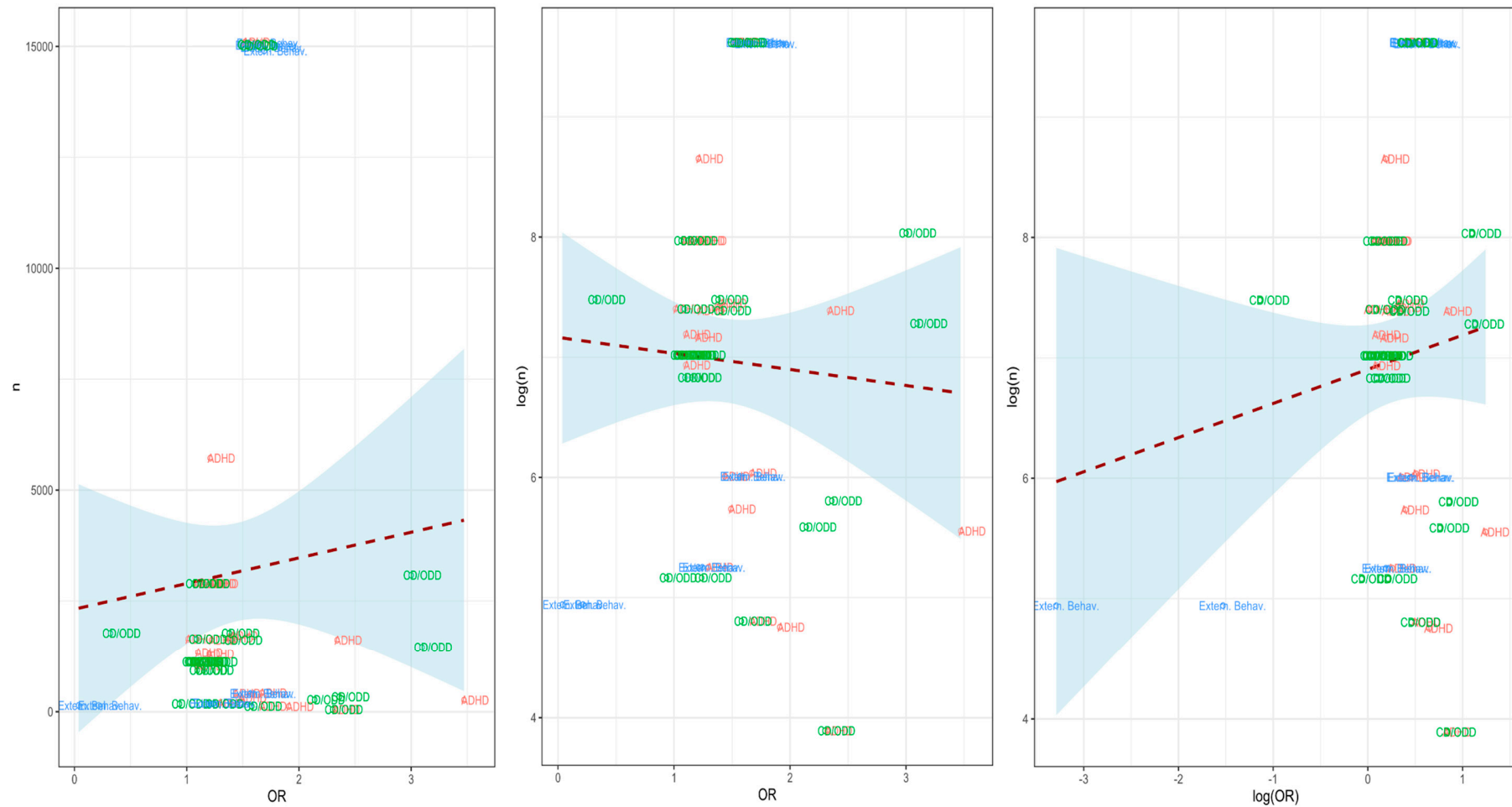


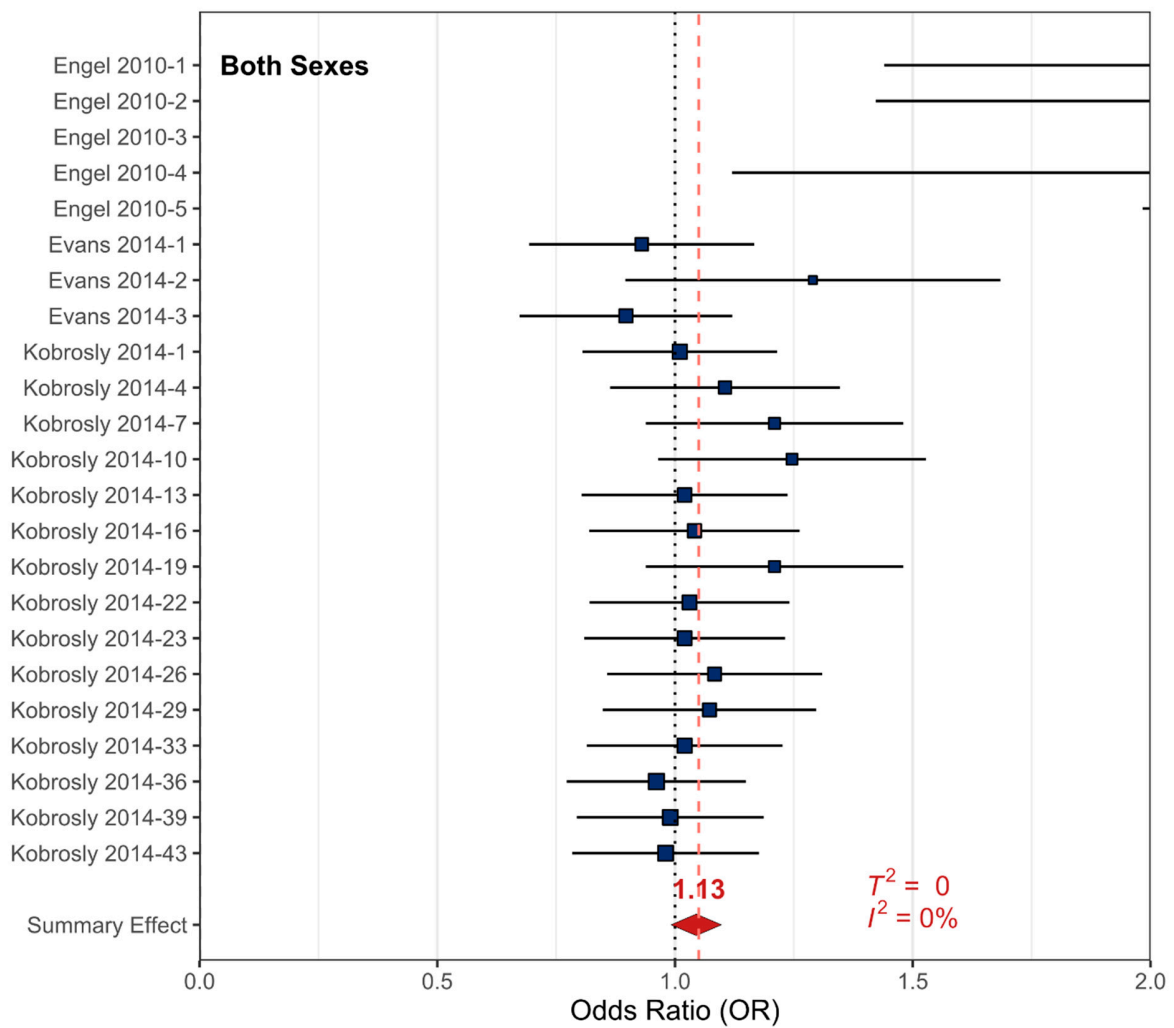
*A systematic review and meta-analysis investigating the relationship between exposures to chemical and non-chemical stressors during prenatal development and childhood externalizing behaviors*

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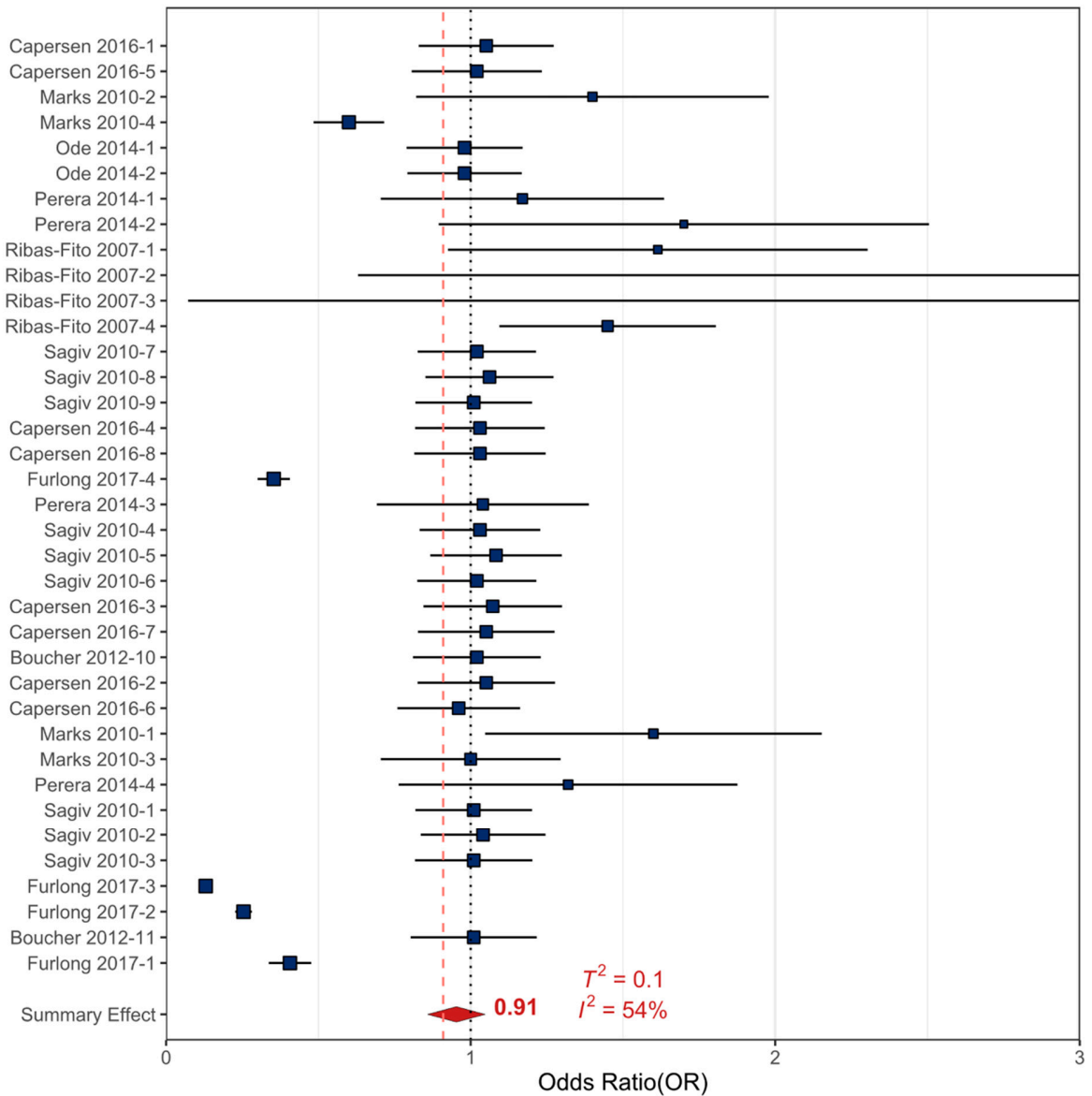
**Supplemental Information**



**Figure S1.** The meta-regression plots for the prenatal cigarette smoke exposure and childhood behavioral health outcome data. The odds ratio (OR) is plotted along the x-axis and the number of participants in each study (n) is plotted along the y-axis. The red dashed line represents the regression line and the shaded blue area represents the 95% confidence intervals. Each behavioral health outcome category is represented by a different color and each sampling event is denoted with the behavioral health outcome category text. The behavioral health outcome categories are “ADHD” which includes all ADHD [red text] related outcomes, “CD/ODD” [green text] which includes both conduct and oppositional defiance outcomes, “Extern. Behav.” [blue text] represents outcomes that do not fall into the other two categories, as well as the generalized externalizing behavior outcomes that many original studies reported. Plots were made in R Studio using the “*ggplot2*” package.



**Figure S2.** Forest plot showing the externalizing behaviors in the random effects meta-analysis for prenatal PhPI exposure (both sexes combined in original studies). The blue squares represent the mean OR from each reference dataset (Table S4), horizontal error bars represent the upper and lower 90% CI, the size variation of the boxes represents the weight each dataset had in the meta-analysis with a larger size indicating larger weights. The red diamond is the summary effect OR based on the meta-analysis. The ‘line of no effect’ at an OR of 1 is indicated with a dotted line.



**Figure S3.** Forest plot showing the random effects meta-analysis for prenatal exposure to OCs and all childhood externalizing behavioral health outcomes. The blue squares represent the mean OR from each reference dataset (Table S5), horizontal error bars represent the upper and lower 90% CI, the size variation of the boxes represents the weight each dataset had in the meta-analysis with a larger size indicating larger weights. The red diamond is the summary effect OR based on the meta-analysis. The ‘line of no effect’ at an OR of 1 is indicated with a dotted line.

**Table S1.** Publication bias and sensitivity analysis.

Chemical Stressor	Sensitivity Analysis							Publication Bias		
	Meta-Analysis Estimation Model							Data Robustness (% ORs within 15%)	Method	p value
	REML (this study)	FE	HE	DL	PM	EB	ML			
Cigarette Smoke	<b>2.16</b>	7.89	7.89	1.85	2.49	2.45	2.17	71%	SE	0.34
	<i>OR Difference</i>	5.73	5.73	-0.31	0.33	0.29	0.01		1/n	<b>0.65</b>
	<i>% Difference</i>	114%	114%	15%	14%	13%	0%			
Cocaine	<b>2.49</b>	4.83	4.83	2.37	2.58	2.58	2.51	71%	SE	0.26
	<i>OR Difference</i>	2.34	2.34	-0.12	0.09	0.09	0.02		1/n	<b>&lt;0.01</b>
	<i>% Difference</i>	64%	64%	5%	4%	4%	1%			
Alcohol	<b>1.69</b>	3.39	1.72	1.71	1.68	1.68	1.69	86%	SE	0.66
	<i>OR Difference</i>	1.7	0.03	0.02	-0.01	-0.01	0		1/n	<b>&lt;0.01</b>
	<i>% Difference</i>	67%	2%	1%	1%	1%	0%			
Phthalates/Plasticizers (PhPI) Both Sexes	<b>1.13</b>	1.13	1.73	1.23	1.62	1.62	1.13	57%	SE	<0.01
	<i>OR Difference</i>	0	0.6	0.1	0.49	0.49	0		1/n	<b>0.13</b>
	<i>% Difference</i>	0%	42%	8%	36%	36%	0%			
Organic Contaminants	<b>0.91</b>	0.52	1.05	0.96	0.90	0.90	0.91	86%	SE	<0.01
	<i>OR Difference</i>	-0.39	0.14	0.05	-0.01	-0.01	0		1/n	<b>0.02</b>
	<i>% Difference</i>	55%	14%	5%	1%	1%	0%			
Mercury (Hg)	<b>1.28</b>	1.28	1.37	1.3	1.32	1.32	1.28	100%	SE	<0.01
	<i>OR Difference</i>	0	0.09	0.02	0.04	0.04	0		1/n	<b>0.67</b>
	<i>% Difference</i>	0%	7%	2%	3%	3%	0%			
<b>Data Subsets</b>										
Cigarette Smoke (ADHD only)	<b>2.76</b>	8.73	8.73	2.40	3.41	3.41	2.79	43%	SE	0.11
	<i>OR Difference</i>	5.97	5.97	-0.36	0.65	0.65	0.03		1/n	<b>0.76</b>
	<i>% Difference</i>	104%	104%	14%	21%	21%	1%			
Cigarette Smoke (CD/ODD Only)	<b>2.61</b>	2.62	2.62	2.62	2.62	2.62	2.62	100%	SE	0.35
	<i>OR Difference</i>	0.01	0.01	0.01	0.01	0.01	0.01		1/n	<b>0.64</b>
	<i>% Difference</i>	0%	0%	0%	0%	0%	0%			
Cigarette Smoke (1st Trimester Only)	<b>1.45</b>	1.45	1.45	1.45	1.45	1.45	1.45	100%	SE	0.97
	<i>OR Difference</i>	0	0	0	0	0	0		1/n	<b>0.87</b>
	<i>% Difference</i>	0%	0%	0%	0%	0%	0%			
Phthalates/Plasticizers (PhPI) Males	<b>1.24</b>	1.24	2.34	1.51	2.14	2.14	1.24	43%	SE	<0.01
	<i>OR Difference</i>	0	1.1	0.27	0.9	0.9	0		1/n	<b>0.02</b>
	<i>% Difference</i>	0%	61%	20%	53%	53%	0%			
Phthalates/Plasticizers (PhPI) Females	<b>0.77</b>	0.73	0.92	0.77	0.76	0.76	0.77	86%	SE	<0.01
	<i>OR Difference</i>	-0.04	0.15	0	-0.01	-0.01	0		1/n	<b>0.1</b>
	<i>% Difference</i>	5%	18%	0%	1%	1%	0%			
Organic Contaminants (ADHD Only)	<b>0.99</b>	0.96	1.14	0.96	0.96	0.96	0.99	100%	SE	<0.01
	<i>OR Difference</i>	-0.03	0.15	-0.03	-0.03	-0.03	0		1/n	<b>0.3</b>
	<i>% Difference</i>	3%	14%	3%	3%	3%	0%			
Mercury (Hg - ADHD Only)	<b>1.49</b>	1.37	1.53	1.49	1.52	1.52	1.46	100%	SE	<0.01
	<i>OR Difference</i>	-0.12	0.04	0	0.03	0.03	-0.03		1/n	<b>0.93</b>
	<i>% Difference</i>	8%	3%	0%	2%	2%	2%			

**Table S2.** References and prenatal cigarette smoke data used in the meta-analyses in this review.

Prenatal Smoke Exposure & Behavior Disorders										
Reference	Exposure Period and Frequency	Mental Health Assessment	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Desrosiers 2013-1	general prenatal	CBCL	ADHD	11	258	3.47	2.8	0.1	1.0	12.1
Galera 2011-1	general prenatal	CBCL	ADHD	8	1665	1.37	0.2	18.2	0.98	1.9
Galera 2011-2	general prenatal	CBCL	ADHD	8	1721	1.41	0.2	19.0	1.03	1.93
Joo 2017-1	general prenatal	DSM	ADHD	6-10	418	1.67	0.4	6.8	1.1	2.6
Langley 2012-1	general prenatal	DSM	ADHD	7	5719	1.21	0.0	461.5	1.1	1.3
Pineda 2007-1	general prenatal	DSM	ADHD	8	486	8.9	19.7	0.0	1	78.4
Tiesler 2011-3	general prenatal	DSM	ADHD	10	49	2.32	0.9	1.2	1.1	4.8
Tiesler 2011-4	general prenatal	DSM	ADHD	10	122	1.67	0.4	5.4	1.0	2.7
Ball 2010-1	<1/2 pack/day	DSM	ADHD - Inat	7	1294	1.20	0.2	19.4	0.8	1.7
Ball 2010-2	1/2-1 pack/day	DSM	ADHD - Inat	7	1327	1.10	0.2	21.3	0.8	1.6
Ball 2010-3	> full pack/day	DSM	ADHD - Inat	7	1027	1.10	0.3	12.0	0.7	1.8
Cornelius 2007-2	general prenatal	CBCL	ADHD - Inat	6	407	1.44	0.3	14.3	1.0	2.0
Joo 2017-2	general prenatal	DSM	ADHD - Inat	6-10	310	1.49	0.4	6.0	0.9	2.5
Knopik 2009 - 5	1-10 cig/day	DSM	ADHD - Inat	3-10	2892	1.24	0.1	140.1	1.1	1.4
Knopik 2009 - 6	11+ cig/day	DSM	ADHD - Inat	3-10	2892	1.09	0.1	182.5	1.0	1.2
Palmer 2016-1	general prenatal	DSM	ADHD - Inat	12-23	1616	2.34	0.7	1.8	1.3	4.2
Dolan 2016-3	general prenatal	CBCL	ADHD -Hyp	3	15100	1.52	0.1	328.4	1.4	1.6
Dolan 2016-7	general prenatal	CBCL	ADHD -Hyp	3	15058	1.51	0.1	333.0	1.4	1.6
Joo 2017-3	general prenatal	DSM	ADHD -Hyp	6-10	116	1.91	1.0	1.0	0.8	4.8
Palmer 2016-2	general prenatal	DSM	ADHD -Hyp	12-23	1616	1.22	0.3	14.5	0.8	1.8
Knopik 2009 - 3	1-10 cig/day	DSM	ADHD -Hyp/Imp	3-10	2892	1.22	0.1	168.4	1.1	1.4
Knopik 2009 - 4	11+ cig/day	DSM	ADHD -Hyp/Imp	3-10	2892	1.14	0.1	218.8	1.0	1.3
Ruckinger 2010-1	general prenatal	DSM	ADHD-Hyp	10	1638	1.01	0.2	29.9	0.71	1.4
Hsieh 2010-2	general prenatal	CBCL	ADHD-Inat	2	191	1.29	0.4	5.5	0.71	2.4
Hsieh 2010-3	general prenatal	CBCL	Extern. Behav	2	191	1.21	0.4	6.3	0.66	2.2
Boden 2010-1	general prenatal	DSM	CD	14-16	926	1.15	0.0	471.4	1.1	1.2
Braun 2008-8	general prenatal	DSM	CD	8-15	3082	3.00	1.3	0.6	1.4	6.6
Chastang 2015-1	general prenatal	DSM	CD	10-12	1771	1.38	0.8	1.6	0.5	3.7
Chastang 2015-2	general prenatal	DSM	CD	10-12	1771	0.32	0.6	2.8	0.0	2.4
Gaysina 2013-1	general prenatal	DSM	CD	5-16	1452	3.10	2.1	0.2	1.0	9.4
Knopik 2009 - 1	1-10 cig/day	DSM	CD	3-10	2892	1.12	0.0	554.7	1.0	1.2
Knopik 2009 - 2	11+ cig/day	DSM	CD	3-10	2892	1.06	0.0	554.3	1.0	1.1
Maughan 2004-1	1-9 cig/day	CBCL	CD	5	1116	1.11	0.1	260.2	0.9	1.1
Maughan 2004-2	10-14 cig/day	CBCL	CD	5	1116	1.06	0.0	419.5	1.0	1.2
Maughan 2004-3	15+ cig/day	CBCL	CD	5	1116	1.09	0.1	221.8	1.0	1.2
Maughan 2004-4	1-9 cig/day	CBCL	CD	7	1116	1.05	0.1	264.3	0.9	1.2
Maughan 2004-5	10-14 cig/day	CBCL	CD	7	1116	1.03	0.0	445.4	0.9	1.1

Maughan 2004-6	15+ cig/day	CBCL	CD	7	1116	1.19	0.1	120.6	1.0	1.4
Palmer 2016-3	general prenatal	DSM	CD	12-18	1616	1.40	0.2	22.5	1.1	1.9
Ruckinger 2010-2	general prenatal	DSM	CD	10	1638	1.09	0.2	24.2	0.8	1.6
Tiesler 2011-1	general prenatal	DSM	CD	10	49	2.30	0.7	1.8	1.3	4.2
Tiesler 2011-2	general prenatal	DSM	CD	10	122	1.58	0.3	9.0	1.1	2.4
Wakschlag 2010-2	general prenatal	DSM	CD (boys)	15	175	1.24	0.1	136.3	1.1	1.4
Wakschlag 2010-1	general prenatal	DSM	CD (girls)	15	175	0.94	0.0	985.7	0.9	1.0
Desrosiers 2013-2	general prenatal	CBCL	CD/ODD	11	267	2.14	1.3	0.6	0.8	5.8
McLaughlin 2011-1	general prenatal	CBCL	CD/ODD	9	332	2.36	0.2	27.3	1.0	1.8
Barthelemy 2016-1	prenatal (10+ vs none)	CBCL	Extern. Behav	10	140	0.22	4.1	0.1	-7.8	8.2
Barthelemy 2016-2	prenatal (1-10 vs none)	CBCL	Extern. Behav	10	140	0.04	4.4	0.1	-8.7	8.7
Cornelius 2007-3	general prenatal	CBCL	Extern. Behav	6	407	1.59	0.3	11.6	1.1	2.3
Dolan 2016-2	general prenatal	CBCL	Extern. Behav	3	15077	1.63	0.1	285.7	1.5	1.7
Dolan 2016-6	general prenatal	CBCL	Extern. Behav	3	15030	1.62	0.1	290.0	1.5	1.7
Cornelius 2007-1	general prenatal	CBCL	Extern. Behav.	6	407	1.57	0.3	12.0	1.1	2.2
Dolan 2016-4	general prenatal	CBCL	Extern. Behav.	3	14976	1.66	0.1	274.7	1.5	1.8
Dolan 2016-8	general prenatal	CBCL	Extern. Behav.	3	14901	1.69	0.1	265.4	1.6	1.8
Hsieh 2010-1	general prenatal	CBCL	Extern. Behav.	2	191	1.24	0.4	6.0	0.7	2.3
Boden 2010-2	general prenatal	DSM	ODD	14-16	926	1.09	0.0	521.0	1.0	1.2
Dolan 2016-1	general prenatal	CBCL	ODD	3	15042	1.52	0.1	326.9	1.4	1.6
Dolan 2016-5	general prenatal	CBCL	ODD	3	15011	1.54	0.1	318.6	1.4	1.7
<b>First Trimester Only Data</b>										
Reference	Exposure Period and Frequency	Mental Health Assessment	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Cornelius 2007-4	1st trimester only	CBCL	Extern. Behav.	6	355	1.34	0.3	14.0	0.9	2.0
Cornelius 2007-5	1st trimester only	CBCL	ADHD - Inat	6	355	1.41	0.3	12.7	1.0	2.1
Cornelius 2007-6	1st trimester only	CBCL	Extern. Behav.	6	355	1.62	0.3	9.5	1.1	2.4
Knopik 2009 - 7	1st Trimester; 1-10 cig/day	DSM	ADHD -Hyp/Imp	3-10	2892	1.33	0.1	128.3	1.2	1.5
Knopik 2009 - 8	1st trimester; 11+ cig/day	DSM	CD	3-10	2892	1.10	0.1	235.6	1.0	1.2
Knopik 2009 - 9	1st trimester; 11+ cig/day	DSM	ADHD -Hyp/Imp	3-10	2892	1.07	0.1	141.8	0.9	1.2
Knopik 2009 - 10	1st Trimester; 1-10 cig/day	DSM	ADHD - Inat	3-10	2892	1.18	0.1	150.1	1.0	1.4
Knopik 2009 - 11	1st trimester; 11+ cig/day	DSM	ADHD - Inat	3-10	2892	1.11	0.1	110.9	0.9	1.3
Knopik 2009 - 12	1st Trimester; 1-10 cig/day	DSM	CD	3-10	2892	1.15	0.0	407.8	1.1	1.3
Palmer 2016-4	1st trimester only	DSM	ADHD - Inat	12-18	1616	1.38	0.9	1.2	0.5	4.0
Palmer 2016-5	1st trimester only	DSM	ADHD -Hyp	12-18	1616	1.20	0.4	7.5	0.7	2.1
Palmer 2016-6	1st trimester only	DSM	CD	12-18	1616	1.54	0.3	15.0	1.1	2.1
Tiesler 2011-5	1st trimester only	SDQ	CD	10	70	1.57	0.4	5.1	0.9	2.7
Tiesler 2011-6	1st trimester only	SDQ	ADHD	10	70	1.67	0.6	3.1	0.9	3.1

DSM – Diagnostic and Statistical Manual of Mental Disorders; CBCL – Child Behavior Checklist; SDQ – Strengths and Difficulties Questionnaire; ADHD – Attention Deficient Hyperactivity Disorder; Hyp – hyperactivity; Imp – impulsiveness; Inat – inattention; Extern. Behav. – general externalizing; ODD – Oppositional Defiance Disorder; CD – Conduct Disorder; OR – odds ratio; SE – standard error; V – variance; CI – confidence intervals.

**Table S3.** References and prenatal cocaine data used in the meta-analyses in this review.

Prenatal Cocaine Exposure & Behavior disorders										
Reference	Exposure Period, Frequency, and Matrix	Mental Health Assessment	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Bada 2007-1	<3x/week in 1st trimester (Some)	CBCL	Extern. Behav.	3	807	1.07	0.14	0.15	0.83	1.38
Bada 2007-2	>3x/week in 1st trimester (High)	CBCL	Extern. Behav.	3	517	1.78	0.36	0.98	1.21	2.61
Bada 2007-3	<3x/week in 1st trimester (Some)	CBCL	Extern. Behav.	5	642	1.54	0.20	0.32	1.19	1.99
Bada 2007-4	>3x/week in 1st trimester (High)	CBCL	Extern. Behav.	5	345	1.91	0.41	1.32	1.26	2.89
Bada 2007-5	<3x/week in 1st trimester (Some)	CBCL	Extern. Behav.	7	719	1.38	0.18	0.25	1.07	1.78
Bada 2007-6	>3x/week in 1st trimester (High)	CBCL	Extern. Behav.	7	422	2.14	0.43	1.45	1.45	3.15
Barthelemy 2016-3	intrauterine cocaine exposure (high v none)	CBCL	Extern. Behav.	10	140	6.49	6.49	0.02	-6.23	19.21
Barthelemy 2016-4	intrauterine cocaine exposure (light v one)	CBCL	Extern. Behav.	10	140	4.10	3.82	0.07	-3.39	11.58
McLaughlin 2011-2	cocaine metabolites in maternal/infant urine/infant meconium, maternal admission of use	CBCL	Extern. Behav.	9	329	2.03	0.42	5.54	1.36	3.03
McLaughlin 2011-3	cocaine metabolites in maternal/infant urine/infant meconium, maternal admission of use	CBCL	Extern. Behav.	9	329	2.09	0.44	5.19	1.40	3.12
McLaughlin 2011-4	cocaine metabolites in maternal/infant urine/infant meconium, maternal admission of use	CBCL	Extern. Behav.	9	329	1.77	0.37	7.41	1.19	2.63
McLaughlin 2011-5	cocaine metabolites in maternal/infant urine/infant meconium, maternal admission of use	CBCL	ODD	9	325	1.39	0.29	11.97	0.94	2.07
McLaughlin 2011-6	cocaine metabolites in maternal/infant urine/infant meconium, maternal admission of use	CBCL	CD	9	325	1.07	0.22	20.54	0.72	1.59
McLaughlin 2011-7	cocaine metabolites in maternal/infant urine/infant meconium, maternal admission of use	CBCL	ADHD	9	325	1.17	0.24	17.08	0.79	1.74

DSM – Diagnostic and Statistical Manual of Mental Disorders; CBCL – Child Behavior Checklist; SDQ – Strengths and Difficulties Questionnaire; CRS – Conner’s Rating Scales; ADHD – Attention Deficient Hyperactivity Disorder; Hyp – hyperactivity; Imp – impulsiveness; Inat – inattention; Extern. Behav. – general externalizing; ODD – Oppositional Defiance Disorder; CD – Conduct Disorder; OR – odds ratio; SE – standard error; V – variance; CI – confidence intervals.



**Table S4.** References and prenatal alcohol data used in the meta-analyses in this review.

Prenatal Alcohol Exposure & Behavior disorders										
Reference	Exposure Period and Frequency	Mental Health Assessment	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Barthelemy 2016 - 5	prenatal (0.5 drinks/day v none)	CBCL	Extern. Behav.	10	140	4.90	10.70	0.01	-16.06	10.71
Barthelemy 2016 - 6	prenatal (0.5+ drinks/day v none)	CBCL	Extern. Behav.	10	140	1.73	5.00	0.04	-8.07	5.08
Knopik 2009-13	1-10 days	DSM	ADHD - Hyp/Inat	3-10	2892	0.57	1.04	0.93	0.88	1.02
Knopik 2009-14	11-35 days	DSM	ADHD - Hyp/Inat	3-10	2892	0.44	1.11	0.81	0.75	1.14
Knopik 2009-15	>35 days	DSM	ADHD - Hyp/Inat	3-10	2892	1.10	1.16	0.74	0.82	1.47
Knopik 2009-16	some heavy use	DSM	ADHD - Hyp/Inat	3-10	2892	1.03	1.12	0.79	0.82	1.29
Knopik 2009-17	frequent heavy use	DSM	ADHD - Hyp/Inat	3-10	2892	1.03	1.19	0.71	0.73	1.45
Knopik 2009-18	1-10 days	DSM	ADHD - Inat	3-10	2892	0.53	1.04	0.92	0.86	1.02
Knopik 2009-19	11-35 days	DSM	ADHD - Inat	3-10	2892	0.97	1.13	0.79	0.76	1.22
Knopik 2009-20	>35 days	DSM	ADHD - Inat	3-10	2892	1.24	1.22	0.67	0.84	1.84
Knopik 2009-21	some heavy use	DSM	ADHD - Inat	3-10	2892	0.88	1.13	0.79	0.69	1.11
Knopik 2009-22	frequent heavy use	DSM	ADHD - Inat	3-10	2892	1.70	1.29	0.60	1.03	2.83
Knopik 2009-23	1-10 days	DSM	CD	3-10	2892	1.00	1.02	0.95	0.95	1.05
Knopik 2009-24	11-35 days	DSM	CD	3-10	2892	0.93	1.06	0.89	0.83	1.04
Knopik 2009-25	>35 days	DSM	CD	3-10	2892	1.10	1.14	0.77	0.85	1.42
Knopik 2009-26	some heavy use	DSM	CD	3-10	2892	0.95	1.10	0.83	0.79	1.14
Knopik 2009-27	frequent heavy use	DSM	CD	3-10	2892	1.47	1.17	0.73	1.08	2.01
Knudsen 2014-1	1st trimester	CBCL	Extern. Behav.	1.5	56682	1.48	2.19	0.21	1.28	1.71
Knudsen 2014-2	2nd trimester	CBCL	Extern. Behav.	1.5	56682	1.56	2.12	0.22	1.35	1.79
Knudsen 2014-3	3rd trimester	CBCL	Extern. Behav.	1.5	56682	1.56	2.12	0.22	1.35	1.79
Knudsen 2014-4	1st trimester	CBCL	Extern. Behav.	3	46759	1.53	2.14	0.22	1.32	1.77
Knudsen 2014-5	2nd trimester	CBCL	Extern. Behav.	3	46759	1.59	2.09	0.23	1.37	1.83
Knudsen 2014-6	3rd trimester	CBCL	Extern. Behav.	3	46759	1.6	2.09	0.23	1.38	1.85
Pfinder 2012-1	prenatal	DSM	ADHD- Hyp/Inat	3-10	837	2.558	1.41	0.50	1.651	3.962
Pfinder 2012-2	prenatal	DSM	ADHD- Hyp/Inat	3-10	560	5.26	0.98	1.04	3.207	8.629
Pfinder 2012-3	prenatal	DSM	ADHD- Hyp/Inat	3-10	837	2.11	1.53	0.43	1.271	3.505
Pfinder 2012-4	prenatal	DSM	ADHD- Hyp/Inat	3-10	560	3.092	1.17	0.74	1.646	5.809
Pineda 2007-2	prenatal	DSM	ADHD	8	486	14.1	0.26	15	1.7	114
Sayal 2014-1	binge drinking during pregnancy (4+ drinks/day) at least once	DSM	CD	5	4183	1.05	2.76	0.13	0.94	1.16
Sayal 2014-2	binge drinking during pregnancy (4+ drinks/day) at least once	DSM	ADHD - Hyp/Inat	5	4183	1.12	2.61	0.15	0.95	1.31

DSM – Diagnostic and Statistical Manual of Mental Disorders; CBCL – Child Behavior Checklist; SDQ – Strengths and Difficulties Questionnaire; CRS – Conner’s Rating Scales; ADHD – Attention Deficient Hyperactivity Disorder; Hyp – hyperactivity; Imp – impulsiveness; Inat – inattention; Extern. Behav. – general externalizing; ODD – Oppositional Defiance Disorder; CD – Conduct Disorder; OR – odds ratio; SE – standard error; V – variance; CI – confidence intervals.

**Table S5.** References and prenatal phthalate/plasticizer data used in the meta-analyses in this review.

Prenatal Phthalate/Plasticizer Exposures & Behavior Disorders											
Reference	Biological Sample	Mental Health Assessment	sex	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Engel 2010-11	maternal urine increases in LMWP	BASC	F	Extern. Behav	5-18	161	2.4	1.0	1.0	0.4	12.4
Engel 2010-12	maternal urine increases in LMWP	BASC	F	ADHD - Inat	5-18	161	2.3	1.0	0.9	0.4	12.7
Engel 2010-13	maternal urine increases in LMWP	BASC	F	CD	5-18	149	5.5	0.6	3.2	1.1	27.4
Engel 2010-14	maternal urine increases in LMWP	BASC	F	ADHD - Hyp	5-18	161	1.5	1.4	0.5	0.2	10.0
Engel 2010-15	maternal urine increases in LMWP	BASC	F	Extern. Behav	5-18	161	3.2	0.8	1.6	0.6	18.0
Evans 2014-7	maternal urine BPA	DSM	F	ADHD	6-10	59	1.0	2.4	0.2	0.4	2.6
Evans 2014-8	maternal urine BPA	DSM	F	ODD	6-10	59	0.8	2.7	0.1	0.3	2.2
Evans 2014-9	maternal urine BPA	DSM	F	CD	6-10	59	0.5	4.5	0.0	0.2	1.3
Harley 2013-1	maternal urine BPA	BASC	F	Extern. Behav	7	155	0.7	3.0	0.1	0.3	2.0
Harley 2013-2	maternal urine BPA	BASC	F	Extern. Behav	7	155	1.2	2.0	0.3	0.4	3.0
Harley 2013-3	maternal urine BPA	BASC	F	CD	7	156	0.4	5.1	0.0	0.1	1.5
Harley 2013-4	maternal urine BPA	BASC	F	ADHD - Hyp	7	155	1.0	2.3	0.2	0.3	2.0
Harley 2013-5	maternal urine BPA	BASC	F	ADHD - Inat	7	155	0.7	3.1	0.1	0.3	1.5
Kobrosly 2014-12	maternal urine MiBP	CBCL	F	CD	6-10	76	1.0	2.8	0.1	0.8	1.2
Kobrosly 2014-15	maternal urine MBP	CBCL	F	ADHD	6-10	76	1.0	2.8	0.1	0.8	1.2
Kobrosly 2014-18	maternal urine MBP	CBCL	F	ODD	6-10	76	0.9	2.9	0.1	0.8	1.2
Kobrosly 2014-21	maternal urine MBP	CBCL	F	CD	6-10	76	1.0	2.7	0.1	0.8	1.3
Kobrosly 2014-25	maternal urine MBzP	CBCL	F	ADHD	6-10	76	1.0	2.8	0.1	0.8	1.2
Kobrosly 2014-28	maternal urine MBzP	CBCL	F	ODD	6-10	76	1.0	2.8	0.1	0.9	1.2
Kobrosly 2014-3	maternal urine DEHP	CBCL	F	CD	6-10	76	0.9	3.0	0.1	0.8	1.1
Kobrosly 2014-31	maternal urine MBzP	CBCL	F	CD	6-10	76	0.9	3.0	0.1	0.8	1.1
Kobrosly 2014-35	maternal urine MEP	CBCL	F	ADHD	6-10	76	1.1	2.7	0.1	1.0	1.2
Kobrosly 2014-38	maternal urine MEP	CBCL	F	ODD	6-10	76	0.9	3.0	0.1	0.8	1.1
Kobrosly 2014-41	maternal urine DEHP	CBCL	F	ADHD	6-10	76	1.1	2.7	0.1	0.9	1.2
Kobrosly 2014-42	maternal urine MEP	CBCL	F	CD	6-10	76	0.9	3.0	0.1	0.8	1.0
Kobrosly 2014-45	maternal urine DEHP	CBCL	F	ODD	6-10	76	1.0	2.9	0.1	0.8	1.1

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Kobrosly 2014-6	maternal urine MiBP	CBCL	F	ADHD	6-10	76	1.1	2.6	0.1	0.9	1.3
Kobrosly 2014-9	maternal urine MiBP	CBCL	F	ODD	6-10	76	1.1	2.6	0.1	0.9	1.3
Engel 2010-10	maternal urine increases in LMWP	BASC	M	Extern. Behav	5-18	161	8.0	0.5	3.9	2.1	30.6
Engel 2010-6	maternal urine increases in LMWP	BASC	M	Extern. Behav	5-18	161	4.3	0.7	1.9	1.2	15.8
Engel 2010-7	maternal urine increases in LMWP	BASC	M	ADHD - Inat	5-18	161	4.7	0.7	2.2	1.2	17.8
Engel 2010-8	maternal urine increases in LMWP	BASC	M	CD	5-18	149	16.3	0.4	6.0	4.7	56.3
Engel 2010-9	maternal urine increases in LMWP	BASC	M	ADHD - Hyp	5-18	161	4.0	0.7	1.9	0.9	17.3
Evans 2014-4	maternal urine BPA	DSM	M	ADHD	6-10	66	0.8	2.8	0.1	0.3	2.1
Evans 2014-5	maternal urine BPA	DSM	M	ODD	6-10	66	2.9	1.0	0.9	1.0	7.9
Evans 2014-6	maternal urine BPA	DSM	M	CD	6-10	66	2.6	1.1	0.8	1.0	6.9
Harley 2013-6	maternal urine BPA	BASC	M	Extern. Behav	7	133	2.0	1.1	0.8	0.3	12.2
Harley 2013-7	maternal urine BPA	BASC	M	Extern. Behav	7	135	1.6	1.4	0.5	0.3	8.2
Harley 2013-8	maternal urine BPA	BASC	M	CD	7	133	3.0	0.8	1.5	0.5	20.1
Harley 2013-9	maternal urine BPA	BASC	M	ADHD - Hyp	7	133	1.1	2.0	0.3	0.2	6.0
Harley 2013-10	maternal urine BPA	BASC	M	ADHD - Inat	7	133	0.8	2.8	0.1	0.3	2.2
Kobrosly 2014-11	maternal urine MiBP	CBCL	M	CD	6-10	77	1.5	2.2	0.2	1.2	1.8
Kobrosly 2014-14	maternal urine MBP	CBCL	M	ADHD	6-10	77	1.1	2.6	0.1	0.9	1.3
Kobrosly 2014-17	maternal urine MBP	CBCL	M	ODD	6-10	77	1.2	2.5	0.2	0.9	1.4
Kobrosly 2014-2	maternal urine DEHP	CBCL	M	CD	6-10	77	1.1	2.7	0.1	0.9	1.2
Kobrosly 2014-20	maternal urine MBP	CBCL	M	CD	6-10	77	1.4	2.2	0.2	1.2	1.8
Kobrosly 2014-24	maternal urine MBzP	CBCL	M	ADHD	6-10	77	1.1	2.7	0.1	0.9	1.3
Kobrosly 2014-27	maternal urine MBzP	CBCL	M	ODD	6-10	77	1.2	2.5	0.2	1.0	1.4
Kobrosly 2014-30	maternal urine MBzP	CBCL	M	CD	6-10	77	1.2	2.4	0.2	1.1	1.4
Kobrosly 2014-32	maternal urine DEHP	CBCL	M	ADHD	6-10	77	1.0	2.8	0.1	0.9	1.2
Kobrosly 2014-34	maternal urine MEP	CBCL	M	ADHD	6-10	77	1.0	2.9	0.1	0.9	1.1
Kobrosly 2014-37	maternal urine MEP	CBCL	M	ODD	6-10	77	1.0	2.9	0.1	0.9	1.1
Kobrosly 2014-40	maternal urine MEP	CBCL	M	CD	6-10	77	1.1	2.7	0.1	0.9	1.2
Kobrosly 2014-44	maternal urine DEHP	CBCL	M	ODD	6-10	77	1.0	2.8	0.1	0.9	1.2
Kobrosly 2014-5	maternal urine MiBP	CBCL	M	ADHD	6-10	77	1.1	2.5	0.2	0.9	1.4
Kobrosly 2014-8	maternal urine MiBP	CBCL	M	ODD	6-10	77	1.3	2.3	0.2	1.1	1.6

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Engel 2010-1	maternal urine increases in LMWP	BASC	M+F	Extern. Behav	5-18	171	3.5	0.9	1.2	1.2	10.4
Engel 2010-2	maternal urine increases in LMWP	BASC	M+F	ADHD - Inat	5-18	171	3.6	0.9	1.3	1.2	11.1
Engel 2010-3	maternal urine increases in LMWP	BASC	M+F	CD	5-18	159	11.0	0.5	3.6	3.8	31.8
Engel 2010-4	maternal urine increases in LMWP	BASC	M+F	ADHD - Hyp	5-18	171	2.8	1.0	1.0	0.8	9.8
Engel 2010-5	maternal urine increases in LMWP	BASC	M+F	Extern. Behav	5-18	171	5.8	0.7	2.3	1.8	17.8
Evans 2014-1	maternal urine BPA	DSM	M+F	ADHD	6-10	125	0.9	2.6	0.1	0.5	1.8
Evans 2014-2	maternal urine BPA	DSM	M+F	ODD	6-10	125	1.3	2.0	0.2	0.7	2.5
Evans 2014-3	maternal urine BPA	DSM	M+F	CD	6-10	125	0.9	2.7	0.1	0.5	1.7
Kobrosly 2014-1	maternal urine DEHP	CBCL	M+F	CD	6-10	153	1.0	2.8	0.1	0.9	1.1
Kobrosly 2014-10	maternal urine MiBP	CBCL	M+F	CD	6-10	153	1.2	2.4	0.2	1.1	1.5
Kobrosly 2014-13	maternal urine MBP	CBCL	M+F	ADHD	6-10	153	1.0	2.8	0.1	0.9	1.2
Kobrosly 2014-16	maternal urine MBP	CBCL	M+F	ODD	6-10	153	1.0	2.7	0.1	0.9	1.2
Kobrosly 2014-19	maternal urine MBP	CBCL	M+F	CD	6-10	153	1.2	2.5	0.2	1.0	1.4
Kobrosly 2014-22	maternal urine DEHP	CBCL	M+F	ADHD	6-10	153	1.0	2.8	0.1	0.9	1.2
Kobrosly 2014-23	maternal urine MBzP	CBCL	M+F	ADHD	6-10	153	1.0	2.8	0.1	0.9	1.2
Kobrosly 2014-26	maternal urine MBzP	CBCL	M+F	ODD	6-10	153	1.1	2.7	0.1	1.0	1.2
Kobrosly 2014-29	maternal urine MBzP	CBCL	M+F	CD	6-10	153	1.1	2.7	0.1	0.9	1.2
Kobrosly 2014-33	maternal urine MEP	CBCL	M+F	ADHD	6-10	153	1.0	2.8	0.1	0.9	1.1
Kobrosly 2014-36	maternal urine MEP	CBCL	M+F	ODD	6-10	153	1.0	3.0	0.1	0.9	1.1
Kobrosly 2014-39	maternal urine MEP	CBCL	M+F	CD	6-10	153	1.0	2.9	0.1	0.9	1.1
Kobrosly 2014-4	maternal urine MiBP	CBCL	M+F	ADHD	6-10	153	1.1	2.6	0.1	0.9	1.3
Kobrosly 2014-43	maternal urine DEHP	CBCL	M+F	ODD	6-10	153	1.0	2.9	0.1	0.9	1.1
Kobrosly 2014-7	maternal urine MiBP	CBCL	M+F	ODD	6-10	153	1.2	2.5	0.2	1.0	1.4

DSM – Diagnostic and Statistical Manual of Mental Disorders; CBCL – Child Behavior Checklist; BASC – Behavior Assessment System for Children; ADHD – Attention Deficient Hyperactivity Disorder; Hyp – hyperactivity; Imp – impulsiveness; Inat – inattention; Extern. Behav. – general externalizing; ODD – Oppositional Defiance Disorder; CD – Conduct Disorder; OR – odds ratio; SE – standard error; V – variance; CI – confidence intervals.

**Table S6.** References and prenatal OC data used in the meta-analyses in this review.

Prenatal OC Exposure Data										
Reference	Exposure Period, Matrix and Chemical	Mental Health Assessment	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Capersen 2016-1	maternal PCB 153	DSM	ADHD	2-6	1024	1.1	2.7	0.1	0.9	1.2
Capersen 2016-5	maternal dioxin like compounds	DSM	ADHD	2-6	1024	1.0	2.8	0.1	0.9	1.2
Marks 2010-2	prenatal DAP	CBCL	ADHD	3.5	288	1.40	1.69	0.352	0.4	3.1
Marks 2010-4	prenatal DAP	CBCL	ADHD	5	319	0.60	3.77	0.07	0.3	1.2
Ode 2014-1	Cord Serum PFOS	DSM	ADHD	8-12	408	1.0	2.9	0.1	0.9	1.0
Ode 2014-2	Cord Serum PFOA	DSM	ADHD	8-12	408	1.0	3.0	0.1	0.9	1.0
Perera 2014-1	cord Pah adducts	CBCL	ADHD	9	162	1.2	1.9	0.3	0.2	5.7
Perera 2014-2	cord Pah adducts	DSM	ADHD	9	162	1.7	1.4	0.5	0.5	6.2
Ribas-Fito 2007-1	In utero HCB (.5-.99 ng/ml)	DSM	ADHD	5	405	1.6	1.5	0.4	0.5	6.5
Ribas-Fito 2007-2	In utero HCB (1-1.49 ng/ml)	DSM	ADHD	5	405	4.1	0.7	2.1	0.9	-32.6
Ribas-Fito 2007-3	In utero HCB (1.5+ ng/ml)	DSM	ADHD	5	405	6.4	0.5	3.8	1.3	-15.3
Ribas-Fito 2007-4	In utero HCB (ng/ml)	DSM	ADHD	5	405	1.4	2.2	0.2	1.2	5.3
Sagiv 2010-7	Cord Serum- Sum of 51 PCBS	DSM	ADHD	8	521	1.0	2.9	0.1	1.0	1.0
Sagiv 2010-8	Cord Serum- Sum of 4 PCBS	DSM	ADHD	8	521	1.1	2.8	0.1	1.0	1.1
Sagiv 2010-9	Cord Serum DDE	DSM	ADHD	8	521	1.0	2.9	0.1	1.0	1.0
Capersen 2016-4	maternal PCB 153	DSM	ADHD Hyp	2-6	1024	1.0	2.8	0.1	0.9	1.2
Capersen 2016-8	maternal dioxin like compounds	DSM	ADHD Hyp	2-6	1024	1.0	2.8	0.1	0.9	1.2
Furlong 2017-4	maternal Urinary pyrethroids	BASC	ADHD Hyp/Imp	6-9	162	0.4	5.6	0.0	0.0	14.3
Perera 2014-3	cord Pah adducts	DSM	ADHD Hyp/Imp	9	162	1.0	2.2	0.2	0.3	3.2
Sagiv 2010-4	Cord Serum- Sum of 51 PCBS	DSM	ADHD Hyp/Imp	8	521	1.0	2.9	0.1	1.0	1.0
Sagiv 2010-5	Cord Serum- Sum of 4 PCBS	DSM	ADHD Hyp/Imp	8	521	1.1	2.8	0.1	1.0	1.1
Sagiv 2010-6	Cord Serum DDE	DSM	ADHD Hyp/Imp	8	521	1.0	2.9	0.1	1.0	1.0
Capersen 2016-3	maternal PCB 153	DSM	ADHD Imp	2-6	1024	1.1	2.7	0.1	0.9	1.2
Capersen 2016-7	maternal dioxin like compounds	DSM	ADHD Imp	2-6	1024	1.1	2.7	0.1	0.9	1.2
Boucher 2012-10	Cord PCB 153	DSM	ADHD Inat	8-14	68	1.0	2.8	0.1	0.9	1.2
Capersen 2016-2	maternal PCB 153	DSM	ADHD Inat	2-6	1024	1.1	2.7	0.1	0.9	1.3
Capersen 2016-6	maternal dioxin like compounds	DSM	ADHD Inat	2-6	1024	1.0	2.9	0.1	0.8	1.2
Marks 2010-1	prenatal DAP	CBCL	ADHD Inat	3.5	289	1.60	1.73	0.336	0.8	3.5
Marks 2010-3	prenatal DAP	CBCL	ADHD Inat	5	319	1.00	2.36	0.18	0.4	2.4
Perera 2014-4	cord Pah adducts	DSM	ADHD Inat	9	162	1.3	1.7	0.3	0.3	5.6
Sagiv 2010-1	Cord Serum- Sum of 51 PCBS	DSM	ADHD Inat	8	521	1.0	2.9	0.1	1.0	1.0
Sagiv 2010-2	Cord Serum- Sum of 4 PCBS	DSM	ADHD Inat	8	521	1.0	2.8	0.1	1.0	1.1
Sagiv 2010-3	Cord Serum DDE	DSM	ADHD Inat	8	521	1.0	2.9	0.1	1.0	1.0
Furlong 2017-3	maternal Urinary pyrethroids	BASC	CD	6-9	162	0.1	15.1	0.0	0.0	3.0
Furlong 2017-2	maternal Urinary pyrethroids	BASC	Extern. Behav.	6-9	162	0.3	7.8	0.0	0.0	5.2
Boucher 2012-11	Cord PCB 153	DSM	Extern. Behav.	8-14	268	1.0	2.8	0.1	0.9	1.1
Furlong 2017-1	maternal Urinary pyrethroids	BASC	Extern. Behav.	6-9	162	0.4	4.9	0.0	0.0	9.4

DSM – Diagnostic and Statistical Manual of Mental Disorders; CBCL – Child Behavior Checklist; BASC – Behavior Assessment System for Children; ADHD – Attention Deficient Hyperactivity Disorder; Hyp – hyperactivity; Imp – impulsiveness; Inat – inattention; Extern. Behav. – general externalizing; ODD – Oppositional Defiance Disorder; CD – Conduct Disorder; OR – odds ratio; SE – standard error; V – variance; CI – confidence intervals.

**Table S7.** References and prenatal Hg data used in the meta-analyses in this review.

Prenatal Hg Exposure Data										
Reference	Biological Matrix	Mental Health Assessment	Outcome	Age Range (years)	n	OR	SE	V	Lower 95% CI	Upper 95% CI
Sagiv 2012-3	maternal hair hg (< 1ug/g)	DSM	ADHD	8	362	0.45	1.51	0.44	-2.52	3.42
Sagiv 2012-6	maternal hair hg (1+ug/g)	DSM	ADHD	8	362	2.54	1.35	0.55	-0.10	5.19
Sagiv 2012-2	maternal hair hg (< 1ug/g)	DSM	ADHD Hyp/Imp	8	363	0.55	1.32	0.57	-2.04	3.14
Sagiv 2012-5	maternal hair hg (1+ug/g)	DSM	ADHD Hyp/Imp	8	362	2.92	1.48	0.46	0.03	5.81
Boucher 2012-3	cord hg	DSM	ADHD Inat	8-14	269	1.14	2.60	0.15	1.00	1.28
Desrosier 2013-5	cord hg (low)	CBCL	ADHD Inat	11	131	1.16	2.47	0.16	0.90	3.28
Desrosier 2013-8	cord hg (high)	CBCL	ADHD Inat	11	131	1.19	2.47	0.16	0.99	3.69
Sagiv 2012-1	maternal hair hg (< 1ug/g)	DSM	ADHD Inat	8	362	0.59	1.45	0.47	-2.26	3.43
Sagiv 2012-4	maternal hair hg (1+ug/g)	DSM	ADHD Inat	8	362	1.93	1.33	0.56	-0.68	4.55
Boucher 2012-5	cord hg	DSM	ADHD-HypImp	8-14	181	0.95	2.38	0.18	0.30	3.00
Boucher 2012-8	cord hg	DSM	ADHD-HypImp	8-14	178	2.92	1.04	0.93	1.07	8.04
Boucher 2012-4	cord hg	DSM	ADHD-Inat	8-14	181	2.77	1.07	0.88	1.00	7.65
Boucher 2012-7	cord hg	DSM	ADHD-Inat	8-14	178	2.87	1.05	0.92	1.04	7.94
Desrosier 2013-4	cord hg (low)	CBCL	Extern. Behav.	11	131	1.28	2.52	0.16	1.27	5.07
Desrosier 2013-7	cord hg (high)	CBCL	Extern. Behav.	11	131	1.11	2.46	0.16	0.77	2.78
Boucher 2012-2	cord hg	DSM	Extern. Behav.	8-14	269	1.05	2.75	0.13	0.93	1.20
Desrosier 2013-3	cord hg (low)	CBCL	Extern. Behav.	11	131	1.31	2.55	0.15	1.38	5.64
Desrosier 2013-6	cord hg (high)	CBCL	Extern. Behav.	11	131	1.16	2.47	0.16	0.90	3.28
Boucher 2012-1	cord hg	DSM	ODD CD	8-14	178	1.39	1.88	0.28	0.65	2.98
Boucher 2012-6	cord hg	DSM	ODD CD	8-14	181	1.19	2.12	0.22	0.56	2.56

DSM – Diagnostic and Statistical Manual of Mental Disorders; CBCL – Child Behavior Checklist; ADHD – Attention Deficient Hyperactivity Disorder; Hyp – hyperactivity; Imp – impulsiveness; Inat – inattention; Extern. Behav. – general externalizing; ODD – Oppositional Defiance Disorder; CD – Conduct Disorder; OR – odds ratio; SE – standard error; V – variance; CI – confidence intervals.