

## **Appendix 1. (revised October 3, 2018)**

List of participating centers and collaborators of the JUMODA (JUmeaux Mode d'Accouchement) study group and the GROG (Groupe de Recherche en Obstétrique et Gynécologie):

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## Appendix 2. Maternal and Pregnancy Characteristics According to the Maternal Age

MATERNAL AGE	<30 YEARS		[30-34] YEARS		≥35 YEARS	
	PCD n=1,065 n (%)	PVD n=1,861 n (%)	PCD n=1,069 n (%)	PVD n=1,904 n (%)	PCD n=928 n (%)	PVD n=1,297 n (%)
Body mass index before pregnancy (mean ± SD, Kg.m-2)	24.7±5.4	23.9±5	24.3±5.4	23.5±4.6	24.2±5.3	23.9±4.5
<18.5	65 (6.4)	128 (7.2)	68 (6.7)	117 (6.4)	68 (7.7)	81 (6.5)
[18.5-24]	550 (53.9)	1,105 (61.9)	599 (59.0)	1,207 (66.1)	511 (58.1)	768 (61.5)
[25-29]	245 (24.0)	364 (20.4)	211 (20.8)	318 (17.4)	187 (21.3)	279 (22.4)
≥30	160 (15.7)	189 (10.6)	138 (13.6)	184 (10.1)	114 (13.0)	120 (9.6)
Parity and previous caesarean						
Nulliparous	663 (62.3)	1,078 (58.0)	479 (44.9)	839 (44.3)	411 (44.3)	484 (37.3)
Parous without previous caesarean	253 (23.8)	732 (39.4)	355 (33.2)	980 (51.7)	282 (30.4)	737 (56.9)
Parous with previous caesarean	149 (14.0)	48 (2.6)	234 (21.9)	77 (4.1)	235 (25.3)	75 (5.8)
Smokers	189 (18.3)	316 (17.5)	178 (17.2)	246 (13.4)	118 (13.2)	146 (11.7)
Previous diabetes	13 (1.2)	5 (0.3)	10 (0.9)	12 (0.6)	21 (2.3)	8 (0.6)
Previous hypertension	11 (1.0)	10 (0.5)	15 (1.4)	20 (1.1)	27 (2.9)	9 (0.7)
In vitro fertilization	128 (12.0)	210 (11.3)	238 (22.4)	432 (22.8)	368 (39.9)	462 (35.8)
Fetal reduction	5 (0.5)	12 (0.6)	5 (0.5)	22 (1.2)	13 (1.4)	14 (1.1)
Chorionicity						
Dichorionic	785 (73.7)	1,386 (74.5)	824 (77.1)	1,572 (82.6)	809 (87.2)	1,114 (85.9)
Monochorionic / diamniotic	252 (23.7)	469 (25.2)	219 (20.5)	315 (16.5)	106 (11.4)	177 (13.6)
Monochorionic / monoamniotic	26 (2.4)	2 (0.1)	18 (1.7)	6 (0.3)	10 (1.1)	0 (0.0)
Pregnancy complications	459 (43.2)	408 (22.0)	457 (42.8)	403 (21.2)	394 (42.5)	352 (27.2)
Premature rupture of membranes	93 (8.7)	179 (9.6)	75 (7.0)	164 (8.6)	65 (7.0)	132 (10.2)
Preterm labor	379 (35.7)	815 (43.9)	276 (25.8)	675 (35.5)	196 (21.2)	363 (28.1)

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PCD: planned cesarean delivery; PVD: planned vaginal delivery; SD: standard deviation

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MATERNAL AGE	<30 YEARS		[30-34] YEARS		≥35 YEARS	
	PCD n=1,065 n (%)	PVD n=1,861 n (%)	PCD n=1,069 n (%)	PVD n=1,904 n (%)	PCD n=928 n (%)	PVD n=1,297 n (%)
Mode of delivery						
Cesarean for both	1,055 (99.1)	310 (16.7)	1,054 (98.6)	312 (16.4)	914 (98.5)	291 (22.4)
Vaginal and cesarean	0 (0.0)	50 (2.7)	2 (0.2)	51 (2.7)	2 (0.2)	33 (2.5)
Vaginal for both	10 (0.9)	1,501 (80.7)	13 (1.2)	1,541 (80.9)	12 (1.3)	973 (75.0)
First twin in noncephalic presentation	575 (54.0)	136 (7.3)	532 (49.8)	143 (7.5)	402 (43.3)	108 (8.3)
Second twin in noncephalic presentation	610 (57.3)	702 (37.8)	614 (57.5)	763 (40.1)	538 (58.2)	584 (45.1)
Gestational age at delivery (weeks) (mean)						
<32 0/7	158 (14.8)	144 (7.7)	124 (11.6)	113 (5.9)	112 (12.1)	65 (5.0)
32 0/7-36 6/7	535 (50.2)	856 (46.0)	507 (47.5)	800 (42.0)	405 (43.7)	540 (40.8)
≥37 0/7	372 (32.9)	861 (46.3)	798 (40.9)	991 (52.0)	411 (44.3)	702 (54.1)
General anesthesia at delivery	53 (5.0)	47 (2.5)	69 (6.5)	38 (2.0)	43 (4.6)	33 (2.5)
Birth weight T1 (mean±SD, grams)	2190.1±629.3	2348.6±542.7	2280.6±604.5	2416.3±511.5	2309.6±632.6	2441.2±514.0
Birth weight T2 (mean±SD, grams)	2135.2±633.3	2304.4±532.5	2199.4±628.9	2364.5±510.1	2232.1±629.7	2384.8±501.5
<b>Hospital characteristics</b>						
Annual number of twin deliveries						
<50	365 (34.3)	639 (34.3)	370 (34.6)	651 (34.2)	326 (35.1)	402 (31.0)
[50-99]	364 (34.2)	544 (29.2)	325 (30.4)	526 (27.6)	263 (28.3)	321 (24.7)
≥100	336 (31.5)	678 (36.4)	374 (35.0)	727 (38.2)	339 (36.5)	574 (44.3)
University hospital	449 (42.2)	839 (45.1)	463 (43.3)	887 (46.6)	406 (43.8)	683 (52.7)
Level of care						
I	11 (1.0)	32 (1.7)	22 (2.1)	36 (1.9)	11 (1.2)	30 (2.3)
II	430 (40.4)	695 (37.3)	425 (39.8)	717 (37.7)	397 (42.8)	436 (33.6)

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III	624 (58.6)	1,134 (60.9)	622 (58.2)	1,151 (60.5)	520 (56.0)	831 (64.1)
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PCD: planned cesarean delivery; PVD: planned vaginal delivery; SD: standard deviation

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## Appendix 4. Maternal and Pregnancy Characteristics in the Matched Cohort

Characteristic	Overall cohort			Matched cohort		
	Planned cesarean delivery n=3,062 n (%)	Planned vaginal delivery n=5,062 n (%)	Standardized difference %	Planned cesarean delivery n=1,699 n (%)	Planned vaginal delivery n=1,699 n (%)	Standardized difference %
Age						
<30	1,065 (34.8)	1,861 (36.8)	7.8	600 (35.3)	622 (36.6)	0.4
[30-34]	1,069 (34.9)	1,904 (37.6)		597 (35.1)	577 (34.0)	
≥35	928 (30.3)	1,297 (25.6)		502 (29.5)	500 (29.4)	
Body mass index before pregnancy						
<18.5	201 (6.9)	326 (6.7)	14.0	120 (7.4)	120 (7.3)	2.6
[18.5-24]	1,660 (56.9)	3,080 (63.4)		925 (57.1)	948 (58.1)	
[25-29]	643 (22.1)	961 (19.8)		353 (21.8)	352 (21.6)	
≥30	412 (14.1)	493 (10.1)		222 (13.7)	213 (13.0)	
Parity and previous cesarean			19.5			13.1
Nulliparous	1,553 (50.7)	2,401 (47.5)		873 (51.4)	928 (54.7)	
Parous without previous cesarean	890 (29.1)	2,449 (48.5)		550 (32.4)	568 (33.5)	
Parous with previous cesarean	618 (20.2)	200 (4.0)		275 (16.2)	199 (11.7)	
Smokers	485 (16.4)	708 (14.5)	5.5	273 (16.6)	263 (16.1)	10.0
Previous diabetes	44 (1.4)	25 (0.5)	10.1	21 (1.2)	16 (0.9)	3.9
Previous hypertension	53 (1.7)	39 (0.8)	9.0	27 (1.6)	27 (1.6)	0.0
In vitro fertilization	734 (24.1)	1,104 (21.9)	4.2	408 (24.1)	428 (25.3)	4.3
Chorionicity			4.2			6.0
Dichorionic	2,418 (79.3)	4,072 (80.7)		1,309 (77.4)	1,310 (77.5)	
Monochorionic/diamnionic	577 (18.9)	961 (19.1)		336 (19.8)	378 (22.4)	
Monochorionic/monoamnionic	54 (1.8)	8 (0.2)		48 (2.8)	1 (0.1)	
Pregnancy complications	1,310 (42.9)	1,163 (23.0)	42.9	731 (43.1)	721 (42.6)	9.0
Premature rupture of membranes	233 (7.6)	475 (9.4)	5.6	135 (8.0)	134 (7.9)	7.0
Preterm labor	851 (27.8)	1,853 (36.7)	18.0	543 (32.0)	559 (33.0)	1.0

SD: standard deviation

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Characteristic	Overall cohort			Matched cohort		
	Planned cesarean delivery	Planned vaginal delivery	Standardized	Planned cesarean delivery	Planned vaginal delivery	Standardized
	n=3,062 n (%)	n=5,062 n (%)	difference %	n=1,699 n (%)	n=1,699 n (%)	difference %
Mode of delivery			279.4			252.9
Cesarean for both	3,023 (98.7)	913 (18.0)		1,669 (98.2)	421 (24.8)	
Vaginal and cesarean	4 (0.1)	134 (2.6)		2 (0.1)	54 (3.2)	
Vaginal for both	35 (1.1)	4,015 (79.3)		28 (1.6)	1,224 (72.0)	
First twin in noncephalic presentation	1,509 (49.3)	387 (7.6)	100.0	531 (31.3)	378 (22.2)	22.5
Second twin in noncephalic presentation	1,762 (57.7)	2,049 (40.5)	34.4	894 (52.7)	877 (51.7)	2.2
Gestational age at delivery (weeks)			25.9			0.0
<32 0/7	394 (12.9)	322 (6.4)		219 (12.9)	195 (11.5)	
32 0/7-36 6/7	1,427 (47.3)	2,186 (43.2)		824 (48.5)	885 (52.1)	
≥ 37 0/7	1,221 (39.9)	2,554 (50.4)		656 (38.6)	619 (36.4)	
Analgesia or anesthesia at delivery			12.4			12.9
Regional	2,891 (94.4)	4,762 (94.1)		1,590 (93.6)	1,576 (92.8)	
General	165 (5.4)	118 (2.3)		106 (6.2)	62 (3.6)	
None	5 (0.2)	165 (3.3)		2 (0.1)	56 (3.3)	
Other	0 (0.0)	15 (0.3)		0 (0.0)	5 (0.3)	
Birth weight T1 (mean±SD, grams)	2,257.9±623.6	2,397.8±525.1	23.7	2257.8±617.3	2238.6±580.9	3.8
Birth weight T2 (mean±SD, grams)	2,187.1±631.7	2,347.6±517.3	17.4	2161.0±630.9	2196.2±569.1	5.5
<b>Hospital characteristics</b>						
Annual number of twin deliveries			6.6			1.0
<50	1,061 (34.7)	1,692 (33.4)		566 (33.3)	560 (33.0)	
[50-99]	952 (31.1)	1,391 (27.5)		534 (31.4)	522 (30.7)	
≥100	1,049 (34.3)	1,979 (39.1)		599 (35.3)	617 (36.3)	
University hospital	1,318 (43.0)	2,409 (47.6)	8.5	744 (43.8)	867 (51.0)	13.5
Level of care			5.9			8.8
I	44 (1.4)	98 (1.9)		26 (1.5)	28 (1.6)	
II	1,252 (40.9)	1,848 (36.5)		674 (39.7)	583 (34.3)	
III	1,766 (57.7)	3,116 (61.6)		999 (58.8)	1,088 (64.0)	

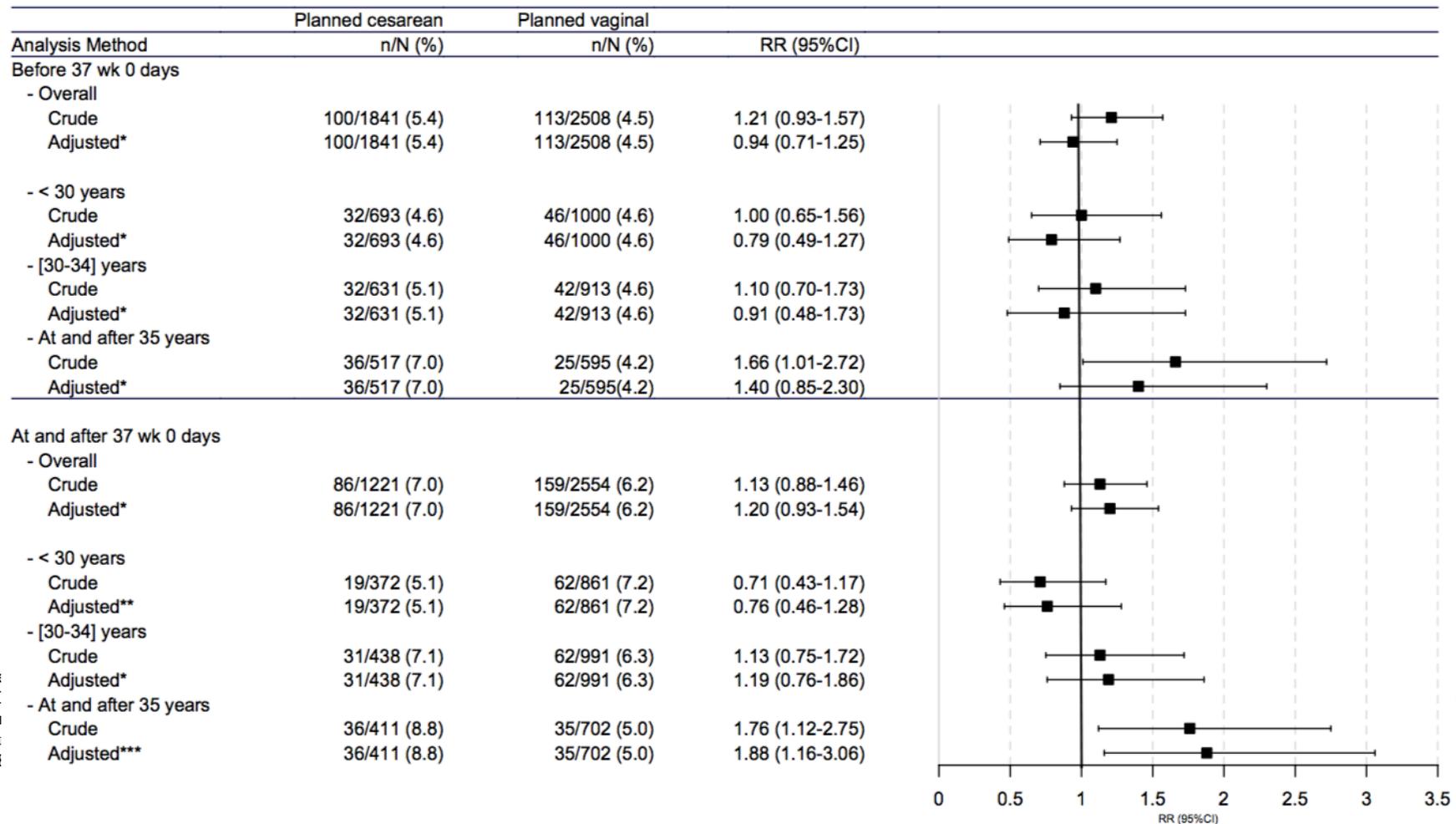
SD: standard deviation

October 3, 2018: Appendix 1 was updated to correct the following error: Laurence Lecomte was omitted from the list of JUMODA group contributors, and his name is now added. Korb D, Deneux-Tharoux C, Seco A, Goffinet F, Schmitz T; Jumeaux MODE d'Accouchement (JUMODA) study group and the Groupe de Recherche en Obstétrique et Gynécologie (GROG). Risk of Severe Acute Maternal Morbidity According to Planned Mode of Delivery in Twin Pregnancies. *Obstet Gynecol* 2018;132:647-655.

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**Appendix 6. Association Between Planned Mode of Delivery and Severe Acute Maternal Morbidity in the Overall Population, According to Maternal Age and Gestational Age at Delivery.** \*Model 1: adjusted for maternal age, body mass index, parity and previous cesarean, previous diabetes or hypertension, *in vitro* fertilization, pregnancy complications, premature rupture of membranes, annual number of twin deliveries. \*\*Model 2: same as in model 1 except no adjustment for maternal age. \*\*\* Model 3: same as in model 1 except no adjustment for premature rupture of membranes

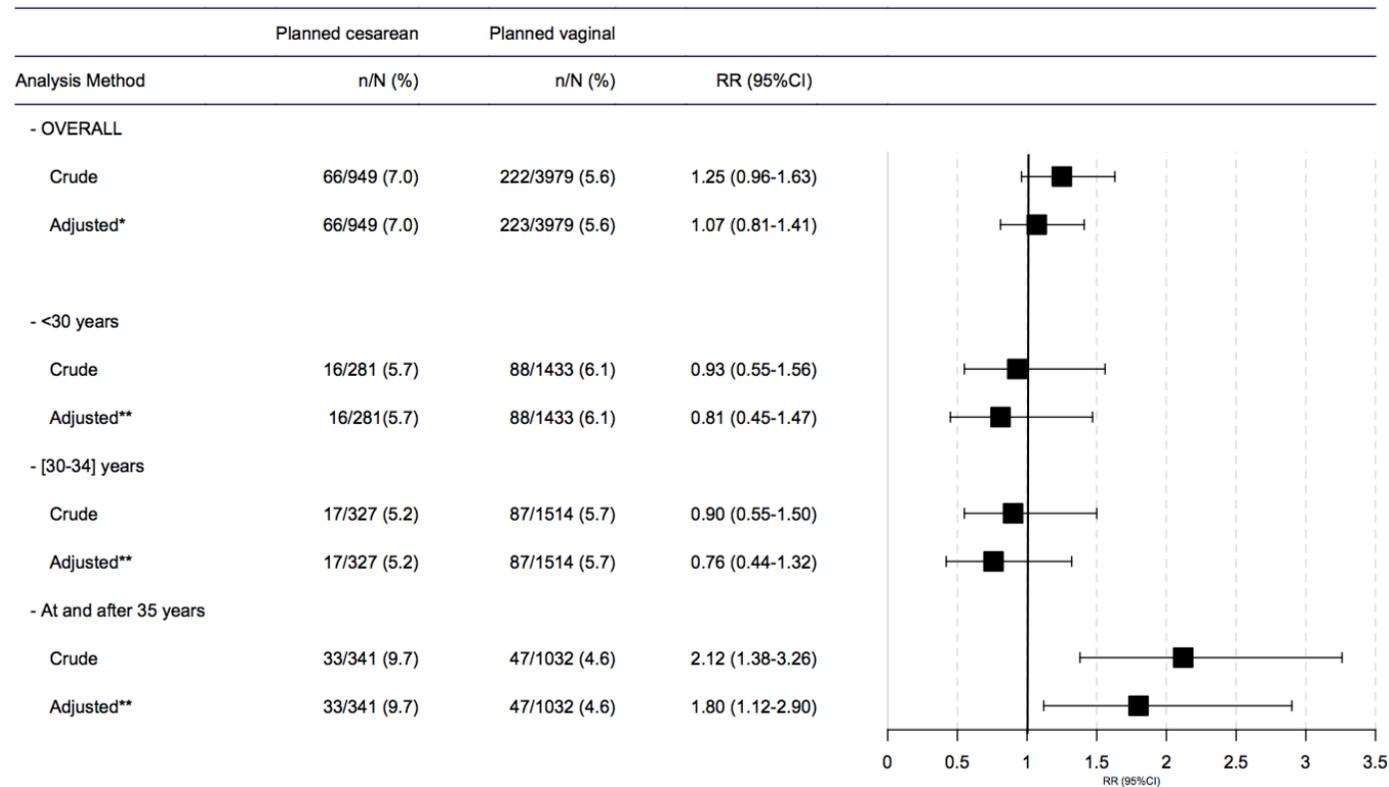


## Appendix 7. Rate and Components of Severe Acute Maternal Morbidity According to the Planned Mode of Delivery in the TBS-Like Population

Outcome	Planned cesarean delivery	Planned vaginal delivery
	n=949	n=3,979
	n (%)	n (%)
<b>Severe acute maternal morbidity</b>	<b>66 (7.0)</b>	<b>222 (5.6)</b>
Death	0 (0)	0 (0)
Severe postpartum hemorrhage	50 (5.3)	190 (4.8)
Blood transfusion	14 (1.5)	41 (1.0)
Uterine artery embolization	10 (1.1)	25 (0.6)
Vascular ligation, compressive uterine suture	12 (1.3)	31 (0.8)
Hysterectomy	2 (0.2)	9 (0.2)
Pulmonary embolism	2 (0.2)	3 (0.1)
Stroke or cerebral transient ischemic attack	0 (0)	0 (0)
Severe psychiatric disorders	1 (0.1)	1 (0.03)
Cardiovascular dysfunction	2 (0.2)	3 (0.1)
Respiratory dysfunction	1 (0.1)	2 (0.1)
Renal dysfunction	2 (0.2)	14 (0.4)
Hematological dysfunction	13 (1.4)	32 (0.8)
Neurological dysfunction	0 (0)	0 (0)
Emergency surgery	17 (1.8)	16 (0.4)
Admission to an intensive care unit	16 (1.7)	39 (1.0)

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**Appendix 8. Association Between Planned Mode of Delivery and Severe Acute Maternal Morbidity In The TBS-Like Population, According to Maternal Age.** \*Model 1: adjusted for maternal age, body mass index, parity and previous cesarean, previous diabetes or hypertension, *in vitro* fertilization, pregnancy complications, premature rupture of membranes, annual number of twin deliveries. \*\*Model 2: same as in model 1 except no adjustment for maternal age.

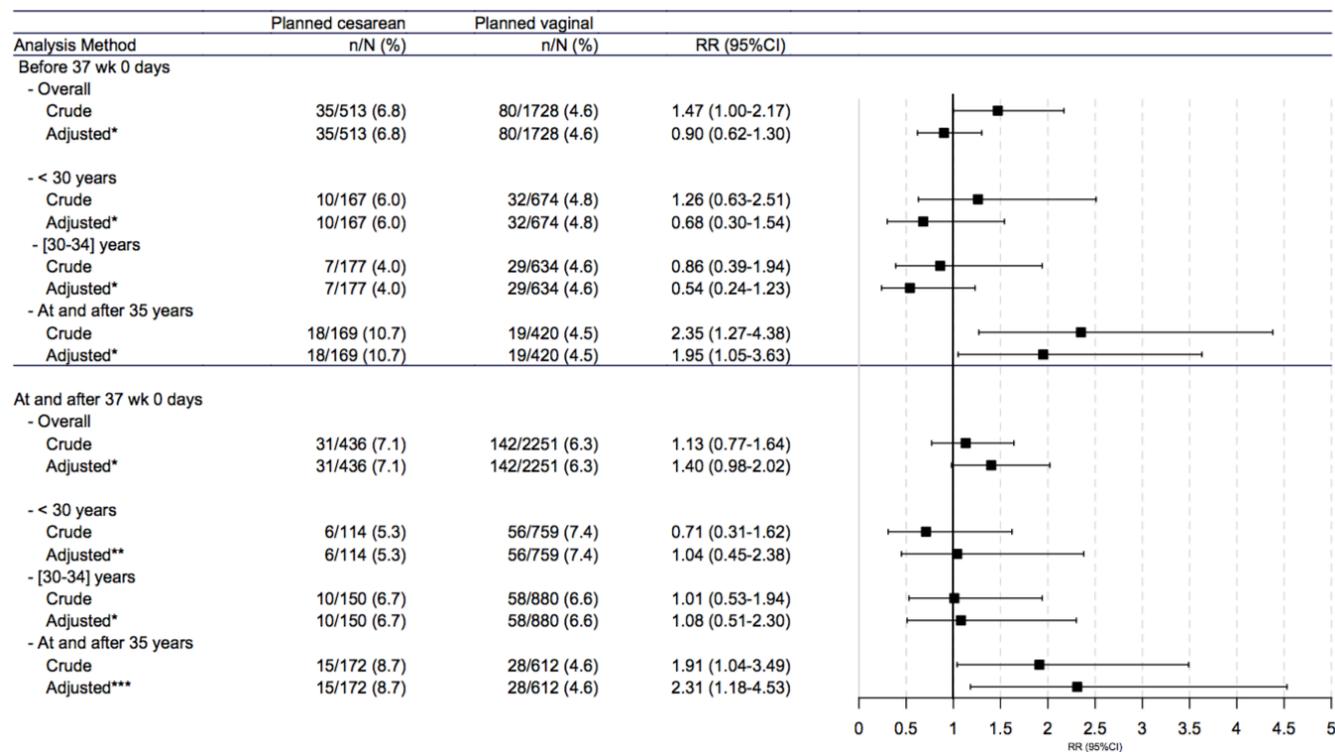


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**Appendix 9. Association Between Planned Mode of Delivery and Severe Acute Maternal Morbidity in the TBS-Like Population According to Maternal Age and Gestational Age.** \*Model 1: adjusted for maternal age, body mass index, parity and previous cesarean, previous diabetes or hypertension, *in vitro* fertilization, pregnancy complications, premature rupture of membranes, annual number of twin deliveries. \*\*Model 2: same as in model 1 except no adjustment for previous diabetes or hypertension. \*\*\*Model 3: same as in model 1 except no adjustment for any of previous diabetes or hypertension or PROM.



October 3, 2018: Appendix 1 was updated to correct the following error: Laurence Lecomte was omitted from the list of JUMODA group contributors, and his name is now added. Korb D, Deneux-Tharoux C, Seco A, Goffinet F, Schmitz T. Risk of severe acute maternal morbidity according to planned mode of delivery in twin pregnancies. *Obstet Gynecol* 2018; 132.

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