Supplementary Material

Contents

Supplementary file 1: Search strategy

Grid of key concepts and terms

Concept 1		Concept 2		Concept 3
Adverse birth outcomes	OR	Pregnancy risk factors	AND	Pacific Island countries

CINAHL searches for key concept terms and terms

Key concept terms	CINAHL Mesh and subject headings identified
Adverse birth outcomes	MH "Pregnancy outcome*" OR MH "Infant very Low birth weight" OR MH "Outcome* of prematurity"
Pregnancy risk factors	MH "Risk factor*" OR MH "Pregnancy risk" OR MH "High risk*" OR MH "Pregnancy in adolescence" OR MH "Pregnancy risk*"
Pacific Island region	MH "Pacific Island*"

Search strings developed

Key concept and general terms and synonyms search string ("adverse birth outcome*" OR "poor birth outcome*" OR "preterm birth*" OR "premature birth*" OR "Poor fetal growth*" OR "fetal growth restriction*" OR "intrauterine growth retardation" OR "growth retardation" OR "low birth weight" OR "low birth weight " OR "very low birth weight" OR "very low birth weight " OR "extremely low birth weight" OR "extremely low birth weight " OR "stillbirth" OR "still birth") AND ("pregnancy risk factor*" OR "adverse pregnancy outcome*" OR "poor pregnancy outcome*") AND ("Pacific Island*" OR "Oceania" OR "South Pacific Island*" OR "Pacific Island country*")
MeSH terms search string (MH "pregnancy outcome*" OR MH "infant very low birth weight" OR MH "outcome* of prematurity") AND (MH "risk factor*" OR MH "pregnancy risk*" OR MH "high risk*" OR MH "pregnancy in adolescence*" OR MH "pregnancy risk*") AND ("MH Pacific Island*")
General and MeSH terms combined search string ("adverse birth outcome*" OR "poor birth outcome*" OR "preterm birth*" OR "premature birth*" OR "Poor fetal growth*" OR "fetal growth restriction*" OR "intrauterine growth retardation" OR "growth retardation" OR "small baby*" OR "very small baby*"OR "low birth weight" OR "low birth weight " OR "very low birth weight" OR "very low birth weight " OR "extremely low birth weight" OR "extremely low birth weight " OR "stillbirth" OR "still birth" OR MH "pregnancy outcome*" OR MH "infant very low birth weight" OR MH "outcome* of prematurity") AND ("pregnancy risk factor*" OR "adverse pregnancy outcome*" OR "poor pregnancy outcome*" OR MH "risk factor*"OR MH "pregnancy risk*" OR MH "high risk*" OR MH "pregnancy in adolescence*" OR MH "pregnancy risk*") AND ("Pacific Island*" OR "Oceania" OR "South Pacific Island*" OR "Pacific Island country*" OR "MH Pacific Island*")
Specific and MeSH terms combined search string ("preterm birth*" OR "premature birth*" OR "Poor fetal growth*" OR "fetal growth restriction*" OR "intrauterine growth retardation" OR "growth retardation" OR "small baby*" OR "very small baby*" OR "low birth weight" OR "low birth weight " OR "very low birth weight" OR "very low birth weight " OR "extremely low birth weight" OR "extremely low birth weight " OR "stillbirth" OR "still birth" OR MH "pregnancy outcome*" OR MH "infant very low birth weight" OR MH "outcome* of prematurity") AND ("malaria in pregnancy" OR "anaemia in pregnancy" OR "substance use" OR "alcohol use" OR "betel nut use" OR "areca nut use" OR "tobacco use" OR "cigarette use" OR "maternal obesity" OR "maternal malnutrition" OR "maternal undernutrition" OR "teenage pregnancy") AND ("American Samoa" OR "Cook Island*" OR "Easter Island*" OR "Federated States of Micronesia" OR "Fiji" OR "Guam" OR "Kiribati" OR "Mariana Island*" OR "Marshall Island*" OR "Nauru" OR "New Caledonia" OR "Niue" OR "Palau" OR "Papua New Guinea" OR "Samoa" OR "Solomon Island*" OR "Tahiti" OR "Tokelau" OR "Tonga" OR "Tuvalu" OR "Vanuatu" OR "Wallis and Futuna") Filter/limiter used
Filter/Limiter used -Year inclusion 2000-1st January-28th 2021 -Full text articles -English Language

Abbreviation used. MS: Medical subject heading or MeSH term

Supplementary file 2: Data extraction table

Main category
a. Author(s)
b. Year of publication
c. Origin/country study was conducted
d. Study design
e. Aims/purpose.
f. Sampling strategy
g. Study population
h. Sample size
i. Methodology
j. Intervention/exposure type (if applicable) and comparison group (if applicable)
k. Duration of the exposure/intervention (if applicable)
l. Outcome assessment and method to assess associations (if applicable)
m. Key findings that relate to the scoping review question(s)

Supplementary File 3: Prevalence of adverse birth outcome

Countries	Sources	Adverse birth outcome prevalence	Effect size 95%
Low birth weight			
PNG	Peters, Vince [50]	8%	(7%, 11%)
	Stanisic, Moore [52]	17%	(14%, 28%)
	Unger, Ome-Kaius [53]	16%	(14%, 23%)
	Ome-Kaius, Unger [49]	14%	(14%, 19%)
	Lufele, Umbers [48]	14%	(14%, 19%)
	Fowkes, Davidson [47]	17%	(14%, 29%)
	Unger, Rosanas-Urgell [54]	15%	(16%, 20%)
	National Statistics Office [21]	14%	(15%, 18%)
Vanuatu	Ministry of Health [59]	11%	(10%, 15%)
Solomon Islands	Cafaro, Randle [45]	12%	(11%, 17%)
	National Statistic Office [61]	10%	(10%, 13%)
Tonga	Ministry of Health [20]	4%	(3%, 5%)
Samoa	Bureau of Statistics [19]	5%	(4%, 6%)
Tuvalu	Central Statistics Division [57]	6%	(4%, 10%)
CNMI	Cruz, Grant [46,55]	3%	(3%, 4%)
Palau	Berger, Masterson [44]	8%	(7%, 11%)
Kiribati	National Statistic Office [60]	13%	(11%, 17%)
Marshall Is.	Economic Policy [58]	18%	(18%, 26%)
Nauru	Bureau of Statistics [55]	27%	(27%, 50%)
Preterm birth			
PNG	Stanisic, Moore [52]	22%	(20%, 39%)
	Fowkes, Davidson [47]	22%	(20%, 40%)
	Unger, Rosanas-Urgell [54]	9 %	(8%, 13%)
Solomon Islands	Cafaro, Randle [45]	24%	(26%, 36%)
CNMI	Cruz, Grant [46]	7 %	(6%, 8%)
Palau	Berger, Masterson [44]	9%	(8%, 12%)
Preterm low birth weight			
Palau	Berger, Masterson [44]	5%	(4%, 5%)
Term low birth weight			
	Berger, Masterson [44]	4%	(3%, 5%)
Preterm normal weight			
Palau	Berger, Masterson [44]	4%	(3%, 6%)
Small for gestational age			
PNG	Unger, Rosanas-Urgell [54]	2%	(1%, 3%)
Smaller than average babies			
PNG	National Statistics Office [21]	19%	(21%, 25%)
Solomon Islands	National Statistic Office [61]	11%	(11%, 14%)
Samoa	Bureau of Statistics [19]	11%	(11%, 14%)
Tuvalu	Central Statistics Division [57]	11%	(9%, 17%)
Kiribati	National Statistic Office [60]	5%	(4%, 7%)
Marshall Islands	Economic Policy [58]	18%	(18%, 26%)
Very small babies			
Solomon	National Statistic Office [61]	3%	(3%, 4%)
Tonga	Ministry of Health [20]	5%	(4%, 7%)
Samoa	Bureau of Statistics [19]	1%	(0%, 1%)
Tuvalu	Central Statistics Division [57]	3%	(2%, 5%)
Kiribati	National Statistic Office [60]	2%	(1%, 3%)
Marshall Islands	Economic Policy [58]	5%	(4%, 7%)
Nauru	Bureau of Statistics [55]	22%	(21%, 39%)

Supplementary File 4: Preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	4
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	https://bmjopen.bmj.com/content/11/4/e042423
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	4 Detailed in protocol inclusion and exclusion criteria"
Information sources	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	5
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Outlined in page 5 More detail in Supplementary file 1
Selection of sources of evidence	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6 Figure 1 PRISMA flow diagram
Data charting process	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or 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 and any assumptions and simplifications made.	Table 1 summary of studies

Critical appraisal of individual sources of evidence	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Not applicable
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	6, Figure 1 PRISMA flow diagram
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	6-7, supplementary 5 and 6 presenting effect estimates
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	6-7, supplementary 5 and 6 presenting effect estimates
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	6-7, supplementary 4 and 5 presenting effect estimates
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	6-7
Limitations	20	Discuss the limitations of the scoping review process.	11
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	11
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	11

Retrieved from: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Supplementary file 5. Health, demographic and social risk factors associated with low birth weight

AUTHORS	EXPOSURES COMPARISON	EFFECT ESTIMATE (95%, confidence interval)
Lufele, Umbers [48]	**Placenta malaria infection**	
	No	**Reference**
	Acute	aOR 2.00 (0.89, 3.95)
	Chronic	aOR 1.2 (0.59, 2.50)
	Past	aOR 1.0 (0.61, 1.63)
Stanisic, Moore [52]	**Placenta malaria infection**	
	No	**Reference**
	Chronic	aOR 3.3 (1.0, 10.60)
	Acute	aOR 0.7 (0.22, 2.0)
	Past	aOR 1.5 (0.37, 6.10)
	Sub-microscopic malaria infection	
	Negative	**Reference**
	Positive	aOR 2.4 (0.99, 5.89)
Unger, Rosanas-Urgell [54]	**Plasmodium falciparum malaria infection**	
	No	**Reference**
	Sub-microscopic	aOR 1.0 (0.55, 1.84)
	Microscopic	aOR 1.0 (0.54, 1.75)
	Plasmodium falciparum malaria (peripheral blood)	
	No	**Reference**
	Sub-microscopic	aOR 1.0 (0.35, 2.83)
	Microscopic	aOR 2.8 (1.27, 5.94)
	P.falciparum malaria (placenta blood)	
	No	**Reference**
	Sub-microscopic	aOR 2.9 (0.82, 9.91)
	Microscopic	aOR 2.1 (0.87, 4.98)
Stanisic, Moore [52]	**Clinical history of infection**	
	No	**Reference**
	Yes	aOR 1.0 (0.42, 1.90)
	Maternal parasitaemia (enrolment)	
	No	**Reference**
	Yes	aOR 1.0 (0.50, 2.20)
Berger, Masterson [44]	**Betel nut users with tobacco use**	
	No	**Reference**
	Yes	aOR 2.4 (1.0, 6.0)
Senn, Baiwog [51]	**Betel nut users**	
	No	**Reference**
	Yes	OR 1.9 (0.4, 17.0)
	Betel nut users (term LBW)	
	No	**Reference**
	Yes	OR 3.0 (0.4, 13.0)
Peters, Vince [50]	**Maternal tobacco users**	
	No	**Reference**
	Yes	OR 2.9 (1.28, 6.32)
Stanisic, Moore [52]	**Maternal tobacco users**	
	No	**Reference**
	Yes	aOR 1 .4 (0.62, 3.35)
Fowkes, Davidson [47]	**Iron deficiency and gravidity**	
	Primigravida	aOR 0.3 (0.10, 0.66)
	Multigravida	**Reference**
	Southeast Asian ovalocytosis	
	Normal	**Reference**

Stanisic, Moore [52]	Infected	aOR 2.3 (0.94, 5.75)
	Alpha thalassaemia infection	
	Wildtype	**Reference**
	Heterozygote	aOR 0.7 (0.27, 1.58)
	Homozygote	aOR 0.6 (0.22, 1.34)
	Maternal anaemia (Hb <8 g/dL)	
	No	**Reference**
	Yes	OR 1.0 (0.52, 1.80)
Ome-Kaius, Unger [49]	**Maternal height** (<150cm)	
	No	**Reference**
	Yes	aOR 1.7 (1.22, 2.41)
	Maternal MUAC (<23 cm)	
	No	**Reference**
	Yes	aOR 1.5 (1.10, 2.03)
Peters, Vince [50]	**Maternal age** (years)	
	22-35	**Reference**
	< 22 years and >35	OR 1.9 (1.04, 3.56)
Berger, Masterson [44]	**Body mass index** (kgm3)	
	<30 kgm3	**Reference**
	≥30 kgm3	aOR 0.6 (0.3, 1.4)
Peters, Vince [50]	**Birth intervals** (years)	
	> 2 years	**Reference**
	<2 years	OR 3.6 (1.39, 9.30)
	Antenatal booking	
	Booked	**Reference**
	Unbooked	aOR 4.0 (2.12, 7.57)
	Antenatal visits	
	≥3 visits	**Reference**
	<3 visits	OR 2.9 (1.36, 6.14)
	Fever during pregnancy	
	No	**Reference**
	Yes	OR 2.8 (0.87, 8.83)
Ome-Kaius, Unger [49]	**Female infants**	
	Yes	**Reference**
	No	OR 1.6 (1.22, 2.22)
	Primigravida	
	No	**Reference**
	Yes	aOR 2.9 (2.13, 3.96)
	Number of antenatal visits	
	≥3 visits	**Reference**
	1-2 visits	aOR 0.7 (0.46, 0.92)
Stanisic, Moore [52]	**Gravidity**	
	Primigravida	**Reference**
	Multigravida	aOR 0.3 (0.13, 0.57)
Ome-Kaius, Unger [49]	**Malaria prophylaxis** (SPAZ-IPTp)	
	Yes	**Reference**
	No	aOR 0.6 (0.48, 0.85)
	PNG highlands mothers	
	Yes	**Reference**
	No	aOR 0.3 (0.14, 0.80)
Stanisic, Moore [52]	**Maternal education status**	
	No	**Reference**
	Primary	aOR 0.5 (0.13, 1.70)
	Secondary	aOR 0.6 (0.16, 2.0)

Abbreviation and notes. aOR: adjusted odds ratio, cm: centimetre, g/dL: gram per decilitre, kgm3: kilogram per cubic metre, SPAZ-IPTp: sulphadoxine-pyrimethamine and azithromycin, Odds ratio rounded to the nearest one decimal place

Supplementary file 6. Health, demographic and social risk factors associated with preterm births

AUTHORS	EXPOSURES COMPARISON	EFFECT ESTIMATE (95%, confidence interval)
Lufele, Umbers [48]	**Placenta malaria infection**	
	No	**Reference**
	Acute	aOR 2.3 (0.86, 6.35)
	Chronic	aOR 3.9 (1.64, 9.38)
	Past	aOR 1.5 (0.71, 3.03)
Stanisic, Moore [52]	**Placenta malaria infection**	
	No	**Reference**
	Acute	aOR 2.1 (0.75, 5.80)
	Chronic	aOR 4.2 (1.30, 13.40)
	Past	aOR 1.3 (0.30, 6.10)
Unger, Rosanas-Urgell [54]	**Plasmodium falciparum malaria infection**	
	No	**Reference**
	Sub-microscopic	aOR 0.2 (0.02, 1.26)
	Microscopic	aOR 1.2 (0.49, 1.26)
	Plasmodium falciparum malaria (peripheral blood)	
	No	**Reference**
	Sub-microscopic	aOR 0.5 (0.07, 4.29)
	Microscopic	aOR 6.6 (2.46, 17.62)
	Plasmodium falciparum malaria (placenta blood)	
	No	**Reference**
	Sub-microscopic	aOR 3.3 (0.66, 16.83)
	Microscopic	aOR 3.0 (0.87, 10.30)
Stanisic, Moore [52]	**Tobacco smoke users**	
	No	**Reference**
	Yes	aOR 1.1 (0.50, 2.62)
Berger, Masterson [44]	**Betel nut and tobacco smoke users**	
	No	**Reference**
	Yes	aOR 1.0 (0.6, 1.70)
Senn, Baiwog [51]	**Betel nut users**	
	No	**Reference**
	Yes	OR 0.6 (0.1, 5.4)
Ome-Kaius, Unger [49]	**Betel nut users**	
	No	**Reference**
	Yes	OR 0.9 (0.65, 1.38)
Stanisic, Moore [52]	**Southeast Asian ovalocytosis infection**	
	No	**Reference**
	Yes	aOR 1.1 (0.40, 2.99)
	Alpha thalassaemia infection	
	Wildtype	**Reference**
	Heterozygote	aOR 0.9 (0.38, 2.23)
	Homozygote	aOR 0.6 (0.25, 1.56)
Berger, Masterson [44]	**Body mass index** (kgm3**)**	
	<30 kgm3	**Reference**
	≥30 kgm3	aOR 1.5 (1.0, 2.3)
Cruz, Grant [46]	**Maternal age** (years)	
	20-34 years	**Reference**
	<20 years	aOR 1.3 (1.0, 1.80)
	≥35 years	aOR 1.5 (1.20, 1.9)
	Number of antenatal visits	
	≥9 visits	**Reference**
	0 visit	aOR 3.9 (2.90, 5.3)

	1-8 visits	aOR 2.8 (2.10, 3.7)
Stanisic, Moore [52]	**Gravidity**	
	Primigravida	**Reference**
	Multigravida	aOR 0.4 (0.19, 0.79)
	Used of bed nets during pregnancy	
	No	**Reference**
	Yes	aOR 0.8 (0.36, 1.7)
Cruz, Grant [46]	**Maternal race/ethnicity**	
	Chinese women	**Reference**
	CNMI women	aOR 2.7 (2.0, 3.6)
	Pacific Island women	aOR 2.9 (2.1, 4.1)
	Filipino	aOR 2.3 (1.7, 3.1)
	Another non-Pacific Islander	aOR 1.1 (0.7, 1.7)
Stanisic, Moore [52]	**Maternal education status**	
	No	**Reference**
	Primary	aOR 0.2 (0.07, 0.66)
	Secondary	aOR 0.1 (0.04, 0.42)

Abbreviation and notes. aOR: adjusted odds ratio, kgm3: kilogram per cubic metre, OR: odds ratio, Odds ratio rounded to the nearest one decimal place

Supplementary file 7. Health, demographic and social risk factors associated with small for gestational age

AUTHORS	EXPOSURES COMPARISON	EFFECT ESTIMATE (95%, confidence interval)
Lufele, Umbers [48]	**Placenta malaria infection**	
	No	**Reference**
	Acute	aOR -0.7 (-5.02, 3.71)
	Chronic	aOR -3.4 (-7.79, 1.02)
	Past	aOR -1.5 (-4.27, 1.23)
Unger, Rosanas-Urgell [54]	**Plasmodium falciparum malaria**	
	No	**Reference**
	Sub-microscopic	aOR 1.7 (0.93, 2.92)
	Microscopic	aOR 0.7 (0.35, 1.43)
	Plasmodium falciparum malaria (peripheral blood)	
	No	**Reference**
	Sub-microscopic	aOR 1.3 (0.44, 3.96)
	Microscopic	aOR 1.7 (0.67, 4.39)
	Plasmodium Falciparum malaria (placenta blood)	
	No	**Reference**
	Sub-microscopic	aOR 2.6 (0.71, 9.56)
	Microscopic	aOR 1.6 (0.61, 4.34)
Unger, Ome-Kaius [53]	**Malaria infection**	
	No	**Reference**
	Yes	aRR 1.1 (0.91, 1.36)
	Maternal recent infection (weeks)	
	>6	**Reference**
	<6	aRR 1.0 (0.81, 1.32)
	Maternal infection	
	1 infection	**Reference**
	≥2 infection	aRR 1.2 (0.85, 1.63)
	Betel nut chewing	
	No	**Reference**
	Yes	aRR 0.9 (0.72, 1.09
	Tobacco smoke	
	No	**Reference**
	Yes	aRR 1.0 (0.79, 1.22)
	Anaemia at enrolment (mg/L)	
	Hb<90	aRR 1.3 (1.06, 1.51)
	Hb>90	**Reference**
	Mid upper arm circumference (cm)	
	>22	**Reference**
	<22	aRR 1.5 (1.29, 1.76)
	Maternal height (cm)	
	>150	**Reference**
	<150	aRR 1.3 (1.04, 1.55)
	Maternal body mass index (kg/m3)	
	>18.5	**Reference**
	<18.5	aRR 1.3 (0.95, 1.80)
	Gravidity	
	Multigravida	**Reference**
	Primigravida	RR 1.4 (1.13, 1.61)
	Recent IPTp malaria prophylaxis	
	No	**Reference**
	Yes	aRR 0.2 (0.04, 0.27)
	Maternal ethnicity	

	Madang/Morobe	**Reference**
	Other	RR 0.8 (0.70, 1.02)
	Literate mother	
	No	**Reference**
	Yes	RR 1.1 (0.81, 1.49)
	Mother generating income	
	No	**Reference**
	Yes	RR 1.0 (0.87, 1.24)
	Partner generating income	
	No	**Reference**
	Yes	RR 0.9 (0.73, 1.02)
	Maternal area of residence	
	Urban area	**Reference**
	Peri-urban area	RR 1.2 (0.87, 1.52)
	Rural area	RR 1.1 (0.83, 1.37)
Stillbirth and miscarriage risks		
Ome-Kaius, et al. 6	**Betel nut chewing mothers**	
	Non-users	**Reference**
	Heavy users	RR 1.8 (0.63, 2.97)*
Unger, Rosanas-Urgell [54]	**Malaria Infection**	
	No infection	**Reference**
	Submicroscopic infection	aOR 0.8 (0.19, 3.41)
	Microscopic infection	aOR 2.0 (0.68, 5.66)

Abbreviation and notes. aOR: adjusted odds ratio, aRR: adjusted relative risks, cm: centimetre, Hb: haemoglobin, kg/m: kilogram per cubic metre, mg/L: milligram per litre, RR: relative risk , * RR and CI recalculated, Odds ratio rounded to the nearest one decimal place

Supplementary file 8. Health, demographic and social risk factors associated with changes in mean birth weight

AUTHORS	EXPOSURES COMPARISON	EFFECT ESTIMATE (95%, confidence interval)
Lufele, Umbers [48]	**Placenta malaria infection**	
	No infection	**Reference**
	Acute infection	-189.0 (-323.3, -54.6)
	Chronic infection	-63.6 (-199.08, -71.7)
	Past infection	-76.1 (-159, -6.8)
Senn, Baiwog [51]	**Malaria infection**	
	Non-infected	**Reference**
	Infected	-42 (NR)
Stanisic, Moore [52]	**Submicroscopic Plasmodium falciparum malaria infection**	
	Negative	**Reference**
	Positive	-64 (-188, 59)
	Clinical history taken during antenatal care	
	No	**Reference**
	Yes	-104 (-230, 22)
	Parasitaemia	
	No	**Reference**
	Yes	-30 (-149, 89)
	Tobacco smoke users	
	No	**Reference**
	Yes	-197 (-333, -261)
Senn, Baiwog [51]	**Betel nut users**	
	Non-users	**Reference**
	Users	-238 (NR)
Ome-Kaius, Unger [49]	**Betel nut users**	
	Non-users	**Reference**
	Users	-1 (NR)
Stanisic, Moore [52]	**Haemoglobin test at enrolment**	
	No	**Reference**
	Yes	61 (19, 102)
	Anaemia	
	No	**Reference**
	Yes	-101 (-215, 13)
Fowkes, Davidson [47]	**Gravidity and iron deficiency**	
	Primigravida	351 (188, 514)
	Multigravida	125 (-28, 277)
Senn, Baiwog [51]	**Anaemia** (g/l)	
	Hb >80	**Reference**
	Hb <80	-65 NR
Stanisic, Moore [52]	**Southeast Asian ovalocytosis infection**	
	Yes	**Reference**
	Infected	-129 (-287, 29)
	Alpha thalassemia	
	Wildtype	**Reference**
	Heterozygote	-12 (-159, 135)
	Homozygote	47 (-100, 194)
Senn, Baiwog [51]	**Body mass index** (kgm3)	
	<20	**Reference**
	>20	-175 (NR)
Ome-Kaius, Unger [49]	**Mid upper arm circumference** (cm)	
	>23	**Reference**
	<23	-99 (NR)

	Short stature	
	>150cm	**Reference**
	<150 cm	-151 (NR)
Senn, Baiwog [51]	**Gravidity**	
	Multigravida	**Reference**
	Primigravida	-467 (NR)
	Hypertension	
	No	**Reference**
	Yes	-117 (NR)
	Haemoglobin (g/l)	
	>80	**Reference**
	<80	-65 (NR)
	Antenatal care	
	Yes	**Reference**
	No	-23 (NR)
Ome-Kaius, Unger [49]	**Gravidity**	
	Multigravida	**Reference**
	Primigravida	-214 (NR)
	Fewer antenatal visits	
	≥3 visits	**Reference**
	1-2 visits	-73 (NR)
	Infant sex	
	Male	**Reference**
	Female	-78 (NR)
	Malaria prophylaxis	
	Yes	**Reference**
	No	44 (NR)
	Use of bed net	
	Regular	**Reference**
	Irregular	16 (NR)
Stanisic, Moore [52]	**Use of bed net**	
	No	**Reference**
	Yes	-40 (-165, 84)
	Gravidity	
	Primigravida	**Reference**
	Multigravida	325 (211, 439)
Ome-Kaius, Unger [49]	**PNG ethnicity**	
	Highlander	**Reference**
	Non-Highlander	-311 (NR)
	Received income	
	Yes	**Reference**
	No	-22 (NR)
Senn, Baiwog [51]	**Socio-economic level**	
	High	**Reference**
	Low	-54 (NR)
	Education level	
	High	**Reference**
	Low	-33 (NR)
Stanisic, Moore [52]	**Maternal education status**	
	No education	**Reference**
	Primary education	100 (-104, 305)
	Secondary education	79 (-127, 286)

Abbreviation. cm: centimetre, kgm3:kilogram per cubic metre, g/l: grams per litre, Hb: haemoglobin, NR: confidence interval not reported. Note: Effect estimate illustrated changes in mean birth weight in grams.

Supplementary file 9: Reported adverse birth outcomes and counts of risk factors nominated by health professionals interviewed (n=18)

Reported adverse birth outcomes	Health professionals (n=18)
Preterm birth	14
LBW	12
SGA	11
Stillbirth	8
Miscarriage or abortion	8
Reported risk factors for adverse birth outcomes	
Physical and emotional stress	13
Teenaged pregnancy	11
Malaria during pregnancy	11
Poverty	11
Poor antenatal care access	10
Pre-eclampsia	10
Anaemia and iron deficiency	9
Sexually transmitted infections including HIV	9
Hypertension or pregnancy-induced hypertension	7
Unplanned or unwanted pregnancies	6
Substance use (betel nut, tobacco, kava and marijuana)	7
Type 2 diabetes or gestational diabetes	5
Abortion (spontaneous)	5
History of rheumatic heart disease	4
Domestic violence	5
Maternal illiteracy	5
Poor nutrition	4
Tuberculosis	4
Falls and accidents	3
Poor health seeking behaviour	3
Urinary tract infection and intrauterine infection	2
Food taboo	2