

Supplementary Online Content

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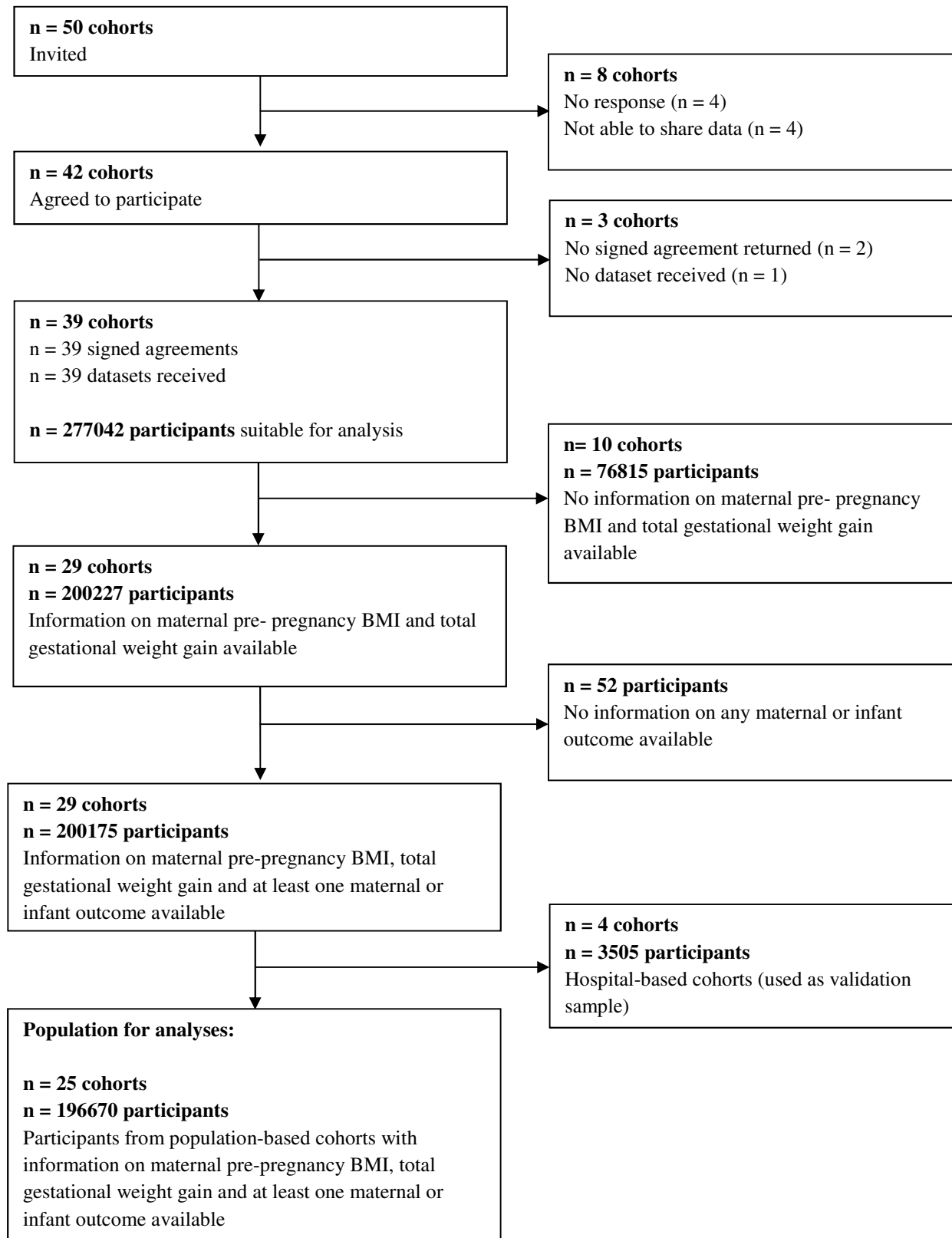
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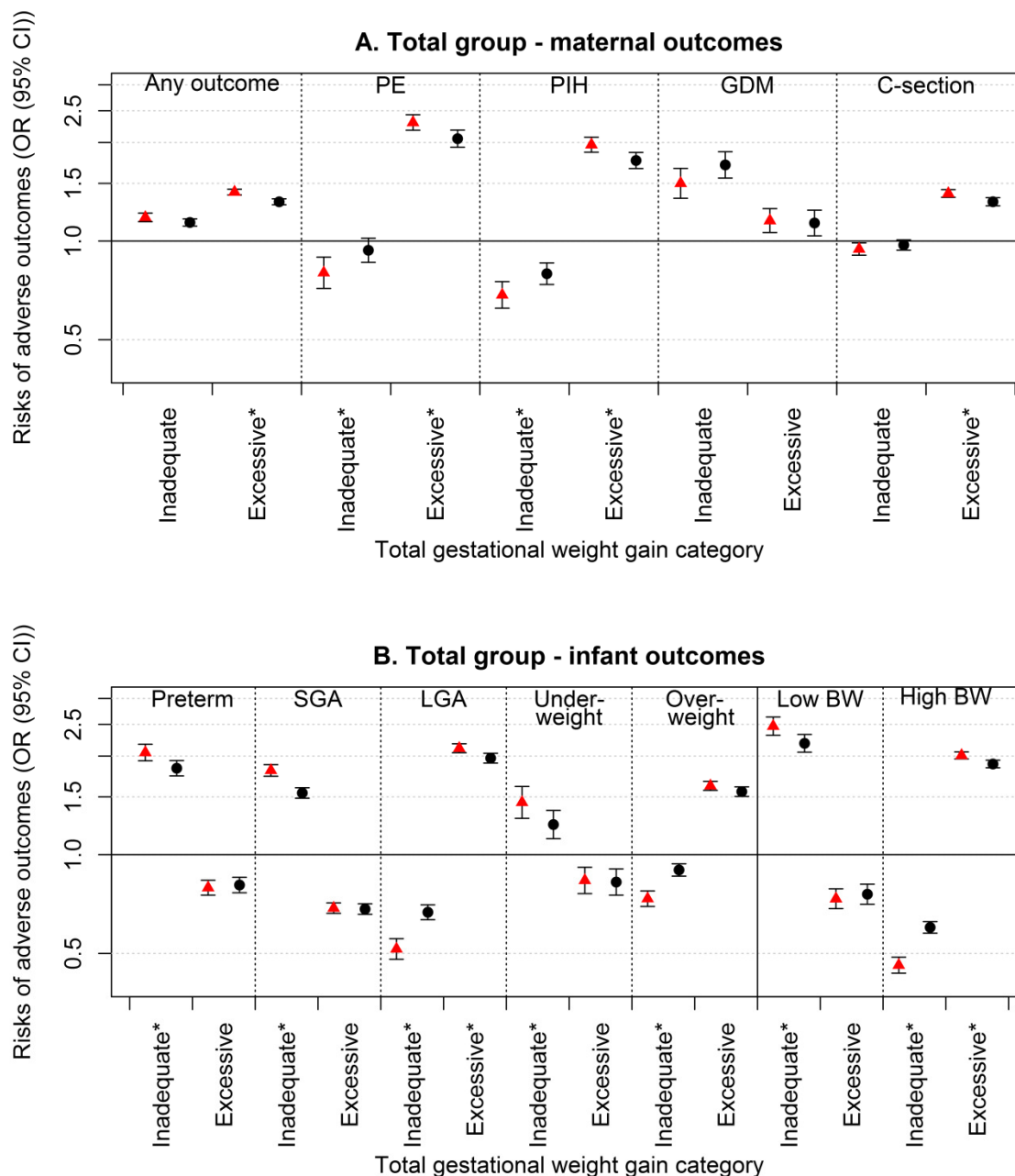
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This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure 1. Flow chart of the cohorts and participants



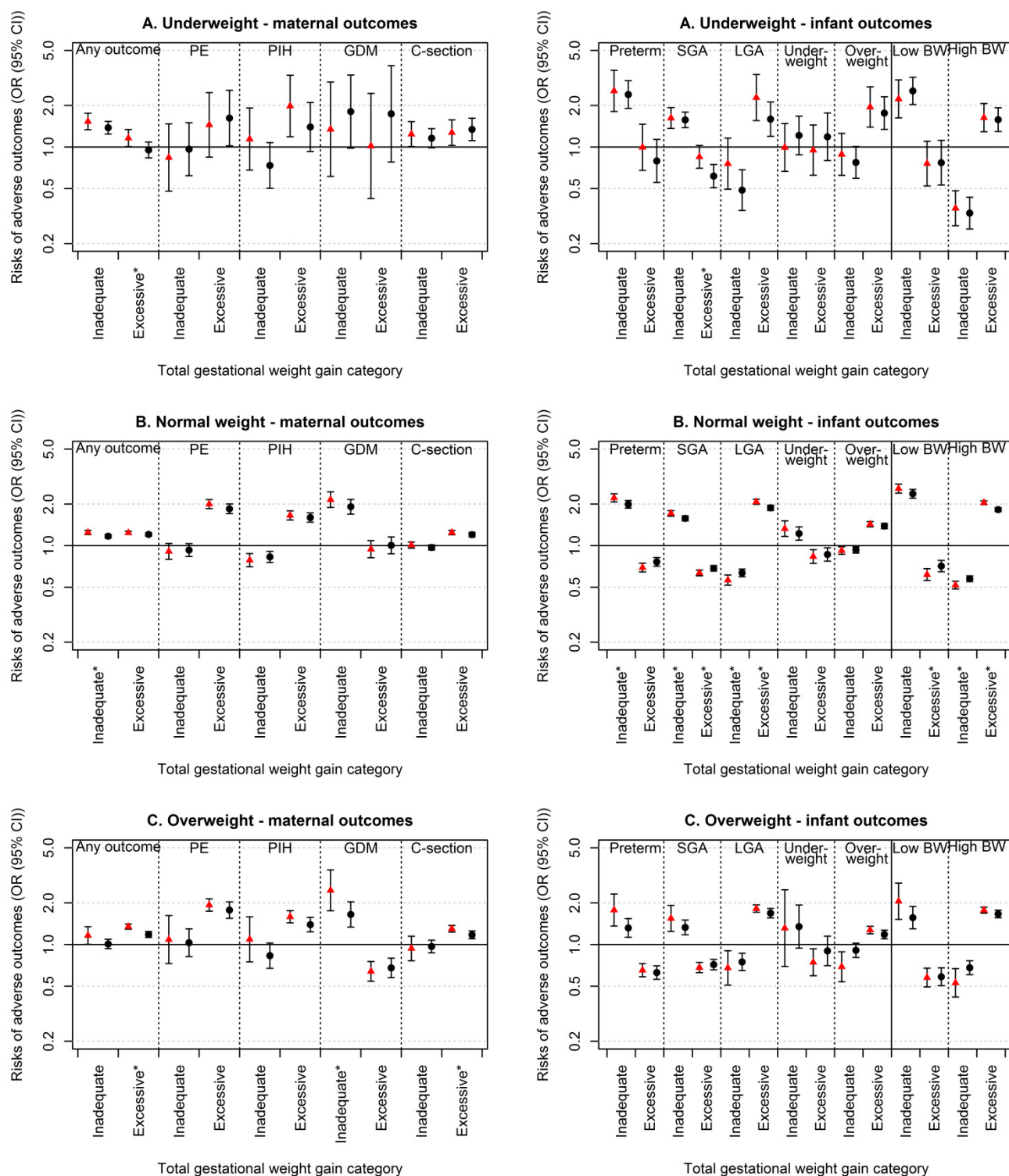
▲ This study ● IOM



eFigure 2. Associations of inadequate and excessive gestational weight gain by classifications from this study and IOM with adverse maternal and infant outcomes

Abbreviations: IOM: US Institute of Medicine (nowadays called National Academy of Medicine (NAM)). Values represent odds ratios (OR) (95% Confidence Intervals (CI)) reflecting the risk of adverse maternal and infant outcomes in women with inadequate and excessive weight gain as compared to women with adequate weight gain, according to this study (red triangles) and IOM classification (black dots). Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges defined by this study and IOM, respectively (eTable 10). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, small size-for-gestational-age (SGA), and large size-for-gestational-age (LGA). Low and high birth and childhood under- and overweight were not included for the definition of the optimal weight gain ranges. * P-value for the difference between ORs for this study and IOM (calculated using $Z = (\log\text{odds}_{\text{This study}} - \log\text{odds}_{\text{IOM}}) / \sqrt{SE_{\text{This study}}^2 + SE_{\text{IOM}}^2}$).

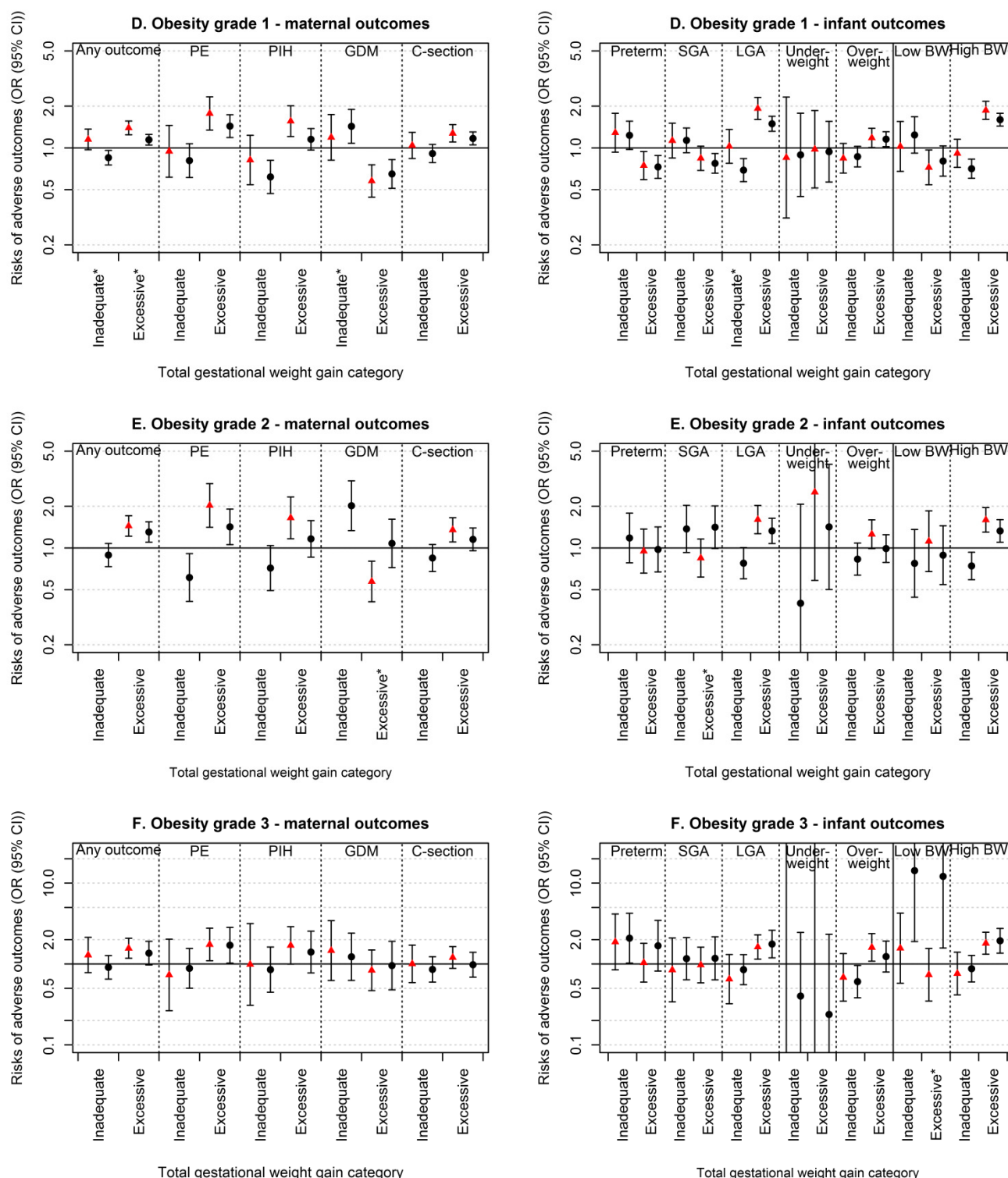
▲ This study ● IOM



eFigure 3. Associations of inadequate and excessive gestational weight gain by classifications from this study and IOM with adverse maternal and infant outcomes, by clinical body mass index group

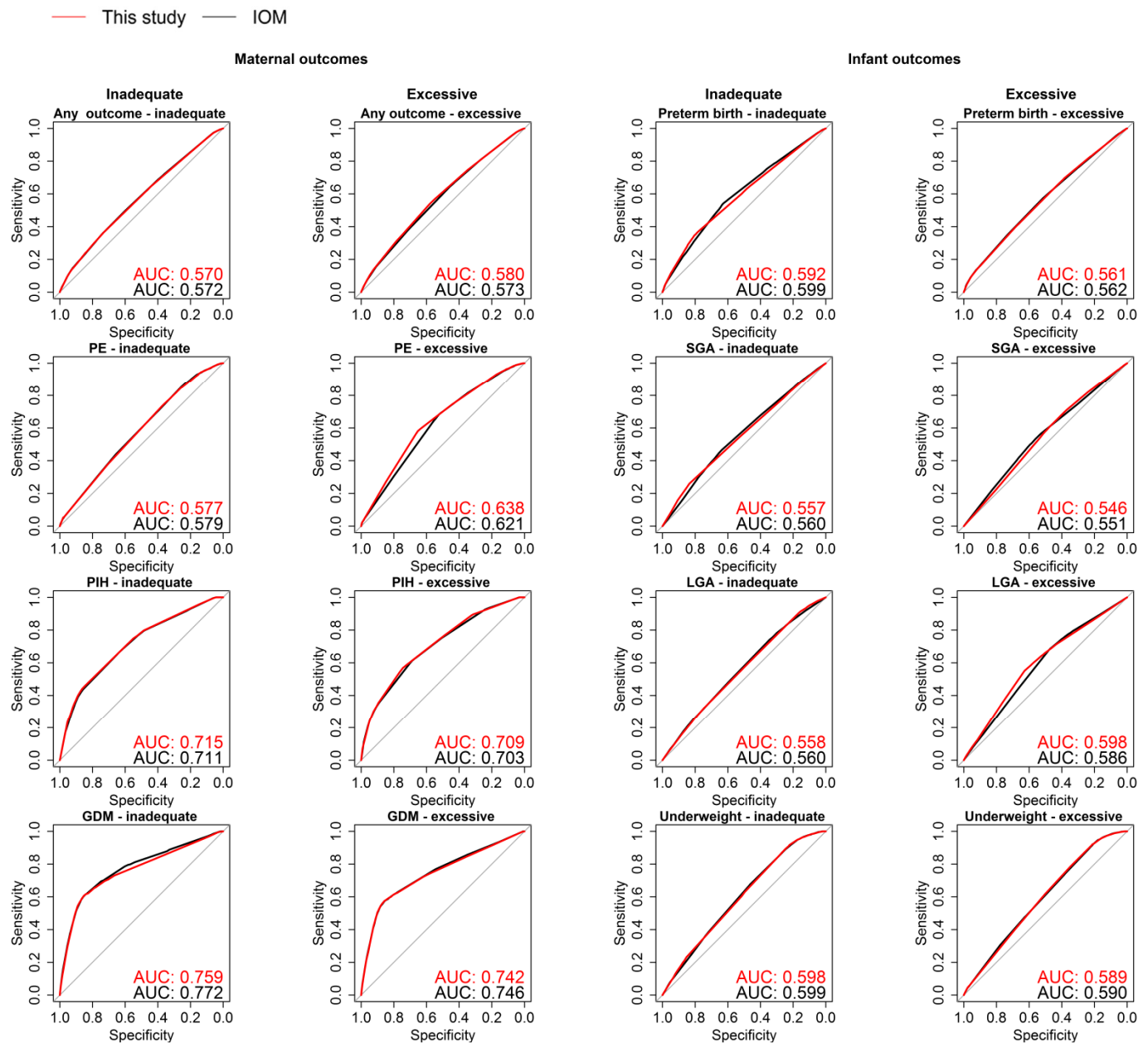
Values represent odds ratios (95% Confidence Intervals) reflecting the risk of adverse maternal or infant outcome in women with inadequate and excessive weight gain as compared to women with adequate weight gain, according to this study (red triangles) and IOM (US Institute of Medicine, nowadays called National Academy of Medicine (NAM)) classification (black dots), per clinical BMI category. Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges defined by this study and IOM, respectively (**eTable 10**). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, and small size-for-gestational-age (SGA), large size-for-gestational-age (LGA). Low and high birth weight and childhood under- and overweight were not included for the definition of the optimal weight gain ranges. * P-value for the difference between ORs for this study and IOM (calculated using $Z = (\log\text{odds}_{\text{This study}} - \log\text{odds}_{\text{IOM}}) / \sqrt{\text{SE}_{\text{This study}}^2 + \text{SE}_{\text{IOM}}^2}$).

▲ This study ● IOM



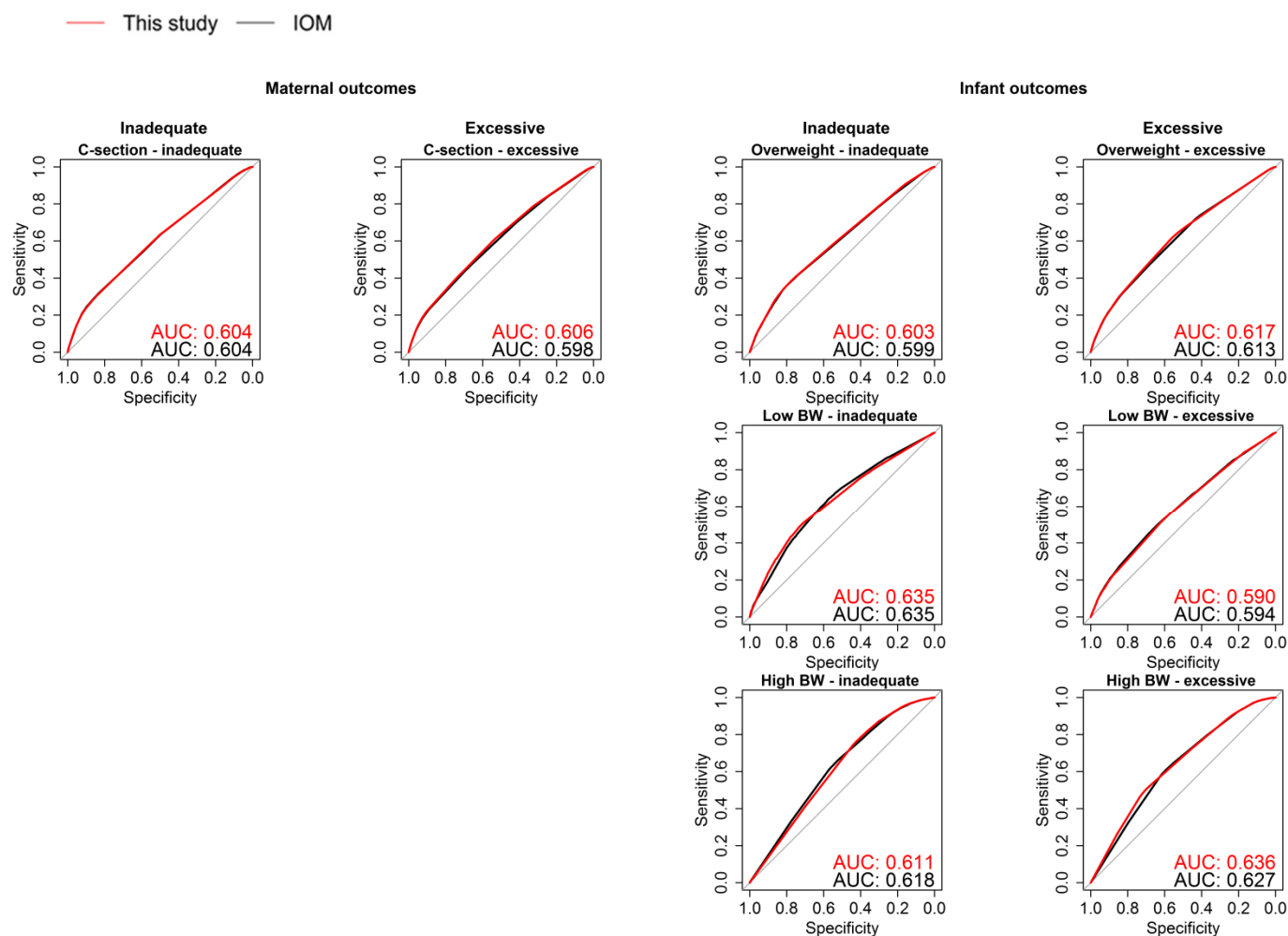
eFigure 3 (continued). Associations of inadequate and excessive gestational weight gain by classifications from this study and IOM with adverse maternal and infant outcomes, by clinical body mass index group

Values represent odds ratios (95% Confidence Intervals) reflecting the risk of adverse maternal or infant outcome in women with inadequate and excessive weight gain as compared to women with adequate weight gain, according to this study (red triangles) and IOM (US Institute of Medicine, nowadays called National Academy of Medicine (NAM)) classification (black dots), per clinical BMI category. Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges defined by this study and IOM, respectively (eTable 10). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, and small size-for-gestational-age (SGA), large size-for-gestational-age (LGA). Low and high birth weight and childhood under- and overweight were not included for the definition of the optimal weight gain ranges. * P-value for the difference between ORs for this study and IOM (calculated using $Z = (\log\text{odds}_{\text{This study}} - \log\text{odds}_{\text{IOM}}) / \sqrt{\text{SE}_{\text{This study}}^2 + \text{SE}_{\text{IOM}}^2}$).



eFigure 4. Receiver operator characteristic curves of inadequate and excessive gestational weight gain by classifications from this study and IOM for the detection of adverse maternal and infant outcomes

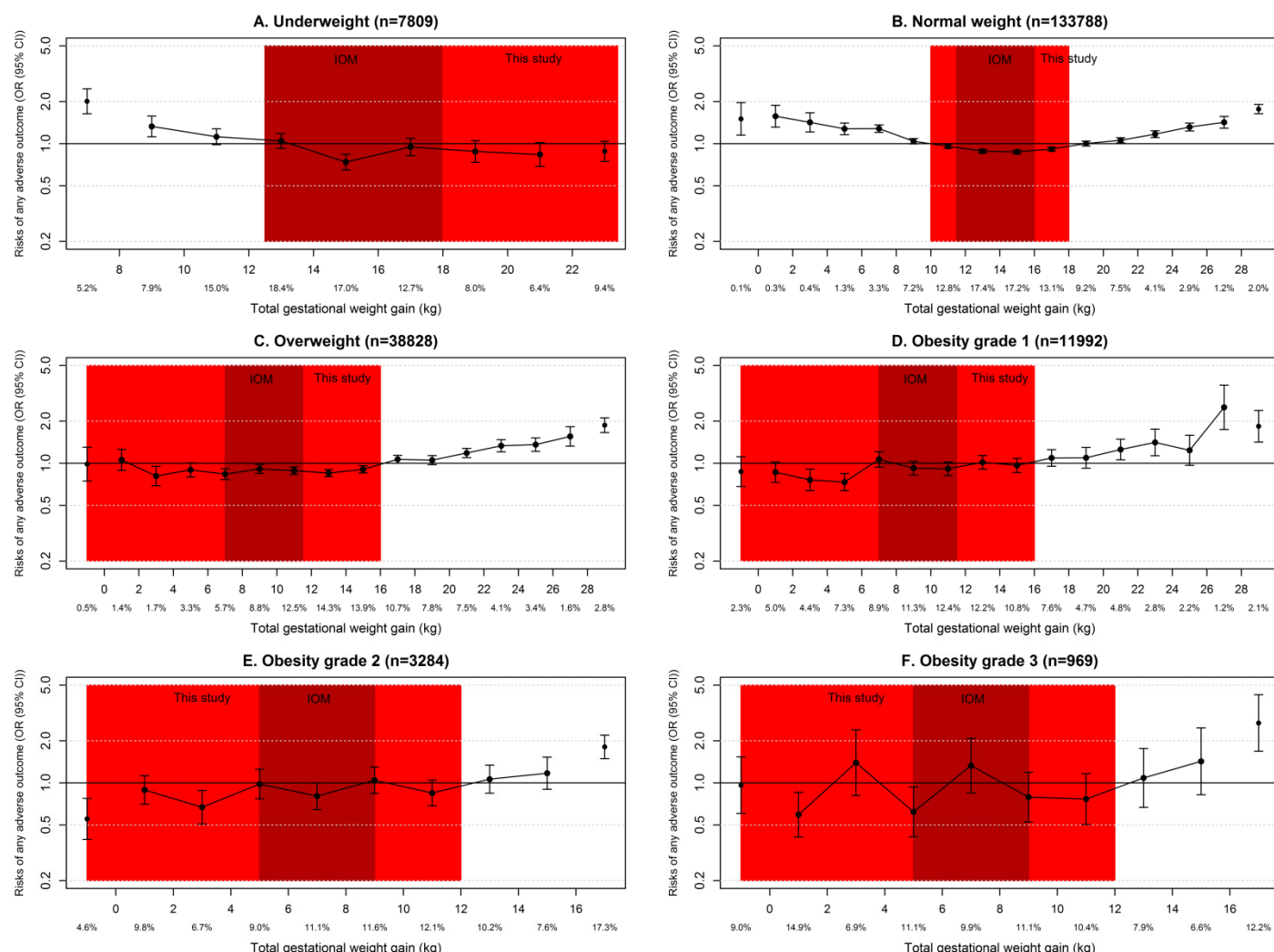
Abbreviations: AUC, area under the Receiver Operator Characteristic curve; IOM, US Institute of Medicine (nowadays called National Academy of Medicine (NAM)). Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges defined by this study and IOM, respectively (**eTable 10**). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, small size-for-gestational-age (SGA), and large size-for-gestational-age (LGA). Low and high birth weight and childhood under- and overweight were not included for the definition of the optimal weight gain ranges.



eFigure 4 (continued). Receiver operator characteristic curves of inadequate and excessive gestational weight gain by classifications from this study and IOM for the detection of adverse maternal and infant outcomes

Abbreviations: AUC, area under the Receiver Operator Characteristic curve; IOM, US Institute of Medicine (US Institute of Medicine, nowadays called National Academy of Medicine (NAM)). Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges defined by this study and IOM, respectively (**eTable 10**). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, small size-for-gestational-age (SGA), and large size-for-gestational-age (LGA). Low and high birth weight and childhood under- and overweight were not included for the definition of the optimal weight gain ranges.

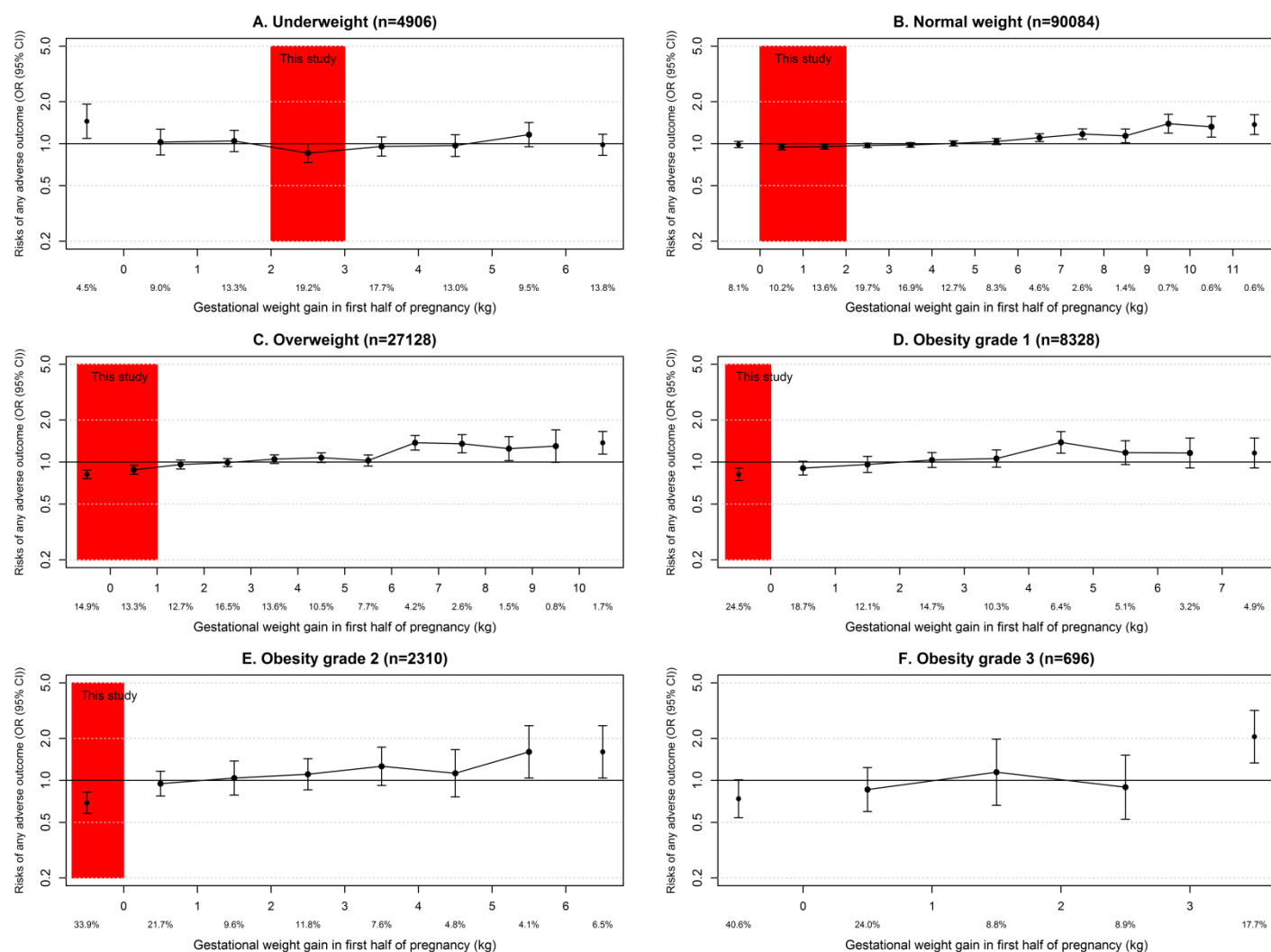
● Any adverse outcome



eFigure 5. Associations of gestational weight gain categories with any adverse outcome per maternal clinical body mass index group, ranges from this study based on protective associations only

The symbols represent odds ratios (95% Confidence Intervals) reflecting the risk of any adverse outcome per gestational weight gain category for women with (A) underweight, (B) normal weight, (C) overweight, (D) obesity grade 1, (E) obesity grade 2 and (F) obesity grade 3, as compared to all other gestational weight gain categories in that specific clinical maternal body mass index group. The symbols represent the mean for all participants in each gestational weight gain category. The percentages below each of the figures represent the number of participants in that gestational weight gain category as a percentage of all participants within that BMI category. Participants in the extreme categories of gestational weight gain had values beyond the most extreme labeled tick marks. Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age. This figure is equal to **Figure 3**, but shows ranges from this study when optimal weight gain would be defined as all associations below 1, regardless of statistical significance. The red area represents the optimal weight gain range according to this study, the grey area represents the weight gain ranges as recommended by the US Institute of Medicine (IOM, nowdays called National Academy of Medicine (NAM)).

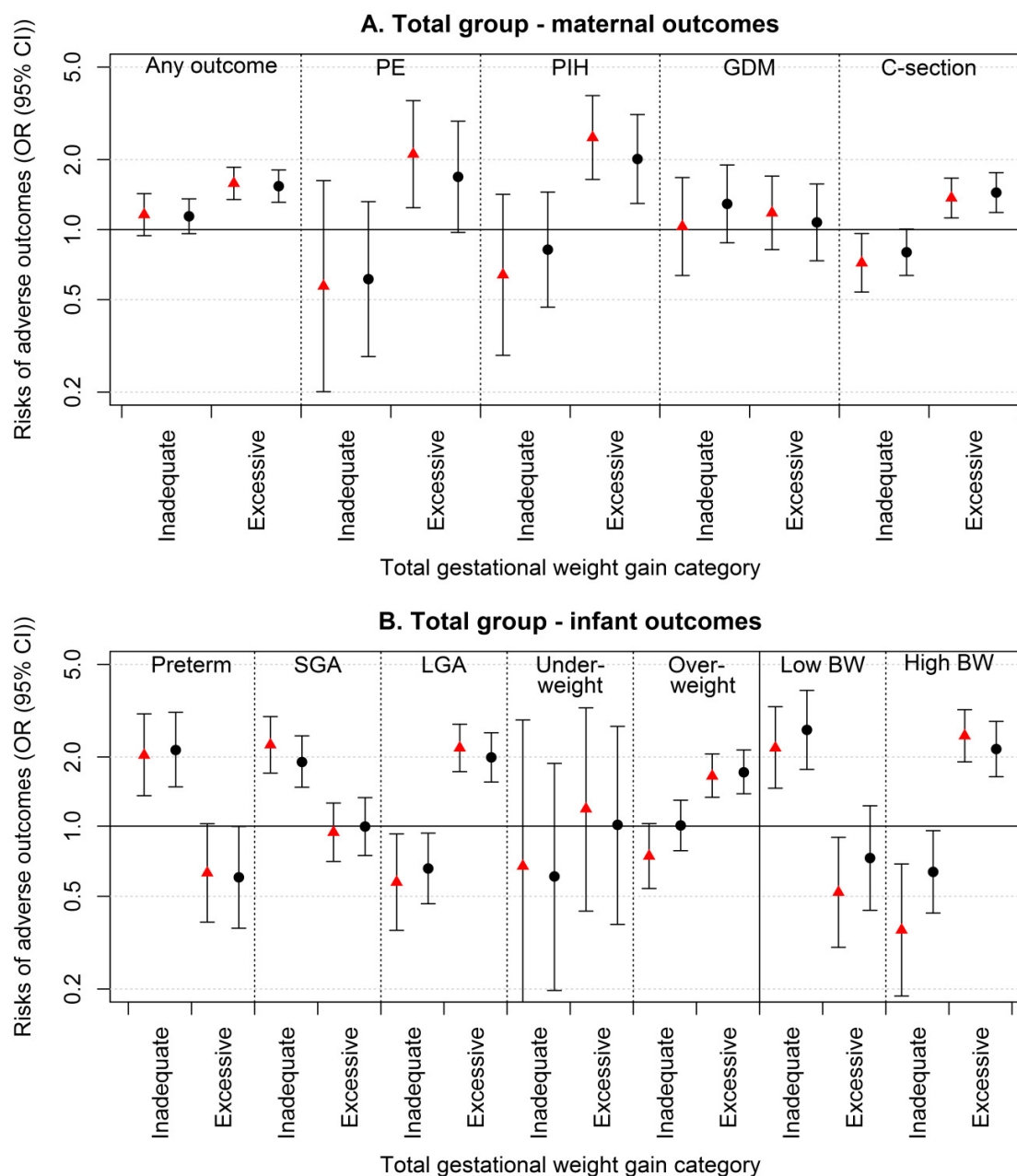
● Any adverse outcome



eFigure 6. Associations of categories of gestational weight gain in first half of pregnancy with any adverse outcome per maternal clinical body mass index group

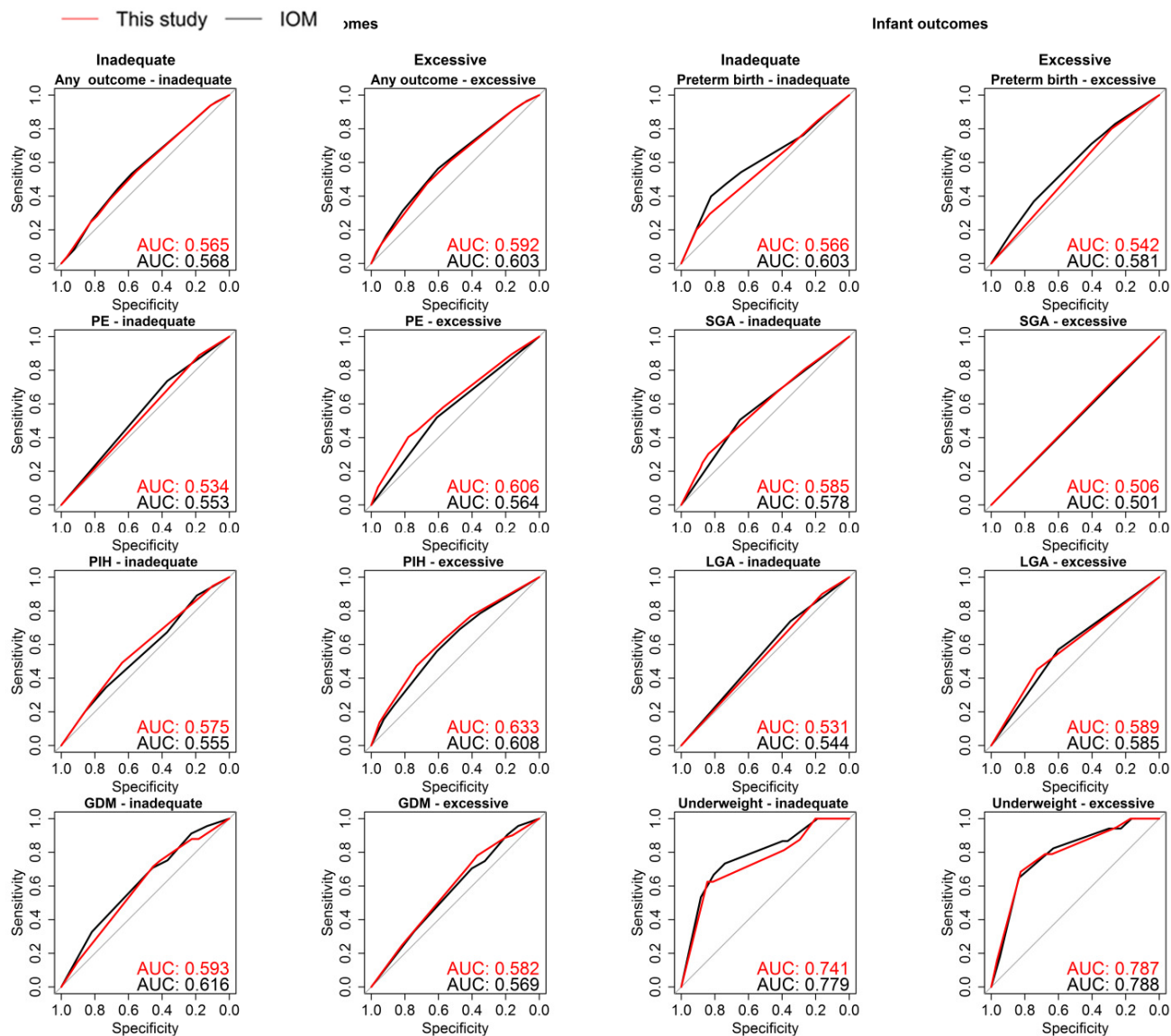
The symbols represent odds ratios (95% Confidence Intervals) reflecting the risk of any adverse outcome per category of gestational weight gain in first half of pregnancy for women with (A) underweight, (B) normal weight, (C) overweight, (D) obesity grade 1, (E) obesity grade 2 and (F) obesity grade 3, as compared to all other gestational weight gain categories in that specific clinical maternal body mass index group. The percentages below each of the figures represent the number of participants in that gestational weight gain category as a percentage of all participants within that BMI category. The symbols represent the mean for all participants in each gestational weight gain category. Participants in the extreme categories of gestational weight gain had values beyond the most extreme labeled tick marks. Because of the relatively low levels of gestational weight gain in first half of pregnancy, we categorized weight gain within this time interval into categories of 1 kg each. Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age. The red area represents the optimal weight gain range according to the current analysis. No optimal weight gain range was observed for obesity grade 3 due to low numbers.

▲ This study ● IOM



eFigure 7. Associations of inadequate and excessive gestational weight gain by classifications from this study and IOM with adverse maternal and infant outcomes, hospital-based population (used as validation sample)

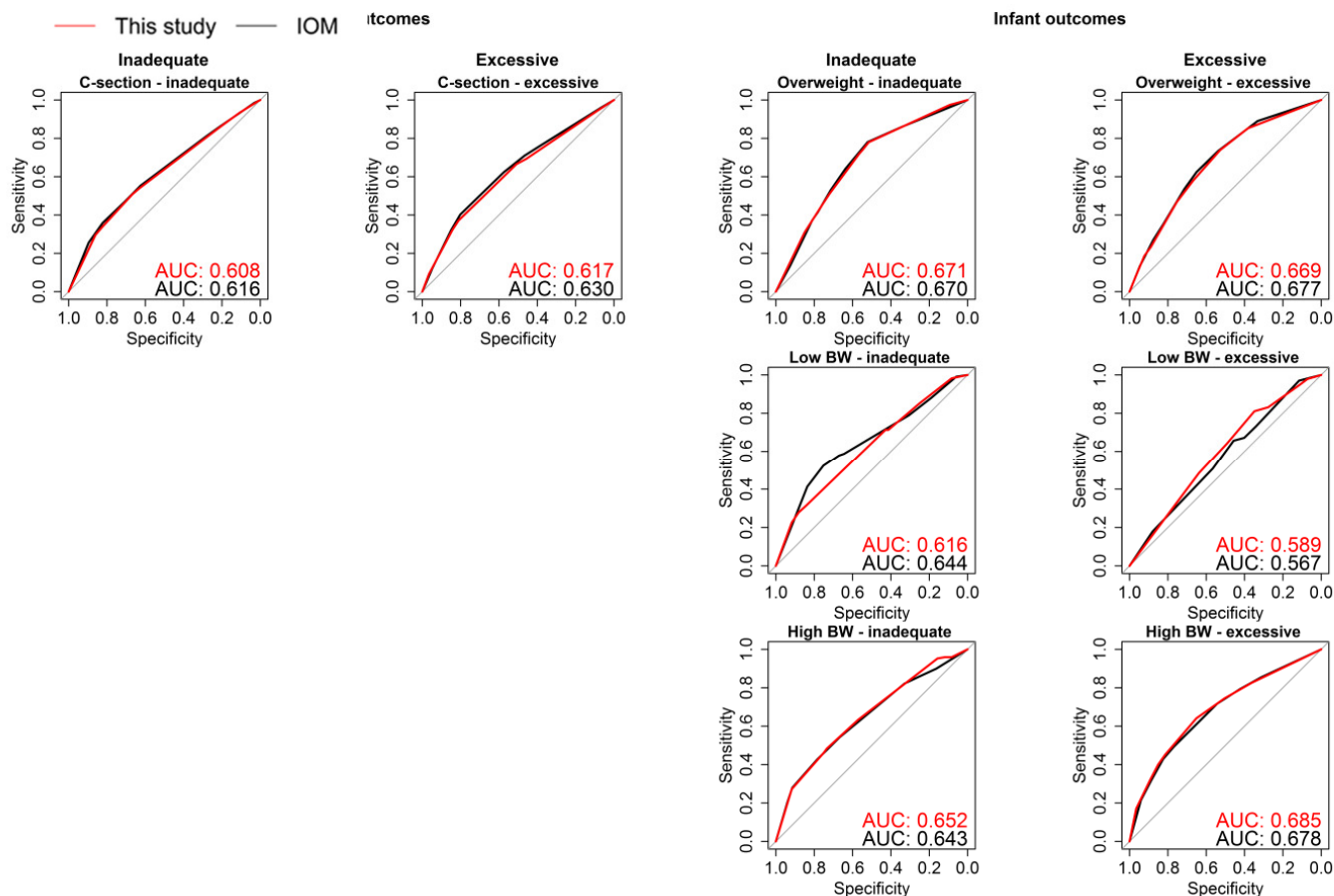
Abbreviations: IOM, US Institute of Medicine (nowadays called National Academy of Medicine (NAM)). Values represent odds ratios (OR) (95% Confidence Intervals (CI)) reflecting the risk of adverse maternal and infant outcomes in women with inadequate and excessive weight gain as compared to women with adequate weight gain, according to this study (red triangles) and IOM classifications (black dots). Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges from this study and IOM, respectively (**eTable 14**). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, small size-for-gestational-age (SGA), and large size-for-gestational-age (LGA). Low and high birth and childhood under- and overweight were not included for the definition of the optimal weight gain ranges. * P-value for the difference between ORs for this study and IOM (calculated using $Z = (\log\text{odds}_{\text{This study}} - \log\text{odds}_{\text{IOM}}) / \sqrt{SE_{\text{This study}}^2 + SE_{\text{IOM}}^2}$).



eFigure 8. Receiver operator characteristic curves of inadequate and excessive gestational weight gain by classifications from this study and IOM for the detection of adverse maternal and infant outcomes, hospital-based population (used as validation sample)

Abbreviations: AUC, area under the Receiver Operator

Characteristic curve; IOM, US Institute of Medicine (nowadays called National Academy of Medicine (NAM)). Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges from this study and IOM, respectively (**eTable 14**). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, small size-for-gestational-age (SGA), and large size-for-gestational-age (LGA). Low and high birth weight and childhood under- and overweight were not included for the definition of the optimal weight gain ranges.



eFigure 8 (continued). Receiver operator characteristic curves of inadequate and excessive gestational weight gain by classifications from this study and IOM for the detection of adverse maternal and infant outcomes, hospital-based population (used as validation sample)

Abbreviations: AUC, area under the Receiver Operator Characteristic curve; IOM, US Institute of Medicine (nowadays called National Academy of Medicine (NAM)). Inadequate and excessive gestational weight gain are defined as gestational weight gain below or above the ranges from this study and IOM, respectively (**eTable 14**). Any adverse outcome includes pre-eclampsia (PE), gestational hypertension (PIH), gestational diabetes (GDM), caesarean section, preterm birth, small size-for-gestational-age (SGA), and large size-for-gestational-age (LGA). Low and high birth weight and childhood under- and overweight were not included for the definition of the optimal weight gain ranges.

eTable 1. Cohort-specific methods of data collection^a

Cohort name (country)	Maternal height	Maternal pre- pregnancy weight	Maternal latest weight before delivery or gestational weight gain	Pre-eclampsia	Gestational hypertension	Gestational diabetes	Mode of delivery	Gestational age at birth	Birth weight	Childhood weight and height
Main analysis										
ALSPAC (United Kingdom)	Self-reported	Self-reported	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Measured	Measured
DNBC (Denmark)	Self-reported	Self-reported	Self-reported	Clinical records	Self-reported	Clinical records	National Medical Birth Registry	Parental report or National Medical Birth Registry	National Medical Birth Registry	Reported or Measured
FCOU (Ukraine)	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	NA	Clinical records	Clinical records
GECKO Drenthe (The Netherlands)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Clinical records or Self-reported	Clinical records	Clinical records	Measured
Gen3G (Canada)	Measured	Self-reported	Clinical records	Clinical records	Clinical records	Oral glucose tolerance test	Clinical records	Clinical records	Clinical records	NA
GENESIS (Greece)	Self-reported	Self-reported	Self-reported	NA	NA	Self-reported	NA	Clinical records	Clinical records	Measured
GENERATION R (The Netherlands)	Measured	Self-reported	Self-reported	Clinical records or Self-reported	Clinical records or Self-reported	Clinical records or Self-reported	Clinical records	Clinical records	Clinical records	Measured
GENERATION XXI (Portugal)	Measured or ID card	Self-reported	Self-reported	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Measured
GINIplus (Germany)	Self-reported	Self-reported	Self-reported	NA	NA	Self-reported	Self-reported	NA	NA	Clinical records at 4y, Measured and Reported at 10 and 15y
HUMIS (Norway)	Self-reported	Self-reported	Self-reported	Medical birth registry	Medical birth registry	Medical birth registry	Medical birth registry	Clinical records	Clinical records	Reported
INMA (Spain)	Measured or Self-reported	Self-reported	Clinical records	NA	NA	Clinical records	Clinical records	Clinical records	Clinical records	Measured
KOALA (The Netherlands)	Self-reported	Self-reported	Self-reported	Clinical records or Self-reported	Clinical records or Self-reported	Clinical records or Self-reported	Self-reported	Clinical records	Clinical records	Reported
Krakow Cohort (Poland)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Clinical records	Clinical records	Clinical records	Measured
LISAplus (Germany)	Self-reported	Self-reported	Self-reported	NA	NA	Self-reported	Self-reported	NA	NA	Clinical records at 4y, Measured and Reported at 10 and 15y
MoBa (Norway)	Self-reported	Self-reported	Self-reported	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Reported
NINFEA (Italy)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Parental report	Parental report	Reported
PIAMA (The Netherlands)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Parental report	Parental report	Reported and measured (4 and 8y)
Piccolipiù (Italy)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Clinical records	Clinical records	Measured
PRIDE Study (The Netherlands)	Self-reported	Self-reported	Self-reported	Clinical records or Self-reported	Clinical records or Self-reported	Clinical records or Self-reported	Self-reported	Parental report	Parental report	NA
Project Viva (United States)	Self-reported	Self-reported	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Parental report	Clinical records	Measured

eTable 1 (continued). Cohort-specific methods of data collection^a

Cohort name (country)	Maternal height	Maternal pre-pregnancy weight	Maternal latest weight before delivery or gestational weight gain	Pre-eclampsia	Gestational hypertension	Gestational diabetes	Mode of delivery	Gestational age at birth	Birth weight	Childhood weight and height
REPRO_PL (Poland)	Measured	Self-reported	Measured	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Clinical records	Measured
RHEA (Greece)	Measured	Self-reported	Measured	Self-reported	Measured or Self-reported	Self-reported	Self-reported	Clinical records	Clinical records	Clinical records or Measured
Slovak PCB study (Slovakia)	Self-reported	Self-reported	Self-reported	NA	NA	Self-reported	Clinical records	Clinical records	Clinical records	Measured
STEPS (Finland)	Self-reported	Self-reported	Self-reported	NA	NA	Clinical records	NA	National Longitudinal Census Files	National Longitudinal Census Files	Measured
SWS (United Kingdom)	Measured	Measured	Measured	Clinical records	Clinical records	Clinical records	Clinical records	Measured	Clinical records	Measured
Hospital-based^b										
Co.N.ER (Italy)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Parental report	Parental report	Reported
EDEN (France)	Measured	Self-reported	Clinical records	Clinical records	Clinical examination at 24 weeks of gestation and clinical records	Oral glucose tolerance test and clinical records	Clinical records	Clinical records	Clinical records	Clinical records or Measured
GASPII (Italy)	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Self-reported	Clinical records	Measured	Measured	Measured
LUKAS (Finland)	Self-reported	Self-reported	Clinical records or Self-reported	NA	NA	NA	Reported by midwives	NA	Clinical records	Reported

^a NA: not available (not collected or not provided) or not applicable (gestational age at birth (FCOU, GINIplus, LISApplus, LUKAS) and birth weight (GINIplus, LISApplus) due to selected samples).

^b The hospital-based cohorts were used as validation sample.

eTable 2. Associations of general characteristics with total gestational weight gain^a

	Total gestational weight gain, kg (95% CI)
Pre-pregnancy BMI (kg/m ²) ^b	-0.25 (-0.26, -0.24)
Underweight (<18.5 kg/m ²)	-0.16 (-0.29, -0.04)
Normal weight (18.5-24.9 kg/m ²)	Reference
Overweight (25.0-29.9 kg/m ²)	-0.79 (-0.85, -0.73)
Obesity grade 1 (30.0-34.9 kg/m ²)	-3.48 (-3.58, -3.37)
Obesity grade 2 (35.0-39.9 kg/m ²)	-5.73 (-5.92, -5.54)
Obesity grade 3 (≥40.0 kg/m ²)	-7.61 (-7.96, -5.54)
Maternal age (years)	-0.11 (-0.12, -0.11)
Parity	
Nulliparous	Reference
Multiparous	-1.07 (-1.12, -1.02)

^a Values are regression coefficients from exploratory multilevel linear regression models that represent differences in total gestational weight gain for each of the characteristics listed. Models are not adjusted for covariates.

^b Body mass index is calculated as weight in kilograms divided by height in meters squared.

eTable 3. Description of missing data

Outcome	Information available		Information missing	
	n	%	n	%
Main sample (n=196670)				
Used in models to construct ranges (main analysis)				
Pre-pregnancy BMI	196670	100.0	NA	NA
Total gestational weight gain	196670	100.0	NA	NA
Any adverse outcome ^a	196670	100.0	NA	NA
Separate outcomes (included in ‘any adverse outcome’)				
Gestational hypertensive disorders ^b	179577	91.3	17093	8.7
Gestational diabetes	189772	96.5	6898	3.5
Caesarean section	186884	95.0	9786	5.0
Preterm birth	188129	95.7	8541	4.3
Size-for-gestational-age at birth	190217	96.7	6453	3.3
All of the separate outcomes used to construct ranges (complete cases) ^c	169437 ^d	86.2	27233 ^e	13.8
Validation sample (Hospital-based) (n=3505)				
Any adverse outcome	3505	100.0	NA	NA
Gestational hypertensive disorders ^b	3082	87.9	423	12.1
Gestational diabetes	3084	88.0	421	12.0
Caesarean section	3490	99.6	15	0.4
Preterm birth	3089	88.1	416	11.9
Size-for-gestational-age at birth	3498	99.8	7	0.2
All of the separate outcomes (complete cases)	3059 ^d	87.3	446 ^e	12.7

^a Any adverse outcome is defined as the presence of at least one of the following outcomes: pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth and small or large size-for-gestational age.

^b Includes both pre-eclampsia and gestational hypertension.

^c Sensitivity analysis with complete cases is shown in **eTable 10**.

^d Reflects the number of participants with information on all outcomes included in ‘any adverse outcome’.

^e Reflects the number of participants with missing information on one or more of the outcomes included in ‘any adverse outcome’.

eTable 4. Characteristics of the hospital-based population, used as a validation sample^a

	Total group
	n=3505
Pre-pregnancy body mass index, median (Q1, Q3) ^b	22.0 (20.1, 24.8)
Pre-pregnancy body mass index ^b	
Underweight (<18.5 kg/m ²)	277 (7.9)
Normal weight (18.5-24.9 kg/m ²)	2400 (68.4)
Overweight (25.0-29.9 kg/m ²)	577 (16.5)
Obesity grade 1 (30.0-34.9 kg/m ²)	188 (5.4)
Obesity grade 2 (35.0-39.9 kg/m ²)	53 (1.5)
Obesity grade 3 (≥40.0 kg/m ²)	10 (0.3)
Total gestational weight gain (kg)	
Median (Q1, Q3)	13.0 (10.7, 16.0)
P2.5, P97.5	4.0, 24.0
Maternal age (years), median (Q1, Q3)	31.0 (27.7, 34.7)
Education ^c	
Low, n (%)	721 (20.6)
Medium, n (%)	1254 (35.9)
High, n (%)	1521 (43.5)
Country	
France, n (%)	1794 (51.2)
Italy, n (%)	1296 (37.0)
Finland, n (%)	415 (11.8)
Gestational hypertension, n (%) ^d	102 (3.4)
Pre-eclampsia, n (%) ^e	61 (2.0)
Gestational diabetes, n (%) ^f	162 (5.3)
Caesarean section, n (%)	653 (18.7)
Preterm birth, n (%) ^g	140 (4.5)
Small size-for-gestational-age, n (%) ^h	349 (10.0)
Large size-for-gestational-age, n (%) ⁱ	348 (10.0)
Childhood underweight, n (%) ^j	21 (0.8)
Childhood overweight, n (%) ^k	563 (20.5)
Any adverse outcome, n (%) ^l	1423 (40.6)

^a Values are median (Q1, Q3), median (P2.5, P97.5) or n (valid %).

^b Body mass index is calculated as weight in kilograms divided by height in meters squared.

^c Education level was based on cohort-specific criteria. Each cohort used their own country-specific criteria to define low, medium and high educational level. These 3 categories were subsequently used in the meta-analysis.

^d Gestational hypertension is defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg after 20 weeks of gestation in previously normotensive women.

^e Pre-eclampsia is defined as gestational hypertension plus proteinuria.

^f Gestational diabetes is defined as either a random glucose level >11.0 mmol/L, a fasting glucose level ≥7.0 mmol/L or a fasting glucose level between 6.1 and 6.9 mmol/L with a subsequent abnormal glucose tolerance test (glucose level >7.8 mmol/L after glucose intake).

^g Preterm birth is defined as gestational age at birth <37 weeks.

^h Small size-for-gestational-age at birth is defined as sex- and gestational age adjusted birth weight <10th percentile.

ⁱ Large size-for-gestational-age at birth is defined as sex- and gestational age adjusted birth >90th percentile.

^j Childhood underweight at the highest age available for each child (median (Q1, Q3): 84.9 (61.9, 95.9) months) is defined as sex- and age adjusted standard deviation scores (SDS) <-2 SDS for children of 2-5 years of age, and <-2 SDS for children of >5 years.

^k Childhood overweight at the highest age available for each child (median (Q1, Q3): 84.9 (61.9, 95.9) months) is defined as sex- and age adjusted standard deviation scores (SDS) >2.0 SDS for children of 2-5 years of age, and >1 SDS for children of >5 years.

^l Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age.

eTable 5. Description of exposures and general characteristics per cohort^{a,b}

	Participants, n	Maternal pre-pregnancy BMI ^c	Total gestational weight gain (kg)		Maternal age (years)	Education, n(%) ^d		
Cohort name (country)		median (Q1, Q3)	median (Q1, Q3)	P2.5, P97.5	median (Q1, Q3)	Low	Medium	High
Main analysis								
ALSPAC (United Kingdom)	10156	22.2 (20.5, 24.5)	12.5 (9.5, 15.5)	4.0, 22.3	28.0 (25.0, 32.0)	6100 (63.1)	2262 (23.4)	1305 (13.5)
DNBC (Denmark)	60963	22.7 (20.7, 25.5)	15.0 (12.0, 18.0)	4.0, 28.0	30.2 (27.4, 33.3)	5461 (9.0)	23332 (38.4)	31959 (52.6)
FCOU (Ukraine)	3261	21.6 (19.9, 24.0)	12.0 (9.2, 15.0)	3.0, 21.5	23.0 (20.0, 27.0)	163 (5.1)	2177 (68.1)	857 (26.8)
GECKO Drenthe (The Netherlands)	2044	23.7 (21.5, 26.8)	13.0 (10.0, 17.0)	4.0, 25.0	31.0 (28.0, 34.0)	1257 (62)	771 (38.0)	0 (0.0)
Gen3G (Canada)	844	23.3 (20.9, 27.3)	13.7 (10.7, 17.0)	3.2, 24.1	28.0 (25.0, 31.0)	NA	NA	NA
GENESIS (Greece)	2173	21.9 (20.2, 24.0)	13.0 (10.0, 17.0)	3.0, 28.7	30.3 (27.2, 33.3)	95 (4.5)	1096 (52.0)	918 (43.5)
GENERATION R (The Netherlands)	6808	22.6 (20.8, 25.4)	12.0 (9.0, 16.0)	1.0, 25.0	30.4 (26.1, 33.6)	698 (10.6)	3055 (46.2)	2855 (43.2)
GENERATION XXI (Portugal)	7220	22.9 (21.0, 25.8)	13.0 (10.0, 17.0)	2.0, 26.0	29.0 (25.0, 33.0)	2329 (32.3)	3157 (43.8)	1717 (23.8)
GINIplus (Germany)	2262	22.1 (20.5, 24.2)	13.0 (10.0, 15.7)	5.0, 25.0	31.0 (29.0, 34.0)	264 (11.7)	963 (42.7)	1030 (45.6)
HUMIS (Norway)	1045	23.4 (21.3, 26.1)	14.0 (11.0, 18.0)	5.0, 27.0	30.0 (27.0, 33.0)	109 (12.0)	177 (19.5)	622 (68.5)
INMA (Spain)	1933	22.5 (20.7, 25.1)	13.5 (10.5, 16.6)	4.1, 24.5	30.0 (28.0, 33.0)	504 (26.1)	790 (41.0)	635 (32.9)
KOALA (The Netherlands)	2621	22.7 (20.9, 25.3)	14.0 (11.0, 17.0)	4.0, 25.0	32.0 (30.0, 34.0)	258 (10.4)	988 (39.7)	1242 (49.9)
Krakow Cohort (Poland)	498	21.0 (19.5, 22.7)	15.0 (12.0, 18.0)	7.0, 27.6	28.0 (26.0, 30.0)	48 (9.6)	188 (37.8)	262 (52.6)
LISAplus (Germany)	2837	21.7 (20.2, 24.0)	14.0 (11.5, 17.0)	6.0, 25.5	31.0 (28.0, 34.0)	278 (9.9)	1081 (38.6)	1443 (51.5)
MoBa (Norway)	73462	23.1 (21.1, 25.9)	15.0 (11.0, 18.0)	3.2, 27.0	30.0 (27.0, 33.0)	21573 (29.9)	31440 (43.6)	19027 (26.4)
NINFEA (Italy) ^e	2134	21.3 (19.8, 23.9)	12.0 (10.0, 15.0)	3.0, 22.0	33.0 (30.0, 36.0)	84 (3.9)	729 (34.2)	1317 (61.8)
PIAMA (The Netherlands)	3388	22.2 (20.6, 24.3)	13.0 (10.0, 16.0)	5.0, 25.0	30.0 (28.0, 33.0)	757 (22.4)	1399 (41.3)	1228 (36.3)
Piccolipiù (Italy)	3173	21.7 (19.9, 24.2)	13.0 (10.0, 15.0)	5.3, 22.0	34.0 (30.0, 37.0)	377 (11.9)	1372 (43.4)	1414 (44.7)

^a Values are median (Q1, Q3), median (P2.5, P97.5) or n (valid %).

^b NA: not available (not collected or not provided).

^c Body mass index is calculated as weight in kilograms divided by height in meters squared.

^d Education level was based on cohort-specific criteria. Each cohort used their own country-specific criteria to define low, medium and high educational level. These 3 categories were subsequently used in the meta-analysis.

^e Subset of participants with 4-years follow-up completed.

eTable 5 (continued). Description of exposures and general characteristics per cohort^{a,b}

	Participants, n	Maternal pre-pregnancy BMI ^c	Total gestational weight gain (kg)		Maternal age (years)	Education, n (%) ^d		
Cohort name (country)		median (Q1, Q3)	median (Q1, Q3)	P2.5, P97.5	median (Q1, Q3)	Low	Medium	High
PRIDE Study (The Netherlands)	1081	22.5 (20.6, 24.7)	14.0 (11.0, 17.0)	4.0, 25.0	30.0 (28.0, 33.0)	20 (1.9)	196 (18.5)	843 (79.6)
Project Viva (United States)	2021	23.5 (21.0, 27.1)	15.5 (12.3, 19.1)	4.1, 27.3	32.3 (29.1, 35.4)	699 (34.8)	717 (35.7)	595 (29.6)
REPRO_PL (Poland)	1204	21.5 (19.8, 23.7)	12.0 (9.0, 15.0)	4.0, 22.5	28.0 (25.0, 31.0)	150 (12.5)	368 (30.6)	685 (56.9)
RHEA (Greece)	699	23.3 (21.2, 25.9)	13.0 (10.0, 17.0)	4.0, 26.0	30.0 (27.0, 33.0)	102 (14.6)	361 (51.7)	235 (33.7)
Slovak PCB study (Slovakia)	983	21.2 (19.5, 24.0)	13.0 (10.0, 17.0)	4.9, 24.0	25.0 (22.0, 29.0)	423 (43.1)	472 (48.1)	87 (8.9)
STEPS (Finland)	1406	23.0 (21.1, 26.0)	13.9 (10.8, 17.4)	2.5, 25.4	30.7 (28.0, 33.6)	127 (9.3)	388 (28.3)	855 (62.4)
SWS (United Kingdom)	2454	24.2 (21.9, 27.4)	11.9 (8.3, 15.7)	0.1, 25.3	30.2 (27.2, 32.7)	316 (12.9)	1445 (59.0)	688 (28.1)
Hospital-based^e								
Co.N.ER (Italy)	625	21.1 (19.7, 23.2)	13.0 (10.0, 16.0)	7.0, 22.4	33.8 (30.9, 36.5)	109 (17.5)	279 (44.7)	236 (37.8)
EDEN (France)	1794	22.1 (20.1, 25.2)	13.0 (11.0, 16.3)	3.0, 24.0	29.5 (26.2, 32.6)	502 (28.1)	324 (18.1)	960 (53.8)
GASPII (Italy)	671	21.3 (19.8, 23.6)	13.0 (10.5, 16.0)	6.0, 23.3	33.0 (30.0, 36.0)	92 (13.7)	338 (50.4)	241 (35.9)
LUKAS (Finland)	415	24.0 (21.9, 27.2)	13.8 (11.0, 17.8)	4.2, 25.3	30.9 (27.4, 34.6)	18 (4.3)	313 (75.4)	84 (20.2)

^a Values are median (Q1, Q3), median (P2.5, P97.5) or n (valid %).

^b NA: not available (not collected or not provided).

^c Body mass index is calculated as weight in kilograms divided by height in meters squared.

^d Education level was based on cohort-specific criteria. Each cohort used their own country-specific criteria to define low, medium and high educational level. These 3 categories were subsequently used in the meta-analysis.

^e The hospital-based cohorts were used as validation sample.

eTable 6. Description of outcomes per cohort^{a,b}

Cohort name (country)	Participants, n	Gestational hypertension, n (%) ^d	Pre-eclampsia, n (%) ^e	Gestational diabetes, n (%) ^f	Caesarean section, n (%)	Preterm birth, n (%) ^g	Small size-for-gestational-age, n (%) ^h	Large size-for-gestational-age, n (%) ⁱ	Childhood underweight, n (%) ^j	Childhood overweight, n (%) ^k	Any adverse outcome, n (%) ^l
Main analysis											
ALSPAC (United Kingdom)	10156	1482 (14.9)	206 (2.4)	76 (0.7)	1068 (17.1)	463 (4.6)	1001 (10.0)	1001 (10.0)	116 (1.6)	1874 (25.5)	4156 (40.9)
DNBC (Denmark)	60963	2239 (4.0)	2230 (4.0)	416 (0.7)	9290 (15.3)	2625 (4.3)	6064 (10.0)	6063 (10.0)	728 (2.3)	4930 (15.3)	22997 (37.7)
FCOU (Ukraine)	3261	284 (9.2)	186 (6.3)	9 (0.3)	273 (8.5)	NA	338 (10.5)	319 (10.0)	47 (2.6)	208 (11.6)	1197 (36.7)
GECKO Drenthe (The Netherlands)	2044	142 (8.0)	38 (2.3)	78 (3.8)	271 (15.0)	80 (4.0)	197 (10.0)	197 (10.0)	NA	348 (21.4)	780 (38.2)
Gen3G (Canada)	844	42 (5.0)	9 (1.1)	71 (8.6)	144 (17.1)	39 (4.6)	84 (10.0)	84 (10.0)	NA	NA	360 (42.7)
GENESIS (Greece)	2173	NA	NA	34 (1.6)	NA	206 (9.5)	209 (10.0)	208 (10.0)	11 (0.6)	289 (15.6)	579 (26.6)
GENERATION R (The Netherlands)	6808	0 (0.0)	140 (2.2)	72 (1.1)	726 (11.9)	349 (5.1)	675 (10.0)	675 (10.0)	42 (0.8)	1425 (25.6)	2202 (32.3)
GENERATION XXI (Portugal)	7220	132 (1.9)	112 (1.6)	474 (6.6)	2526 (35.4)	526 (7.3)	719 (10.0)	718 (10.0)	24 (0.4)	2001 (35.5)	3917 (54.3)
GINIplus (Germany)	2262	NA	NA	58 (2.6)	445 (19.7)	NA	NA	NA	45 (2.0)	362 (16)	493 (21.8)
HUMIS (Norway)	1045	40 (4.2)	85 (8.5)	6 (0.6)	195 (18.7)	85 (8.2)	103 (9.9)	103 (9.9)	21 (2.3)	101 (10.9)	444 (42.5)
INMA (Spain)	1933	NA	NA	195 (11.9)	334 (17.6)	76 (3.9)	192 (10.0)	192 (10.0)	5 (0.3)	406 (27.8)	801 (41.4)
KOALA (The Netherlands)	2621	82 (3.2)	30 (1.2)	21 (0.8)	307 (11.7)	81 (3.1)	260 (10.0)	260 (10.0)	63 (3.2)	204 (10.5)	887 (33.8)
Krakow Cohort (Poland)	498	21 (4.2)	1 (0.2)	21 (4.2)	96 (19.3)	18 (3.6)	49 (9.9)	49 (9.9)	8 (1.9)	94 (22.5)	216 (43.4)
LISApplus (Germany)	2837	NA	NA	56 (3.7)	481 (17.2)	NA	NA	NA	50 (2.2)	332 (14.8)	525 (18.5)
MoBa (Norway)	73462	1448 (2.0)	2666 (3.7)	587 (0.8)	9831 (13.4)	2919 (4.0)	7300 (10.0)	7304 (10.0)	1234 (2.4)	7531 (14.8)	25826 (35.2)
NINFEA (Italy) ^c	2134	105 (5.3)	47 (2.4)	153 (7.5)	555 (29.2)	81 (3.8)	210 (10.0)	209 (10.0)	64 (3.8)	156 (9.3)	1030 (48.3)

^a Values are median (Q1, Q3), median (P2.5, P97.5) or n (valid %).

^b NA: not available (not collected or not provided) or not applicable (preterm birth (FCOU, GINIplus, LISApplus, LUKAS) and small and large size-for-gestational age (GINIplus, LISApplus) due to selected samples).

^c Subset of participants with 4-years follow-up completed.

^d Gestational hypertension is defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg after 20 weeks of gestation in previously normotensive women.

^e Pre-eclampsia is defined as gestational hypertension plus proteinuria.

^f Gestational diabetes is defined as either a random glucose level > 11.0 mmol/L, a fasting glucose level ≥ 7.0 mmol/L or a fasting glucose level between 6.1 and 6.9 mmol/L with a subsequent abnormal glucose tolerance test (glucose level > 7.8 mmol/L after glucose intake).

^g Preterm birth is defined as gestational age at birth < 37 weeks.

^h Small size-for-gestational-age at birth is defined as sex- and gestational age adjusted birth weight $< 10^{\text{th}}$ percentile.

ⁱ Large size-for-gestational-age at birth is defined as sex- and gestational age adjusted birth $> 90^{\text{th}}$ percentile.

^j Childhood underweight at the highest age available for each child (median (Q1, Q3): 84.9 (61.9, 95.9) months) is defined as sex- and age adjusted standard deviation scores (SDS) < -2.0 SDS for children of 2-5 years of age, and < -2.0 for children of > 5 years.

^k Childhood overweight at the highest age available for each child (median (Q1, Q3): 84.9 (61.9, 95.9) months) is defined as sex- and age adjusted standard deviation scores (SDS) > 2.0 SDS for children of 2-5 years of age, and > 1.0 SDS for children of > 5 years.

^l Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age.

eTable 6 (continued). Description of outcomes per cohort^{a,b}

Cohort name (country)	Participants, n	Gestational hypertension, n (%) ^c	Pre-eclampsia, n (%) ^d	Gestational diabetes, n (%) ^e	Caesarean section, n (%)	Preterm birth, n (%) ^f	Small size-for-gestational-age, n (%) ^g	Large size-for-gestational-age, n (%) ^h	Childhood underweight, n (%) ⁱ	Childhood overweight, n (%) ^j	Any adverse outcome, n (%) ^k
PIAMA (The Netherlands)	3388	163 (8.0)	52 (2.7)	18 (0.9)	284 (8.5)	162 (4.8)	336 (10.0)	336 (10.0)	26 (1.1)	391 (17.2)	1122 (33.1)
Piccolipiù (Italy)	3173	114 (3.6)	35 (1.1)	283 (9.0)	854 (27.0)	94 (3.0)	316 (10.0)	314 (9.9)	24 (3.6)	40 (6.0)	1572 (49.5)
PRIDE Study (The Netherlands)	1081	85 (8.7)	33 (3.6)	15 (1.5)	106 (10.5)	44 (4.2)	104 (10.0)	104 (10.0)	NA	NA	398 (36.8)
Project Viva (United States)	2021	134 (6.9)	63 (3.4)	113 (5.6)	476 (23.6)	108 (5.3)	202 (10.0)	202 (10.0)	8 (0.6)	345 (25.6)	954 (47.2)
REPRO_PL (Poland)	1204	51 (4.2)	2 (0.2)	45 (3.7)	404 (34.9)	41 (3.4)	120 (10.0)	118 (9.8)	6 (2.3)	35 (13.4)	636 (52.8)
RHEA (Greece)	699	28 (4.6)	4 (0.7)	57 (9.3)	347 (49.9)	83 (12.0)	68 (9.9)	66 (9.6)	2 (0.3)	79 (12.4)	455 (65.1)
Slovak PCB study (Slovakia)	983	NA	NA	9 (0.9)	14 (1.4)	22 (2.2)	97 (9.9)	99 (10.1)	9 (2.0)	169 (37.7)	230 (23.4)
STEPS (Finland)	1406	NA	NA	54 (6.0)	NA	54 (3.8)	140 (10.0)	140 (10.0)	NA	19 (4.6)	357 (25.4)
SWS (United Kingdom)	2454	91 (3.8)	57 (2.4)	25 (1.0)	540 (26.2)	94 (3.8)	243 (10.0)	244 (10.0)	9 (0.4)	379 (18.2)	1027 (41.9)
Hospital-based^l											
Co.N.ER (Italy)	625	21 (3.5)	16 (2.7)	16 (2.6)	121 (19.8)	27 (4.3)	62 (9.9)	62 (9.9)	13 (2.5)	121 (23.4)	259 (41.4)
EDEN (France)	1794	51 (2.9)	37 (2.1)	118 (6.6)	271 (15.1)	86 (4.8)	180 (10.1)	179 (10.0)	7 (0.5)	143 (11.1)	716 (39.9)
GASPII (Italy)	671	30 (4.5)	8 (1.3)	28 (4.2)	209 (31.1)	27 (4.0)	66 (9.9)	66 (9.9)	NA	NA	331 (49.3)
LUKAS (Finland)	415	NA	NA	NA	52 (12.5)	NA	41 (9.9)	41 (9.9)	1 (0.3)	114 (30.2)	117 (28.2)

^a Values are median (Q1, Q3), median (P2.5, P97.5) or n (valid %).

^b NA: not available (not collected or not provided) or not applicable (preterm birth (FCOU, GINIplus, LISApplus, LUKAS) and small and large size-for-gestational age (GINIplus, LISApplus) due to selected samples).

^c Gestational hypertension is defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg after 20 weeks of gestation in previously normotensive women.

^d Pre-eclampsia is defined as gestational hypertension plus proteinuria.

^e Gestational diabetes is defined as either a random glucose level >11.0 mmol/L, a fasting glucose level ≥ 7.0 mmol/L or a fasting glucose level between 6.1 and 6.9 mmol/L with a subsequent abnormal glucose tolerance test (glucose level >7.8 mmol/L after glucose intake).

^f Preterm birth is defined as gestational age at birth <37 weeks.

^g Small size-for-gestational-age at birth is defined as sex- and gestational age adjusted birth weight $<10^{\text{th}}$ percentile.

^h Large size-for-gestational-age at birth is defined as sex- and gestational age adjusted birth $>90^{\text{th}}$ percentile.

ⁱ Childhood underweight at the highest age available for each child (median (Q1, Q3): 84.9 (61.9, 95.9) months) is defined as sex- and age adjusted standard deviation scores (SDS) <-2.0 SDS for children of 2-5 years of age, and <-2.0 for children of >5 years.

^j Childhood overweight at the highest age available for each child (median (Q1, Q3): 84.9 (61.9, 95.9) months) is defined as sex- and age adjusted standard deviation scores (SDS) >2.0 SDS for children of 2-5 years of age, and >1.0 SDS for children of >5 years.

^k Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age.

^l The hospital-based cohorts were used as validation sample.

eTable 7. Description of outcomes by gestational weight gain category^a

	Pre-eclampsia			Gestational hypertension			Gestational diabetes			Caesarean section			Preterm birth			Small size-for-gestational-age			Large size-for-gestational age			Any adverse outcome		
	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%
Underweight (n=7809)																								
<8	10	346	2.9	12	348	3.4	5	389	1.3	55	348	15.8	54	381	14.2	125	390	32.1	3	268	1.1	203	404	50.2
8 to 9.9	6	526	1.1	12	532	2.3	9	597	1.5	68	562	12.1	55	568	9.7	147	585	25.1	12	450	2.7	252	619	40.7
10 to 11.9	12	1011	1.2	17	1016	1.7	12	1117	1.1	144	1095	13.2	78	1070	7.3	236	1087	21.7	26	877	3	434	1175	36.9
12 to 13.9	12	1235	1.0	22	1245	1.8	8	1365	0.6	174	1357	12.8	71	1299	5.5	275	1342	20.5	25	1092	2.3	506	1437	35.2
14 to 15.9	18	1181	1.5	19	1182	1.6	8	1269	0.6	134	1269	10.6	39	1217	3.2	195	1237	15.8	33	1075	3.1	387	1326	29.2
16 to 17.9	17	864	2.0	27	874	3.1	5	955	0.5	109	956	11.4	29	930	3.1	161	909	17.7	42	790	5.3	334	993	33.6
18 to 19.9	9	536	1.7	9	536	1.7	2	591	0.3	77	597	12.9	20	577	3.5	69	552	12.5	40	523	7.6	198	623	31.8
20 to 21.9	7	438	1.6	9	440	2.0	3	475	0.6	62	478	13.0	16	481	3.3	72	467	15.4	20	415	4.8	157	499	31.5
>=22	21	628	3.3	24	631	3.8	5	706	0.7	104	699	14.9	21	708	3.0	56	654	8.6	55	653	8.4	235	733	32.1
Normal weight (n=133788)																								
Weight loss	2	100	2.0	2	100	2.0	3	107	2.8	18	106	17.0	11	98	11.2	16	99	16.2	5	88	5.7	47	109	43.1
0 to 1.9	6	309	1.9	6	309	1.9	9	341	2.6	52	325	16.0	37	343	10.8	74	328	22.6	19	273	7.0	158	356	44.4
2 to 3.9	6	499	1.2	17	510	3.3	22	560	3.9	67	524	12.8	63	537	11.7	113	534	21.2	25	446	5.6	245	577	42.5
4 to 5.9	21	1505	1.4	42	1526	2.8	43	1664	2.6	219	1542	14.2	180	1604	11.2	305	1597	19.1	66	1358	4.9	691	1721	40.2
6 to 7.9	84	3882	2.2	123	3921	3.1	112	4327	2.6	621	4049	15.3	393	4142	9.5	811	4124	19.7	143	3456	4.1	1793	4463	40.2
8 to 9.9	151	8369	1.8	217	8435	2.6	170	9289	1.8	1172	8823	13.3	630	9015	7.0	1488	8901	16.7	370	7783	4.8	3412	9658	35.3
10 to 11.9	271	14885	1.8	405	15019	2.7	233	16444	1.4	2079	15933	13.0	888	16017	5.5	2253	15519	14.5	823	14089	5.8	5742	17081	33.6
12 to 13.9	386	20354	1.9	519	20487	2.5	224	22312	1.0	2910	21916	13.3	916	21971	4.2	2549	20940	12.2	1354	19745	6.9	7424	23217	32.0
14 to 15.9	456	20396	2.2	567	20507	2.8	195	22221	0.9	2963	21973	13.5	716	21973	3.3	2123	20493	10.4	1710	20080	8.5	7314	23073	31.7
16 to 17.9	358	15522	2.3	512	15676	3.3	132	16896	0.8	2326	16731	13.9	502	16737	3.0	1445	15387	9.4	1507	15449	9.8	5648	17498	32.3
18 to 19.9	299	10954	2.7	356	11011	3.2	88	11862	0.7	1671	11794	14.2	341	11817	2.9	925	10543	8.8	1362	10980	12.4	4161	12271	33.9
20 to 21.9	319	8903	3.6	326	8910	3.7	76	9644	0.8	1432	9666	14.8	263	9729	2.7	665	8550	7.8	1208	9093	13.3	3511	10011	35.1
22 to 23.9	209	4962	4.2	155	4908	3.2	33	5330	0.6	851	5358	15.9	125	5369	2.3	333	4569	7.3	803	5039	15.9	2046	5526	37.0
24 to 25.9	187	3473	5.4	137	3423	4	31	3745	0.8	631	3760	16.8	112	3819	2.9	197	3188	6.2	625	3616	17.3	1548	3882	39.9
26 to 27.9	92	1476	6.2	59	1443	4.1	18	1624	1.1	289	1607	18.0	46	1619	2.8	104	1365	7.6	253	1514	16.7	691	1666	41.5
>=28.0	220	2339	9.4	140	2259	6.2	18	2590	0.7	524	2597	20.2	91	2631	3.5	126	2106	6.0	516	2496	20.7	1256	2679	46.9

^a Values are number of cases of each outcome, total number of participants, and absolute risks of adverse maternal and infant outcomes (% , calculated as (n (outcome) / n (gestational weight gain category within BMI group))*100) within each gestational weight gain category.

eTable 7 (continued). Description of outcomes by gestational weight gain category^a

	Pre-eclampsia			Gestational hypertension			Gestational diabetes			Caesarean section			Preterm birth			Small size-for-gestational-age			Large size-for-gestational age			Any adverse outcome		
	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%
Overweight (n=38828)																								
Weight loss	11	192	5.7	3	184	1.6	9	206	4.4	34	195	17.4	21	199	10.6	28	188	14.9	18	178	10.1	88	213	41.3
0 to 1.9	15	489	3.1	28	502	5.6	31	530	5.8	82	510	16.1	42	534	7.9	73	501	14.6	35	463	7.6	236	546	43.2
2 to 3.9	16	598	2.7	17	599	2.8	24	651	3.7	98	623	15.7	49	638	7.7	80	603	13.3	40	563	7.1	249	667	37.3
4 to 5.9	31	1120	2.8	47	1136	4.1	47	1235	3.8	218	1206	18.1	71	1205	5.9	160	1134	14.1	96	1070	9.0	505	1271	39.7
6 to 7.9	63	1961	3.2	72	1970	3.7	82	2138	3.8	334	2071	16.1	148	2108	7.0	224	1970	11.4	167	1913	8.7	850	2206	38.5
8 to 9.9	97	2983	3.3	166	3052	5.4	87	3308	2.6	592	3235	18.3	191	3267	5.8	336	3004	11.2	313	2981	10.5	1383	3416	40.5
10 to 11.9	135	4252	3.2	179	4296	4.2	132	4688	2.8	826	4608	17.9	243	4638	5.2	418	4199	10.0	490	4271	11.5	1928	4847	39.8
12 to 13.9	186	4861	3.8	229	4904	4.7	118	5342	2.2	893	5313	16.8	217	5345	4.1	429	4768	9.0	627	4966	12.6	2148	5551	38.7
14 to 15.9	202	4768	4.2	249	4815	5.2	86	5252	1.6	928	5177	17.9	205	5249	3.9	384	4587	8.4	688	4891	14.1	2154	5400	39.9
16 to 17.9	188	3662	5.1	232	3706	6.3	71	4037	1.8	735	3983	18.5	133	4032	3.3	247	3413	7.2	629	3795	16.6	1787	4136	43.2
18 to 19.9	147	2713	5.4	149	2715	5.5	42	2951	1.4	605	2943	20.6	99	2973	3.3	189	2538	7.4	442	2791	15.8	1304	3045	42.8
20 to 21.9	172	2596	6.6	137	2561	5.3	34	2830	1.2	574	2835	20.2	110	2881	3.8	171	2320	7.4	545	2694	20.2	1325	2925	45.3
22 to 23.9	83	1406	5.9	91	1414	6.4	22	1545	1.4	323	1555	20.8	38	1563	2.4	83	1245	6.7	312	1474	21.2	760	1583	48.0
24 to 25.9	101	1159	8.7	80	1138	7.0	13	1272	1.0	282	1272	22.2	42	1288	3.3	73	1025	7.1	257	1209	21.3	636	1304	48.8
26 to 27.9	55	545	10.1	33	523	6.3	6	592	1.0	148	600	24.7	16	601	2.7	25	457	5.5	143	575	24.9	315	611	51.6
>=28.0	135	983	13.7	64	912	7.0	14	1064	1.3	272	1084	25.1	39	1093	3.6	43	786	5.5	297	1040	28.6	624	1107	56.4
Obesity grade 1 (n=11992)																								
Weight loss	6	251	2.4	12	257	4.7	14	273	5.1	60	260	23.1	26	266	9.8	29	242	12.0	26	239	10.9	128	275	46.5
0 to 1.9	29	541	5.4	26	538	4.8	37	576	6.4	113	575	19.7	46	588	7.8	59	523	11.3	64	528	12.1	280	596	47.0
2 to 3.9	28	473	5.9	23	468	4.9	29	515	5.6	100	509	19.6	36	513	7.0	56	471	11.9	46	461	10.0	234	533	43.9
4 to 5.9	31	741	4.2	52	762	6.8	46	854	5.4	167	817	20.4	54	834	6.5	70	750	9.3	96	776	12.4	377	872	43.2
6 to 7.9	62	898	6.9	77	913	8.4	50	1034	4.8	232	1013	22.9	66	1028	6.4	97	882	11.0	160	945	16.9	549	1068	51.4
8 to 9.9	80	1166	6.9	95	1181	8.0	51	1313	3.9	292	1302	22.4	81	1317	6.2	124	1142	10.9	183	1201	15.2	663	1359	48.8
10 to 11.9	81	1264	6.4	100	1283	7.8	53	1426	3.7	317	1419	22.3	64	1450	4.4	128	1241	10.3	213	1326	16.1	720	1487	48.4
12 to 13.9	82	1246	6.6	107	1271	8.4	34	1419	2.4	321	1405	22.8	83	1435	5.8	108	1181	9.1	254	1327	19.1	741	1463	50.6
14 to 15.9	81	1136	7.1	83	1138	7.3	38	1267	3.0	301	1264	23.8	51	1274	4.0	71	1031	6.9	237	1197	19.8	644	1301	49.5
16 to 17.9	68	774	8.8	73	779	9.4	25	876	2.9	215	870	24.7	38	890	4.3	50	699	7.2	191	840	22.7	472	905	52.2
18 to 19.9	47	484	9.7	40	477	8.4	13	536	2.4	128	542	23.6	22	550	4.0	29	416	7.0	134	521	25.7	290	561	51.7
20 to 21.9	59	507	11.6	32	480	6.7	12	550	2.2	147	556	26.4	33	566	5.8	31	424	7.3	142	535	26.5	319	575	55.5
22 to 23.9	49	301	16.3	26	278	9.4	7	334	2.1	84	335	25.1	16	334	4.8	17	252	6.7	77	312	24.7	197	341	57.8
24 to 25.9	30	238	12.6	17	225	7.6	6	255	2.4	74	258	28.7	13	261	5.0	11	198	5.6	61	248	24.6	144	262	55.0
26 to 27.9	14	116	12.1	17	119	14.3	1	138	0.7	53	138	38.4	3	137	2.2	6	90	6.7	48	132	36.4	101	143	70.6
>=28.0	34	207	16.4	27	200	13.5	4	242	1.7	81	244	33.2	11	249	4.4	14	183	7.7	63	232	27.2	160	251	63.7

^a Values are number of cases of each outcome, total number of participants, and absolute risks of adverse maternal and infant outcomes (% , calculated as (n (outcome) / n (gestational weight gain category within BMI group))*100) within in each gestational weight gain category.

eTable 7 (continued). Description of outcomes by gestational weight gain category^a

	Pre-eclampsia			Gestational hypertension			Gestational diabetes			Caesarean section			Preterm birth			Small size-for-gestational-age			Large size-for-gestational-age			Any adverse outcome		
	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%	Cases	Total	%
Obesity grade 2 (n=3284)																								
Weight loss	5	139	3.6	3	137	2.2	6	150	4.0	31	145	21.4	8	149	5.4	14	127	11.0	21	134	15.7	65	151	43.0
0.0 to 1.9	17	274	6.2	29	286	10.1	31	309	10	80	314	25.5	22	317	6.9	26	270	9.6	46	290	15.9	175	322	54.3
2.0 to 3.9	14	194	7.2	12	192	6.3	19	214	8.9	48	214	22.4	9	216	4.2	17	182	9.3	32	197	16.2	105	221	47.5
4.0 to 5.9	25	241	10.4	26	242	10.7	17	280	6.1	73	284	25.7	20	287	7.0	13	237	5.5	51	275	18.5	168	297	56.6
6.0 to 7.9	25	299	8.4	31	305	10.2	22	349	6.3	90	349	25.8	15	353	4.2	22	288	7.6	62	328	18.9	189	363	52.1
8.0 to 9.9	28	314	8.9	34	320	10.6	16	368	4.3	107	362	29.6	26	374	7.0	21	290	7.2	80	349	22.9	220	380	57.9
10.0 to 11.9	28	337	8.3	32	341	9.4	16	387	4.1	100	380	26.3	22	390	5.6	31	320	9.7	71	360	19.7	212	398	53.3
12.0 to 13.9	39	285	13.7	29	275	10.5	17	323	5.3	93	324	28.7	14	328	4.3	23	255	9.0	73	305	23.9	195	334	58.4
14.0 to 15.9	22	216	10.2	24	218	11	10	247	4.0	77	247	31.2	11	247	4.5	20	186	10.8	60	226	26.5	152	251	60.6
>=16.0	84	463	18.1	64	443	14.4	29	549	5.3	183	554	33.0	30	556	5.4	37	400	9.3	153	516	29.7	384	567	67.7
Obesity grade 3 (n=969)																								
Weight loss	5	73	6.8	4	72	5.6	9	85	10.6	29	84	34.5	10	85	11.8	7	73	9.6	11	77	14.3	52	87	59.8
0.0 to 1.9	14	120	11.7	7	113	6.2	9	134	6.7	34	140	24.3	11	142	7.7	12	121	9.9	19	128	14.8	73	144	50.7
2.0 to 3.9	5	52	9.6	10	57	17.5	4	64	6.3	25	63	39.7	7	66	10.6	10	48	20.8	18	56	32.1	46	67	68.7
4.0 to 5.9	9	92	9.8	6	89	6.7	8	102	7.8	32	101	31.7	3	108	2.8	7	86	8.1	21	100	21.0	56	108	51.9
6.0 to 7.9	14	79	17.7	10	75	13.3	4	92	4.3	35	93	37.6	6	93	6.5	10	72	13.9	21	83	25.3	64	96	66.7
8.0 to 9.9	8	91	8.8	8	91	8.8	6	101	5.9	32	102	31.4	5	106	4.7	6	83	7.2	20	97	20.6	60	107	56.1
10.0 to 11.9	13	86	15.1	9	82	11.0	5	98	5.1	21	97	21.6	6	100	6.0	10	77	13.0	23	90	25.6	56	101	55.4
12.0 to 13.9	13	64	20.3	5	56	8.9	5	76	6.6	23	74	31.1	8	75	10.7	7	55	12.7	20	68	29.4	48	77	62.3
14.0 to 15.9	7	49	14.3	10	52	19.2	4	59	6.8	22	61	36.1	4	62	6.5	5	40	12.5	21	56	37.5	44	64	68.8
>=16.0	24	102	23.5	13	91	14.3	7	116	6.0	51	114	44.7	9	117	7.7	6	73	8.2	43	110	39.1	93	118	78.8

^a Values are number of cases of each outcome, total number of participants, and absolute risks of adverse maternal and infant outcomes (% , calculated as (n (outcome) / n (gestational weight gain category within BMI group))*100) within in each gestational weight gain category.

eTable 8. Odds Ratios for the associations of gestational weight gain categories with any adverse outcome per maternal clinical body mass index group^a

Underweight		Normal weight		Overweight		Obesity grade 1		Obesity grade 2		Obesity grade 3	
Weight gain(kg)	OR (95% CI)	Weight gain (kg)	OR (95% CI)	Weight gain (kg)	OR (95% CI)	Weight gain (kg)	OR (95% CI)	Weight gain (kg)	OR (95% CI)	Weight gain (kg)	OR (95% CI)
		Weight loss	1.5 (1.15,1.96)	Weight loss	0.99 (0.75,1.30)	Weight loss	0.87 (0.68,1.11)	Weight loss	0.55 (0.39,0.78)	Weight loss	0.96 (0.60,1.53)
		0 to 1.9	1.57 (1.31,1.88)	0 to 1.9	1.06 (0.89,1.26)	0 to 1.9	0.86 (0.73,1.02)	0 to 1.9	0.89 (0.70,1.13)	0 to 1.9	0.59 (0.41,0.85)
		2 to 3.9	1.42 (1.21,1.66)	2 to 3.9	0.81 (0.69,0.95)	2 to 3.9	0.76 (0.64,0.91)	2 to 3.9	0.67 (0.51,0.88)	2 to 3.9	1.39 (0.81,2.39)
		4 to 5.9	1.28 (1.16,1.40)	4 to 5.9	0.90 (0.80,1.01)	4 to 5.9	0.73 (0.64,0.84)	4 to 5.9	0.98 (0.77,1.25)	4 to 5.9	0.62 (0.41,0.94)
<8	2.01 (1.64,2.46)	6 to 7.9	1.28 (1.20,1.36)	6 to 7.9	0.84 (0.77,0.92)	6 to 7.9	1.06 (0.94,1.21)	6 to 7.9	0.80 (0.65,1.00)	6 to 7.9	1.33 (0.85,2.08)
8 to 9.9	1.33 (1.12,1.57)	8 to 9.9	1.04 (1.00,1.09)	8 to 9.9	0.91 (0.85,0.98)	8 to 9.9	0.92 (0.82,1.03)	8 to 9.9	1.04 (0.84,1.30)	8 to 9.9	0.79 (0.53,1.19)
10 to 11.9	1.12 (0.98,1.28)	10 to 11.9	0.96 (0.93,0.99)	10 to 11.9	0.89 (0.83,0.94)	10 to 11.9	0.91 (0.82,1.02)	10 to 11.9	0.85 (0.68,1.05)	10 to 11.9	0.77 (0.50,1.16)
12 to 13.9	1.04 (0.93,1.18)	12 to 13.9	0.88 (0.86,0.91)	12 to 13.9	0.85 (0.80,0.90)	12 to 13.9	1.02 (0.91,1.13)	12 to 13.9	1.06 (0.84,1.34)	12 to 13.9	1.08 (0.67,1.76)
14 to 15.9	0.74 (0.65,0.84)	14 to 15.9	0.87 (0.85,0.90)	14 to 15.9	0.90 (0.85,0.96)	14 to 15.9	0.96 (0.86,1.08)	14 to 15.9	1.17 (0.90,1.53)	14 to 15.9	1.43 (0.82,2.47)
16 to 17.9	0.95 (0.82,1.09)	16 to 17.9	0.91 (0.88,0.95)	16 to 17.9	1.07 (1.00,1.14)	16 to 17.9	1.09 (0.95,1.25)	>=16	1.81 (1.49,2.19)	>=16	2.68 (1.68,4.27)
18 to 19.9	0.88 (0.74,1.05)	18 to 19.9	1.00 (0.96,1.04)	18 to 19.9	1.05 (0.98,1.13)	18 to 19.9	1.09 (0.92,1.30)				
20 to 21.9	0.84 (0.69,1.02)	20 to 21.9	1.06 (1.01,1.10)	20 to 21.9	1.18 (1.10,1.28)	20 to 21.9	1.25 (1.06,1.49)				
>=22	0.88 (0.75,1.04)	22 to 23.9	1.17 (1.10,1.24)	22 to 23.9	1.33 (1.21,1.47)	22 to 23.9	1.41 (1.13,1.75)				
		24 to 25.9	1.31 (1.23,1.40)	24 to 25.9	1.36 (1.22,1.52)	24 to 25.9	1.24 (0.97,1.58)				
		26 to 27.9	1.42 (1.29,1.56)	26 to 27.9	1.56 (1.33,1.82)	26 to 27.9	2.51 (1.74,3.61)				
		>= 28	1.77 (1.64,1.91)	>= 28	1.87 (1.66,2.11)	>= 28	1.84 (1.42,2.38)				

^aValues represent odds ratios (95% Confidence Intervals) reflecting the risk of any adverse outcome per gestational weight gain category for women with underweight, normal weight, overweight, obesity grade 1, obesity grade 2 and obesity grade 3, as compared to all other gestational weight gain categories in that specific clinical maternal BMI group. Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age.

eTable 9. Absolute Risk Reductions for the associations of gestational weight gain categories with any adverse outcome per maternal clinical body mass index group^a

Underweight		Normal weight		Overweight		Obesity grade 1		Obesity grade 2		Obesity grade 3	
Weight gain(kg)	ARR (95% CI)	Weight gain (kg)	ARR (95% CI)	Weight gain (kg)	ARR (95% CI)	Weight gain (kg)	ARR (95% CI)	Weight gain (kg)	ARR (95% CI)	Weight gain (kg)	ARR (95% CI)
		Weight loss	-0.09 (-0.18,0.00)	Weight loss	0.01 (-0.06,0.07)	Weight loss	0.04 (-0.02,0.10)	Weight loss	0.14 (0.06,0.22)	Weight loss	0.01 (-0.09,0.12)
		0 to 1.9	-0.10 (-0.15,-0.05)	0 to 1.9	-0.01 (-0.05,0.03)	0 to 1.9	0.03 (-0.01,0.07)	0 to 1.9	0.03 (-0.03,0.08)	0 to 1.9	0.12 (0.03,0.21)
		2 to 3.9	-0.08 (-0.12,-0.04)	2 to 3.9	0.05 (0.01,0.08)	2 to 3.9	0.07 (0.02,0.11)	2 to 3.9	0.10 (0.03,0.17)	2 to 3.9	-0.08 (-0.20,0.03)
		4 to 5.9	-0.06 (-0.08,-0.04)	4 to 5.9	0.02 (0.00,0.05)	4 to 5.9	0.08 (0.04,0.11)	4 to 5.9	0.00 (-0.06,0.06)	4 to 5.9	0.10 (0.00,0.20)
<8	-0.16 (-0.21,-0.11)	6 to 7.9	-0.06 (-0.08,-0.05)	6 to 7.9	0.04 (0.02,0.06)	6 to 7.9	-0.01 (-0.04,0.02)	6 to 7.9	0.05 (0.0,0.11)	6 to 7.9	-0.06 (-0.16,0.04)
8 to 9.9	-0.07 (-0.11,-0.03)	8 to 9.9	-0.01 (-0.02,0.00)	8 to 9.9	0.02 (0.00,0.03)	8 to 9.9	0.02 (-0.01,0.04)	8 to 9.9	-0.01 (-0.07,0.04)	8 to 9.9	0.06 (-0.04,0.16)
10 to 11.9	-0.03 (-0.06,0.00)	10 to 11.9	0.01 (0.00,0.01)	10 to 11.9	0.02 (0.01,0.04)	10 to 11.9	0.02 (-0.01,0.05)	10 to 11.9	0.04 (-0.01,0.09)	10 to 11.9	0.06 (-0.04,0.17)
12 to 13.9	-0.01 (-0.03,0.02)	12 to 13.9	0.03 (0.02,0.03)	12 to 13.9	0.04 (0.02,0.05)	12 to 13.9	-0.01 (-0.03,0.02)	12 to 13.9	-0.02 (-0.07,0.04)	12 to 13.9	-0.01 (-0.13,0.10)
14 to 15.9	0.07 (0.04,0.09)	14 to 15.9	0.03 (0.02,0.04)	14 to 15.9	0.02 (0.01,0.04)	14 to 15.9	0.01 (-0.02,0.04)	14 to 15.9	-0.04 (-0.10,0.02)	14 to 15.9	-0.08 (-0.20,0.04)
16 to 17.9	0.01 (-0.02,0.04)	16 to 17.9	0.02 (0.01,0.03)	16 to 17.9	-0.01 (-0.03,0.00)	16 to 17.9	-0.02 (-0.06,0.01)	>=16	-0.13 (-0.17,-0.09)	>=16	-0.20 (-0.28,-0.12)
18 to 19.9	0.03 (-0.01,0.07)	18 to 19.9	0.00 (-0.01,0.01)	18 to 19.9	-0.01 (-0.03,0.01)	18 to 19.9	-0.02 (-0.06,0.03)				
20 to 21.9	0.03 (-0.01,0.08)	20 to 21.9	-0.01 (-0.02,0.00)	20 to 21.9	-0.04 (-0.05,-0.02)	20 to 21.9	-0.06 (-0.10,-0.01)				
>=22	0.03 (-0.01,0.06)	22 to 23.9	-0.03 (-0.04,-0.02)	22 to 23.9	-0.06 (-0.09,-0.04)	22 to 23.9	-0.08 (-0.13,-0.02)				
		24 to 25.9	-0.06 (-0.07,-0.04)	24 to 25.9	-0.07 (-0.10,-0.04)	24 to 25.9	-0.05 (-0.11,0.01)				
		26 to 27.9	-0.07 (-0.10,-0.05)	26 to 27.9	-0.10 (-0.14,-0.06)	26 to 27.9	-0.21 (-0.28,-0.13)				
		>= 28	-0.13 (-0.15,-0.11)	>= 28	-0.15 (-0.18,-0.12)	>= 28	-0.14 (-0.20,-0.08)				

^a Values represent absolute risk reductions (95% Confidence Intervals) reflecting the reduction of absolute risk of any adverse outcome per gestational weight gain category for women with underweight, normal weight, overweight, obesity grade 1, obesity grade 2 and obesity grade 3, as compared to all other gestational weight gain categories in that specific clinical maternal BMI group. Any adverse outcome includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age.

eTable 10. Classification of gestational weight gain by classifications from this study and IOM

	This study		IOM	
	Range (kg)	n (%)	Range (kg)	n (%)
Underweight (n=7809)				
Inadequate	<14.0	3635 (46.5)	<12.5	2894 (37.1)
Adequate	14.0 – <16.0	1326 (17.0)	12.5 – 18.0	3416 (43.7)
Excessive	≥16.0	2848 (36.5)	>18.0	1499 (19.2)
Normal weight (n=133788)				
Inadequate	<10.0	16884 (12.6)	<11.5	32755 (24.5)
Adequate	10.0 – <18.0	80869 (60.5)	11.5 – 16.0	55188 (41.2)
Excessive	≥18.0	36035 (26.9)	>16.0	45845 (34.3)
Overweight (n=38828)				
Inadequate	<2.0	759 (2.0)	<7.0	3691 (9.5)
Adequate	2.0 – <16.0	233580 (60.1)	7.0 – 11.5	9309 (24.0)
Excessive	≥16.0	14711 (37.9)	>11.5	25828 (66.5)
Obesity grade 1 (n=11992)				
Inadequate	<2.0	871 (7.3)	<5.0	1798 (15.0)
Adequate	2.0 – <6.0	1405 (11.7)	5.0 – 9.0	2779 (23.2)
Excessive	≥6.0	9716 (81.0)	>9.0	7415 (61.8)
Obesity grade 2 (n=3284)				
Inadequate	NA	NA	<5.0	835 (25.4)
Adequate	Weight loss – <4.0 ^a	694 (21.1)	5.0 – 9.0	865 (26.3)
Excessive	≥4.0	2590 (78.9)	>9.0	1584 (48.2)
Obesity grade 3 (n=969)				
Inadequate	Weight loss ^b	87 (9.0)	<5.0	350 (36.1)
Adequate	0 – <6.0	319 (32.9)	5.0 – 9.0	246 (25.4)
Excessive	≥6.0	563 (58.1)	>9.0	373 (38.5)
Total group (n=196670)				
Inadequate		22236 (11.3)		42323 (21.5)
Adequate		107971 (54.9)		71803 (36.5)
Excessive		66463 (33.8)		82544 (42.0)

Abbreviations: NA, not available; IOM, US Institute of Medicine (nowadays called National Academy of Medicine (NAM)).

^aMedian gestational weight gain in the weight loss category: -3.00 kg (range: -25.00 to -0.13) for obesity grade 2.

^bMedian gestational weight gain in the weight loss category: -3.00 kg (range: -13.58 to -0.40) for obesity grade 3.

eTable 11. Optimal total gestational weight gain ranges, sensitivity analyses^a

Model	Underweight	Normal weight	Overweight	Obesity grade 1	Obesity grade 2	Obesity grade 3
Main model (any adverse outcome)^b	14.0-<16.0	10.0 - <18.0	2.0 - <16.0	2.0 - <6.0	Weight loss-<4.0	0.0 - <6.0
Account for length of gestation						
Main model additionally adjusted for gestational age at birth	14.0 - <16.0	8.0 - <16.0	2.0 - <16.0	Weight loss – <6.0	Weight loss - <4.0	0.0 - <2.0
Study sample with term births only	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	0.0 – <6.0	Weight loss - <4.0	0.0 - <2.0
Account for maternal age and parity						
Main model additionally adjusted for maternal age and parity	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	2.0 - <6.0	Weight loss - <4.0	0.0 - <6.0
Definition of ‘any adverse outcome’						
Gestational diabetes excluded from definition	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	Weight loss - <6.0	Weight loss – <8.0	0.0 - <6.0
Pre-eclampsia excluded from definition	≥14.0	12.0 - <18.0	2.0 - <16.0	2.0 - <6.0	Weight loss - <4.0	0.0 - <6.0
Gestational diabetes and pre-eclampsia excluded from definition	≥14.0	12.0 - <18.0	2.0 - <16.0	0.0 – <6.0	Weight loss – <4.0	0.0 - <6.0
Preterm birth excluded from definition	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	0.0 – 6.0	Weight loss – <4.0	0.0 - <2.0
Gestational diabetes, pre-eclampsia and preterm birth excluded from definition	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	Weight loss – <6.0	Weight loss – <4.0	0.0 - <2.0
Caesarean section excluded from definition	≥14.0	12.0 - <18.0	6.0 - <16.0	2.0 - <6.0	Weight loss – <4.0	0.0 - <6.0
Childhood underweight and overweight included in the definition	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	0.0 - <6.0	Weight loss – <4.0	0.0 - <6.0
Selection study population						
Complete cases only	14.0 - <16.0	10.0 - <18.0	2.0 - <16.0	0.0 - <6.0	Weight loss – <4.0	0.0 - <2.0

^a Values represent optimal gestational weight gain ranges (kg) based on each of the sensitivity analyses.

^b Main model includes pre-eclampsia, gestational hypertension, gestational diabetes, caesarean section, preterm birth, small size-for-gestational-age, and large size-for-gestational-age.

eTable 12. Classification of gestational weight gain in first half of pregnancy by classification from this study

	This study	
	Range (kg)	n (%)
Underweight (n=4906)		
Inadequate	<2.0	1315 (26.8)
Adequate	2.0 – <3.0	941 (19.2)
Excessive	≥3.0	2650 (54.0)
Normal weight (n=90084)		
Inadequate	Weight loss ^a	7272 (8.1)
Adequate	0.0 – <2.0	21481 (23.8)
Excessive	≥2.0	61331 (68.1)
Overweight (n=27128)		
Inadequate	NA	NA
Adequate	<1.0 ^a	7662 (28.2)
Excessive	≥1.0	19466 (71.8)
Obesity grade 1 (n=8328)		
Inadequate	NA	NA
Adequate	Weight loss ^a	2053 (24.7)
Excessive	≥0.0	6275 (75.3)
Obesity grade 2 (n=2310)		
Inadequate	NA	NA
Adequate	Weight loss ^a	784 (33.9)
Excessive	≥0.0	1526 (66.1)
Obesity grade 3	NA	NA
Total group (n=132756)		
Inadequate		8587 (6.5)
Adequate		32921 (24.8)
Excessive		91248 (68.7)

Abbreviations: NA, not available.

^a Results need to be interpreted with caution, as the effect and safety of weight loss during pregnancy are not known.

eTable 13. Classification table for ranges of this study for weight gain in first half of pregnancy vs. total gestational weight gain^{a, b}

	Total pregnancy			
First half	Inadequate	Adequate	Excessive	Total
Inadequate	3634 (25.1)	4462 (5.8)	791 (1.7)	8587
Adequate	5309 (36.6)	21296 (29.5)	6316 (13.7)	32921
Excessive	5545 (38.3)	46683 (64.7)	39020 (84.6)	91248
Total	14488	72141	46127	132756

^a Values are n (% within groups of total gestational weight gain (columns)).

^b As no inadequate weight gain categories were observed in first half of pregnancy for most BMI categories, classification for inadequate gestational weight gain needs to be interpreted carefully.

eTable 14. Classification of gestational weight gain by classifications from this study and IOM, hospital-based population (used as validation sample)

	This study		IOM	
	Range (kg)	n (%)	Range (kg)	n (%)
Underweight (n=277)				
Inadequate	<14.0	134 (48.4)	<12.5	99 (35.7)
Adequate	14.0 – <16.0	58 (20.9)	12.5 – 18.0	136 (49.1)
Excessive	≥16.0	85 (30.7)	>18.0	42 (15.2)
Normal weight (n=2400)				
Inadequate	<10.0	303 (12.6)	<11.5	664 (27.7)
Adequate	10.0 – <18.0	1656 (69.0)	11.5 – 16.0	1142 (47.6)
Excessive	≥18.0	441 (18.4)	>18.0	594 (24.8)
Overweight (n=577)				
Inadequate	<2.0	7 (1.2)	<7.0	57 (9.9)
Adequate	2.0 – <16.0	404 (70.0)	7.0 – 11.5	171 (26.6)
Excessive	≥16.0	166 (28.8)	>11.5	349 (60.5)
Obesity grade 1 (n=188)				
Inadequate	<2.0	6 (3.2)	<5.0	23 (12.2)
Adequate	2.0 – <6.0	25 (13.3)	5.0 – 9.0	65 (34.6)
Excessive	≥6.0	157 (83.5)	>9.0	100 (53.2)
Obesity grade 2 (n=53)				
Inadequate	NA	NA	<5.0	15 (28.3)
Adequate	Weight loss – <4.0	13 (24.5)	5.0 – 9.0	17 (32.1)
Excessive	≥4.0	40 (75.5)	>9.0	21 (39.6)
Obesity grade 3 (n=10)				
Inadequate	Weight loss	1 (10.0)	<5.0	6 (60.0)
Adequate	0 – <6.0	6 (60.0)	5.0 – 9.0	2 (20.0)
Excessive	≥6.0	3 (30.0)	>9.0	2 (20.0)
Total group (n=3505)				
Inadequate		451 (12.9)		864 (24.7)
Adequate		2162 (61.7)		1533 (43.7)
Excessive		892 (25.4)		738 (31.6)

Abbreviations: NA, not available; IOM: US Institute of Medicine (nowadays called National Academy of Medicine (NAM)).