

Supplemental File B: Summary of risk of bias assessment

Table 1. Risk of Bias assessment for studies reporting measures of physical size.

Study (Physical Size)	Valid/reliable measures to assess confounding	Confounding variables taken into account	Similar inclusion/exclusion across groups	Similar recruitment across groups	Appropriate selection of comparison group	Blinding of outcome assessors	Reliable/valid measures to assess exposure	Reliable/valid measures to assess outcome	Similar length of follow-up across groups	Impact of high loss to follow-up considered	Overall rating	Main reason
Exposure studies - quantified												
Addila et al 2021	Yes	Yes	Yes	Cannot determine	Yes	N/A	Yes	Yes	N/A	N/A	Moderate	Lack of information on recruitment
Autti-Ramo et al 1991a	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Cannot determine	Yes	N/A	Serious	No control for confounding
Bada et al 2005	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
Bakhireva et al 2018	Yes	Partially	No	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	Different inclusion/exclusion criteria
Bandoli et al 2019*	Yes	No (raw scores) Yes (regression)	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information inclusion/exclusion (regression)
Bandoli et al 2020*	Yes	Yes	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Moderate	Not enough information for inclusion/exclusion criteria
Beauchamp et al 2020	Cannot determine	Partially	Yes	Yes	Yes	Yes	Yes	Cannot determine	Yes	N/A	Moderate	Limited consideration of confounding variables
Berger et al 2019	Cannot determine	No	Yes	Cannot determine	Yes	N/A	Yes	Cannot determine	Yes	N/A	Serious	No control for confounding
Carter et al 2007*	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Low (regression)	No control for confounding (raw scores) Low across all areas (regression)
Carter et al 2012*	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious (raw scores) Low (regression)	No control for confounding (raw scores) Low across all areas (regression)
Carter et al 2022*	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Low (regression)	No control for confounding (raw scores) Low across all areas (regression)
Chiaffarino et al 2006	Yes	Yes	Cannot determine	Cannot determine	Yes	N/A	Yes	Cannot determine	N/A	N/A	Moderate	Not enough information across some areas
Coles et al 1991	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Serious	No control for confounding
Coles et al 2021	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Cannot determine	Yes	N/A	Serious	No control for confounding
Day et al 1990	Cannot determine	Yes	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate	Not enough information across some areas
Faden et al 1997	Yes	Yes	Cannot determine	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Moderate	Lack of information about inclusion/exclusion
Falgreen-Eriksen et al 2012	Yes	No	Yes	Yes	Yes	N/A	Cannot determine	Yes	Yes	Yes	Serious	No control for confounding
Fraser et al 2012* (regression only)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Greene et al 1991a* (regression only)	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate	Not enough information about how confounding variables measured
Hannigan 2010* (regression only)	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	No	Serious	High dropout rate and impact not assessed

Jacobson et al 1994a*	Yes	Partially (raw scores) Yes (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate (raw scores) Low (regression)	No control for confounding (raw scores) Low across all areas (regression)
Jacobson et al 1998* (regression only)	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Moderate	Not enough information in some areas
Jaddoe et al 2007	Yes	Yes (SGA/LBW) No (BW)	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low (SGA/LBW) Serious (BW)	Scored low across all areas (for SGA/LBW); No control of confounding for BW
Kelly et al 2009	Yes	No	Yes	Yes	Yes	N/A	Yes	Cannot determine	Yes	N/A	Serious	No control for confounding
Larroque et al 1998	Yes	Partially	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Moderate	Limited consideration of confounding
Lazzaroni et al 1993	Yes	Yes (LBW) No (BW & BL)	Cannot determine	Cannot determine	Cannot determine	N/A	Yes	Yes	Yes	N/A	Moderate (LBW) Serious (BW & BL)	Not enough information across some areas; No control of confounders for BW or BL
Lees et al 2020	Cannot determine	No	Yes	Yes	Yes	N/A	Yes	Cannot determine	Yes	N/A	Serious	No control for confounding
Little et al 1990	Yes	No	Cannot determine	Yes	Yes	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Lumley et al 1985	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	Yes	N/A	Serious	No control for confounding
Lundsberg et al 1997	Yes	Yes	Yes	Yes	Yes	N/A	No	Yes	Yes	N/A	Serious	Unreliable information collected for PAE
Lundsberg et al 2015	Yes	Yes	Cannot determine	Yes	Yes	N/A	No	Yes	Yes	N/A	Serious	Limited information collected for PAE
Marbury et al 1983	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	No	Yes	Yes	N/A	Serious	Limited information collected for PAE
Marianian et al 2020	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Mariscal et al 2006	Yes	Yes	Cannot determine	Cannot determine	Yes	N/A	Cannot determine	Yes	N/A	N/A	Serious	Limited information collected for PAE
McCarthy et al 2013	Yes	Yes	Yes	Cannot determine	Cannot determine	N/A	Yes	Yes	Yes	N/A	Moderate	Not enough information provided across some areas
McDonald et al 1992	Yes	Yes	Yes	Yes	Yes	N/A	Cannot determine	Yes	Yes	N/A	Moderate	Not enough information on exposure
Mills et al 1984	Yes	Yes (SGA & BW) No (LBW)	Yes	Cannot determine	Yes	N/A	Cannot determine	Yes	Yes	N/A	Moderate (SGA & BW) Serious (LBW)	Not enough information provided in some areas (SGA & BW); No control for confounding (LBW)
Miyake et al 2014	Yes	Yes	Yes	Yes	Yes	N/A	No	No	Yes	N/A	Serious	Self-reported outcome measure
Nykjaer et al 2014	Yes	Partially	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Moderate	Limited consideration of confounding
Oberlander et al 2010	Yes	No	Yes	Yes	Yes	N/A	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
O'Leary et al 2009a	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Scored low across all areas
Olsen et al 1991	Yes	Yes	Yes	Cannot determine	Yes	Yes	Cannot determine	Yes	Yes	N/A	Moderate	Not enough information across some areas
Popova et al 2021	Yes	Yes (SGA & LBW) No (BL)	Yes	Yes	Yes	N/A	No	Cannot determine	N/A	N/A	Serious	IUGR not defined, PAE based on maternal health providers collecting if deemed a risk.
Primates et al 1993	Yes	No	Cannot determine	Yes	Yes	Yes	No	Yes	Yes	N/A	Serious	No control for confounding
Sayal et al 2013	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Shu et al 1995	Yes	Partially	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Moderate	Limited consideration of confounders
Sood et al 2005	Yes	No	Yes	Yes	Yes	N/A	Cannot determine	Cannot determine	Yes	N/A	Serious	No control for confounding

Verkerk 1993* (regression only)	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	No	Cannot determine	N/A	N/A	Moderate	Not enough information across some areas
Whitehead & Lipscomb 2003	Yes	Yes	Yes	Yes	Yes	N/A	No	Yes	Yes	N/A	Serious	Limited information collected for PAE
Windham et al 1995	Cannot determine	Partially	Yes	Yes	Yes	N/A	No	Cannot determine	Yes	N/A	Serious	Limited information collected for PAE
Virji 1991*	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	N/A	Yes	Cannot determine	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information PAE (regression)
Yang et al 2001	Yes	Yes	Yes	Cannot determine	Yes	N/A	Yes	Yes	N/A	N/A	Moderate	Not enough information on recruitment
Exposure studies - unquantified or no/any												
Borges et al 1993	Yes	Partially	Cannot determine	Yes	Yes	N/A	Yes	No	Yes	N/A	Serious	Self-reported outcome measure
Chandran et al 2021	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Cho et al 2021	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Low	Low across all areas
Donald et al 2016	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Furtado et al 2016	Yes	No	Yes	Yes	Yes	N/A	Yes	Cannot determine	Yes	Cannot determine	Serious	No control for confounding
Golden et al 1982	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Graham et al 2013	Cannot determine	Partially	Cannot determine	No	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment
Grisso et al 1984	Yes	No	Yes	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Hutchinson et al 2019	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Jackson et al 2007	Yes	Partially	Cannot determine	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Moderate	Limited consideration of confounding
Kyllerman et al 1985	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	N/A	Cannot determine	Cannot determine	N/A	N/A	Serious	Not enough information across many areas
Mattson et al 2010 ^a	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2013 [†]	Cannot determine	No	Yes	No	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Muggli et al 2017	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Niclasen et al 2014	Yes	No	Yes	Yes	Yes	N/A	Cannot determine	Cannot determine	Yes	N/A	Serious	No control for confounding
Noland et al 2003	Yes	Partially	Yes	Cannot determine	Yes	N/A	Cannot determine	Cannot determine	Yes	N/A	Moderate	Limited consideration of confounding
Okah et al 2005	Yes	Yes	Yes	Yes	Yes	N/A	Cannot determine	Yes	Yes	N/A	Moderate	Not enough information for exposure
Roos et al 2021	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Salihu et al 2011	Yes	Yes	Yes	Yes	Yes	N/A	Cannot determine	Cannot determine	Yes	N/A	Moderate	Not enough information provided across some areas
Tamura et al 2018	Yes	Yes	Yes	Yes	Yes	N/A	Cannot determine	Yes	N/A	N/A	Moderate	Limited information collected for PAE
Diagnosed studies												
Adnams et al 2001	Cannot determine	Partially	No	Cannot determine	Cannot determine	Yes	Yes	Yes	N/A	N/A	Serious	Differences in inclusion/exclusion criteria

Aragon et al 2008a	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Aragon et al 2008b	Cannot determine	Partially	Cannot determine	Yes	Yes	N/A	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Astley et al 2009b	Yes	Partially	Cannot determine	Cannot determine	Yes	N/A	No	Yes	N/A	N/A	Serious	Not enough information in some areas
Bagheri et al 1998	Yes	Partially	Cannot determine	Yes	Yes	N/A	No	Yes	Yes	N/A	Serious	Limited information collected for PAE
Blanck-Lubarsch et al 2019b	Cannot determine	No	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Blanck-Lubarsch et al 2020	No	No	Yes	No	Yes	Yes	Cannot determine	Cannot determine	N/A	N/A	Critical	
Chambers et al 2019	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Colby et al 2012	Cannot determine	Partially	Yes	Cannot determine	Yes	N/A	No	Cannot determine	N/A	N/A	Serious	PAE not collected directly from all participants
Coles et al 1997	Yes	No	Yes	Yes	Yes	Yes	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
Coles et al 2002	Cannot determine	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Davies et al 2017	Yes	No	Cannot determine	Cannot determine	Yes	N/A	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
de Water et al 2021	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Hasken et al 2021	Yes	No (raw scores) Yes (regression)	Cannot determine	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information across all areas (regression)
Jacobson et al 2011	Cannot determine	No	Cannot determine	Cannot determine	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Kable et al 2021	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Kodituwakku et al 2006b	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounders
Kvigne et al 2004	No	No	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Critical	
Lynch et al 2015	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2010 ^d	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2013 [†]	Cannot determine	No	Yes	No	Cannot determine	N/A	No	Cannot determine	N/A	N/A	Serious	No control for confounding
May et al 2000	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2007	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2010 [‡]	Yes	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across in some areas
May et al 2015	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2020a	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants

May et al 2020b	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2020c	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Meintjes et al 2014	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Naidoo et al 2005	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounders
Nayak et al 2012	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Cannot determine	N/A	N/A	Serious	Not enough information across many areas
Popova et al 2019	Yes	No	Yes	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Spottiswoode et al 2011	Yes	No	Cannot determine	Cannot determine	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Taggart et al 2017	Cannot determine	No	Yes	No	Yes	N/A	No	Cannot determine	N/A	N/A	Serious	No control for confounding
Viljoen 2005	Yes	No	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Willoughby et al 2008	Yes	No	Yes	Cannot determine	Cannot determine	N/A	Cannot determine	Cannot determine	N/A	N/A	Serious	No control for confounding
Wozniak et al 2006	Yes	Partially	Yes	No	Yes	N/A	No	Cannot determine	N/A	N/A	Serious	PAE not collected directly from all participants
Wozniak et al 2013	Cannot determine	No	Yes	No	Cannot determine	N/A	Cannot determine	Cannot determine	N/A	N/A	Serious	No control for confounding

Notes: * indicates studies with regression data

#) Mattson et al 2010 has both an alcohol exposed analysis and diagnosed analysis.

†) Mattson et al 2013 has both an alcohol exposed analysis and diagnosed analysis.

‡) May et al 2010 reports data separated into three cohort. Data from the Native American cohort was not included due to high prenatal alcohol exposure rates in the control population.

Table 2. Risk of Bias assessment for studies reporting measures of dysmorphology.

Study (Dysmorphology)	Valid/reliable measures to assess confounding	Confounding variables taken into account	Similar inclusion/exclusion across groups	Similar recruitment across groups	Appropriate selection of comparison group	Blinding of outcome assessors	Reliable/valid measures to assess exposure	Reliable/valid measures to assess outcome	Similar length of follow-up across groups	Impact of high loss to follow-up considered	Overall Rating	Main concern
Exposure studies - quantified PAE												
Autti-Ramo Gaily et al 1992a	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	Yes	Yes	Yes	Yes	No	Serious	No control for confounding
Bandoli et al 2020*	Yes	No (raw scores) Yes (regression)	Cannot determine	Yes	Yes	No	Yes	Yes	Yes	Yes	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) No blinding (regression)
Bandoli et al 2022	Yes	No	Cannot determine	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Coles et al 1991	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Serious	No control for confounding
Exposure studies - confirmed unquantifiable or no/any PAE												
Gautam et al 2015	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Golden et al 1982	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Graham et al 2013	Cannot determine	Partially	Cannot determine	No	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment
Hendrickson et al 2017	Yes	No	Yes	No	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2010 [‡]	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding

Mattson et al 2013 [†]	Cannot determine	No	Yes	No	Cannot determine	No	No	Cannot determine	N/A	N/A	Serious	No control for confounding
Lebel et al 2012	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Diagnosed studies												
Aragon et al 2008b	Cannot determine	Partially	Cannot determine	Yes	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Astley et al 2009b	Yes	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Blanck-Lubarsch et al 2019a	Cannot determine	No	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Blanck-Lubarsch et al 2019b	Cannot determine	No	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Chambers et al 2019	No	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Coles et al 1997	Yes	No	Yes	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
Coles et al 2002	Cannot determine	No	Yes	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
de Water et al 2021	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Foround et al 2012*	Yes	No (raw scores) Partially (regression)	Cannot determine	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) No blinding (regression)
Gomez et al 2020	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Hasken et al 2021	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Kalberg et al 2013	Yes	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Kodituwakku et al 2006b	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounding
Kvigne et al 2004	No	No	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Cannot determine	N/A	N/A	Critical	
Mattson et al 2010 [†]	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2013 [†]	Cannot determine	No	Yes	No	Cannot determine	No	No	Cannot determine	N/A	N/A	Serious	No control for confounding
May et al 2000	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2006	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2007	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2010 [‡]	Yes	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
May et al 2013a	Yes	Partially	No	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2014	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2015	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants

May et al 2017b	Yes	Partially (raw scores) Yes (regression)	No	Yes	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2020a	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2020b	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2020c	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
May et al 2021	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Moore et al 2002	Yes	Partially	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	Lack of reliable PAE information
Nayak et al 2012	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Cannot determine	N/A	N/A	Serious	Not enough information across many areas
Popova et al 2019	Cannot determine	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Roediger et al 2021	Cannot determine	No	Partially	No	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Suttie et al 2013	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounding
Suttie et al 2018	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Viljoen et al 2005	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Yang et al 2012a	Cannot determine	No	Yes	No	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Yang et al 2012b	Cannot determine	No	Yes	No	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding

Notes: * indicates studies with regression data

#) Mattson et al 2010 has both an alcohol exposed analysis and diagnosed analysis.

†) Mattson et al 2013 has both an alcohol exposed analysis and diagnosed analysis.

‡) May et al 2010 reports data separated into three cohorts. Data from the Native American cohort was not included due to high prenatal alcohol exposure rates in the control population.

Table 3. Risk of Bias assessment for studies reporting measures of functional neurobehaviour.

Study (Functional Neurobehavioural Measures)	Outcome	Valid/reliable measures to assess confounding	Confounding variables taken into account	Similar inclusion/exclusion across groups	Similar recruitment across groups	Appropriate selection of comparison group	Blinding of outcome assessors	Reliable/valid measures to assess exposure	Reliable/valid measures to assess outcome	Similar length of follow-up across groups	Impact of high loss to follow-up considered	Overall Rating	Main Concern
Exposure studies - quantified													
Alati et al 2008*	IQ	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control of confounding (regression)
Alati et al 2009	Behaviour/Social	Yes	No	Cannot determine	Yes	Yes	N/A	Cannot determine	Yes	Yes	Yes	Serious	No control for confounding
Alati et al 2013*	Academic	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious (raw scores) Low (regression)	No control for confounding (raw scores) Low risk across all areas (regression)
Bakhireva et al 2018*	IQ, Motor, Language, Behaviour, Sensory	Yes	Partially (raw data) Yes (regression)	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate	Limited control for confounding (raw data) Differences in inclusion/exclusion (regression)
Bandoli et al 2019*	IQ, Motor	Yes	No (raw scores) Yes (regression)	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information inclusion/exclusion (regression)

Bandoli et al 2022	Behaviour, BSID, Working Memory, IQ	Yes	No	Cannot determine	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Bay et al 2012	Motor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Low	Low across all areas
Brown et al 1991	Behaviour, Social	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Brown et al 2010* (regression only)	Behaviour, Sensory, Cognition, Motor	Yes	Yes	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Burden Jacobson et al 2005a* (regression only)	Working Memory, Attention, Executive Function	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Burden et al 2011	IQ	Cannot determine	No	Cannot determine	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
Carter et al 2022* (regression only)	Memory, Information processing, Temperament	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
Chiodo et al 2009* (regression only)	Cognition, Working Memory, Motor, Executive Function, Academic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Moderate	Not enough information about follow-up rates
Chiodo et al 2010* (regression only)	Attention	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Coles et al 1987	IQ, Motor	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Coles et al 1991	IQ, Academic, Memory	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Serious	No control for confounding
Coles et al 2019*	Motor	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Serious (raw scores) Low (regression)	No control for confounding (raw scores) Low risk across all areas (regression)
Coles et al 2021	IQ, Motor, Language, Attention	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Day et al 2013* (regression only)	Behaviour	Yes	Yes	Yes	Yes	Yes	N/A	Cannot determine	Yes	Yes	N/A	Moderate	Not enough information about PAE assessment
Falgreen Eriksen et al 2012*	IQ	Yes	Partially (raw scores) Yes (regression)	Yes	Yes	Yes	Yes	Cannot determine	Yes	Yes	Yes	Moderate (raw scores) Moderate (regression)	Limited control for confounding (raw) Not enough info re PAE assessment (regression)
Forrest et al 1991* (regression only)	Cognition, Motor	Yes	Yes	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate	Not enough information about inclusion/exclusion criteria
Fraser et al 2012* (regression only)	Cognition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Goldschmidt et al 1996* (regression only)	Academic	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Yes	Yes	N/A	Moderate	Not enough information about PAE assessment
Greene et al 1990* (regression only)	Language	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Moderate	Not enough information about follow-up rates
Greene et al 1991a* (regression only)	IQ	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate	Not enough information about how confounding variables measured

Halliday et al 2017*	IQ, Motor, Language, Sensory, Behaviour	Yes	No (raw Bayleys) Yes (IQ regression) Yes (Sensory/Behaviour)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious (raw Bayleys) Low (Regression & Sensory/Behaviour)	No control for confounding (raw Bayleys) Low for all areas (Bayleys regression and sensory/behaviour)
Hannigan et al 2010* (regression only)	IQ, Behaviour	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	No	Serious	High dropout rate and impact not assessed
Hutchinson et al 2019	Motor	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	N/A	Moderate	Large age range in follow-up
Ichikawa et al 2018* (regression only)	Behaviour	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Low	Low across all areas
Jacobson et al 1998* (regression only)	Cognition, Motor	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Moderate	Not enough information across some areas
Jacobson et al 1993b* (regression only)	Memory, BSID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Low	Low across all areas
Jacobson et al 2004* (regression only)	IQ & Attention	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Kesmodel et al 2012	Executive Function, Cognition, Attention	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Low	Low across all areas
Korkman et al 1998	IQ, Motor, Language	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Yes	Yes	N/A	Serious	No control for confounding
Larroque et al 1998	IQ	Yes	Partially	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Moderate	Limited consideration of confounding
Lees et al 2020*	Behaviour/ Social, Memory, Executive Function	Cannot determine	No (raw scores) Yes (regression)	Yes	Yes	Yes	No (Memory); N/A (behaviour)	Yes	Yes	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information about data collection (regression)
Maier et al 2022	IQ, Behaviour	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Serious	No control for confounding
McCormack et al 2018*	IQ	Yes	No (raw data) Yes (regression)	Yes	Yes	Yes	No	Yes	Yes	Yes	N/A	Serious (raw data) Moderate (regression)	No control for confounding (raw data) No blinding (regression)
Mitchell et al 2020	Hyperactivity	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Cannot determine	Moderate	Not enough info re. loss to follow-up
O'Callaghan et al 2007	IQ, Academic, Attention	Yes	Yes	Cannot determine	Yes	Yes	No	Yes	Yes	Yes	N/A	Moderate	No blinding
O'Leary et al 2009b	Language	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
O'Leary et al 2010	Behaviour/ Social	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
O'Leary et al 2013	Academic	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
Sayal et al 2007	Behaviour	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Low	Low across all areas
Sayal et al 2013	Behaviour	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
Skogerbo et al 2012	Executive Function	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	No	Moderate	High loss to follow-up impact not assessed
Skogerbo et al 2013	Behaviour, Social	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Low across all areas
Sood et al 2001*	Behaviour/ Social	Cannot determine	No (raw scores) Yes (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious (raw data) Moderate (regression)	No control for confounding (raw data) Not enough information about confounding assessment (regression)
Streissguth et al 1980* (regression only)	Cognition, Motor	Yes	Partially	Cannot determine	Cannot determine	Cannot determine	No	Yes	Yes	N/A	N/A	Moderate	Limited control for confounding variables

Streissguth et al 1984* (regression only)	Attention	Yes	Yes	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Moderate	Not enough information about inclusion/exclusion criteria
Underbjerg et al 2012	Attention	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Willford 2006* (regression only)	IQ	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	N/A	Moderate	No information about blinding
Exposure studies - unquantified or no/any													
Bjorkquist et al 2010	Behaviour, Attention	Cannot determine	Partially	Yes	No	Yes	No	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment across groups
Crocker et al 2009*	Adaptive	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	Lack of direct PAE info
Crocker et al 2015	Attention, working memory	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Donald et al 2016	IQ, Motor, Language, Adaptive, Social	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Doyle et al 2018	Language, Adaptive, Executive Function, working memory	Cannot determine	No	Yes	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Doyle et al 2019a	IQ, Adaptive	Cannot determine	No	Yes	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Furtado et al 2016	IQ, Memory, Attention, Executive Function	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Gautam et al 2015	Behaviour, Academic	Cannot determine	No	Yes	No	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Glass et al 2013	Executive Function, Working Memory	Cannot determine	No	Yes	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Glass et al 2014	IQ	Yes	No	Yes	Yes	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Glass et al 2015	Language, Memory	Cannot determine	No	Yes	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Glass et al 2017	Academic, Behaviour	Cannot determine	No	Yes	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Gao et al 2019	IQ	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Golden et al 1982	IQ	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Gomez et al 2022	Language, Executive Function	Yes	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Graham et al 2013	Behaviour	Cannot determine	Partially	Cannot determine	No	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment across groups
Gross et al 2018	Memory	Cannot determine	No	Yes	No	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Hendricks et al 2020	Motor	Yes	Partially	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Moderate	Limited control for confounding
Kyllerman et al 1985	Motor	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas

Lee et al 2004	IQ, Attention	Cannot determine	Partially	Yes	No	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Long et al 2019	IQ	Cannot determine	No	Cannot determine	Yes	Yes	No	No	Cannot determine	N/A	N/A	Serious	No control for confounding
Mattson et al 2010 [#]	IQ, Motor, Attention, Executive Function, working memory	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2013 [†]	IQ	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
McGee et al 2008a	Social, Executive Function	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
McGee et al 2008b	Executive Function	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
McGee et al 2009	Language	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Migliorini et al 2015	Executive Function	Cannot determine	No	Yes	Yes	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Moore et al 2021 ^{††}	Behaviour	Cannot determine	Partially	Yes	No	Yes	N/A	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Nakhid et al 2022	IQ	Cannot determine	No	Cannot determine	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Nguyen et al 2014	Executive Function, Working Memory	Yes	Partially	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Noland et al 2003 [*]	IQ, Executive Function	Yes	No (raw scores) Yes (regression)	Yes	Cannot determine	Yes	No	Cannot determine	Yes	Yes	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information in some areas (regression)
Panczakiewicz et al 2016	IQ	Yes	No	Yes	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Pfänder et al 2020	Hyperactivity, Social, Behaviour	Yes	Yes	Yes	Yes	Yes	N/A	Cannot determine	Yes	N/A	N/A	Moderate	Limited PAE information
Poth et al 2022	Language, IQ	Yes	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Schonfeld et al 2005	Social	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	Lack of direct PAE info
Vaurio et al 2011	Academic, Motor, Language, Attention, Executive Function, Social	Cannot determine	No	Cannot determine	No	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Ware et al 2012	Adaptive, Executive Function	Cannot determine	No	Yes	No	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Ware et al 2013	Behaviour	Cannot determine	No	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Whaley et al 2001	IQ	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Diagnosed studies													
Adnams et al 2001	Motor, Language, Social	Cannot determine	Partially	No	Cannot determine	Yes	Yes	Yes	Yes	N/A	N/A	Serious	Differences in inclusion criteria across groups

Agnihotri et al 2019	IQ, Memory	Yes	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Aragon et al 2008a	IQ, Academic, Language, Attention	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Aragon et al 2008b	IQ, Motor, Executive Function, Working Memory	Cannot determine	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Astley et al 2009b	All Domains	Yes	Partially	Cannot determine	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Barrett et al 2019	Executive Function	Cannot determine	No	Yes	Cannot determine	Yes	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Ben-Shachar et al 2020	Academic	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	N/A	Serious	No control for confounding
Bernes et al 2021	Executive Function, Working Memory	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Breiner et al 2013	Behaviour	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Candelaria-Cook et al 2021	IQ, Motor, Executive Function	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No	N/A	Yes	N/A	N/A	Serious	PAE not collected from all participants
Chambers et al 2019	IQ, Academic, Language, Adaptive, Behaviour, Executive Function	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Colby et al 2012	Motor, Executive Function	Cannot determine	No	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Coles et al 1997	Academic, Motor, Behaviour, Memory, Executive Function	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Coles et al 2002	Attention	Cannot determine	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Coles et al 2010	Memory	Cannot determine	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Crawford et al 2020	IQ, Language, Adaptive, Executive Function	Yes	No	Cannot determine	Cannot determine	Cannot determine	No (direct measures) ; N/A (adaptive)	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Crocker et al 2011	Memory	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Davies et al 2017	IQ	Yes	No	Cannot determine	Cannot determine	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
de Water et al 2021	Adaptive, Social	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Doney et al 2016	IQ, Motor	Yes	No	Yes	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Doney et al 2017a	Motor	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Doney et al 2017b	Motor	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding

Dudek et al 2014	Memory, Attention, Working Memory	Cannot determine	Partially	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Fagerlund et al 2011	Behaviour	Yes	Partially	Cannot determine	Yes	Yes	N/A	Cannot determine	Yes	N/A	N/A	Moderate	Limited control for confounding
Fagerlund et al 2012	IQ, Adaptive, Behaviour	Yes	Partially	Cannot determine	Yes	Yes	No (IQ); N/A (adaptive)	No	Yes	N/A	N/A	Serious	PAE assessment unclear
Fryer et al 2012	Language, Executive Function, Memory, Academic	Cannot determine	No	Yes	No	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Gautam et al 2014	Attention, Executive Function, Memory, Working Memory	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Greenbaum et al 2009	Behaviour/Social	Yes	Yes	Yes	No	Yes	N/A	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Hansen & Jirikowic 2013	IQ, Sensory Processing	Yes	No	Yes	No	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Howell et al 2006	IQ, Working Memory, Adaptive	Yes	No	Yes	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
Inkelis et al 2020	IQ	Yes	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE assessment unclear
Jirikowic et al 2008a	IQ, Academic, Motor, Adaptive, Social, Sensory, Soft Neurological Signs	Cannot determine	No	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Jirikowic et al 2008b	Adaptive, Behaviour/Social	Cannot determine	No	Cannot determine	Yes	Yes	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Kable et al 2021	IQ	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Kaemingk et al 2000	Memory	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Kaemingk et al 2003	IQ, Memory	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	No blinding
Kalberg et al 2013	IQ, Motor, Behaviour, Memory, Attention, Working Memory	Yes	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Kerns et al 2016	IQ, Adaptive, Behaviour	Yes	Partially	Cannot determine	Yes	Cannot determine	No (IQ); N/A (Adaptive)	Cannot determine	Yes	N/A	N/A	Moderate	No blinding
Kodituwakku et al 2001	IQ, Executive Function	Cannot determine	Partially	Yes	Yes	Yes	No	No	Yes	N/A	N/A	Serious	PAE assessment unclear
Kodituwakku et al 2006a	Executive Function	Yes	Partially	No	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	Differences in inclusion criteria across groups

Kodituwakku et al 2006b	Academic, Language, Behaviour	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited control for confounding
Kooistra et al 2009	IQ, Motor	Cannot determine	No	Yes	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Krueger et al 2020	Behaviour	Cannot determine	No	Yes	No	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Kvigne et al 2004	Motor, Language, Behaviour	No	No	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Critical	
Lane et al 2014	IQ, Attention	Cannot determine	Partially	Cannot determine	No	Yes	No	No	Yes	N/A	N/A	Serious	PAE assessmnet unclear
Lewis et al 2015* [§]	Memory	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control of confounding (regression)
Lidstone et al 2020	IQ, Motor, Behaviour	Yes	No	Yes	Cannot determine	Cannot determine	No (direct); N/A (behaviour)	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Lindinger et al 2016	Social	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Little et al 2020	Academic	Yes	No	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Lucas et al 2016a	Motor	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Lucas et al 2016b	Motor	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Serious	No control for confounding
Lucas et al 2016c	Soft Neurological Signs	Cannot determine	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Lynch et al 2015	IQ, Adaptive	Yes	No	Cannot determine	Yes	Yes	No (IQ); N/A (behaviour)	Yes	Yes	Yes	N/A	Serious	No control for confounding
Lynch et al 2017	Behaviour	Cannot determine	No	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Malisza et al 2012	IQ, Executive Function, Working Memory	Cannot determine	Partially	Cannot determine	No	Yes	No	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment across groups
Mattson et al 1997	IQ	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Mattson & Riley 1999	Memory, Executive Function	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	Not enough information in many areas
Mattson & Riley 2000	Behaviour/ Social, Memory	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No (Memory); N/A (behaviour)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Mattson & Roebuck 2002	Memory	Cannot determine	Partially	Cannot determine	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Mattson et al 2010 [#]	IQ, Motor, Attention, Executive Function, Working Memory	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding

Mattson et al 2013 [†]	IQ, Executive Function, working memory	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2023	Attention	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
May et al 2000	IQ	Yes	Partially	No	Yes	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2006	IQ, Language, Behaviour	Yes	Partially	No	Yes	Yes	No (direct); N/A (behaviour)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2007	IQ, Behaviour	Yes	Partially	No	Yes	Yes	No (IQ); N/A (behaviour)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2013a	IQ, Behaviour, Working Memory	Yes	Partially	No	Yes	Yes	No (IQ); N/A (behaviour)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2014	IQ, Working Memory	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2015	IQ, Academic, Adaptive, Behaviour	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2016	IQ, Behaviour, Working Memory	Yes	Partially	No	Yes	Yes	No (IQ); N/A (behaviour)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2017b	IQ	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2020a	IQ, Academic, Motor, Language, Adaptive, Behaviour, Executive Function	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2020b	IQ, Academic, Motor, Language, Adaptive, Behaviour, Executive Function	Yes	Partially	No	Yes	Yes	No (direct); N/A (indirect)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2020c	IQ, Academic, Behaviour, Executive Function	Yes	Partially	No	Yes	Yes	No (direct); N/A (indirect)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2021	IQ, Language, Adaptive, Behaviour, Executive Function	Yes	Partially	No	Yes	Yes	No (direct); N/A (indirect)	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
McLachlan et al. 2020	Executive Function, Attention, Memory, Working Memory	Yes	Partially	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Miles et al 2021	Working Memory	Yes	No	Yes	Cannot determine	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Nayak et al 2012	IQ, Behaviour/ Social	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No (IQ); N/A (behaviour)	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas

O'Conaill et al 2015	Attention	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
O'Hare et al 2009	Working Memory	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Olsway et al 2010	Behaviour	Yes	Partially	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Paolozza et al 2014a	Attention, Executive Function	Cannot determine	No	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Paolozza et al 2014c	Executive Function, Working Memory, Attention	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Pei et al 2011	Memory	Yes	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Pinner et al 2020	Motor, Working Memory	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Popova et al 2019	IQ, Language, Behaviour/ Social, Attention, Working Memory	Yes	No	Yes	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Quattlebaum and O'Connor 2013	IQ, Language, Adaptive, Behaviour, Executive Function, Working Memory	Cannot determine	No	Yes	Yes	Yes	No (direct); N/A (indirect)	No	Yes	N/A	N/A	Serious	No control for confounding
Rasmussen et al 2013	Language, Memory, attention, Executive Function, Social	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Rasmussen et al 2009b	Language, Attention, Working Memory	Cannot determine	No	Cannot determine	Cannot determine	No	No	No	Yes	N/A	N/A	Serious	No control for confounding
Rasmussen et al 2011a	Behaviour, social	Yes	No	Yes	Yes	Cannot determine	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Rasmussen et al 2011b	Memory, Attention, Working Memory	Cannot determine	No	Cannot determine	No	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Rockhold et al 2021	Executive Function, Social, Adaptive, Working Memory	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Schonfeld et al 2001	Executive Function	Cannot determine	Partially	Cannot determine	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Sowell et al 2008	Academic, Motor	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Spottiswoode et al 2011	IQ	Yes	No	Cannot determine	Cannot determine	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
Stevens et al 2012	Social	Yes	No	Yes	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding

Stevens et al 2015	Behaviour, Social	Yes	No	Yes	Yes	Yes	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Stevens et al 2017	Social	Yes	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Sullivan et al 2020	IQ	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Suttie et al 2013	IQ	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounding
Suttie et al 2018	IQ	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Thorne et al 2017	Language	Cannot determine	Partially	Yes	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounding
Treit et al 2016	Academic, Memory, Executive Function, Attention, Working Memory	Cannot determine	No	Cannot determine	No	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Treit et al 2017	IQ, Memory	Yes	No	Cannot determine	No	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Uecker and Nadel 1996	Memory	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	Direct PAE not collected from all
Viljoen et al 2005	IQ	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Walthall et al 2008*	IQ, Adaptive, Psychiatric symptoms (regression)	Cannot determine	No (raw scores) Partially (regression)	Yes	Yes	Yes	No (IQ); N/A (adaptive)	No	Yes	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control of confounding (regression)
Ware et al 2021	Attention, Executive Function	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No (direct); N/A (indirect)	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Way et al 2012	Language, Behaviour, Social	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No (language); N/A (behaviour)	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Willoughby et al 2008	Memory	Yes	No	Yes	Cannot determine	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Wheeler et al 2012	Memory	Yes	No	Partially	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Wozniak et al 2009	IQ, Memory, Working Memory	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Wozniak et al 2013	Memory, Executive Function	Cannot determine	No	Yes	No	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Yang et al 2012a	IQ	Cannot determine	No	Yes	No	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding

Notes: * indicates studies with regression data

#) Mattson et al 2010 has both an alcohol exposed analysis and diagnosed analysis.

†) Mattson et al 2013 has both an alcohol exposed analysis and diagnosed analysis.

§) Lewis et al 2015 reports data separated into two cohorts. Data from the Detroit cohort was not included due to light prenatal alcohol exposure in the control population.

††) Moore et al 2021 reports data separated into two cohorts.

Table 4. Risk of Bias assessment for studies reporting measures of structural and neurological development.

Study (Structural and Neurological Measures)	Outcome	Valid/reliable measures to assess confounding	Confounding variables taken into account	Similar inclusion/exclusion across groups	Similar recruitment across groups	Appropriate selection of comparison group	Blinding of outcome assessors	Reliable/valid measures to assess exposure	Reliable/valid measures to assess outcome	Similar length of follow-up across groups	Impact of high loss to follow-up considered	Overall rating	Main reason
Exposure studies - quantified													
Autti-Ramo et al 1991a	Head circumference	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Cannot determine	Yes	N/A	Serious	No control for confounding
Bandoli et al 2019*	Head circumference	Yes	No (raw scores) Yes (regression)	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Not enough information inclusion/exclusion (regression)
Bandoli et al 2020	Head circumference	Yes	Yes	Cannot determine	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Moderate	No control for confounding
Beauchamp et al 2020	Head circumference	Cannot determine	Partially	Yes	Yes	Yes	Yes	Yes	Cannot determine	Yes	N/A	Moderate	Limited consideration of confounding variables
Berger et al 2019	Head circumference	Cannot determine	No	Yes	Cannot determine	Yes	N/A	Yes	Cannot determine	Yes	N/A	Serious	No control for confounding
Carter et al 2007*	Head circumference	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control for confounding (regression)
Carter et al 2012* (regression only)	Head circumference	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low (regression)	Low across all areas (regression)
Carter et al 2022*	Head circumference	Yes	No (raw scores) Yes (regression)	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious (raw scores) Low (regression)	No control for confounding (raw scores) Low across all areas (regression)
Coles et al 1991	Head circumference	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Serious	No control for confounding
Coles et al 2021	Head circumference	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Cannot determine	Yes	N/A	Serious	No control for confounding
Eckstrand et al 2012	MRI	Cannot determine	Partially	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Serious	Potential impact of high loss not considered
Falgreen Eriksen et al 2012	Visual impairment and Hearing Loss	Yes	No	Yes	Yes	Yes	Yes	Cannot determine	Yes	Yes	Yes	Serious	No control for confounding
Flanigan et al 2008	Visual impairment	Cannot determine	Partially	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Moderate	Limited control for confounding
Fraser et al 2012* (regression only)	Head circumference	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Low	Low across all areas
Greene Ernhart 1991a* (regression only)	Head circumference	Cannot determine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Moderate	Not enough information about how confounding variables measured
Hannigan 2010* (regression only)	Head circumference	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	No	Serious	High dropout rate and impact not assessed
Holzman et al 1995	Head circumference	Yes	Partially	Cannot determine	Yes	Yes	N/A	Yes	Cannot determine	Yes	N/A	Moderate	Limited consideration of confounding
Hutchinson et al 2019	Head Circumference	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Jacobson et al 2017*	MRI	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Cannot determine	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control for confounding (regression)
Korkman et al 1998	Head circumference	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	N/A	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
Kuehn et al 2012	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	N/A	Yes	Yes	Yes	N/A	Moderate	Limited consideration of confounding

Lazzaroni et al 1993	Head circumference	Yes	No	Cannot determine	Cannot determine	Cannot determine	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Little et al 1990	Head circumference	Yes	No	Cannot determine	Yes	Yes	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Long & Lebel 2022	MRI	Yes	Yes	Yes	Yes	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	No enough information about exposure
Marianian et al 2020	Head circumference	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Serious	No control for confounding
Oberlander et al 2010	Head circumference	Yes	No	Yes	Yes	Yes	N/A	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
Popova et al 2021	Head circumference	Yes	No	Yes	Yes	Yes	N/A	No	Cannot determine	N/A	N/A	Serious	No control for confounding
Sun et al 2008	Seizures	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Scored low across all areas
Taylor et al 2015*	MRI, Head circumference	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control for confounding (regression)
Zuccolo et al 2016	Head circumference	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	N/A	Low	Scored low across all areas
Exposure studies - confirmed unquantified or no/any PAE													
Aghamohammadi-Sereshki et al 2022	MRI	Cannot determine	Partially	Cannot determine	Yes	Yes	Yes	No	Yes	N/A	N/A	Moderate	PAE information not collected from all participants.
Bjorkquist et al 2010	MRI	Cannot determine	Partially	Yes	No	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment
Cardenas et al 2014	MRI	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Chandran et al 2021	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Donald et al 2016	MRI	Yes	Partially	Cannot determine	Yes	Yes	No	Yes	Yes	Yes	N/A	Moderate	Limited info re inclusion/exclusion and no blinding
Furtado et al 2016	Head circumference	Yes	No	Yes	Yes	Yes	N/A	Yes	Cannot determine	Yes	Cannot determine	Serious	No control for confounding
Golden et al 1982	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Graham et al 2013	Head circumference	Cannot determine	Partially	Cannot determine	No	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment
Hendrickson et al 2017	Head circumference, MRI	Yes	No	Yes	No	Yes	Yes: (HC) No: (MRI)	No	Yes	N/A	N/A	Serious	No control for confounding
Infante et al 2017	MRI	Cannot determine	No	Yes	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Kyllerman et al 1985	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	N/A	Cannot determine	Cannot determine	N/A	N/A	Serious	Not enough information across many areas
Mattson et al 2010 [#]	Head circumference	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2013 [†]	Head circumference	Cannot determine	No	Yes	No	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Migliorini 2015	MRI	Cannot determine	No	Yes	Yes	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Nakhid et al 2022	MRI	Cannot determine	No	Cannot determine	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding

Noland et al 2003	Head circumference	Yes	No	Yes	Cannot determine	Yes	N/A	Cannot determine	Cannot determine	Yes	N/A	Serious	No control for confounding
O'Leary et al 2012	CP (adjusted OR Table 3)	Yes	Yes	Cannot determine	Yes	Yes	N/A	No	Yes	N/A	N/A	Serious	PAE not collected in control group
O'Leary et al 2020	CP (unadjusted ORs Table 2)	Yes	Partially	Yes	Yes	Yes	N/A	No	Yes	N/A	N/A	Serious	PAE not collected in control group
Roos et al 2021	Head circumference	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Subramoney et al 2022	MRI	Yes	No	Yes	Yes	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
Treit et al 2020 ^{††}	MRI	Cannot determine	No	Cannot determine	No	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Yoshida et al 2018	Hearing loss	Yes	Yes	Yes	Yes	Yes	N/A	Yes	No	N/A	N/A	Serious	Not reliable outcome measures
Diagnosed studies													
Adnams et al 2001	Head circumference	Cannot determine	Partially	No	Cannot determine	Cannot determine	Yes	Yes	Yes	N/A	N/A	Serious	Differences in inclusion/exclusion criteria
Aragon et al 2008a - Italian cohort	Head circumference	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Aragon et al 2008b - Native American cohort	Head circumference	Cannot determine	Partially	Cannot determine	Yes	Yes	N/A	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
Astley et al 2009a	MRI	Yes	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Astley et al 2009b	Head circumference	Yes	Partially	Cannot determine	Cannot determine	Yes	N/A	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Biffen et al 2017*	MRI	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control for confounding (regression)
Blanck-Lubarsch et al 2019b	Head circumference	Cannot determine	No	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Blanck-Lubarsch et al 2020	Head circumference	No	No	Yes	No	Yes	Yes	Cannot determine	Cannot determine	N/A	N/A	Critical	
Chambers et al 2019	Head circumference	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Cheng et al 2017	MRI	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Coles et al 1997	Head circumference	Yes	No	Yes	Yes	Yes	Yes	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
Coles et al 2002	Head circumference	Cannot determine	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Coles et al 2011	MRI	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious	No control for confounding
Davies et al 2017	Head circumference	Yes	No	Cannot determine	Cannot determine	Yes	N/A	Yes	Cannot determine	N/A	N/A	Serious	No control for confounding
De Guio et al 2014	MRI	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	Yes	Yes	Yes	Cannot determine	Moderate	Not enough information across some areas
de Water et al 2021	Head circumference, MRI	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A: (HC) No: (MRI)	No	Yes	N/A	N/A	Serious	No control for confounding
Dodge et al 2020	MRI	Yes	Partially	Cannot determine	Cannot determine	Yes	No	Yes	Yes	N/A	N/A	Moderate	Not enough information across some areas

Dudek et al 2014	MRI	Cannot determine	Partially	Yes	Cannot determine	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected directly from all participants
Fan et al 2016*	MRI	Yes	No (raw data) Yes (regression)	Yes	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious (raw data) Moderate (regression)	No control for confounding (raw data) No blinding & limited info re follow-up (regression)
Fryer et al 2009	MRI	Cannot determine	Partially	Yes	No	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	Differences in recruitment
Fryer et al 2012	MRI	Cannot determine	No	Yes	No	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Hasken et al 2021	Head circumference	Yes	No	Cannot determine	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Serious	No control for confounding
Joseph et al 2014	MRI	Cannot determine	No	Cannot determine	Cannot determine	Yes	No	Yes	Yes	N/A	N/A	Serious	No control for confounding
Kable et al 2021	Head circumference	Yes	No	Cannot determine	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Serious	No control for confounding
Kodituwakku et al 2006b - Italian cohort	Head circumference	Yes	Partially	Cannot determine	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounders
Kvigne et al 2004	Head circumference, seizures, hearing loss	No	No	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Yes	N/A	N/A	Critical	
Li et al 2009	MRI	Yes	No	Cannot determine	Yes	Yes	No	Cannot determine	Yes	Yes	N/A	Serious	No control for confounding
Mattson et al 2010 [#]	Head circumference	Cannot determine	No	Yes	Cannot determine	Cannot determine	N/A	No	Yes	N/A	N/A	Serious	No control for confounding
Mattson et al 2013 [†]	Head circumference	Cannot determine	No	Yes	No	Cannot determine	N/A	No	Cannot determine	N/A	N/A	Serious	No control for confounding
May et al 2000	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2007	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2010 [‡]	Head circumference	Yes	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information in some areas
May et al 2015	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2020a	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2020b	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
May et al 2020c	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
McLachlan et al 2019	MRI	Yes	No	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
McLachlan et al 2020	MRI	Yes	Partially	Cannot determine	Cannot determine	Yes	No	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Naidoo et al 2005	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Nardelli et al 2011	MRI	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Nayak et al 2012	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	N/A	Cannot determine	Cannot determine	N/A	N/A	Serious	Not enough information across many areas
O'Hare et al 2009	MRI	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding

Paolozza 2014b	MRI	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Popova et al 2019	Head circumference	Yes	No	Yes	Yes	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Rajaprakash et al 2014	MRI	Yes	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Riley et al 1995	MRI	Cannot determine	Partially	Cannot determine	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	Not enough information across many areas
Robertson et al 2016*	MRI	Yes	No (raw scores) Partially (regression)	Yes	Yes	Yes	No	Yes	Yes	Yes	Cannot determine	Serious (raw scores) Moderate (regression)	No control for confounding (raw scores) Limited control for confounding (regression)
Roediger et al 2021	MRI	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Roussotte et al 2012* (regression only)	MRI	Cannot determine	Partially	Yes	Cannot determine	Yes	Yes	Cannot determine	Cannot determine	N/A	N/A	Moderate	Limited control for confounding
Sowell et al 2001	MRI	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Sowell et al 2008	MRI	Cannot determine	No	Cannot determine	Cannot determine	Cannot determine	Yes	No	Yes	N/A	N/A	Serious	No control for confounding
Spottiswoode et al 2011	Head circumference, MRI	Yes	No	Cannot determine	Cannot determine	Yes	N/A: (HC) No: (MRI)	Yes	Yes	N/A	N/A	Serious	No control for confounding
Stromland 1985	Visual impairment	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE collection not accurate
Sullivan et al 2020	MRI	Cannot determine	Partially	Yes	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Not enough information across some areas
Suttie et al 2013	Head circumference	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	Yes	Cannot determine	Yes	N/A	N/A	Moderate	Limited consideration of confounding
Suttie et al 2018	Head circumference, MRI	Cannot determine	No	Yes	Cannot determine	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Treit et al 2017	MRI	Yes	No	Cannot determine	No	Cannot determine	No	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Treit et al 2020 ^{††}	MRI	Cannot determine	No	Cannot determine	No	Yes	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Viljoen et al 2005	Head circumference	Yes	Partially	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Serious	PAE not collected from all participants
Willoughby et al 2008	MRI	Yes	No	Yes	Cannot determine	Cannot determine	Yes	Cannot determine	Yes	N/A	N/A	Serious	No control for confounding
Wozniak et al 2009	MRI	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Yang et al 2012a	MRI	Cannot determine	No	Yes	No	Yes	No	No	Yes	N/A	N/A	Serious	No control for confounding
Yang et al 2012b	MRI	Cannot determine	No	Yes	No	Cannot determine	No	No	Yes	N/A	N/A	Serious	No control for confounding
Zhou et al 2018	MRI	Cannot determine	Partially	Cannot determine	Cannot determine	Yes	No	No	Yes	N/A	N/A	Serious	PAE not collected from all participants

Notes: * indicates studies with regression data

#) Mattson et al 2010 has both an alcohol exposed analysis and diagnosed analysis.

†) Mattson et al 2013 has both an alcohol exposed analysis and diagnosed analysis.

‡) May et al 2010 reports data separated into three cohorts. Data from the Native American cohort was not included due to high prenatal alcohol exposure rates in the control population.

††) Treit et al 2020 has both an alcohol exposed analysis and diagnosed analysis.