

Supporting Information

Supplementary Material 1: PRISMA Checklist



PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Line 3
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Line 26
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Line 78
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Line 88
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Line 109
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Line 104
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Line 99
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Line 118
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Line 126
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	S2
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	S2
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Line 131
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Line 149
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Line 149
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Line 156
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Line 172
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Line 160
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Line 167
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Line 181
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Line 161





PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Fig 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Fig 1
Study characteristics	17	Cite each included study and present its characteristics.	Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	S4
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Table 2
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Line 227
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Line 232 Table 3 Figs 2&3
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Table 4
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Table 4
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Tables 3-5
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Line 302
	23b	Discuss any limitations of the evidence included in the review.	Line 372
	23c	Discuss any limitations of the review processes used.	Line 372
	23d	Discuss implications of the results for practice, policy, and future research.	Line 393
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Line 466
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Line 471
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Line 476
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Line 451
Competing interests	26	Declare any competing interests of review authors.	Line 455
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Line 461

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi:



Supplementary Material 2: Data Extraction Form

Paper Details	
Title of Study	
Study ID (First Author + Year)	
Reference Details	
ID's of other reports for this study (i.e. duplicates or follow- up studies)	
Notes	

General Information	
Date form completed	
Initials of person extracting data	
Publication type	
Funding sources	
Potential conflicts of interest	
Notes	



Study Eligibility					
Study characteristics	Eligibility criteria	Yes	No	Unclear	Location in text
Inclusion Criteria (must answer yes)	Pregnant women (any gestation at time of birth)				
	BMI measured pre- pregnancy or during pregnancy				
	If BMI measured during pregnancy, was it singleton pregnancy? (NB not applicable if BMI measured pre- pregnancy)				Not applicable ☐
Exclusion Criteria (must answer no)	Selected by age?				
	Selected by race?				
	Selected by health status?				
	Selected by birth outcome?				
	Selected by gestation at birth?*				
	n≤100				
	Only live births				
	Required participants to volunteer or provide consent?				
INCLUDE: ☐		EXCLUDE: ☐			
Reason for exclusion					
Notes: *Please note if database or if study excludes based on gestation at birth					

*** DO NOT PROCEED IF STUDY EXCLUDED FROM REVIEW ***



Population and Setting		
	Description	Location in text
Country (+Region)		
Population + Setting		
Inclusion criteria		
Exclusion criteria		
Method(s) of data collection		
Name of database		
Notes:		

Methods		
	Description	Location in text
Aim of study		
Study Design		
Month / Year of BMI Measurement	Start:	
	End:	
	Other detail:	
Ethical approval needed/ obtained		
Notes:		



Participant Characteristics			
	Description		Location in text
No. cases in sampling frame			
No. cases in reported data			
Gestation at Measurement	Pre-pregnancy:		
	Early pregnancy:		
	Pre- & Early:		
Race/ ethnicity			
Parity	Nulliparous		
	Multiparous		
	Nulli and Multi		
Notes:			



Results related to primary aim of review				
	Description			Location in text
BMI Classification WHO: <18.5 = underweight 18.5-24.99 = normal 25-29.99 = overweight 30-34.99 = obese(I) 35-39.99 = obese(II) ≥40 = obese(III)	Was WHO classification used? (if not, report boundaries)			
BMI	Mean:			
	Median			
	SD:			
	95%CI:			
	Other:			
BMI Class	Underweight	n		
		%		
	Normal	n		
		%		
	Overweight	n		
		%		
	Obese (all classes)	n		
		%		
	Obese I	n		
		%		
	Obese II	n		
		%		
	Obese III	n		
		%		
Notes:				



Supplementary Material 3: Hoy Risk of Bias Tool

Item #	Question	Criteria with bespoke study specific guidance
Q1	Was the study's target population a close representation of the national population in relation to relevant variables (e.g. age, sex, occupation)	Yes (Low Risk) e.g. National database No (High Risk) e.g. Urban hospital database
Q2	Was the sampling frame a true or close representation of the target population?	Yes (Low Risk) No (High Risk) e.g. only public patients (not private or vice versa)
Q3	Was some form of random selection used to select the sample, OR, was a <u>census</u> undertaken?	Yes (Low Risk) No (High Risk)
Q4	Was the likelihood of non-response bias minimal? <i>(NB- interpret as missing pregnancies from dataset or pregnancies with missing information on BMI)</i>	Yes (Low Risk) i.e. <2% excluded due to missing values No (High Risk) i.e. 2% and above
Q5	Were data collected directly from the subjects (as opposed to a proxy)?	Yes (Low Risk) i.e. either self-reported or measured No (High Risk)
Q6	Was an acceptable case definition used in the study?	Yes (Low Risk) No (High Risk)
Q7	Was the study instrument that measured the parameter of interest shown to have reliability and validity?	Yes (Low Risk) i.e. BMI measured No (High Risk) i.e. BMI self-reported or mix of self-reported/measured
Q8	Was the same mode of data collection used for all subjects?	Yes (Low Risk) e.g. all data collected at booking appointment by midwife No (High Risk)
Q9	Was the length of the shortest prevalence period for the parameter of interest appropriate?	Yes (Low Risk) e.g. woman asked about BMI prior to pregnancy/ BMI measured at booking No (High Risk) e.g. any period longer than pre-preg to booking
Q10	Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	Yes (Low Risk) No (High Risk) e.g. if numbers within BMI groups do not add up to the reported total included
Q11	Summary item on the overall risk of study bias	LOW RISK OF BIAS: Further research is very unlikely to change our confidence in the estimate. MODERATE RISK OF BIAS: Further research is likely to have an important impact on our confidence in the estimate and may change the estimate. HIGH RISK OF BIAS: Further research is very likely to have an important impact on our confidence in the estimate and is likely to change the estimate.

Supplementary Material 4: Risk of bias of included studies (assessed using Hoy Risk of Bias Tool)

Study ID	1	2	3	4	5	6	7	8	9	10	Total score	Risk of bias
Asia												
Jin 2021	-	-	-	+	-	-	+	-	-	-	2	Low
Leung 2008	+	+	-	-	-	-	-	-	-	-	2	Low
Ma 2016	+	-	-	-	-	-	+	-	-	-	2	Low
Michlin 2000	+	-	-	+	+	-	+	+	-	-	5	Moderate
Morikawa 2012	-	-	-	+	-	-	-	-	-	-	1	Low
Australia/ Oceania												
Callaway 2006	+	-	-	+	-	-	+	-	-	-	3	Low
Cheney 2018	+	-	-	+	-	-	-	-	-	-	2	Low
Cunningham 2013	+	-	-	+	-	-	-	-	-	-	2	Low
Davey 2020	-	-	-	+	-	-	+	+	-	+	4	Moderate
Dodd 2011	-	-	-	+	-	-	-	-	-	-	1	Low
Donald 2020	-	-	-	+	-	-	+	+	+	-	4	Moderate
Knight-Agarwal 2016	-	-	-	+	-	-	-	-	-	-	1	Low
McIntyre 2012	+	-	-	+	-	-	+	-	-	-	3	Low
San Martin Porter 2021	-	-	-	+	-	-	+	-	-	-	2	Low
Watson 2013	+	+	-	+	-	-	+	+	-	-	5	Moderate
Europe												
Abayomi 2009	+	-	-	+	-	-	-	-	-	-	2	Low
Arrowsmith 2011	+	-	-	+	-	-	-	-	-	-	2	Low
Bak 2016	-	-	-	-	-	-	-	-	-	-	0	Low
Baker 2012	+	-	-	+	-	+	-	-	-	+	4	Moderate
Bastola 2020	-	-	-	+	-	-	+	+	-	-	3	Low
Bhattacharya 2007	+	-	-	+	+	-	+	+	-	-	5	Moderate
Blomberg 2010	-	-	-	+	-	-	+	-	-	-	2	Low
Blomberg 2011	-	-	-	+	-	-	-	-	-	-	1	Low
Briese 2011	-	-	-	+	+	-	+	+	-	-	4	Moderate
Carillo-Aguirre 2020	-	+	-	+	-	-	+	+	-	-	4	Moderate
Cedergren 2007	-	-	-	+	-	-	-	-	-	+	2	Low
Cedergren 2008	-	-	-	+	-	-	+	+	-	-	3	Low
Cnattingius 1998	-	-	-	+	-	-	+	-	-	-	2	Low
Collier 2017	-	-	-	+	-	-	-	-	-	-	1	Low
Denison 2014	-	-	-	+	-	-	+	-	-	-	2	Low
Deruelle 2017	-	-	-	+	-	-	+	-	-	-	2	Low
Erjavec 2016	-	-	-	-	-	-	+	+	-	-	2	Low
Farah 2009	+	-	-	+	-	-	-	-	-	-	2	Low
Frischknecht 2009	+	-	-	+	-	-	-	-	-	+	3	Low
Gardosi 2009	-	-	-	+	-	-	-	-	-	-	1	Low
Hedegaard 2014	-	-	-	+	-	-	+	+	-	-	3	Low
Henriksson 2020	-	-	-	-	-	-	-	-	-	-	0	Low
Heslehurst 2007	+	-	-	+	-	-	-	-	-	+	3	Low
Heslehurst 2012	-	-	-	+	-	-	+	-	-	-	2	Low
Huisman 2013	-	-	-	-	-	-	-	+	-	-	1	Low
Johansson 2017	-	-	-	-	-	-	-	-	-	-	0	Low
Kanagalingam 2005	+	-	-	-	-	-	-	-	-	+	2	Low
Kent 2021	-	-	-	+	-	-	-	-	-	-	1	Low
Khashan 2009	-	-	-	+	-	-	-	-	-	-	1	Low
Kristensen 2005	-	-	-	+	-	-	+	+	-	-	3	Low
Le Ray 2005	-	-	-	+	-	-	-	-	-	-	1	Low
Lindholm 2015	-	-	-	+	-	-	+	-	-	-	2	Low
Lucovnik 2008	-	-	-	-	-	-	-	-	-	-	0	Low
Maier 2016	+	-	-	-	-	-	+	-	-	-	2	Low
Mantakas 2010	+	-	-	+	-	-	+	-	-	-	3	Low
McKeating 2015	+	-	-	+	-	-	-	-	-	-	2	Low
Melchor 2019	+	-	-	-	-	-	-	-	-	+	2	Low
Mogren 2018	-	-	-	-	-	-	-	-	-	-	0	Low

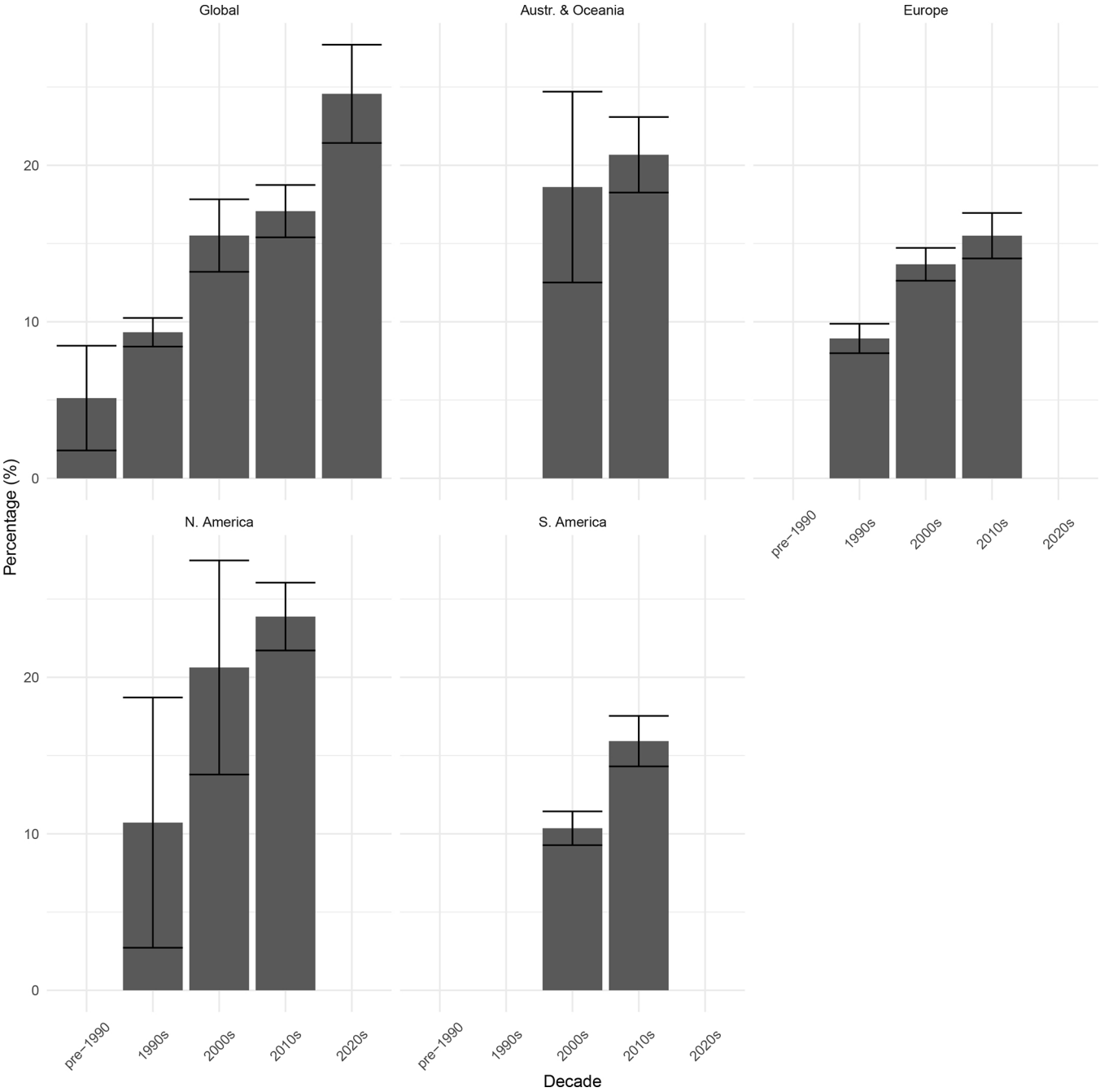
Continued

Supplementary Material 4: Continued

Study ID	1	2	3	4	5	6	7	8	9	10	Total Score	Risk of Bias
Nishikawa 2017	+	+	-	-	-	-	-	-	-	-	2	Low
Nohr 2012	-	-	-	+	-	-	+	+	-	-	3	Low
Oteny-Ntim 2013	+	-	-	+	-	-	+	-	-	-	3	Low
Ovesen 2011	-	-	-	+	-	-	+	-	-	-	2	Low
Penn 2014	+	-	-	+	-	-	-	-	-	-	2	Low
Premru-Srsen 2019	-	-	-	-	-	-	+	-	-	-	1	Low
Raja 2012	+	-	-	+	-	-	-	-	-	-	2	Low
Ramoniene 2017	+	-	-	+	-	-	+	+	-	-	4	Moderate
Rankin 2010	+	-	-	+	-	-	+	+	-	-	4	Moderate
Rantakallio 1995	+	-	-	+	-	-	+	-	-	-	3	Low
Reynolds 2019	+	-	-	-	-	-	-	-	-	-	1	Low
Reynolds 2020	+	-	-	-	-	-	-	-	-	-	1	Low
Scott-Pillai 2015	+	-	-	+	-	-	-	-	-	-	2	Low
Sebire 2001	+	-	-	+	-	-	-	-	-	-	2	Low
Stepan 2006	+	-	-	-	-	-	+	-	-	-	2	Low
Villamor 2006	-	+	-	+	-	-	+	-	-	-	3	Low
North America												
Abenhaim 2007	+	-	-	+	-	-	+	+	+	+	6	Moderate
Berendzen 2013	+	-	-	+	-	-	+	-	-	-	3	Low
Butwick 2018	-	-	-	+	-	-	+	-	-	-	2	Low
Chen 2004	+	+	-	+	-	-	-	-	-	-	3	Low
Crane 2009	-	-	-	+	-	-	+	-	-	-	2	Low
Declerq 2016	-	-	-	+	-	-	+	-	-	-	2	Low
Doyle 2022	-	-	-	+	-	-	+	-	-	-	2	Low
Ehrenthal 2011	+	-	-	+	-	-	+	-	-	-	3	Low
Eick 2019	-	-	-	-	-	-	+	+	-	-	2	Low
Gonzalez-Rios 2022	+	-	-	-	-	-	+	-	-	+	3	Low
Kabiru 2004	+	-	-	+	-	-	-	-	-	-	2	Low
Leonard 2020	-	-	-	+	-	-	+	+	-	-	3	Low
Lisonkova 2017	-	-	-	+	-	-	+	-	-	-	2	Low
Lutsiv 2015a	-	-	-	+	-	-	+	-	-	-	2	Low
Lynch 2014	+	-	-	-	-	-	+	+	-	-	3	Low
Magann 2011	+	-	-	-	-	-	-	-	-	-	1	Low
Miao 2021	-	-	-	+	+	-	+	+	-	-	4	Moderate
Mills 2020	-	-	-	-	+	-	+	+	+	-	4	Moderate
Naeye 1990	+	-	-	+	-	-	+	-	-	-	3	Low
Pasko 2016	+	-	-	+	-	-	-	-	-	-	2	Low
Seaton 2023	+	-	-	-	+	-	+	-	+	-	4	Moderate
Thompson 2019	-	-	-	+	-	-	+	-	-	-	2	Low
Young 2016	+	-	-	+	-	-	+	-	-	-	3	Low
aSouth America												
Carrilho 2022	-	+	-	+	-	-	+	-	-	-	3	Low
Conde-Agudelo 2000	-	-	-	+	-	-	+	-	-	-	2	Low



Supplementary Material 5: Maternal Obesity Pooled Prevalence



Supplementary Material 6: Maternal Overweight and Obesity Prevalence

