery for women with a fetus in breech presentation**

	<b>Planned cesarean n=5 098 n (%)</b>	<b>Planned vaginal delivery n= 2 466 n (%)</b>	<b>crude RR (95% CI)</b>	<b>adjusted RR:* (95% CI)</b>
<b>SAMM-TBT</b>	122 (2.4)	78 (3.2)	0.76 (0.57-1.00)	0.77 (0.53-1.12)
Fever for more than 48 hours or endometritis	37 (0.7)	31 (1.3)		
Third-stage hemorrhage or surgical blood loss $\geq$ 1000 ml	45 (0.9)	32 (1.3)		
Transfusion	14 (0.3)	6 (0.3)		
Pelvic hematoma (thrombus), 4th-degree perineal lacerations, major vaginal lacerations	1 (0.02)	4 (0.2)		
Abscess of abdominal wall or episiotomy	19 (0.4)	17 (0.7)		
Reoperation	24 (0.5)	9 (0.4)		
Deep phlebitis of the lower limbs	1 (0.02)	2 (0.08)		
Pulmonary embolism	4 (0.08)	1 (0.04)		
Intraoperative complications of cesarean	32 (0.7)	8 (0.4)		
Transfer to the ICU	12 (0.2)	4 (0.2)		
Maternal death	0	0		

\*adjusted for geographic origin, parity and previous cesarean, size of the maternity ward, birth weight

**Appendix 3: Risk of SAMM according to mode of delivery for PVD**

	<b>Breech</b>	<b>Cephalic</b>	<b>p</b>
	<b>N=2466</b>	<b>N=10,156</b>	
	<b>n (%)</b>	<b>n (%)</b>	
<b>PLANNED VAGINAL DELIVERY</b>			
Vaginal delivery	<b>10/1755 (0.6)</b>	<b>30/9350 (0.3)</b>	<b>0.11</b>
Cesarean delivery	<b>7/711 (1.0)</b>	<b>9/806 (1.1)</b>	<b>0.80</b>

**Appendix 4: Rate and components of acute maternal morbidity as defined in the Term Birth Trial, according to planned mode of delivery for women with planned vaginal delivery**

	<b>Breech</b> <b>n= 2466</b> <b>n (%)</b>	<b>Cephalic</b> <b>n=10,156</b> <b>n (%)</b>	<b>Crude RR (95% CI)</b>	<b>Adjusted RR* (95% CI)</b>
<b>Composite criterion</b>	78 (3.2)	265 (2.6)	1.21 (0.95-1.55)	1.32 (1.04-1.67)
Fever for more than 48 hours or endometritis	31 (1.3)	64 (0.6)		
Third-stage hemorrhage or surgical blood loss $\geq$ 1000 ml	32 (1.3)	148 (1.5)		
Transfusion	6 (0.3)	27 (0.3)		
Pelvic hematoma (thrombus). 4 <sup>th</sup> -degree perineal lacerations. major vaginal lacerations	4 (0.2)	26 (0.3)		
Abscess of abdominal wall or episiotomy	17 (0.7)	19 (0.2)		
Reoperation	9 (0.4)	11 (0.1)		
Deep phlebitis of the lower limbs	2 (0.08)	4 (0.04)		
Pulmonary embolism	1 (0.04)	0		
Intraoperative complications of cesarean	8 (0.4)	8 (0.1)		
Transfer to the ICU	4 (0.2)	16 (0.2)		
Maternal death	0	0		

\*adjusted for geographic origin, maternal age, parity and previous cesarean, size of the maternity ward, birth weight