Appendix 1. Group Information

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): **Alsace**: Coordinator: Pr Langer: CHU Hautepierre (Dr Sananes), CMCO de Schiltigheim (Dr Favre), CMC de Colmar (Dr Kutnahorsky), CHR de Mulhouse (Mme Fessler), CHR d'Haguenau (Dr Lehmann), Clinique Sainte-Anne, Strasbourg (Dr Adam, Dr Plemere) **— Aquitaine**: Coordinator: Dr Chabanier: CHU de Bordeaux (Dr Chabanier), Clinique Bagatelle, Talence (Dr Trebesses), CH de Bayonne (Dr Poumier-Chabannier), CH de Mont de Marsan (Dr Defert), CH de Pau (Dr Bohec), Polyclinique de Navarre, Pau (Dr Collin) **— Auvergne**: Coordinator: Dr Venditelli: CHU de Clermont-Ferrand (Dr Venditelli), Clinique de la Chataigneraie, Beaumont (Dr Deffarges, Dr Vidal), CH de Vichy (Dr Desvignes), CH du Puy-en-Velay (Dr Samuel) **— Basse Normandie**: Coordinator: Pr Dreyfus, CHU de Caen (Dr Beucher, Dr Dolley), Clinique du Parc, Caen (Dr Durin), CH d'Avranches (Dr Six), CH de Lisieux (Dr Beniada), CH de Saint-Lô (Dr Balouet), CH de Cherbourg (Dr Desprès, Mme Mathis) **— Bourgogne**: Coordinator: Pr Sagot: CHU de Dijon (Dr Yacoub), CH de Chalon-sur-Saône (Dr Bulot), CH d'Auxerre (Dr Dellinger), CH de Mâcon (Dr Spagnolo) **— Bretagne**: Coordinator: Pr Poulain: CHU de Rennes (Pr Poulain), Clinique de la Sagesse, Rennes (Dr Moquet, Mme Bourgault), CHP Saint-Grégoire (Dr Seconda), CH de Saint-Brieuc (Dr Moinon), CH de Saint-Malo (Dr Roy-Dahhou), CH Bretagne Sud, Lorient (Dr Pittion), CH Bretagne Atlantique, Vannes (Dr Chauveau), CHU de Brest (Dr Laurent, Dr Lelièvre), CH de Quimper (Dr Bellot), Polyclinique de Keraudren, Brest (Dr Salnelle) **— Centre**: Coordinator: Pr Perrotin: CHRU de Tours (Pr Perrotin), CH d'Orléans (Dr Ramos), CH de Blois (Dr Montmasson), CH de Chartres (Dr Ollivier), CH de l'agglomération montargoise (Dr Hoock, Dr Ben Romdhane) **— Champagne Ardennes**: Coordinator: Pr Graesslin: CHU de Reims (Pr Graesslin), CH de Charleville Mézières (Dr Méreb) **— Franche-Comté**: Coordinator: Pr Riethmuller: CHU de Besançon (Pr Riethmuller), CH de Pontarlier (Dr Boyadjian), CH de Dole (Dr Gannard), CH de Belfort (Dr Levy), CH de Lons le Saunier (Dr Reviron) **— Haute Normandie**: Coordinator: Pr Marpeau: CHU de Rouen (Pr Verspyck), Clinique Mathilde, Rouen (Dr Durand Reville), CH Le Havre (Dr Talbot), CH d'Elbeuf (Dr Mathieu), CH d'Evreux (Dr Machevin), CH de Vernon (Dr Truong Canh), CH du Belvédère, Mont Saint-Aignan (Dr Guillon) **— Ile-de-France**: Coordinator: Pr Schmitz: CHU Robert Debré (Pr Schmitz), CHU Cochin-Port Royal (Dr Ménard), CHU Bichat (Dr Bourgeois Moine), CHU Pitié Salpêtrière (Pr Nizard,

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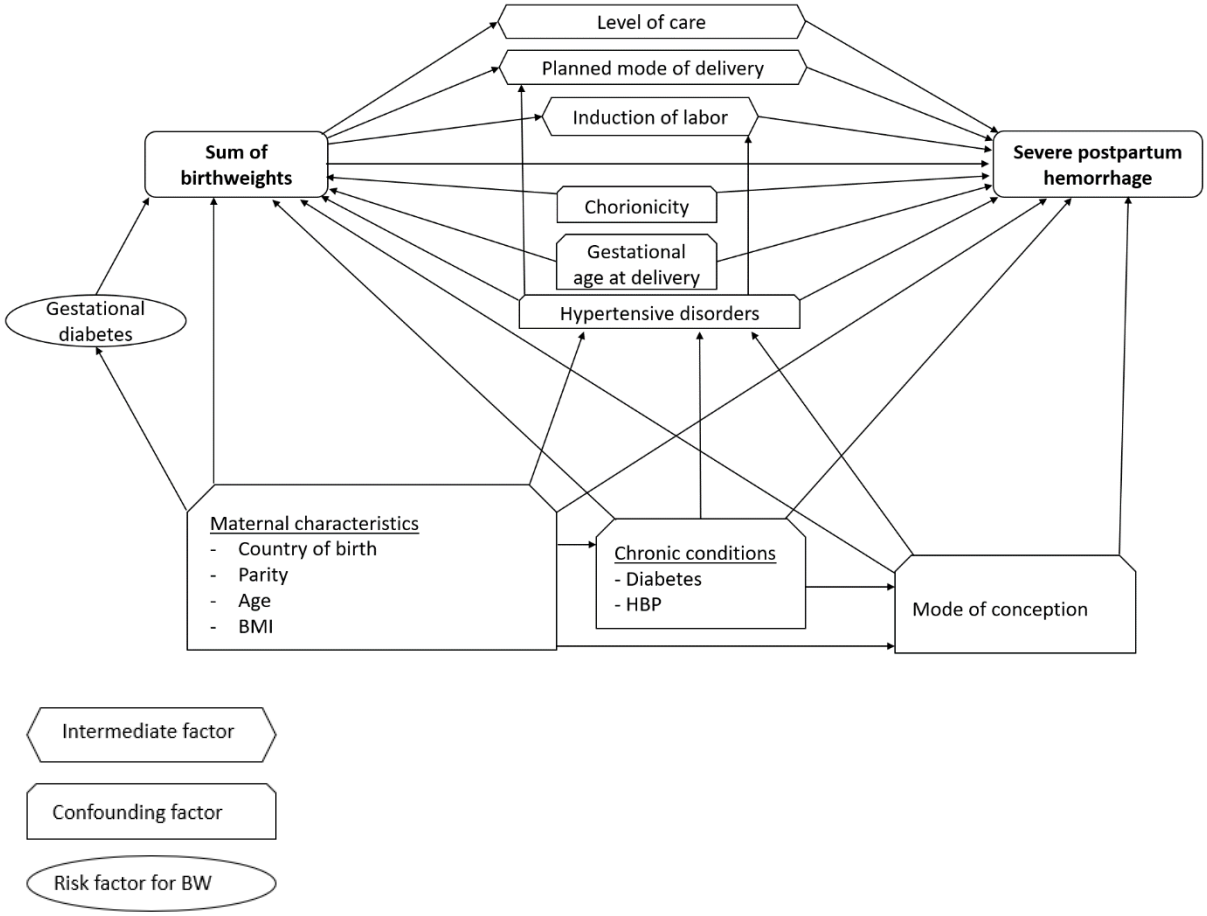
The authors provided this information as a supplement to their article.

Pr Dommergues), CHU Trousseau (Dr De Carné Carnavalet), CHU Necker Enfants Malades (Dr Lemercier), CHU Tenon (Dr Bornes), CHU Lariboisière (Dr Ricbourg), Hôpital des Diaconesses (Dr Harvey), Institut Mutualiste Montsouris (Dr Azarian), Groupe Hospitalier Saint Joseph (Dr Azria), CHU Louis Mourier (Pr Kayem), CHU Antoine Béclère (Pr Benachi), CHU Beaujon (Dr Ceccaldi), CHU Bicêtre (Pr Sénat), CH de Neuilly (Dr Galimard), Hôpital Foch (Dr Picone), CH de Saint-Denis (Dr Bounan, Dr Hatem), CH de Montreuil (Pr Poncelet), CHU Jean Verdier (Pr Carbillon), CHI de Créteil (Pr Haddad), Hôpitaux de Saint Maurice Esquirol (Dr Pachy), CH de Pontoise (Mme Deshons), CH de Montmorency (Dr Colliaut Espagne), CHI de Poissy (Pr Rozenberg), CH de Versailles (Dr Raynal), CH de Mantes la Jolie (Dr Godard), CH de Villeneuve Saint-Georges (Dr Soltane, Dr Piel), CH de Longjumeau (Dr Abbara), CH du Sud Francilien, Corbeil Essonne (Dr Rigonnot), CH de Melun (Dr Jault), CH de Fontainebleau (Dr Marchaudon), CH de Meaux (Dr Moumen), CH de Lagny (Dr Wafo) **— Languedoc-Roussillon**: Coordinator: Pr De Tayrac: CHU de Nîmes (Pr De Tayrac), Polyclinique Grand Sud, Nîmes (Dr Léonard), Polyclinique Kennedy, Nîmes (Dr Terschiphorst), CHU de Montpellier (Dr Vintejoux), Clinique Clémentville, Montpellier (Dr Filippi), Clinique Saint-Roch, Montpellier (Dr Rouard), CH de Béziers (Dr Galtier), CH de Carcassonne (Dr Cogan), CH de Perpignan (Dr Koninck) **— Lorraine**: Coordinator: Pr Morel: CHU de Nancy (Pr Morel), CH de Metz (Dr Dahlhoff Rodriguez), CH de Thionville (Dr Collin) **— Midi Pyrénées**: Coordinator: Pr Parant: CHU de Toulouse (Pr Parant), Clinique Sarrus (Dr Thévenot, Dr Céré) **— Nord Pas-de-Calais**: Coordinator: Pr Deruelle: CHRU de Lille (Pr Deruelle, Dr Clouqueur), Polyclinique du Bois, Lille (Dr Pouilly), GHIC Saint-Vincent-de-Paul, Lille (Dr Denoit), CH d'Armentières (Dr Régis, Dr Rivaux), CH de Roubaix (Dr Legoueff), CH de Tourcoing (Dr Jambon), CH de Seclin (Dr Bory), CH de Valenciennes (Dr Sendon, Dr Tillouche), CH de Dunkerque (Dr Boodhun), CH de Lens (Dr Bothuyne), CH de Boulogne-sur-Mer (Dr Sicot), CH d'Arras (Dr Brochot), CH de Calais (Dr Carillon, Dr Coudoux), CH de Saint-Omer (Dr Notteau) **— PACA Ouest**: Coordinator: Pr D'Ercole: CHU Marseille, Hôpital Nord (Dr Hautemonte), CHU Marseille, Hôpital La Conception (Dr Heckenroth), CH Saint-Joseph (Dr Desbrière), CH de Martigues (Dr Volle), CH de Toulon (Dr Mauviel), CH d'Aix-en-Provence (Dr Danoy), Clinique l'Etoile-Maternité catholique de Provence, Aix en Provence (Dr Marpeau), CH de Salon de Provence (Dr David), CH d'Avignon (Dr Lepreux) **— PACA Est**: Coordinator: Pr Bongain: CHU de Nice (Dr Leroux Hilmi, Dr Adrados), Clinique Saint-Georges, Nice (Mme Roulant), CH de Grasse (Dr Kaemmerlen), CH d'Antibes (Dr Duforestel), CH de Cannes (Dr

De Jesus) **— Pays de Loire**: Coordinators: Pr Winer, Pr Sentilhes: CHU de Nantes (Pr Winer), Polyclinique de l'Atlantique, Nantes (Dr Paumier), Clinique Jules Verne, Nantes (Dr Lebret-Colau), CH de Saint-Nazaire (Dr Troche), CHU d'Angers (Pr Sentilhes), CH Le Mans (Dr Chève), CH de Saumur (Dr Moya), CH de Laval (Dr Karirisi), CH de Cholet (Dr Pasco), CH de La Roche-sur-Yon (Dr Ducarme) **— Picardie**: Coordinator: Pr Gondry: CHU d'Amiens (Dr Théret), Groupe Santé Victor Pauché, Amiens (Mme Buisson), CH de Beauvais (Dr Urbaniack), CH de Creil (Dr Dienga), CH de Saint-Quentin (Dr Closset), CH de Compiègne (Dr Touzart) **— Poitou-Charentes Limousin**: Coordinator: Pr Pierre: CHU de Poitiers (Pr Pierre), CH de La Rochelle (Dr Leborgne), CH de Rochefort (Dr Lathélize), CH de Niort (Dr Chauvet), CH d'Angoulême (Dr Sarreau), CH de Saintes (Dr Bretheau), CH de Châtellerault (Dr Godard), CH Nord Deux Sèvres, Bressuire (Dr Yannoulopoulos), CHU de Limoges (Pr Aubard) **— Rhône Alpes**: Coordinators: Pr Rudigoz, Mme Dupont: CHU La Croix Rousse, Lyon (Pr Rudigoz), CHU Lyon Sud, Lyon (Pr Dupuis), CHU Mère-Enfant, Lyon (Dr Battie), Hôpital Natecia, Lyon (Dr Mein), Clinique du Val d'Ouest, Ecully (Dr Mossan-Lourcy), Clinique Saint-Vincent-de-Paul, Bourgoin-Jallieu (Dr Rane), CH de Valence (Dr Fernandez), CH de Villefranche (Dr Sayegh), CH de Montélimar (Dr Dirix), CH de Roanne (Dr Nord), CHU de Saint-Etienne (Pr Chauleur), CH de Bourg-en-Bresse (Dr Hugot, Dr Ferlay), CHU de Grenoble (Dr Equy), Clinique Belledonne, Grenoble (Dr Canonica), CH de Voiron (Dr Gaillard), CH de Chambéry (Dr Dubois), CH de Sallanches (Dr Dujardin), CH d'Annecy (Dr Braig), CH d'Annemasse (Dr Deramecourt), CH de Thonon (Dr Vincent-Génod).

Appendix 2. Directed acyclic graph. BMI, body mass index; HBP, high blood pressure; hypertensive disorders, preeclampsia or gestational hypertension.



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Appendix 3. Characteristics of Patients, Their Pregnancies, Labors, and Deliveries, According to the Presence or Absence of Missing Data for the Main Analysis

Characteristics	Women with no missing data n=7256	Women with ≥ 1 missing data n=1117
Age (y)		
<30	2591 (35.7)	379 (33.9)
30 – 35	2652 (36.6)	436 (39.0)
35 – 40	1471 (20.3)	226 (20.2)
≥ 40	542 (7.5)	76 (6.8)
BMI before pregnancy (kg.m-2)		
< 18.5	483 (6.7)	47 (6.3)
18.5 – 24,9	4387 (60.5)	439 (58.8)
25-29,9	1498 (20.6)	172 (23.0)
≥ 30	888 (12.2)	89 (11.9)
Region of birth		
Europe	5834 (80.4)	235 (73.9)
North Africa	751 (10.4)	38 (12.0)
Sub-Saharan Africa	421 (5.8)	35 (11.0)
Other	250 (3.5)	10 (3.1)
Parity		
Nulliparous	3501 (48.3)	493 (44.8)
Parous without previous cesarean	2908 (40.1)	461 (41.9)
Parous with previous cesarean	847 (11.7)	147 (13.7)

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Chronic conditions		
Hypertension	77 (1.1)	14 (1.3)
Preexisting diabetes	67 (0.9)	7 (0.6)
Mode of conception		
Spontaneous or Ovulation induction	5594 (77.1)	839 (79.4)
IVF autologous oocytes	1382 (19.1)	188 (17.8)
IVF with oocyte donation	280 (3.9)	30 (2.8)
Chorionicity		
Dichorionic	5824 (80.5)	877 (80.0)
Monochorionic diamniotic	1367 (18.9)	205 (18.7)
Monochorionic monoamniotic	48 (0.7)	14 (1.3)
Pregnancy complications		
Hypertensive disorders †	900 (12.4)	122 (11.1)
PPROM	1105 (15.2)	185 (16.8)
Gestational diabetes	875 (12.1)	111 (9.9)
Preterm labor	2413 (33.3)	342 (31.1)
FGR either twin	1156 (15.9)	152 (13.9)
TTTS	161 (2.2)	16 (1.5)
Induction of labor	4126 (57.1)	607 (54.7)
Gestational age at delivery (weeks)	35.9±2.9	35.8±2.9
Planned mode of delivery		
Planned vaginal delivery	4393 (60.7)	645 (57.9)
Planned cesarean delivery	2842 (39.3)	469 (42.1)
Mode of delivery		

Cesarean delivery for both twins	3589 (49.6)	587 (52.7)
Cesarean for second twin	117 (1.6)	18 (1.6)
Vaginal delivery for both twins	3529 (48.8)	509 (45.7)
Sum of birthweights (grams)	4631.8±1094.2	4591.6±1093.4
Analgesia at delivery		
Regional	6857 (95.0)	1043 (93.9)
General	248 (3.4)	49 (4.4)
None	117 (1.6)	19 (1.7)

Data are n (%) or mean +/- SD

BMI: body mass index, FGR: fetal growth restriction, IVF: in vitro fertilization, PPH: postpartum hemorrhage, PPROM: premature preterm rupture of membranes, TTTS: twin-to-twin transfusion syndrome

† preeclampsia or gestational hypertension

Appendix 4. Incidence of Severe Postpartum Hemorrhage According to the Sum of Twins' Birthweights

Sum of birthweights grams	**Overall population** n (%)	**Patients with severe PPH** n	**Incidence of severe PPH per 100 patients** (95% CI)
≤3000	722 (8.6)	15	2.1 (1.2 – 3.4)
]3000-3500]	491 (5.9)	16	3.3 (1.9 – 5.2)
]3500-4000]	787 (9.4)	26	3.3 (2.2 – 4.8)
]4000-4500]	1264 (15.1)	48	3.8 (2.8 – 5.0)
]4500-5000]	1668 (19.9)	74	4.4 (3.5 – 5.5)
]5000-5500]	1713 (20.5)	79	4.6 (3.7 – 5.7)
]5500-6000]	1158 (13.8)	76	6.6 (5.2 – 8.1)
]6000-6500]	434 (5.2)	33	7.6 (5.3 – 10.5)
>6500	136 (1.6)	12	8.8 (4.6 – 14.9)
Total	8373 (100)	379	4.5 (4.1 – 5.0)

CI: confidence interval, PPH: postpartum hemorrhage

Appendix 5. Main Causes of Severe Postpartum Hemorrhage

Causes	n (%)
Uterine atony	238 (62.8)
Retained placenta	42 (11.1)
Genital tract laceration	28 (7.4)
Placental marginal hematoma	3 (0.8)
Unidentified	107 (28.2)
All	379 (100.0)

Causes are not mutually exclusive

Appendix 6. Incidence of severe Postpartum Hemorrhage According to the Sum of Twins' Birthweights by Planned Mode of Delivery*

	Planned vaginal delivery			Planned cesarean delivery		
Sum of birthweights	**All patients**	**Patients with severe PPH**	**Incidence of severe PPH per 100 patients**	**All Patients**	**Patients with severe PPH**	**Incidence of severe PPH per 100 patients**
grams	n (%)	n	(95% CI)	n (%)	n	(95% CI)
<3000	286 (5.7)	3	1.0 (0.2-3.0)	432 (13.1)	12	2.8 (1.4 – 4.8)
]3000-3500]	243 (4.8)	10	4.1 (2.0 - 7.4)	247 (7.5)	6	2.4 (0.9 - 5.2)
]3500-4000]	446 (8.9)	15	3.4 (1.9 - 5.5)	340 (10.3)	11	3.2 (1.6 - 5.7)
]4000-4500]	787 (15.6)	31	3.9 (2.7 - 5.5)	469 (14.2)	16	3.4 (2.0 - 5.5)
]4500-5000]	1096 (21.8)	49	4.5 (3.3 - 5.9)	567 (17.1)	23	4.1 (2.6 - 6.0)
]5000-5500]	1108 (22.0)	47	4.2 (3.1 - 5.6)	603 (18.2)	32	5.3 (3.7 - 7.4)
]5500-6000]	740 (14.7)	49	6.6 (4.9 - 8.7)	415 (12.5)	27	6.5 (4.3 - 9.3)
]6000-6500]	257 (5.1)	18	7.0 (4.2 - 10.8)	177 (5.4)	15	8.5 (4.8 - 13.6)
>6500	75 (1.5)	7	9.3 (3.8 – 18.3)	61 (1.8)	5	8.2 (2.7 – 18.1)
Total	5038 (100.0)	229	4.5 (4.0 - 5.2)	3311 (100.0)	147	4.4 (3.8 - 5.2)

* Planned mode of delivery was missing for 24 patients

CI: confidence interval, PPH: postpartum hemorrhage

Appendix 7. Incidence of Severe Postpartum Hemorrhage According to the Sum of Twins' Birthweights by Actual Mode of Delivery*

	Vaginal delivery			Cesarean delivery		
Sum of birthweights	**All patients**	**Patients with severe PPH**	**Incidence of severe PPH per 100 patients**	**All patients**	**Patients with severe PPH**	**Incidence of severe PPH per 100 patients**
grams	n (%)	n	(95% CI)	n (%)	n	(95% CI)
<3000	241 (6.0)	2	0.8 (0.1 – 3.0)	477 (11.1)	13	2.7 (1.5 – 4.6)
]3000-3500]	207 (5.1)	6	2.9 (1.1 – 6.2)	283 (6.6)	10	3.5 (1.7 – 6.4)
]3500-4000]	375 (9.3)	12	3.2 (1.7 - 5.5)	411 (9.5)	14	3.4 (1.9 – 5.6)
]4000-4500]	647 (16.0)	20	3.1 (1.9-4.7)	609 (14.1)	27	4.4 (2.9 – 6.4)
]4500-5000]	875 (21.7)	34	3.9 (2.7 – 5.4)	788 (18.3)	38	4.8 (3.4 – 6.6)
]5000-5500]	867 (21.5)	30	3.5 (2.3 – 4.9)	844 (19.6)	49	5.8 (4.3 – 7.6)
]5500-6000]	585 (14.5)	35	6.0 (4.2 – 8.2)	570 (13.2)	41	7.2 (5.2 – 9.6)
]6000-6500]	184 (4.6)	12	6.5 (3.4 – 11.1)	250 (5.8)	21	8.4 (5.3 – 12.6)
>6500	57 (1.4)	4	7.0 (1.9 – 17.0)	79 (1.8)	8	10.1 (4.5 – 19.0)
Total	4038 (100.0)	155	3.8 (3.3 – 4.5)	4311 (100.0)	221	5.1 (4.5 – 5.8)

* Actual mode of delivery was missing for 24 patients

CI: confidence interval, PPH: postpartum hemorrhage

Appendix 8. Sensitivity analysis: Incidence of the Most Severe Postpartum Hemorrhage According to the Sum of Twins' Birthweights

Sum of birthweights grams	**Overall population** n (%)	**Patients with severe PPH** n	**Incidence of severe PPH per 100 patients** (95% CI)
<3000	722 (8.6)	7	1.0 (0.4 – 2.0)
]3000-3500]	491 (5.9)	7	1.4 (0.6 – 2.9)
]3500-4000]	787 (9.4)	15	1.9 (1.1 – 3.1)
]4000-4500]	1264 (15.1)	31	2.5 (1.7 – 3.5)
]4500-5000]	1668 (19.9)	56	3.4 (2.5 – 4.3)
]5000-5500]	1713 (20.5)	49	2.9 (2.1 – 3.8)
]5500-6000]	1158 (13.8)	53	4.6 (3.4 – 5.9)
]6000-6500]	434 (5.2)	27	6.2 (4.1 – 8.9)
>6500	136 (1.6)	8	5.9 (2.6 – 11.3)
Total	8373 (100)	253	3.0 (2.7 – 3.4)

CI: confidence interval, PPH: postpartum hemorrhage

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Appendix 9. Sensitivity Analysis: Incidence of Severe Postpartum Hemorrhage Caused by Uterine Atony or Genital Tract Laceration According to the Sum of Twins' Birthweights

Sum of birthweights grams	**Overall population** n (%)	**Patients with severe PPH** n	**Incidence of severe PPH per 100 patients** (95% CI)
<3000	722 (8.6)	7	1.0 (0.4 – 2.0)
]3000-3500]	491 (5.9)	8	1.6 (0.7 – 3.2)
]3500-4000]	787 (9.4)	18	2.7 (1.7 – 4.1)
]4000-4500]	1264 (15.1)	29	2.5 (1.7 – 3.6)
]4500-5000]	1668 (19.9)	53	3.3 (2.5 – 4.3)
]5000-5500]	1713 (20.5)	50	3.2 (2.4 – 4.2)
]5500-6000]	1158 (13.8)	57	5.2 (4.0 – 6.6)
]6000-6500]	434 (5.2)	24	6.0 (4.0 – 8.7)
>6500	136 (1.6)	6	5.1 (2.1 – 10.3)
Total	8373 (100)	252	3.2 (2.9 – 3.6)

CI: confidence interval, PPH: postpartum hemorrhage

Appendix 10. Sensitivity Analysis: Incidence of Severe Postpartum Hemorrhage According to the Sum of Twins' Birthweights in a Twin Birth Study–Like Population

Sum of birthweights grams	**Overall population** n (%)	**Patientsn with severe PPH** n	**Incidence of severe PPH per 100 patients** (95% CI)
<3000	1 (0.0)	0	0
]3000-3500]	136 (2.8)	3	2.2 (0.5 – 6.3)
]3500-4000]	454 (9.3)	17	3.7 (2.2 – 5.9)
]4000-4500]	815 (16.7)	30	3.7 (2.5 – 5.2)
]4500-5000]	1113 (22.9)	52	4.7 (3.5 – 6.1)
]5000-5500]	1170 (24.0)	50	4.3 (3.2 – 5.6)
]5500-6000]	820 (16.8)	58	7.1 (5.4 – 9.0)
]6000-6500]	277 (5.7)	23	8.3 (5.3 – 12.2)
>6500	82 (1.7)	7	8.5 (3.5 – 16.8)
Total	4868 (100.0)	240	4.9 (4.3 – 5.6)

CI: confidence interval, PPH: postpartum hemorrhage.