THE LANCET

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

This online publication has been corrected. The corrected version first appeared at thelancet.com on Jan 12, 2023

Supplement to: Sheikh J, Allotey J, Kew T, et al. Effects of race and ethnicity on perinatal outcomes in high-income and upper-middle-income countries: an individual participant data meta-analysis of 2 198 655 pregnancies. *Lancet* 2022; **400:** 2049–62.

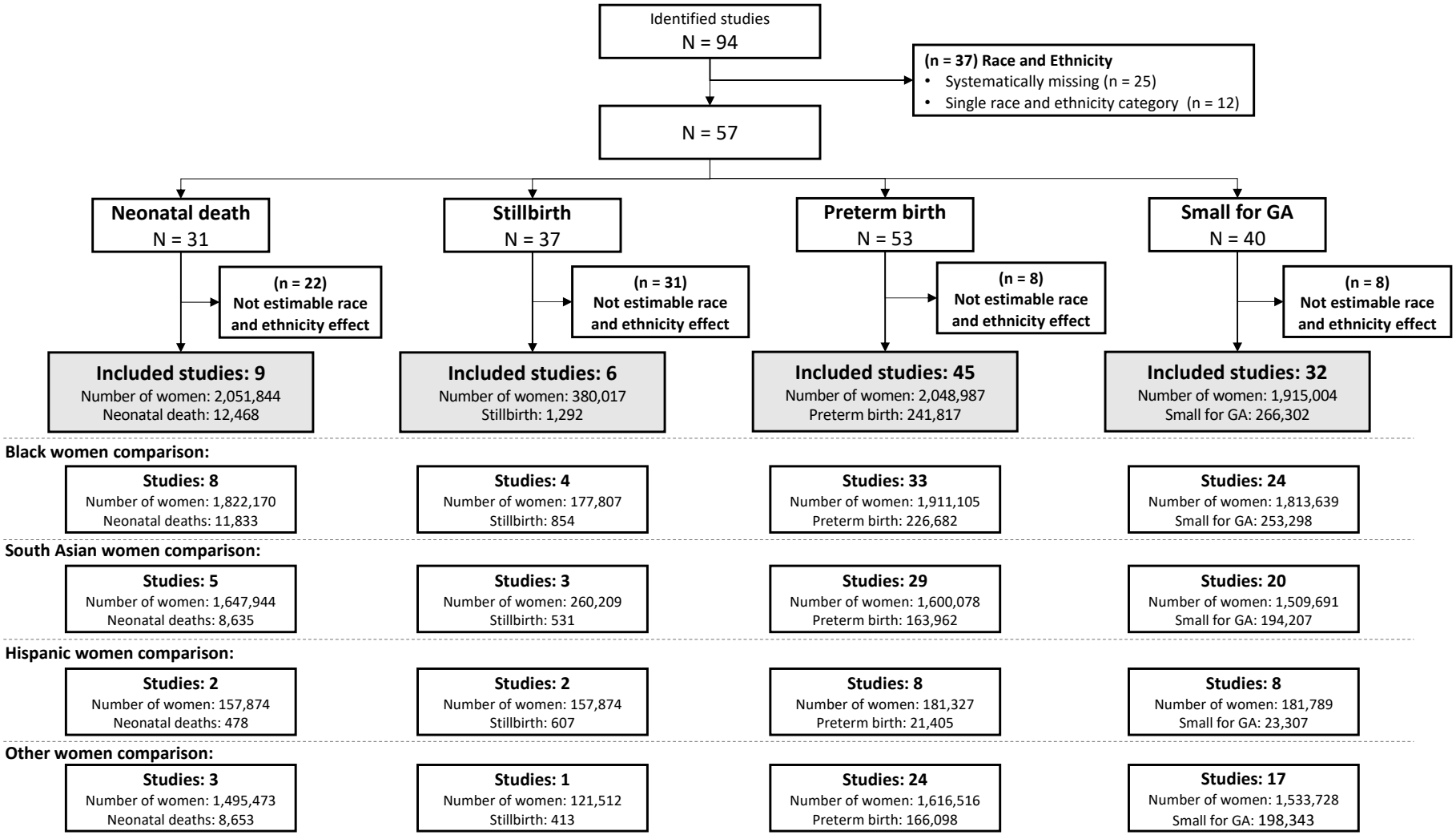
Appendix 1 PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	5
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5-6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-6
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5-6
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6-7
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	8
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	9
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	9-10
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	9-10
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	9
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	10-11
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	11-12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12

Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-14
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	3/17

Appendix 2 Study selection by adverse perinatal outcomes.



Other category includes multiracial, multiethnic and East Asian women.

Appendix 3 *Study level characteristics*

Study/ Dataset	**Study design**	**Country**	**Data collection period**	**Population type** (Any pregnancy; Low risk; High risk)	**Racial and ethnic groups** (W, White; B, Black; A, South Asian; H, Hispanic; O, other)	**Inclusion criteria**	**Exclusion criteria**	**Confounders reported with more than 50% of data recorded**			
								Maternal age	**BMI**	**Parity**	**Maternal educational attainment**
Al-Amin A 2018	Observational: prospective cohort	Australia	2012-2015	Any pregnancy	W/B/A/O	Women attending for their second trimester morphology ultrasound between 19-22 weeks' gestation	None	X	X	X	
Allen RE 2017	Observational: prospective cohort	UK	2010-2014	Any pregnancy	W/B/A/O	All pregnant women attending an inner London hospital between 11-14 weeks' gestation	Women with multiple pregnancies and fetal anomalies	X		X	
Antsaklis A 2000	Observational: prospective cohort	Greece	1997-1998	Low risk	W/B/A/O	All nulliparous women	Women with multiple pregnancies, renal disease, cardiovascular diseases and fetal anomalies	X	X	X	
Audibert F 2010	Observational: prospective cohort	Canada	2006-2008	Low risk	W/B/A/H/O	Nulliparous singleton pregnant women presenting for Down syndrome	Pregnancies with a major fetal chromosomal or structural anomaly	X		X	

						screening at 11-13 weeks' gestation				
Baschat AA 2014	Observational: prospective cohort	USA	2007-2010	Any pregnancy	W/B/A/H/O	All pregnant women attending any of 4 Baltimore (US) hospitals for first-trimester screening	None	X		X	
Cameroni I 2008	Observational: retrospective cohort	Italy	No information provided	High risk	W/O	Singleton pregnant women at risk of pre-eclampsia or intrauterine growth restriction	None	X		X	
Carbillon L 2014	Observational: prospective registry	France	1996-2005	Any pregnancy	W/B/A/O	Women giving birth in the data period in that region	None	X	X	X	
Caritis S 1998	Randomised: trial	USA	1991-1995	High risk	W/B/A/O	Women with pre-gestational, insulin-treated diabetes mellitus, women with chronic hypertension, women with multifetal gestations, and women with a history of pre-eclampsia	Women with multifetal gestation if they also had chronic hypertension, renal disease, diabetes, history of pre-eclampsia, and current proteinuria	X	X	X	X
Carter J 2017	Observational: prospective cohort	UK	2011-2013	Any pregnancy	W/B/A/H/O	Pregnant asymptomatic women with a high risk of spontaneous	No information provided	X	X	X	

						preterm birth, such as the previous history of spontaneous preterm birth, late miscarriage, invasive cervical surgery or a short cervix				
Chappell LC 1999	Randomised: trial	UK	No information provided	High risk	W/B/A/O	Pregnant women with an abnormal Doppler waveform in either uterine artery at 18–22 weeks' gestation or a history of pre-eclampsia in a previous pregnancy which led to preterm birth, eclampsia or HELLP syndrome	Heparin or warfarin treatment, abnormal fetal-anomaly scan or multiple pregnancies.	X	X	X
Coomarasamy A 2015	Randomised: trial	UK	2010-2013	Any pregnancy	W/B/A/O	Women with a history of unexplained miscarriage who conceived within the study period	Any thrombophilic condition, uterine cavity abnormalities, diabetes, thyroid disease, SLE, on heparin treatment or contraindicated to progesterone	X	X	
Coomarasamy A 2019	Randomised: trial	UK	2015-2017	Any pregnancy	W/B/A/H/O	Women <12 weeks pregnant	CRL ≥7mm with no		X	X

						with vaginal bleeding no older than 39 years old.	heartbeat, ectopic pregnancy, life-threatening bleeding, and contraindicatio n to progesterone use			
Crovetto F 2016	Observational: prospective cohort	Spain	2007-2012	Any pregnancy	W/B/A/O	Singleton pregnant women attending routine first-trimester screening	Major fetal defects, miscarriage and termination of pregnancies without medical indication	X		X
Dhillon-Smith RK 2019	Randomised: trial	UK	2011-2016	Any pregnancy	W/B/O	Pregnant women 16-40 years old with previous miscarriage or on treatment for infertility	Women receiving treatment for thyroid disease, had cardiac disease or were on lithium or amiodarone	X	X	X
Figueiró-Filho EA 2012	Observational: prospective case-control cohort	Brazil	2007-2010	High risk	W/B/A/O	Women with severe pre-eclampsia in previous pregnancies	Antiphospholip id antibodies and thrombophilia	X		X
Fraser A 2013	Observational: prospective birth cohort	UK	1991-1992	Any pregnancy	W/B/A/O	All pregnant women resident in Avon UK	None	X	X	X
Giguère Y 2015	Observational: prospective cohort	Canada	2005-2010	Any pregnancy	W/B/A/H/O	Women at least 18 years old and with a gestational age of at least ten	Pregnancies with major fetal abnormalities and those			X

						weeks at their first prenatal visit with no chronic hepatic or renal diseases	ending in termination, miscarriage or fetal death before 24 weeks' gestation				
Goetzinger KR 2010	Observational: retrospective cohort	USA	2003-2008	Any pregnancy	W/B/A	Women seen for aneuploidy screening	None	X			
Gurgel Alves JA 2014	Observational: prospective cohort	Brazil	2009-2014	Any pregnancy	W/B/A/O	Singleton pregnant women attending routine ultrasound screening	Kidney disease diagnosis in their previous history or on ultrasound examination, major fetal malformations or chromosomal abnormalities, and fetuses with crown-rump length greater than 84 mm	X		X	X	
H Al Wattar B 2019	Observational: prospective cohort	UK	2014-2016	Any pregnancy	W/B/A/H/O	Singleton pregnancies <18 weeks' gestation with proficient English language ability	Pre-existing diabetes, gestational diabetes, chronic renal disease, autoimmune disease, on statins or similar drugs	X		X	X	X

Holzman C 2001	Observational: prospective cohort	USA	1998-2004	Any pregnancy	W/B/A/O	Women with a singleton pregnancy at 16-27 weeks' gestation, no known chromosomal abnormality, maternal age of at least 15 years old, no pre-pregnancy diabetes mellitus	None	X		X	X	
Huang T 2010	Observational: retrospective cohort	Canada	2000-2003	Any pregnancy	W/B/A/H/O	All women screened in early pregnancy for Down Syndrome	None	X			X	
Jaddoe VWV 2006	Observational: prospective birth cohort	Netherlands	2002-2006	Any pregnancy	W/B/A/H/O	Resident mothers delivering in the study period	None	X		X	X	X
Jenum AK 2010	Observational: prospective cohort	Norway	2008-2010	Any pregnancy	W/B/A/O	Healthy pregnant women	Women with diabetes or diseases require intensive hospital follow-up in pregnancy	X			X	X
Langenveld J 2011	Observational: retrospective cohort	Netherlands	1996-2004	High risk	W/B/A/O	Women with hypertension (including patients with chronic hypertension), pre-eclampsia or HELLP syndrome, and delivered before 34 weeks' gestation in the	No information provided	X			X	

						study period and primiparous with singleton pregnancy without fetal abnormalities in the first pregnancy				
Lecarpentier E 2013	Observational: retrospective cohort	France	2004-2007	High risk	W/B/A/H/O	Pregnant women with chronic hypertension	Multiple pregnancies, women with secondary hypertension, women with proteinuria at <20 weeks' gestation, women considered as having a chronic hypertension, but without any treatment at first prenatal visit, women transferred from other maternity units or hospitals, pregnancies complicated by fetal malformations	X	X	X
Llurba E 2009	Observational: prospective cohort	Spain	2002-2006	Any pregnancy	W/B/A/H/O	Singleton pregnant women attending routine	None	X		

						second-trimester anomaly scans				
Makrides M 2010	Randomised: trial	Australia	2005-2008	Any pregnancy	W/B/A/O	Singleton pregnancies at <21 weeks' gestation	Already taking a prenatal supplement with DHA, their fetus had a known major abnormality, they had a bleeding disorder in which tuna oil was contraindicated, were taking anticoagulant therapy, had a documented history of drug or alcohol abuse, were participating in another fatty acid trial.	X	X	
Mbah AK 2012	Observational: prospective registry	USA	1989-2005	Any pregnancy	W/B/A/H/O	Women with first and second singleton pregnancies within the gestational age range of 20–44 weeks'	None	X	X	X
Meertens LJE 2017	Observational: prospective cohort	Netherlands	2013-2015	Any pregnancy	W/B/A/H/O	Adult pregnant women <16 weeks' gestation	Miscarriage and termination <24 weeks' gestation	X	X	X

NICHD 2018	Observational: retrospective cohort	USA	2002-2008	Any pregnancy	W/B/A/H/O	All deliveries ≥23 weeks' gestation from 19 hospitals across the US	None	X	X	X	
North RA 2011	Observational: prospective cohort	Multi-country (UK, New Zealand, Australia and the Republic of Ireland)	2004-2008	Low risk	W/B/A/H/O	Healthy nulliparous women with singleton pregnancies	Recognised as high risk of pre-eclampsia, small for gestational age baby or spontaneous preterm birth due to underlying medical condition such as chronic hypertension requiring antihypertensive drugs, diabetes, renal disease, systemic lupus erythematosus, antiphospholipid syndrome, sickle cell disease or HIV. Previous cervical knife cone biopsy, three or more abortions or miscarriages, current ruptured	X		X	X

							membranes, known major fetal anomaly or abnormal karyotype, and interventions that can alter the course of pregnancy such as aspirin or cervical suture				
Odibo AO 2011	Observational: prospective cohort	USA	2009-2011	Any pregnancy	W/B/A/O	Women attending the first-trimester screening	None	X	X	X	
Poston L 2015	Randomised: trial	UK	2009-2014	High risk	W/B/A	Women older than 16 years with a BMI of 30 kg/m² or higher and a singleton pregnancy	Any underlying disorders, including a pre-pregnancy diagnosis of essential hypertension, diabetes, renal disease, systemic lupus erythematosus, antiphospholipid syndrome, sickle cell disease, thalassaemia, coeliac disease, thyroid disease, and current psychosis; or if on metformin	X		X	X

Prefumo F 2008	Observational: prospective cohort	Italy	2001-2005	Any pregnancy	W/B/A/H/O	Women attending routine antenatal care	Known medical condition (e.g., diabetes mellitus, connective tissue disease, essential hypertension) or a history of recurrent miscarriage	X		X	X	
Rumbold AR 2006	Randomised: trial	Australia	2001-2005	Low risk	W/B/A/H/O	Nulliparous women with a singleton pregnancy between 14-22 weeks' gestation and normal blood pressure	Known multiple pregnancies, known potentially lethal fetal anomaly, known thrombophilia, chronic renal failure, antihypertensive therapy, or specific contraindications to vitamin C or E therapy such as hemochromatosis or anticoagulant therapy.	X		X	X	X
Sibai BM 1993	Randomised: trial	USA	No information	Low risk	W/B/A/H/O	Healthy nulliparous women	Women with chronic hypertension, renal disease,	X		X	X	X

			(early 1990s)				diabetes and other illnesses				
Souza RT 2019	Observational: prospective cohort	Brazil	2015-2018	Low risk	W/B/A/O	Nulliparous singleton pregnant women <21 weeks' gestation	≥ 3 abortions, chronic hypertension requiring treatment, diabetes or renal disease, arterial blood pressure >160/100, autoimmune disease, sickle cell disease, HIV, fetal malformation, cervical suture or knife cone biopsy, Mullerian anomalies, use of corticosteroids, aspirin, calcium, fish oil, vitamin C/E or heparin	X		X	X	
Sovio U 2015	Observational: prospective cohort	UK	2008-2012	Any pregnancy	W/B/A/O	Nulliparous singleton pregnant women	None	X		X	X	
Staff AC 2005	Observational: prospective case-control cohort	Norway	No information provided	Low risk	W/B/A	Singleton pregnant women.	No information provided.	X	X	X		

Stirrup OT 2015	Observational: prospective registry	UK	2000-2015	Any pregnancy	W/B/A/H/O	All pregnant women attending an inner London hospital	None	X		X	
van Oostwaard MF 2012	Observational: prospective cohort	Netherlands	2000-2002	High risk	W/B/A/O	Women with a hypertensive disorder in the index pregnancy and delivery at 34–37 weeks' gestation	Fetal abnormalities			X	X
van Oostwaard MF 2014	Observational: retrospective cohort	Netherlands	2000-2002	High risk	W/B/A/O	Women with a hypertensive disorder in the index pregnancy and delivery at 34–37 weeks' gestation	Fetal abnormalities			X	X
Velauthar L 2014	Observational: prospective cohort	UK	No information provided	Any pregnancy	W/B/A/O	All pregnant women attending an inner London hospital	None		X	X	
Verlohren S 2010	Observational: prospective case-control cohort	Spain	No information provided	Any pregnancy	W/B/A/O	Singleton pregnant women	Multi-gestation, antiphospholipid antibody syndrome, systemic lupus erythematosus, or any other autoimmune disease as well as chronic corticosteroid or nonsteroidal anti-inflammatory	X	X	X	

							drug use except low-dosage aspirin <150 mg/day			
Verlohren S 2012	Observational: prospective case-control cohort	Germany	No information provided	Any pregnancy	W/B/A/O	Singleton pregnant women	Multi-gestation, antiphospholipid antibody syndrome, systemic lupus erythematosus, or any other autoimmune disease as well as chronic corticosteroid or nonsteroidal anti-inflammatory drug use except low-dosage aspirin <150 mg/day	X	X	X
Vollebregt KC 2010	Observational: prospective cohort	Netherlands	2004-2006	High risk	W/B/A/H/O	Healthy nulliparous women at low risk and women with elevated risk for pre-eclampsia or fetal growth restriction with singleton pregnancies	None		X	X
Widmer M 2015	Observational: prospective cohort	Multi-country (Argentina, Colombia,	2006-2009	High risk	W/B/A/O	Women with risk factors for pre-eclampsia	Women with known renal disease or proteinuria	X		X

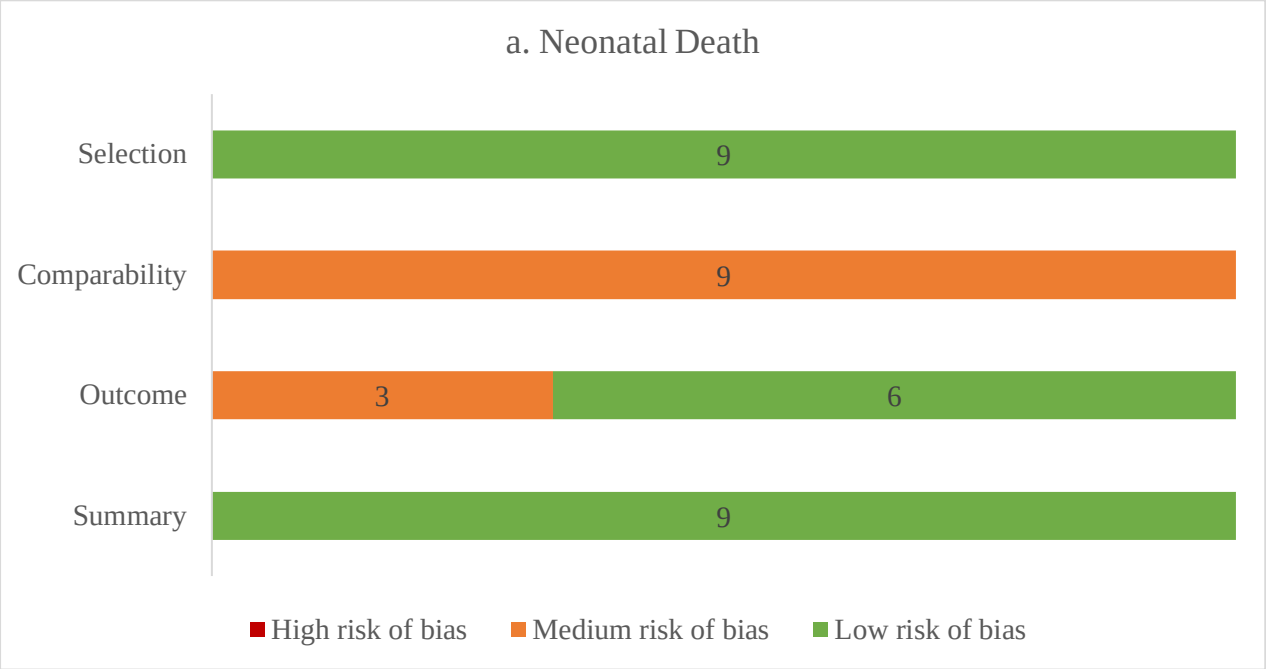
		India, Italy, Kenya, Peru, Switzerland and Thailand)								
Wright E 2017	Observational: prospective cohort	Canada	2012-2013	Low risk	W/B/A/H/O	Healthy nulliparous singleton pregnant women	Chronic hypertension, use of unfractionated or low molecular-weight heparin, pre-gestational diabetes mellitus, major fetal abnormalities, ruptured membranes, vaginal bleeding from 13 0/7 weeks' gestation for greater than one day, or a short cervical length on ultrasonography before 20 weeks' gestation (<2 cm long).	X	X	X
Wright J 2013	Observational: prospective birth cohort	UK	2007-2011	Any pregnancy	W/B/A/O	All pregnant women attending Bradford Royal Infirmary	None	X		X

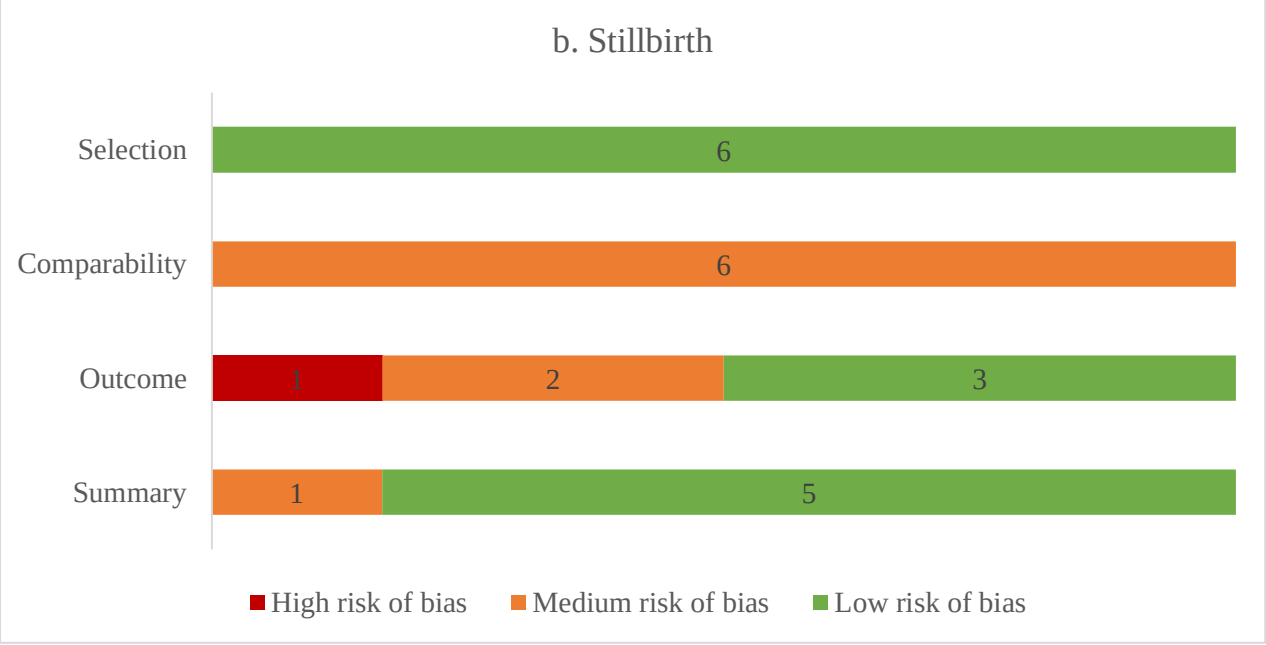
Zhang J 2001	Observational: prospective cohort	USA	1959-1965	Any pregnancy	W/B/O	Women attending prenatal care.	None	X	X

HELLP, haemolysis, elevated liver enzymes, low platelets syndrome; DHA, Docosahexaenoic acid; BMI, body mass index; CRL, crown-rump length; HIV, human immunodeficiency virus.

Note: Other category includes multiracial, multiethnic and East Asian women.

Appendix 4a-b Risk of bias assessment - Newcastle Ottawa Scale



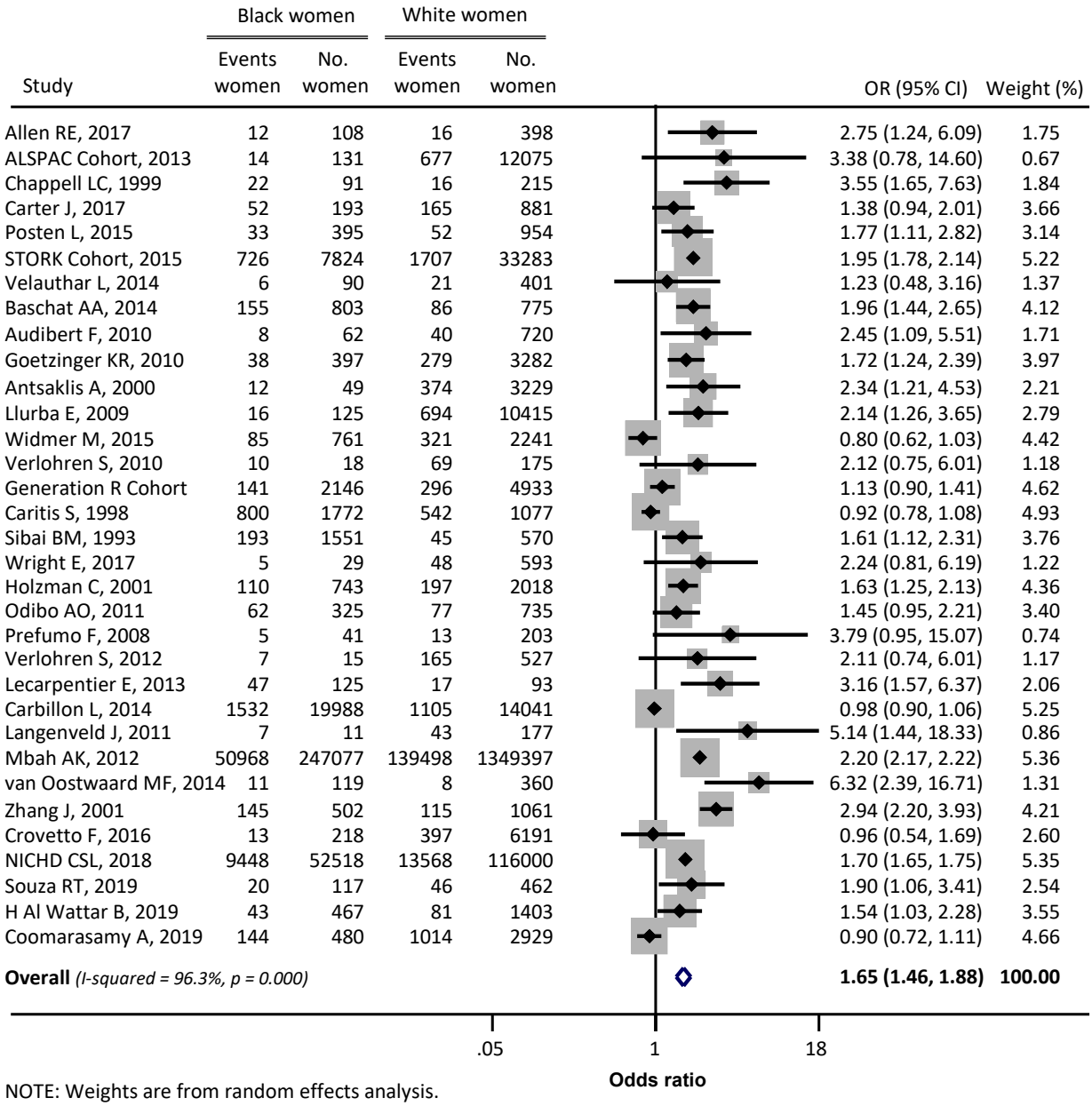


Appendix 4c Risk of bias assessment – Newcastle Ottawa Scale

First author	Selection				Comparability		Outcome			Score	Risk of bias
	Representativeness of exposed cohort	Selection of non-exposed cohort	Ascertainment of exposure	Assessed outcome of interest was not present at the start	Cohorts comparable on the basis of the design	Cohorts comparable on the basis of the selection	Assessment of outcome	Follow-up adequate for outcomes to occur?	Adequate follow-up of cohorts		
Outcome assessed neonatal deaths`											
Baschat AA 2014	+	+	+	+		+	+		+	7	LOW
Huang T 2009	+	+	+	+		+	+	+	+	8	LOW
Jaddoe VWV 2006	+	+	+	+		+	+	+		7	LOW
Mbah AK 2012	+	+	+	+		+	+	+	+	8	LOW
NICHD 2018	+	+	+	+		+	+	+	+	8	LOW
Caritis S 1998	+	+	+	+		+	+		+	8	LOW
Stirrup OT 2015	+	+	+	+		+	+		+	7	LOW
Widmer M 2015	+	+	+	+		+	+	+	+	8	LOW
Zhang J 2001	+	+	+	+		+	+	+	+	8	LOW
Outcome assessed stillbirths											
Goetzinger KR 2010	+	+	+	+		+	+		+	7	LOW
Holzman C 2001	+	+	+	+		+	+			6	MEDIUM
Huang T 2010	+	+	+	+		+	+	+	+	8	LOW
NICHD 2018	+	+	+	+		+	+	+	+	8	LOW
Caritis S 1998	+	+	+	+		+	+		+	7	LOW
Wright J 2013	+	+	+	+		+	+	+	+	8	LOW

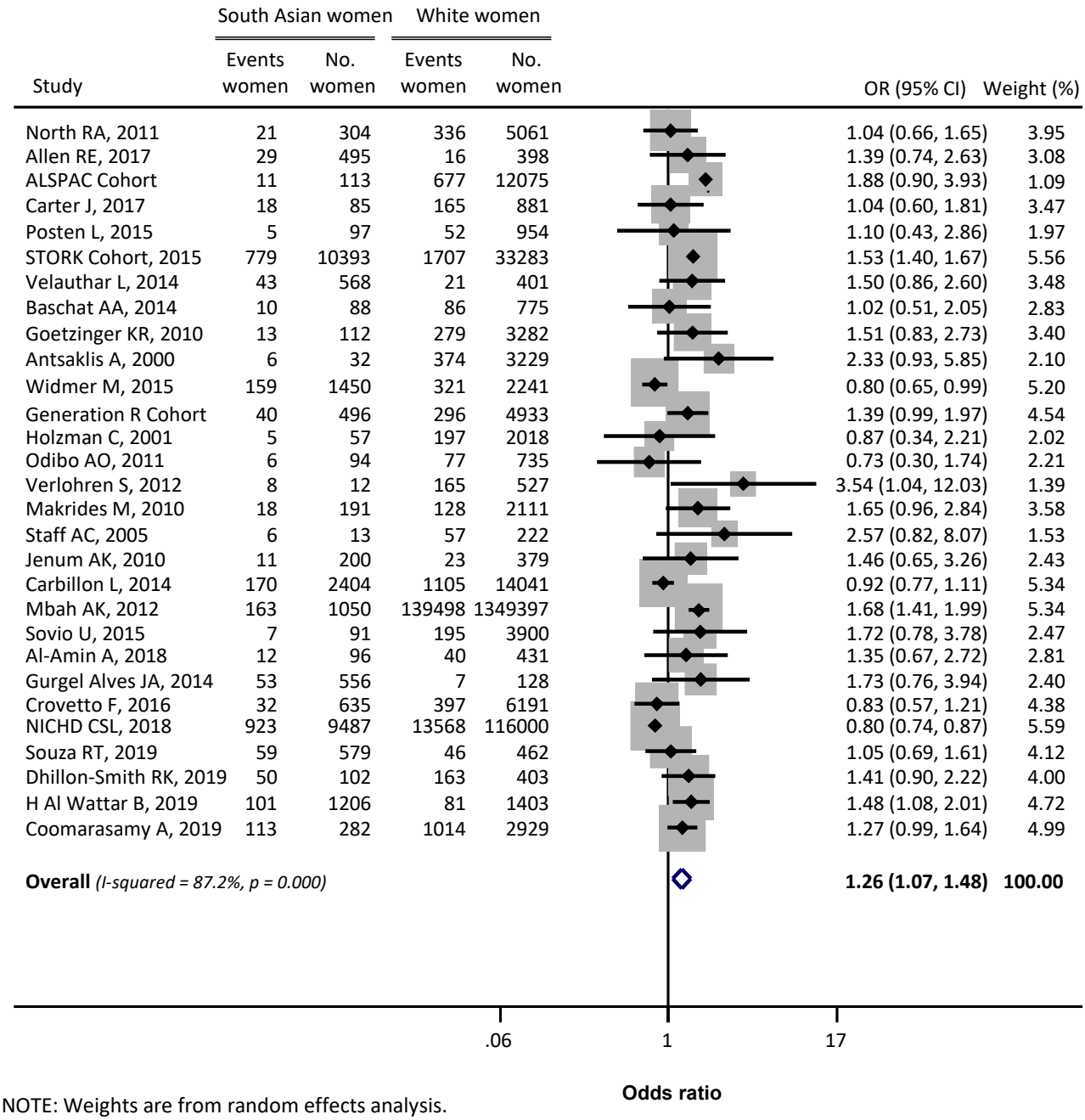
Appendix 5a-b Effects of race and ethnicity on preterm birth adjusted for maternal characteristics.

a. Black women vs White women



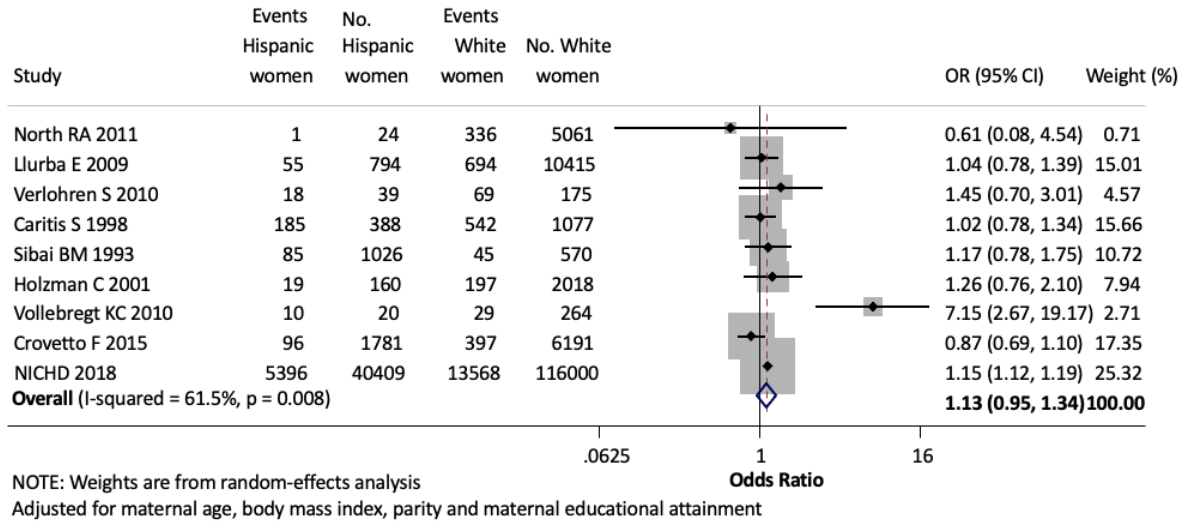
NOTE: Weights are from random effects analysis.
Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

b. South Asian women vs White women



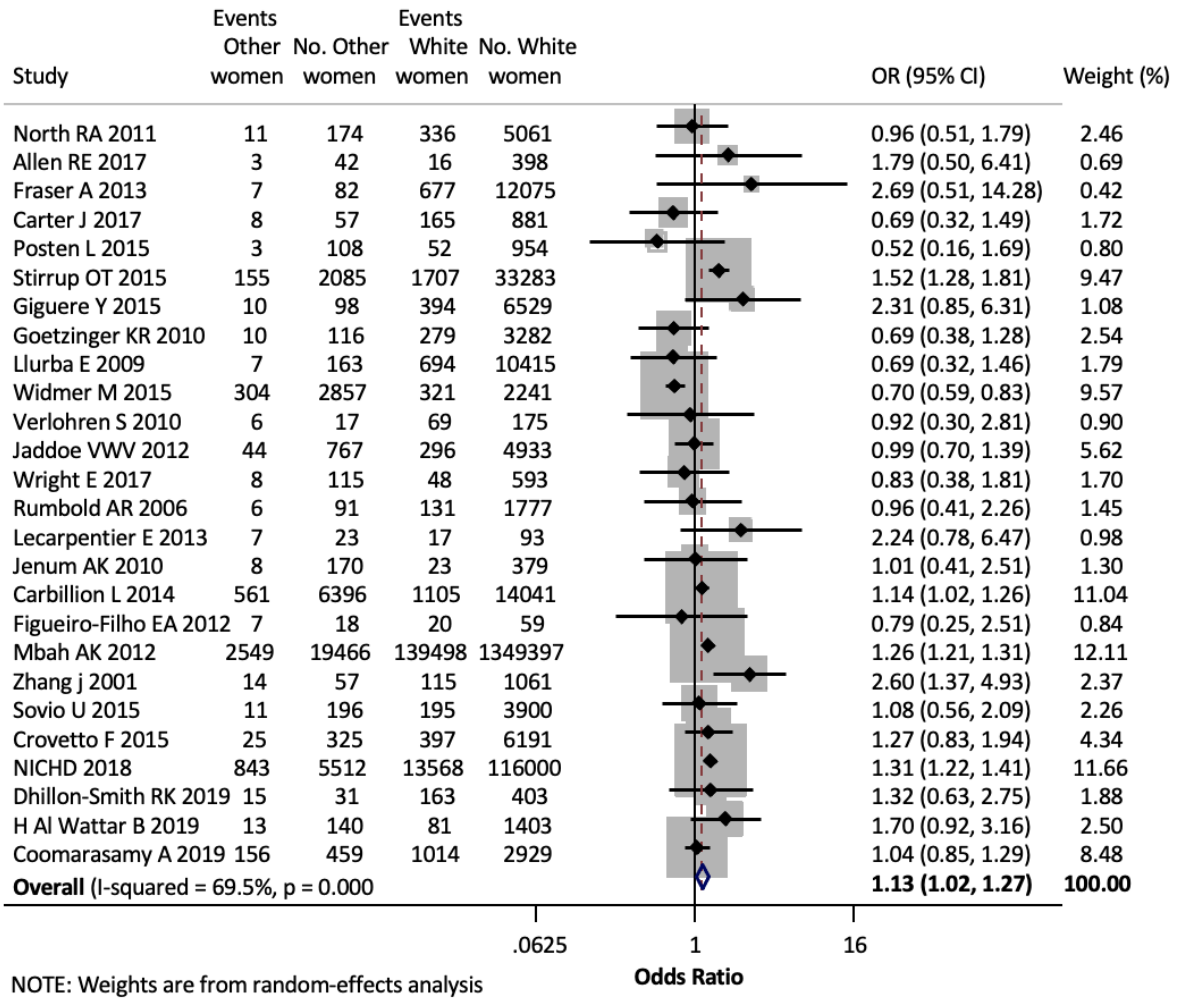
NOTE: Weights are from random effects analysis.
Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

c. Hispanic women vs White women



NOTE: Weights are from random-effects analysis
Adjusted for maternal age, body mass index, parity and maternal educational attainment

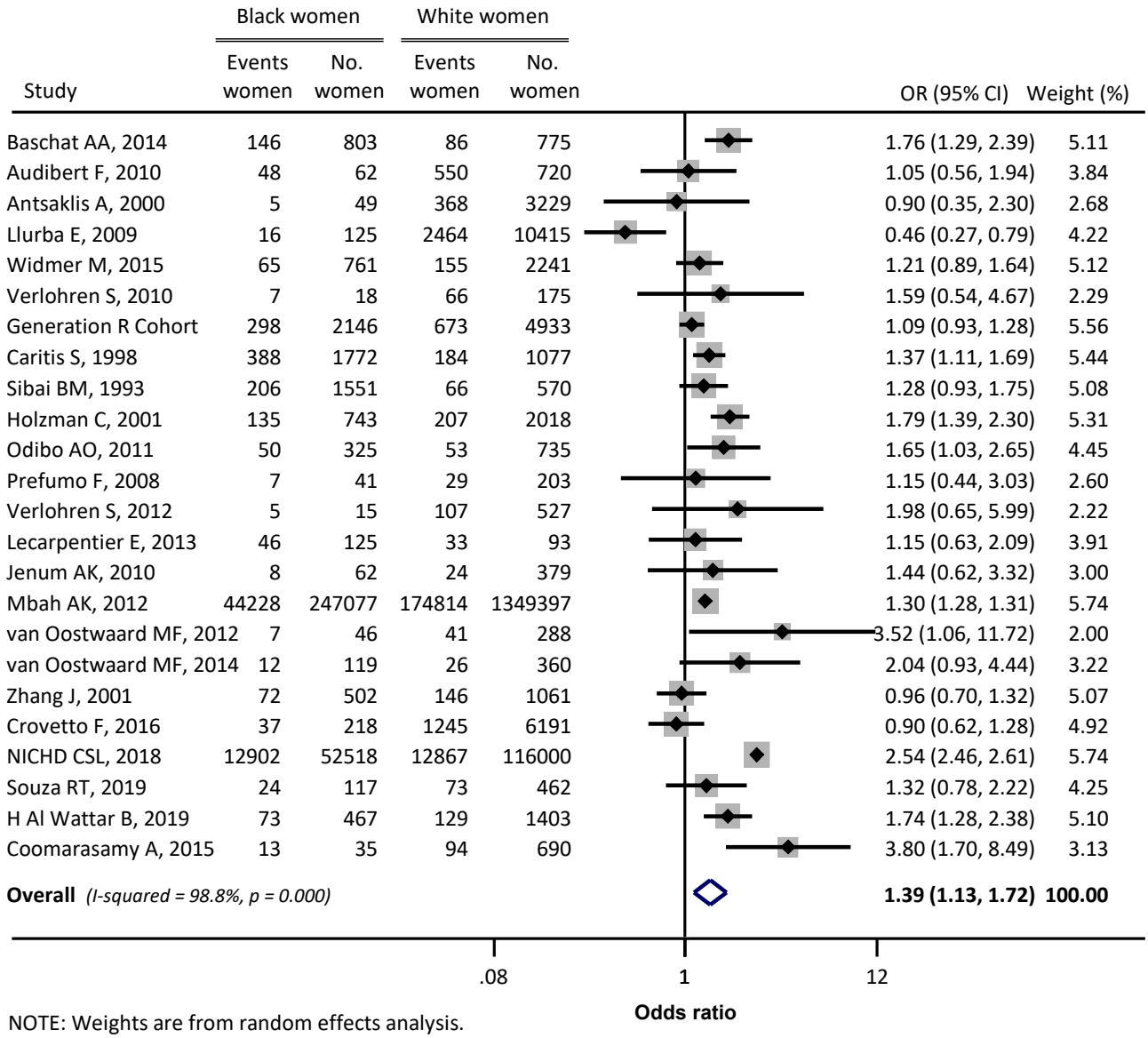
d. Other women vs White women



NOTE: Weights are from random-effects analysis
Adjusted for maternal age, body mass index, parity and maternal educational attainment

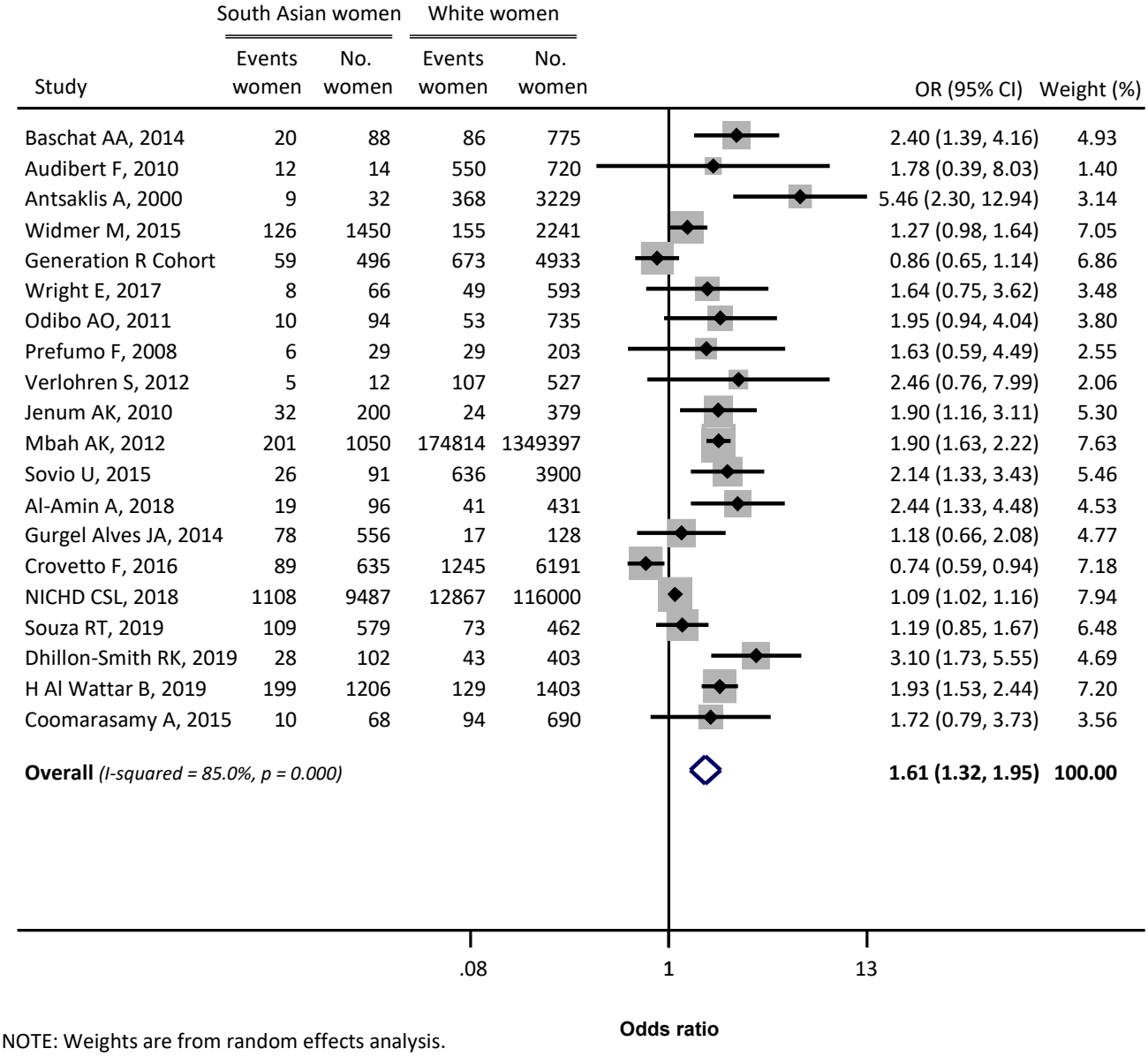
Appendix 6a-b Effects of race and ethnicity on small-for-gestational-age babies adjusted for maternal characteristics.

a. Black women vs White women



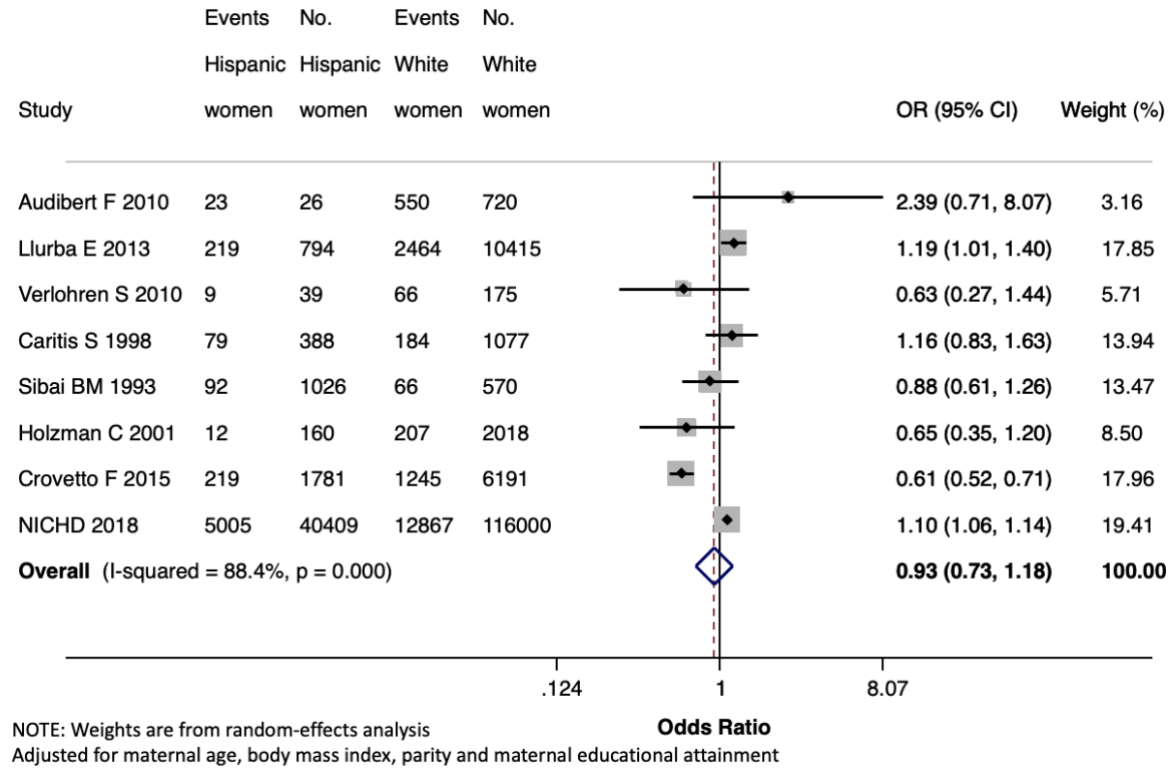
NOTE: Weights are from random effects analysis.
Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

b. South Asian women vs White women



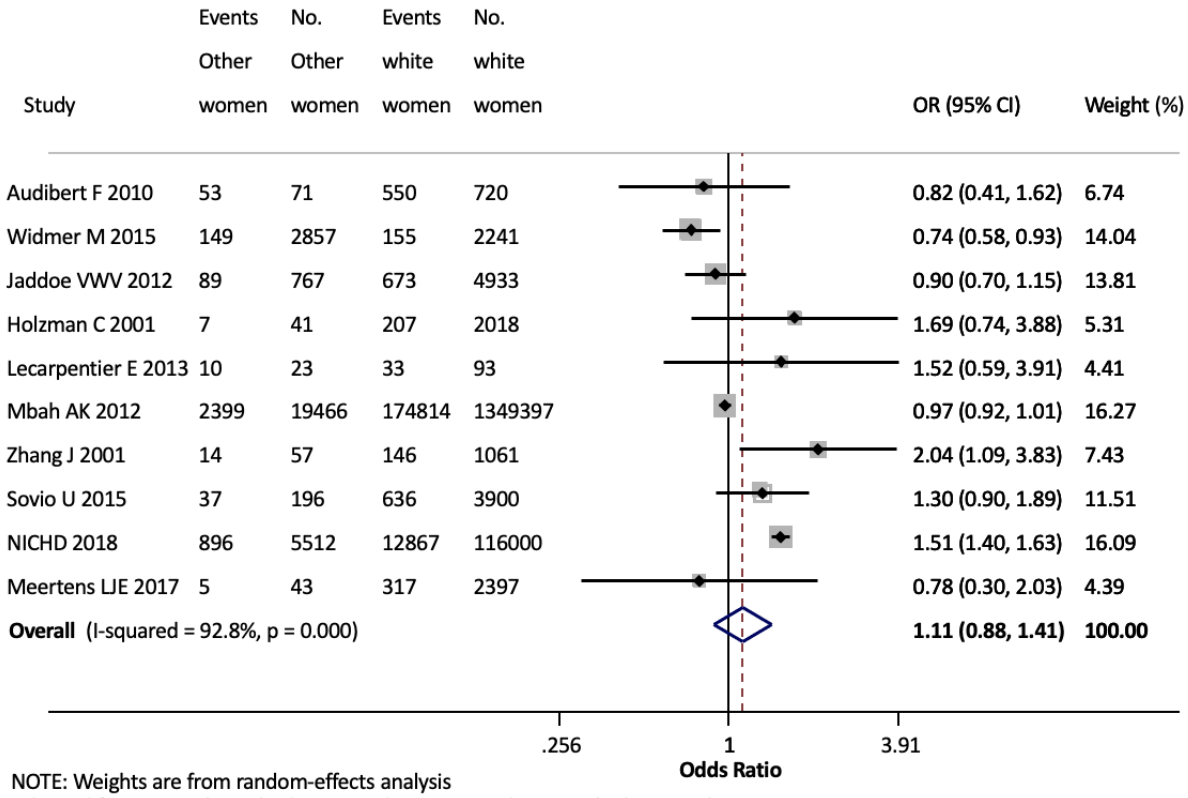
NOTE: Weights are from random effects analysis.
Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

c. Hispanic women vs White women



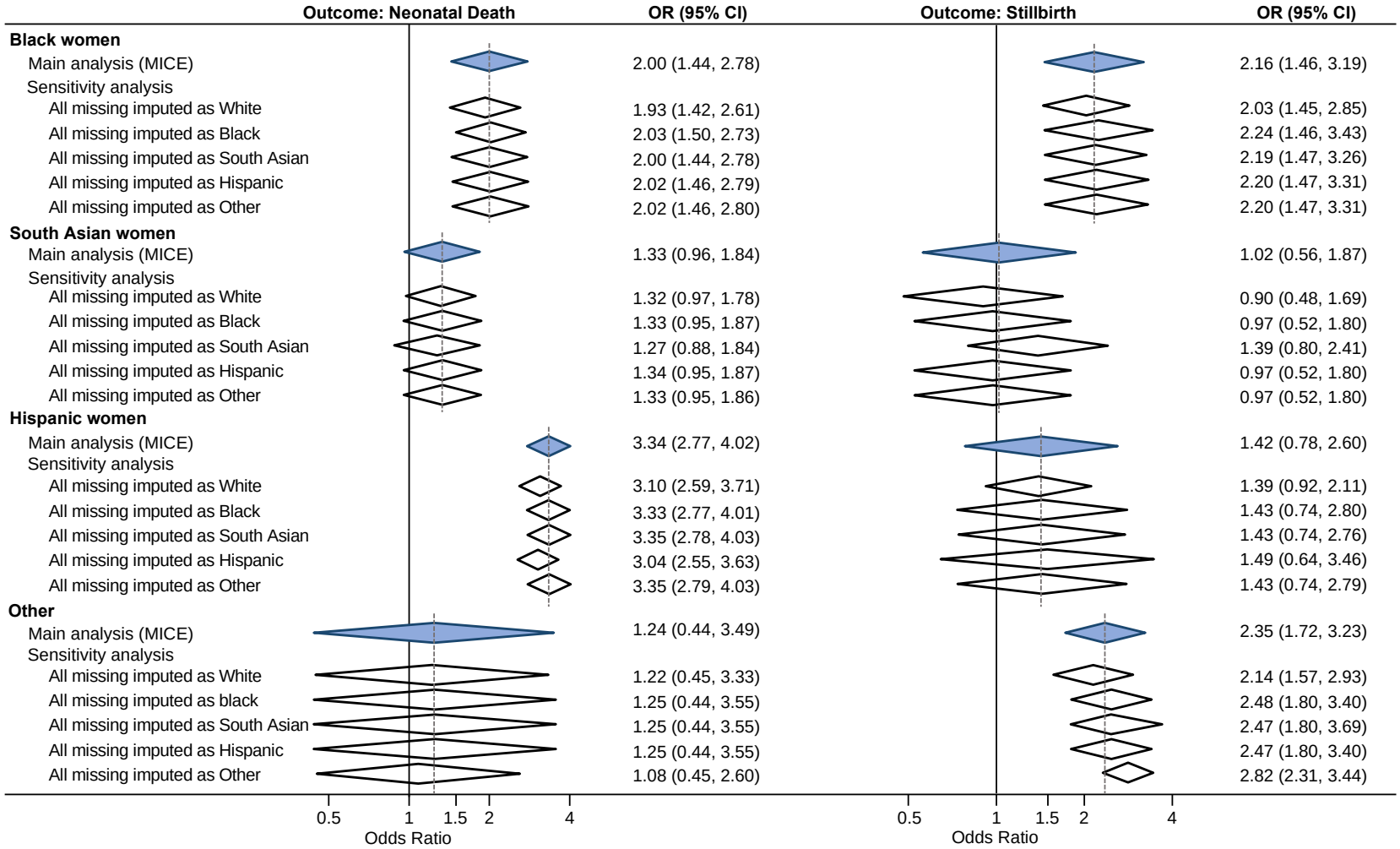
NOTE: Weights are from random-effects analysis
Adjusted for maternal age, body mass index, parity and maternal educational attainment

d. Other women vs White women



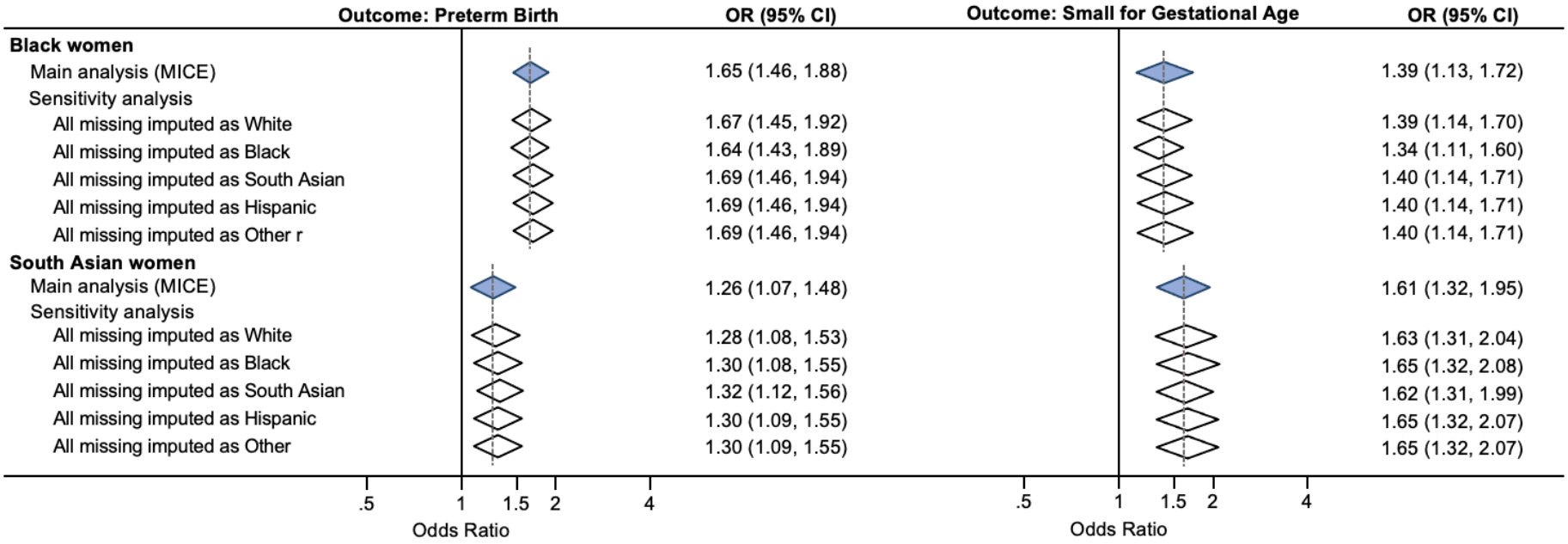
NOTE: Weights are from random-effects analysis
Adjusted for maternal age, body mass index, parity and maternal educational attainment

Appendix 7 Sensitivity analysis for the missingness mechanism on race and ethnicity for outcomes of neonatal death and stillbirth.



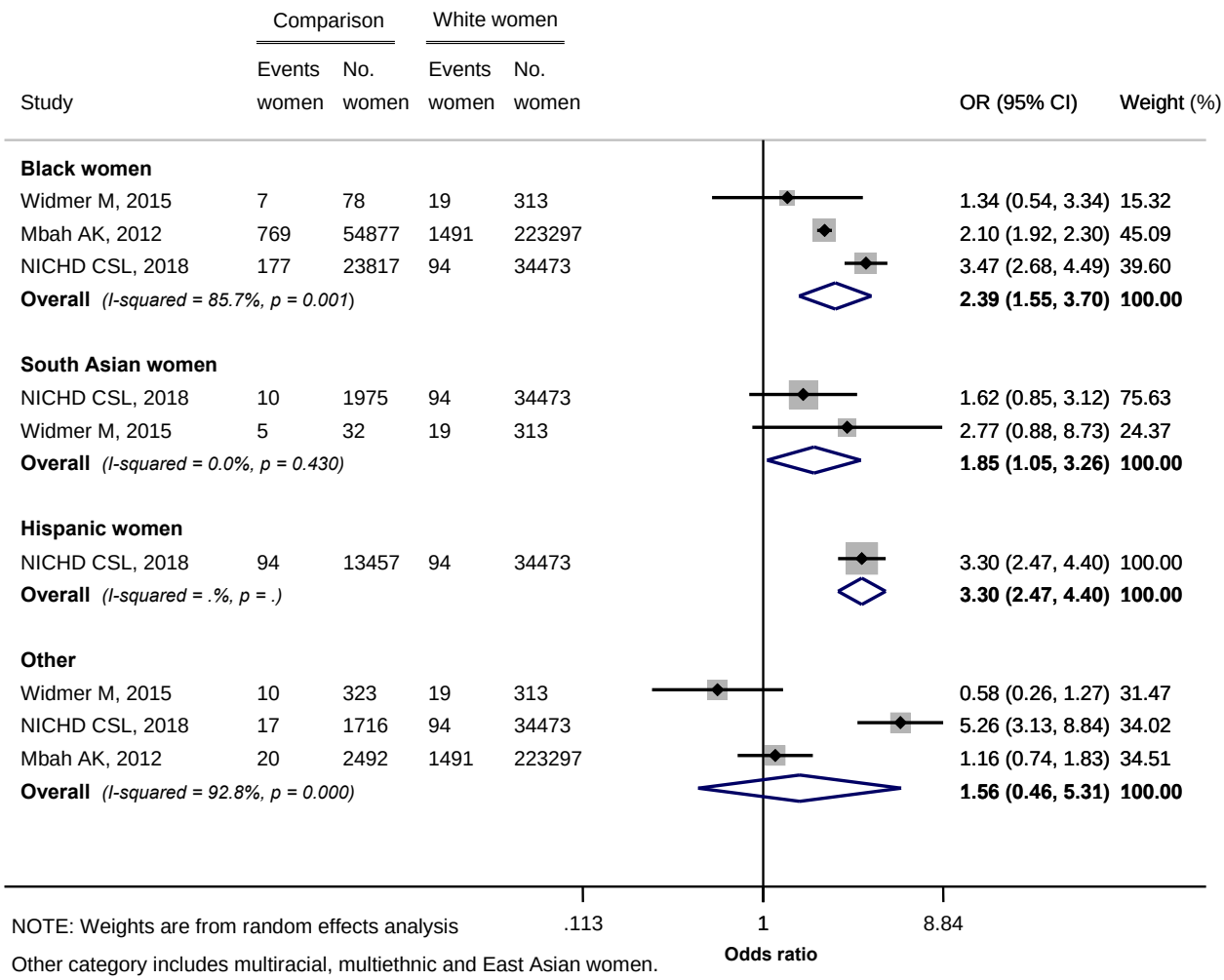
MICE: Multiple Imputation by Chained Equations
Other category includes multiracial, multiethnic and East Asian women.

Appendix 8 Sensitivity analysis for the missingness mechanism on race and ethnicity for outcomes of preterm delivery and small for gestational age babies.



MICE: Multiple Imputation by Chained Equations
Other category includes multiracial, multiethnic and East Asian women.

Appendix 9 Sensitivity analysis of neonatal death restricting by high-risk pregnancies only.

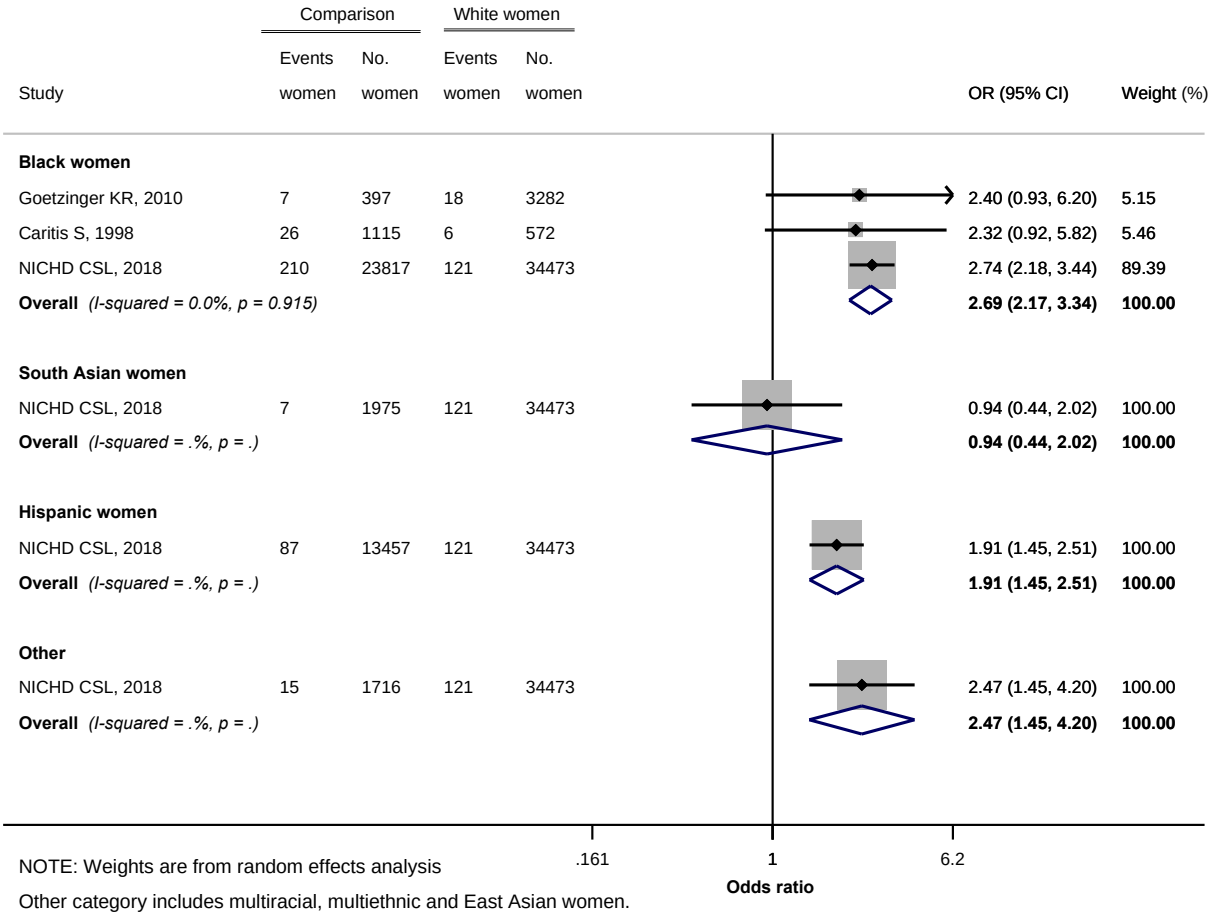


NOTE: Weights are from random effects analysis

Other category includes multiracial, multiethnic and East Asian women.

Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

Appendix 10 Sensitivity analysis of stillbirths restricting by high-risk pregnancies only.

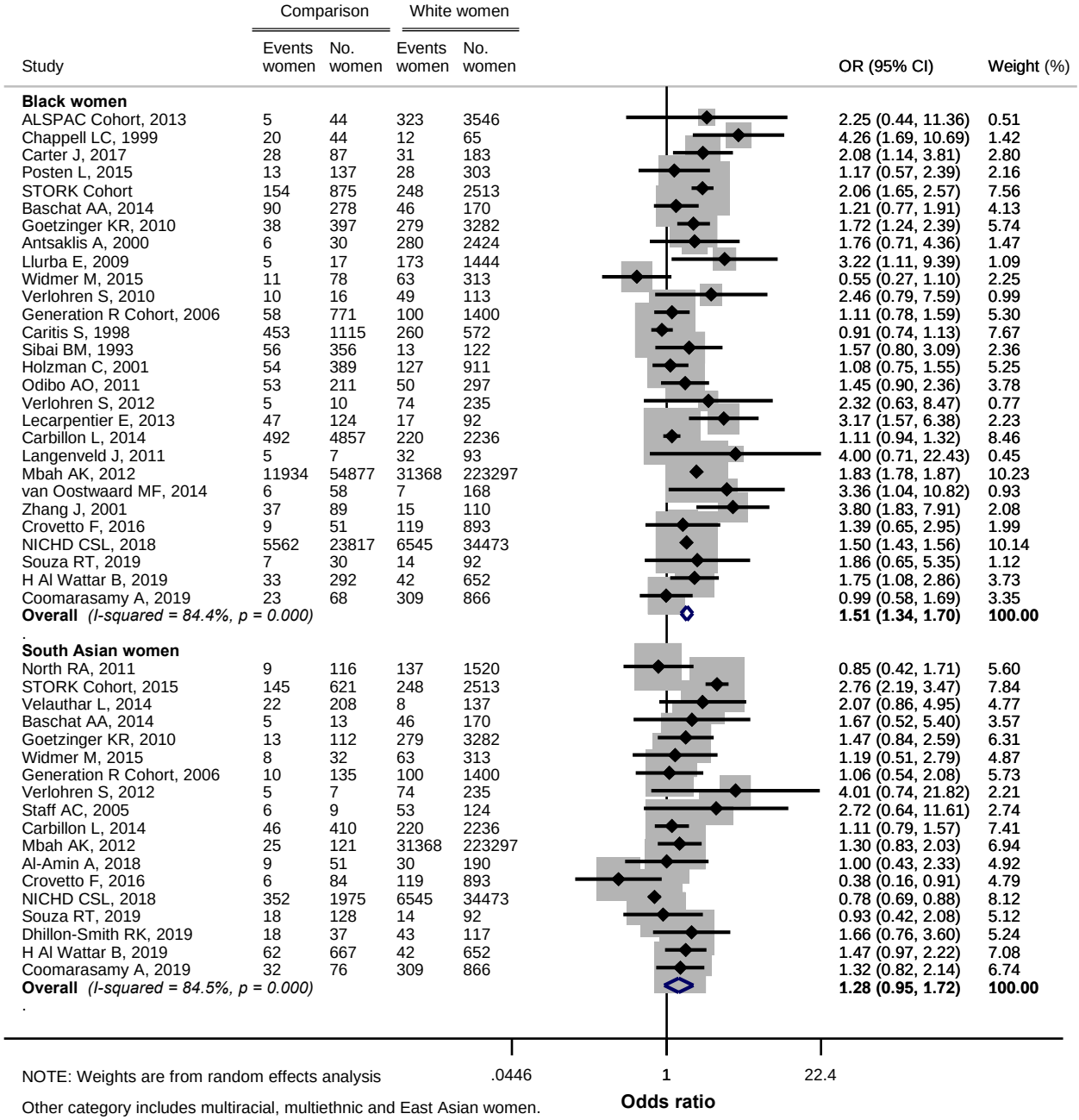


NOTE: Weights are from random effects analysis

Other category includes multiracial, multiethnic and East Asian women.

Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

Appendix 11 Sensitivity analysis of preterm births restricting by high-risk pregnancies only.

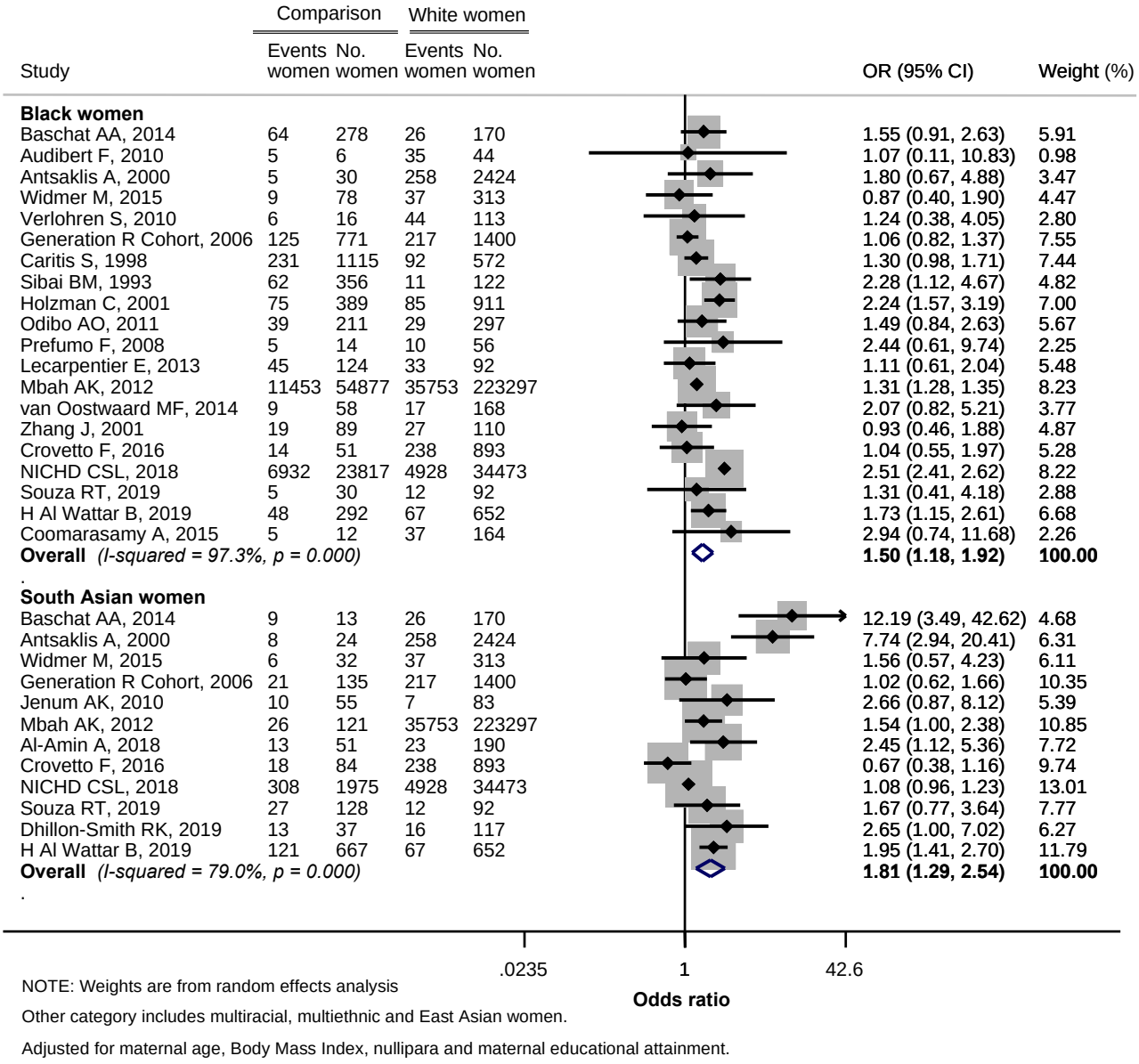


NOTE: Weights are from random effects analysis

Other category includes multiracial, multiethnic and East Asian women.

Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

Appendix 12 Sensitivity analysis of small-for-gestational-age babies restricting by high-risk pregnancies only.

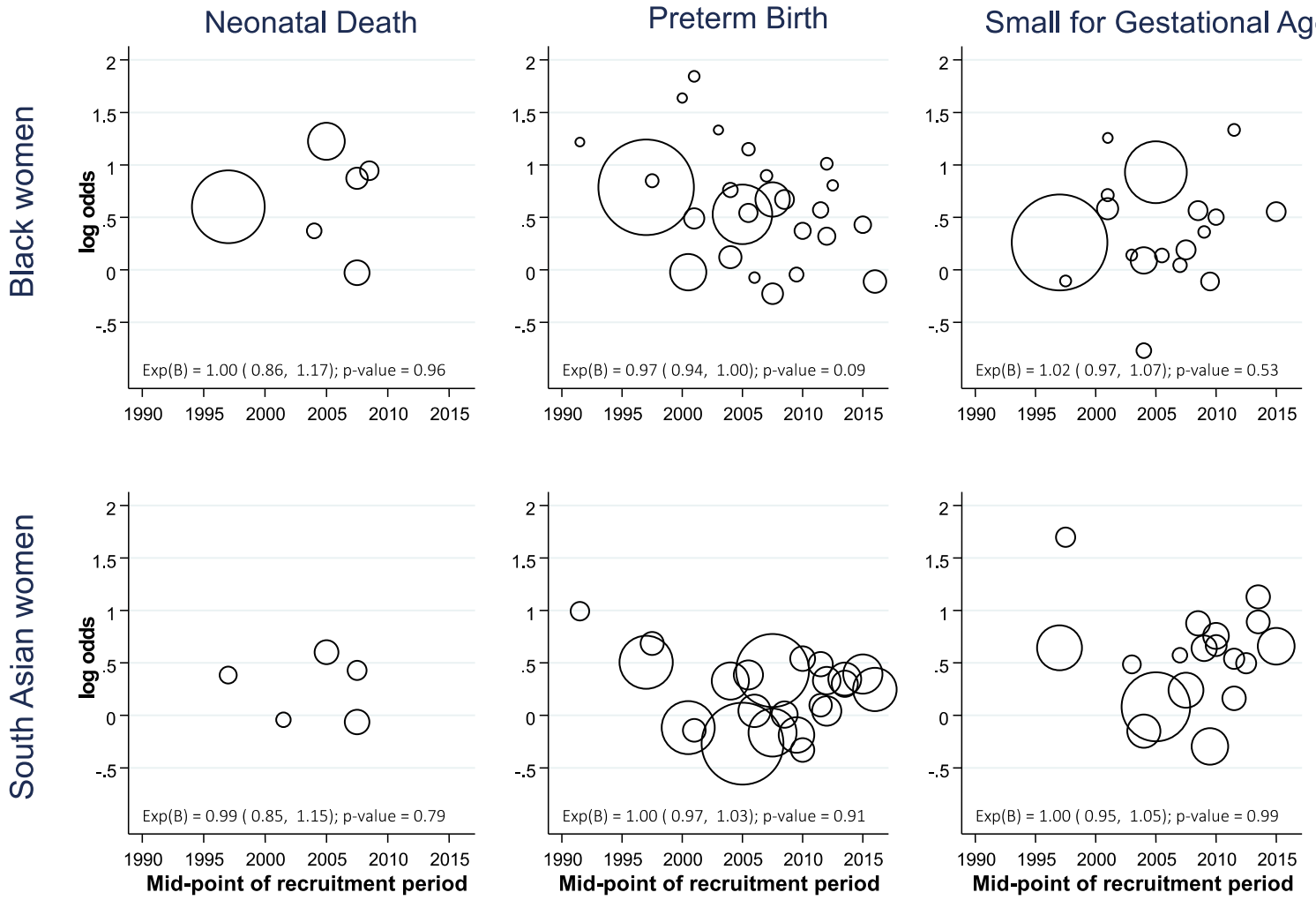


NOTE: Weights are from random effects analysis

Other category includes multiracial, multiethnic and East Asian women.

Adjusted for maternal age, Body Mass Index, nullipara and maternal educational attainment.

Appendix 13 Meta-regression analyses to evaluate the association between time (year) of recruitment and the effect of race and ethnicity compared to White women. The size of the bubbles is proportional to the sample size of the studies.



NOTE: For the stillbirth outcome, we could not perform a meta-regression analysis since there were only three studies.

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Appendix 14 Sensitivity analysis excluding study which recruited data from 1959-1965 (Zhang J 2001).

Outcome	Main analysis OR (95% CI)	Sensitivity analysis without Zhang J, 2001 OR (95% CI)
Neonatal death	2.00 (1.44, 2.78)	2.04 (1.44, 2.89)
Preterm delivery	1.65 (1.46, 1.88)	1.60 (1.41, 1.83)
Small-for-gestational-age	1.39 (1.13, 1.72)	1.42 (1.14, 1.76)

Appendix 15 Sensitivity analysis excluding study which included participants from low- and middle-income countries (Widmer M 2015).

Outcome (White reference group)	Main analysis OR (95% CI)	Sensitivity analysis without Wilmer M, 2015 OR (95% CI)
Neonatal death		
Black	2.00 (1.44, 2.78)	2.28 (1.61, 3.23)
South Asian	1.33 (0.96, 1.84)	**1.62 (1.25, 2.10)**
Other	1.24 (0.44, 3.49)	1.99 (0.46, 8.51)
Preterm birth		
Black	1.65 (1.46, 1.88)	1.71 (1.50, 1.94)
South Asian	1.26 (1.07, 1.48)	1.29 (1.08, 1.53)
Small-for-gestational-age		
Black	1.39 (1.13, 1.72)	1.40 (1.13, 1.74)
South Asian	1.61 (1.32, 1.95)	1.64 (1.33, 2.03)

Appendix 16 Statistical software and commands

Stata Version 17 was used for analysing data with multiple imputation (mi imputed command) and logistic regression (logit command) for estimating the racial-ethnicity effects in the presence of multiple imputation datasets. A user-stata code was developed to average effects estimated in the different imputed data-sets based on Rubin's rule. Metanalyses were conducted using metan command to estimate pooled associations and forest-plot command for plotting. The metareg command was used in a sensitivity analysis. Code for the analysis is available upon a reasonable request to the corresponding author.

Appendix 17 Correlation matrix among covariates included in the analysis of the association between ethnicity and perinatal outcomes using data of the IPPIC project.

	Race and Ethnicity					**Covariates**			
Covariates	White	Black	South Asian	Hispanic	Other	Age	BMI	Parity	Studies
Age	-0.134	-0.183	0.067	-0.016	0.311	1.000			
BMI	0.039	0.131	0.006	0.064	-0.191	0.051	1.000		
Parity	-0.054	-0.050	0.009	-0.034	0.092	-0.256	-0.109	1.000	
Studies	0.160	-0.135	0.002	-0.121	-0.004	0.303	-0.012	0.100	1.000

Other category includes multiracial, multiethnic and East Asian women.

Appendix 18 Members of the IPPIC Collaborative Network

Mali	Abdollahain
Annemarijne	Adank
Rebecca E.	Allen
Louise Bjoerkholt	Andersen
Dewi	Anggraini
Lee	Ann Hawkins
Lucinda	Archer
Lisa M.	Askie
Francois	Audibert
Ahmet	Baschat
Ana Pilar	Betran
Sohinee	Bhattacharya
Mark;	Brown
Joyce L.	Browne
Kerstin	Klipstein-Grobusch
Lionel	Carbillon
Guillermo	Carroli
Jose	Cecatti
Lucy	Chappell
Agustin	Conde-Agudelo
Arri	Coomarasamy
Francesca	Crovetto
Fabricio	Da Silva Costa
George	Daskalakis
Gustaaf	Dekker
Kajantie	Eero
Inge	Eisensee
Anne	Eskild
Fabio	Facchinetti
Diane	Farrar
Sergio	Ferrazzani
Enrico	Ferrazzi
Ernesto A.	Figueiró-Filho
Francesc	Figuera
Jean-Claude	Forest
Tiziana	Frusca
Rinat	Gabbay- Benziv
Alberto	Galindo
Wessel	Ganzevoort
Robert	Gibson
Yves	Giguère
Francois	Goffinet
Henk	Groen
Camilla	Haavaldsen

Bassam G.	Haddad
Seppo	Heinonen
Ignacio	Herraiz
Claudia	Holzman
Tianhua	Huang
Sebastián E.	Illanes
Jan Stener	Jørgensen
Louise C.	Kenny
John C.	Kingdom
Emily C.	Kleinrouweler
Hannele	Laivuori
Josje	Langenveld
Olav	Lapaire
Édouard	LeCarpentier
Pisake	Lumbiganon
Jacob A.	Lykke
Maureen	Macleod
Per Minor	Magnus
Maria	Makrides
Jacques	Massé
Alfred	Mbah
Fionnuala M.	McAuliffe
Lesley	McCowan
Wendy S.	Meschino
Ben W.	Mol
Fionnuala	Mone
Ilza	Monterio
Jenny	Myers
Chie	Nagata
Anthony O.	Odibo
Akihide	Ohkuchi
Elisa Llurba	Olive
Jørn	Olsen
Eva	Pajkrt
Athanasios	Pillalis
Lucilla	Poston
Federico	Prefumo
Javier Arenas	Ramírez
Catherine	Riddell
Richard	Riley
Claire T.	Roberts
Alice R.	Rumbold
Shigeru	Saito
Read	Salim
Kjell Åsmund	Salvesen
Ary I.	Savitri

Paul	Seed
Evan	Sequeira
Ragnhild Bergene	Skråstad
Line	Sletner
Gordon G.S.	Smith
Luc J.M.	Smits
Melanie	Smuk
Kym	Snell
Athena	Souka
Renato	Souza
Annetine C.	Staff
Eric A.P.	Steegers
Satoru	Takeda
Helena J.	Teede
Baskaran	Thilaganathan
Lill	Trogstad
Cuno S.P.M.	Uiterwaal
Joris	van de Post
Marleen	van Gelder
Sander M.J.	van Kuijk
Miriam	van Oostwaard
Luxmi	Velauthar
Patrizia	Vergani
Stefan	Verlohren
Pia M.	Villa
Christina A.	Vinter
Karlijn C.	Vollebregt
Jane	West
Mariana	Widmer
Hans	Wolf
SeonAe	Yeo
Nelly	Zavaleta
Jun	Zhang
Peter A.	Zimmerman