

A. Supplementary Material

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A-1 Log-normal estimate for below threshold measures

Suppose that we approximate the left hand tail ($0 < x < c$) of a lognormal distribution by a straight line of the form $y = kx$, $0 < x < c$. Given $x < c$ (i.e. a below threshold measurement) then for this to be a valid density function it follows that the area under the line must equal 1, i.e.

$$\int_{x=0}^{x=c} kx dx = 1$$

i.e.

$$\left[\frac{kx^2}{2} \right]_{x=0}^{x=c} = 1 \text{ which solves to give } k = \frac{2}{c^2}, \text{ i.e. the linear approximation is}$$

$$y = \frac{2}{c^2} x, \quad 0 < x < c$$

So

$$E[X] = \int_{x=0}^{x=c} \frac{2}{c^2} x^2 dx = \left[\frac{2x^3}{3c^2} \right]_{x=0}^{x=c} = \frac{2}{3} c$$

Personal Communication:

Howard Edwards
Information Sciences Programme Director
Massey University - Auckland campus

A-2: Exclusion criteria for Sydney/Illawarra births based on geocoded Mother's residence at delivery

Scope Characteristics	Exclusion		Inclusion	
	N	%	N	%
Initial Sydney/Illawarra LGA birth population and study period (a)			362,013	
Geocoded to Distribution System	6,248	1.7	355,765	100.0
Potential geocoded subjects in Study Location and Period				
Study Period January 1998 to December 2004	-	-	355,765	-
Birth defects present	5,612	1.6	350,153	96.7
Stillborn	1,915	0.5	248,238	68.6
Multiple births	11,310	3.1	336,928	93.1
Missing birthweight or gestational age	91	0.0	336,837	93.0
Extreme birth weight (b)	127	0.0	336,710	93.0
Extreme gestational age (c)	634	0.2	336,076	92.8
Pre-term births	16,914	4.7	319,162	88.2
Missing covariate data	4,133	1.1	315,029	87.0
Missing exposure data	47	0.0	314,982	87.0
Total subjects in Study	47,031	13.0	314,982	87.0
(a) 47 LGA Local Government Areas (City, Municipality, Shire)				
(b) > 5 standard deviations from mean birthweight for gestational age				
(c) births outside 22 to 42 gestational weeks inclusive				
(d) < 37 weeks gestation				

A-3: Descriptive Statistics for Births excluded due to missing covariate or exposure data, Sydney/Illawarra 1998-2004

	Total N	SGA<3% N	%	SGA<10% N	%	AGA (a) N	%
Maternal Age							
<20yrs	872	33	3.8	89	10.2	783	89.8
20-24yrs	303	15	5.0	48	15.8	255	84.2
25-29yrs	587	43	7.3	99	16.9	488	83.1
30-34yrs	1,099	58	5.3	163	14.8	936	85.2
35+yrs	1319	52	3.9	160	12.1	1159	87.9
Indigenous Status of Mother							
Non Indigenous	3,892	178	4.6	508	13.1	3,384	86.9
Indigenous	106	16	15.1	36	34.0	70	66.0
Missing	182	7	3.8	15	8.2	167	91.8
Country of Birth of Mother							
Australia	2,300	117	5.1	323	14.0	1,977	86.0
Asia	698	42	6.0	120	17.2	578	82.8
Other	1,182	42	3.6	116	9.8	1066	90.2
Gender							
Male	1,892	90	4.8	252	13.3	1640	86.7
Female	2,093	103	4.9	288	13.8	1805	86.2
Indeterminant	17	3	17.6	3	17.6	14	82.4
Missing	178	5	2.8	16	9.0	162	91.0
Smoking anytime during pregnancy							
No	3,324	120	3.6	349	10.5	2,975	89.5
Yes	811	80	9.9	205	25.3	606	74.7
Missing	45	1	2.2	5	11.1	40	88.9
First pregnancy							
No	2,244	118	5.3	299	13.3	1,945	86.7
Yes	1,767	81	4.6	246	13.9	1521	86.1
Missing	169	2	1.2	14	8.3	155	91.7
Maternal Hypertension							
No	4,153	200	4.8	556	13.4	3,597	86.6
Yes	27	1	3.7	3	11.1	24	88.9
Maternal Diabetes							
No	4161	200	4.8	557	13.4	3,604	86.6
Yes	19	1	5.3	2	10.5	17	89.5
Pre-eclampsia							
No	4,001	187	4.7	527	13.2	3,474	86.8
Yes	179	14	7.8	32	17.9	147	82.1
Gestational Diabetes							
No	4,050	197	4.9	551	13.6	3,499	86.4
Yes	130	4	3.1	8	6.2	122	93.8
First Ante-natal Care Visit							
<12 wks	1,085	30	2.8	98	9.0	987	91.0
12+ wks	1,325	58	4.4	174	13.1	1151	86.9
Missing	1,770	113	6.4	287	16.2	1,483	83.8
Year of Birth							
1998	345	8	2.3	31	9.0	314	91.0
1999	604	34	5.6	86	14.2	518	85.8
2000	658	39	5.9	91	13.8	567	86.2
2001	640	31	4.8	95	14.8	545	85.2
2002	770	30	3.9	91	11.8	679	88.2
2003	578	28	4.8	95	16.4	483	83.6
2004	585	31	5.3	70	12.0	515	88.0
Season of Birth							
Summer	1,058	46	4.3	139	13.1	919	86.9
Autumn	925	56	6.1	139	15.0	786	85.0
Winter	993	50	5.0	141	14.2	852	85.8
Spring	1,204	49	4.1	140	11.6	1064	88.4
Index of Relative Socio-Economic Disadvantage (IRSD^b)							
1st quartile	769	65	8.5	151	19.6	618	80.4
2nd quartile	445	27	6.1	69	15.5	376	84.5
3rd quartile	484	21	4.3	57	11.8	427	88.2
4th quartile	640	19	3.0	62	9.7	578	90.3
Missing	1,842	69	3.7	220	11.9	1622	88.1
TOTAL	4,180	201	4.8	559	13.4	3,621	86.6

A-4: Average THM (µg/L) Exposure across entire pregnancy for all births by disinfectant type for Sydney/Illawarra 1998-2004

THM	No.of Births	Mean µg/L	Std Dev µg/L	Min. µg/L	25 th % µg/L	Median µg/L	75 th % µg/L	Max. µg/L
Sydney/Illawarra Water Supply								
Chloroform	314,982	33.6	16.0	3.4	20.4	30.9	43.9	121.5
BDCM	314,982	15.8	4.5	5.7	12.2	15.3	18.1	33.8
DBCM	314,982	6.3	2.2	0.7	5.1	5.9	7.0	25.6
BrTHM	314,982	24.1	6.2	8.1	20.1	22.7	26.1	67.1
THM4	314,982	57.7	20.5	23.2	41.0	55.5	69.0	154.9
Chlorinated Systems								
Chloroform	50,890	45.3	18.5	3.4	31.5	43.7	57.0	121.5
BDCM	50,890	19.0	5.3	5.7	15.3	18.4	22.7	33.8
DBCM	50,890	8.3	3.4	0.7	6.9	7.8	8.7	25.6
BrTHM	50,890	29.7	7.9	8.1	25.2	28.8	33.6	67.1
THM4	50,890	75.0	21.8	23.2	58.0	73.1	89.1	154.9
Chloraminated Systems								
Chloroform	148,356	27.6	11.8	10.6	17.5	24.0	38.8	66.0
BDCM	148,356	14.0	3.1	7.9	11.4	13.3	16.7	24.6
DBCM	148,356	5.6	0.9	2.9	4.9	5.5	6.1	10.2
BrTHM	148,356	21.5	3.0	14.6	19.3	20.9	23.2	32.6
THM4	148,356	49.2	14.3	25.2	36.6	45.0	62.5	98.3
Mixed Disinfectant Systems								
Chloroform	115,736	36.2	15.9	10.7	23.2	36.7	45.3	119.0
BDCM	115,736	16.5	4.5	8.4	13.6	16.3	18.6	33.8
DBCM	115,736	6.4	2.1	3.1	5.2	5.9	7.0	22.1
BrTHM	115,736	24.9	6.5	15.3	21.0	23.6	26.6	63.2
THM4	115,736	61.1	20.8	26.1	44.9	60.7	71.2	152.8

Min= minimum, Max = maximum, 25% 25th percentile, 75% 75th percentile concentrations

A-5: Correlations between THMs by trimester in Sydney/Illawarra 1998-2004

Spearman Correlation Coefficients, N = 314982

Prob > |r| under H0: Rho=0

Trimester 1				
	THM4	Chloroform	BDCM	DBCM
Chloroform	0.96 <.0001	1		
BDCM	0.95 <.0001	0.87 <.0001	1	
DBCM	0.13 <.0001	-0.06 <.0001	0.27 <.0001	1
BrTHM	0.85 <.0001	0.70 <.0001	0.93 <.0001	0.55 <.0001
Trimester 2				
Chloroform	0.97 <.0001	1		
BDCM	0.95 <.0001	0.89 <.0001	1	
DBCM	0.10 <.0001	-0.06 <.0001	0.23 <.0001	1
BrTHM	0.85 <.0001	0.74 <.0001	0.51 <.0001	0.51 <.0001
Trimester 3				
Chloroform	0.98 <.0001	1		
BDCM	0.96 <.0001	0.91 <.0001	1	
DBCM	0.13 <.0001	-0.01 <.0001	0.25 <.0001	1
BrTHM	0.86 <.0001	0.77 <.0001	0.94 <.0001	0.53 <.0001
Entire Pregnancy				
Chloroform	0.98 <.0001	1		
BDCM	0.96 <.0001	0.90 <.0001	1	
DBCM	0.03 <.0001	-0.11 <.0001	0.15 <.0001	1
BrTHM	0.87 <.0001	0.78 <.0001	0.94 <.0001	0.42 <.0001

A-6; Correlation between Trimesters for each THM – ALL Births Sydney/Illawarra 1998-2004

Spearman Correlation Coefficients, N = 314982				
Prob > r under H0: Rho=0				
THM4 Correlation by Trimester				
	Trimester 1	Trimester 2	Trimester 3	Entire Pregnancy
Trimester 2	0.80 <.0001	1		
Trimester 3	0.69 <.0001	0.81 <.0001	1	
Entire Pregnancy	0.90 <.0001	0.94 <.0001	0.90 <.0001	1
Chloroform Correlation by Trimester				
Trimester 2	0.81 <.0001	1		
Trimester 3	0.69 <.0001	0.82 <.0001	1	
Entire Pregnancy	0.90 <.0001	0.95 <.0001	0.90 <.0001	1
BDCM Correlation by Trimester				
Trimester 2	0.76 <.0001	1		
Trimester 3	0.65 <.0001	0.77 <.0001	1	
Entire Pregnancy	0.88 <.0001	0.93 <.0001	0.89 <.0001	1
DBCM Correlation by Trimester				
Trimester 2	0.68 <.0001	1		
Trimester 3	0.49 <.0001	0.64 <.0001	1	
Entire Pregnancy	0.85 <.0001	0.89 <.0001	0.80 <.0001	1
BrTHM Correlation by Trimester				
Trimester 2	0.67 <.0001	1		
Trimester 3	0.53 <.0001	0.64 <.0001	1	
Entire Pregnancy	0.85 <.0001	0.89 <.0001	0.83 <.0001	1

A-7: Summary statistics for haloacetic acids and trichloroacetonitrile - Sydney/Illawarra 1998-2004

Table 1.1. Summary of statistics for haloacetic acids and trihaloacetonitriles - Sydney/Illawarra 1998-2004				
DBP	Sampling Period (number of months of data)	Proportion of HAA9 (%)	Sydney/Illawarra	
			Number of Samples	Mean (min-max) µg/L
Haloacetic Acids				
BAA	Aug-Dec 2001 (5)	1.9	239	0.7 (0.7-1.0)
BCA	Aug 2001-Jul 2002 (12), May-Oct 2003 (6)	12.4	581	4.4 (0.7-16.0)
BDCA	Aug 2001-Jul 2002 (12), May-Oct 2003 (6)	6.8	581	2.4 (0.7-23.0)
CAA	Aug 2001-Jul 2002 (12), May-Nov 2003 (7)	9.7	598	3.4 (3.3-15.0)
CDBA	Aug 2001-Jul 2002 (12), May-Oct 2003 (6)	3.1	581	1.1 (0.7-8.5)
DBA	Aug-Dec 2001 (5)	3.4	239	1.2 (0.7-31.0)
DCA	Aug-Dec 2001 (5)	32.2	598	11.4 (0.7-56.0)
TBA	Aug-Dec 2001 (5)	2.4	239	0.9 (0.7-10.0)
TCA	Aug 2001-Jul 2002 (12), May-Nov 2003 (7)	28.0	598	9.9 (0.7-48.0)
Haloacetonitriles				
TCAN	Jan-Mar, May-Jul 1998 (6)		38	31.8 (26.7-80.0)

BAA= bromoacetic acid, BCA= bromochloro-acetic acid, BDCA= bromodichloro-acetic acid, CAA=chloroacetic acid, CDBA=chlorodibromo-acetic acid, DBA=dibromo-acetic acid, DCA=dichloro-acetic acid, TBA=tribromo-acetic acid, TCA=trichloro-acetic acid, TCAN= trichloroacetonitrile

Results

We had limited data on nine haloacetic acids (HAAs) and trichloroacetonitrile (TCAN) covering several short time periods within the Sydney/Illawarra study period. HAA data was available for 30 (90%) of the 33 distribution systems and nine (27%) of the distribution systems for TCAN. We used a similar approach as described in the paper to obtain distribution /month HAA and TCAN concentrations and produced a range of descriptive statistics in eAppendix A-7.

We also assessed correlations with THM's using the raw monitoring site specific data in eAppendix A-8 and found generally low correlation. Chloroform was correlated with dichloro-acetic acid ($r=0.51$) and trichloro-acetic acid ($r=0.77$), while DBCM was correlated with dibromo-acetic acid ($r=0.49$).

A-8: Spearman Correlations between mean zone concentrations for THMs HAAs and TCAN. Sydney/Illawarra 1998-2004

DBP	chloroform	bromoform	BDCM	BDCM	THM4	BAA	BCA	BDCA	CAA	CDBA	DBA	DCA	TBA	TCA
	N	3950	3950	3950	3950	239	581	581	295	581	239	592	239	38
BAA	rho	0.07	-0.02	0.09	0.04	1.00								
	Sig.	.297	.804	.177	.506	.250								
BCA	rho	0.09	0.14	0.40	0.38	0.24	1.00							
	Sig.	.034	.001	.000	.000	.269								
BDCA	rho	0.17	-0.02	0.19	0.15	0.20	0.25	1.00						
	Sig.	.000	.561	.000	.000	.000	.000							
CAA	rho	-0.04	-0.02	-0.01	-0.02	-0.04	-0.01	0.00	-0.12	1.00				
	Sig.	.291	.561	.849	.634	.304	.863	.934	.003					
CDBA	rho	-0.10	0.12	0.06	0.12	-0.03	0.02	0.18	0.37	-0.06	1.00			
	Sig.	.021	.004	.153	.005	.431	.736	.000	.000	.164				
DBA	rho	-0.17	0.39	0.28	0.49	0.08	0.09	0.71	0.13	-0.04	0.30	1.00		
	Sig.	.011	.000	.000	.000	.230	.146	.000	.041	.552	.000			
DCA	rho	0.51	-0.23	0.11	-0.10	0.40	0.05	0.51	0.24	-0.01	0.05	0.15	1.00	
	Sig.	.000	.000	.008	.016	.000	.413	.000	.000	.776	.243	.021		
TBA	rho	-0.08	0.31	0.10	0.17	0.06	-0.01	0.07	-0.04	-0.04	0.12	-0.13	1.00	
	Sig.	.213	.000	.110	.008	.327	.835	.316	.572	.577	.064	.045		
TCA	rho	0.77	-0.23	0.30	0.01	0.64	0.08	0.19	0.34	-0.06	-0.12	0.69	-0.11	1.00
	Sig.	.000	.000	.000	.892	.000	.234	.000	.000	.176	.071	.000	.102	
TCAN	rho	-0.22	0.20	-0.22	-0.23	-0.26								
	Sig.	.215	.256	.214	.201	.132								
Rho= spearman correlation coefficient														

BAA= bromoacetic acid, BCA= bromochloro-acetic acid, BDCA= bromodichloro-acetic acid, CAA=chloroacetic acid, CDBA=chlorodibromo-acetic acid, DBA=dibromo-acetic acid, DCA=dichloro-acetic acid, TBA=tribromo-acetic acid, TCA=trichloro-acetic acid, TCAN= trichloroacetonitrile

**A-9: Relative Risk (RR) of SGA <10% for an interquartile range increase in THM exposure
Sydney/Illawarra 1998-2004**

Sydney/Mawarra 1998-2004		10 th Percentile					
	IQR (µg/L)	Unadj RR			Adj RR		
		RR Est	Lower CI	Upper CI	RR Est	Lower CI	Upper CI
Chloroform							
Trimester 1	25	1.04	1.02	1.05	1.03	1.01	1.05
Trimester 2	25	1.03	1.01	1.05	1.03	1.00	1.05
Trimester 3	25	1.03	1.02	1.05	1.04	1.02	1.06
Entire Pregnancy	25	1.04	1.02	1.06	1.04	1.02	1.07
BDCM							
Trimester 1	5	1.03	1.02	1.04	1.01	1.00	1.03
Trimester 2	5	1.03	1.02	1.04	1.01	1.00	1.03
Trimester 3	5	1.03	1.02	1.04	1.02	1.01	1.04
Entire Pregnancy	5	1.04	1.03	1.05	1.03	1.01	1.04
DBCM							
Trimester 1	2	1.01	1.00	1.02	1.00	0.99	1.01
Trimester 2	2	1.01	1.00	1.02	1.00	0.99	1.01
Trimester 3	2	1.02	1.01	1.02	1.00	0.99	1.01
Entire Pregnancy	2	1.02	1.01	1.03	1.00	0.99	1.01
BrTHM							
Trimester 1	5	1.02	1.01	1.02	1.01	1.00	1.01
Trimester 2	5	1.02	1.01	1.02	1.00	1.00	1.01
Trimester 3	5	1.02	1.01	1.03	1.01	1.00	1.02
Entire Pregnancy	5	1.03	1.02	1.04	1.01	1.00	1.02
TTHM							
Trimester 1	25	1.03	1.02	1.04	1.02	1.01	1.04
Trimester 2	25	1.03	1.02	1.04	1.02	1.00	1.03
Trimester 3	25	1.03	1.02	1.04	1.03	1.01	1.04
Entire Pregnancy	25	1.04	1.03	1.05	1.03	1.01	1.05

[†]Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal care visit, year of birth, season and socio-economic status

A-10: Decile ranges for THM exposure for All Births in Sydney/Illawarra 1998-2004.

THM Deciles	1 st Trimester Deciles (µg/L)	2 nd Trimester Deciles (µg/L)	3 rd Trimester Deciles (µg/L)	Entire Pregnancy Deciles (µg/L)
Chloroform				
D1	2.15 - 14.91	2.15 - 14.86	1.68 - 13.71	3.49 - 15.51
D2	14.93 - 18.61	14.89 - 18.33	13.71 - 16.83	15.51 - 18.24
D3	18.62 - 22.25	18.34 - 22.06	16.83 - 20.59	18.24 - 22.32
D4	22.26 - 27.05	22.08 - 26.79	20.59 - 25.00	22.32 - 25.61
D5	27.08 - 32.48	26.82 - 32.01	25.00 - 30.18	25.61 - 30.88
D6	32.57 - 38.28	32.03 - 38.18	30.18 - 36.12	30.88 - 37.65
D7	38.32 - 43.53	38.22 - 43.59	36.12 - 41.36	37.66 - 42.15
D8	43.59 - 47.95	43.61 - 47.86	41.36 - 46.86	42.17 - 45.61
D9	47.96 - 57.23	47.86 - 57.05	46.86 - 56.03	45.61 - 53.03
D10	57.32 - 133.98	57.08 - 133.98	56.03 - 147.94	53.05 - 119.03
BDCM				
D1	3.76 - 10.66	3.76 - 10.59	2.95 - 9.78	5.87 - 10.72
D2	10.71 - 11.75	10.59 - 11.63	9.78 - 10.94	10.72 - 11.63
D3	11.77 - 12.96	11.64 - 12.66	10.94 - 12.00	11.63 - 12.84
D4	12.97 - 14.28	12.66 - 14.02	12.00 - 13.17	12.84 - 13.98
D5	14.28 - 15.66	14.02 - 15.32	13.17 - 14.43	13.98 - 15.27
D6	15.66 - 16.78	15.32 - 16.65	14.43 - 15.79	15.28 - 16.5
D7	16.8 - 18.29	16.66 - 18.05	15.79 - 17.23	16.5 - 17.48
D8	18.3 - 19.95	18.06 - 19.8	17.23 - 19.04	17.48 - 18.84
D9	19.95 - 23.16	19.81 - 22.94	19.05 - 21.96	18.84 - 21.64
D10	23.17 - 48.38	22.96 - 48.38	21.96 - 52.55	21.65 - 33.75
BDCM ^(a)				
D1	<5.9	<5.9	<5.9	<5.9
D2	>5.9	>5.9	>5.9	>5.9
THM4				
D1	17.28 - 34.52	17.28 - 34.36	13.56 - 31.79	23.79 - 34.71
D2	34.57 - 38.86	34.37 - 38.13	31.79 - 36.11	34.71 - 38.28
D3	38.87 - 43.77	38.14 - 43.15	36.11 - 40.48	38.28 - 43.3
D4	43.78 - 49.93	43.17 - 48.95	40.49 - 46.17	43.3 - 47.86
D5	49.94 - 57.12	48.99 - 56.58	46.19 - 52.72	47.86 - 55.49
D6	57.3 - 63.45	56.61 - 62.78	52.72 - 59.34	55.49 - 62.01
D7	63.46 - 69.33	62.79 - 68.95	59.34 - 65.94	62.02 - 66.8
D8	69.37 - 76.02	68.95 - 75.6	65.94 - 73.34	66.8 - 71.69
D9	76.09 - 90.87	75.6 - 90.41	73.36 - 86.37	71.69 - 84.29
D10	90.92 - 199.31	90.52 - 199.31	86.37 - 216.46	84.33 - 152.79

(a) DBCM was analysed as a dichotomous variable (above and below the median 5.9µg/L) due to the small range of DBCM trimester concentrations (25th percentile=5.1 µg/L, 75th percentile=7.0 µg/L).

A-11: Adjusted Relative Risks ^(a) and 95% confidence intervals for trimester average deciles THM exposure and SGA 10% in Sydney/Illawarra 1998-2004.

		1 st Trimester	2 nd Trimester	3 rd Trimester	Entire Pregnancy
Deciles (µg/L)	Number	Relative Risk	Relative Risk	Relative Risk	Relative Risk
Chloroform					
D1	31,489	1.00	1.00	1.00	1.00
D2	31,489	0.98 (0.94 - 1.03)	1.02 (0.97 - 1.07)	1.04 (0.99 - 1.09)	1.04 (0.99 - 1.10)
D3	31,535	1.02 (0.97 - 1.07)	1.01 (0.96 - 1.06)	1.03 (0.98 - 1.08)	1.00 (0.94 - 1.06)
D4	31,488	0.98 (0.93 - 1.03)	1.00 (0.95 - 1.06)	1.04 (0.99 - 1.10)	1.05 (0.99 - 1.11)
D5	31,499	0.97 (0.92 - 1.03)	0.96 (0.91 - 1.01)	1.01 (0.96 - 1.07)	1.01 (0.95 - 1.06)
D6	31,371	0.98 (0.93 - 1.04)	0.99 (0.94 - 1.04)	0.98 (0.93 - 1.03)	0.99 (0.93 - 1.05)
D7	31,620	1.04 (0.98 - 1.10)	1.01 (0.96 - 1.07)	1.08 (1.02 - 1.14)	1.02 (0.96 - 1.09)
D8	31,475	1.00 (0.94 - 1.06)	1.00 (0.94 - 1.06)	1.06 (1.00 - 1.13)	1.04 (0.98 - 1.12)
D9	31,487	1.00 (0.95 - 1.06)	1.00 (0.94 - 1.06)	1.08 (1.02 - 1.15)	1.06 (1.00 - 1.13)
D10	31,532	1.07 (1.01 - 1.13)	1.08 (1.01 - 1.14)	1.12 (1.05 - 1.18)	1.12 (1.04 - 1.19)
BDCM					
D1	31,513	1.0	1.0	1.0	1.0
D2	31,448	1.00 (0.96 - 1.05)	0.98 (0.94 - 1.03)	1.03 (0.98 - 1.08)	1.01 (0.97 - 1.06)
D3	31,532	1.00 (0.95 - 1.05)	0.96 (0.92 - 1.01)	1.02 (0.97 - 1.07)	1.02 (0.97 - 1.07)
D4	31,466	0.99 (0.94 - 1.04)	0.95 (0.90 - 1.00)	1.03 (0.98 - 1.08)	1.01 (0.96 - 1.06)
D5	31,395	0.98 (0.93 - 1.03)	0.95 (0.90 - 1.00)	1.04 (0.99 - 1.09)	0.98 (0.93 - 1.03)
D6	31,631	0.95 (0.90 - 1.00)	0.93 (0.88 - 0.98)	0.98 (0.93 - 1.03)	0.97 (0.91 - 1.02)
D7	31,461	0.97 (0.92 - 1.03)	0.94 (0.89 - 0.99)	1.04 (0.98 - 1.09)	0.97 (0.91 - 1.02)
D8	31,561	1.00 (0.95 - 1.06)	0.96 (0.91 - 1.01)	1.02 (0.97 - 1.08)	1.00 (0.94 - 1.06)
D9	31,571	1.02 (0.97 - 1.08)	0.97 (0.92 - 1.02)	1.06 (1.00 - 1.12)	1.01 (0.95 - 1.07)
D10	31,404	1.04 (0.99 - 1.10)	1.01 (0.96 - 1.07)	1.10 (1.04 - 1.16)	1.08 (1.02 - 1.15)
DBCM ^(b)					
D1	31,515	1.00	1.00	1.00	1.00
D2	31,131	1.00 (0.98 - 1.03)	1.00 (0.98 - 1.03)	1.02 (1.00 - 1.04)	1.01 (0.99 - 1.03)
THM4					
D1	31,493	1.00	1.00	1.00	1.00
D2	31,506	1.00 (0.96 - 1.05)	1.00 (0.95 - 1.05)	1.04 (0.99 - 1.09)	1.02 (0.98 - 1.08)
D3	31,460	0.99 (0.94 - 1.04)	0.99 (0.94 - 1.04)	1.04 (0.99 - 1.09)	1.01 (0.96 - 1.07)
D4	31,521	0.98 (0.93 - 1.03)	0.97 (0.92 - 1.02)	1.05 (1.00 - 1.10)	1.04 (0.98 - 1.10)
D5	31,511	0.97 (0.92 - 1.02)	0.96 (0.91 - 1.01)	1.02 (0.97 - 1.08)	1.01 (0.95 - 1.06)
D6	31,506	0.97 (0.91 - 1.02)	0.96 (0.91 - 1.01)	1.01 (0.96 - 1.06)	0.93 (0.88 - 0.99)
D7	31,462	0.97 (0.92 - 1.03)	0.95 (0.90 - 1.01)	1.03 (0.97 - 1.09)	1.00 (0.94 - 1.07)
D8	31,474	1.00 (0.94 - 1.05)	0.95 (0.90 - 1.01)	1.06 (1.00 - 1.12)	1.00 (0.94 - 1.06)
D9	31,598	1.01 (0.96 - 1.07)	1.00 (0.94 - 1.06)	1.07 (1.01 - 1.14)	1.06 (1.00 - 1.12)
D10	31,451	1.05 (0.99 - 1.11)	1.03 (0.97 - 1.09)	1.10 (1.04 - 1.17)	1.09 (1.03 - 1.16)

^(a) Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal visit, year of birth, season and socio-economic status.

^(b) DBCM was analysed as a dichotomous variable (above and below the median 5.9µg/L) due to the small range of DBCM trimester concentrations (25th percentile=5.1 µg/L, 75th percentile=7.0 µg/L).

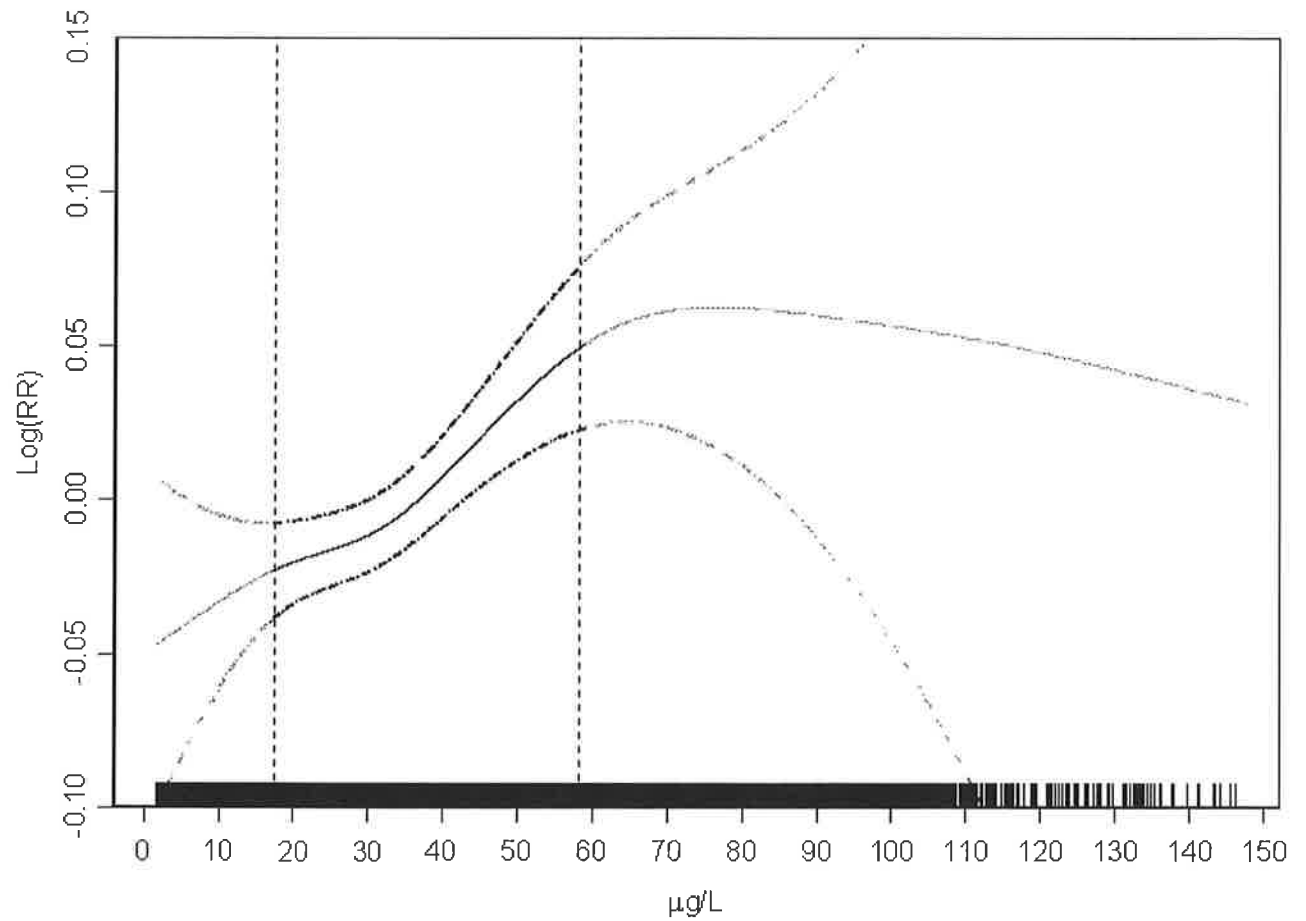
A-12: Generalised Additive Model (GAM) concentration-response plots Figures 1 – 3.

The GAM concentration response plots for Chloroform, BDCM and THM4 are included in Figure 1, 2 and 3. We have include a reference line indicating the 10%ile and 90%ile concentration and the concentration response plot and associated confidence limits should only be interpreted between these values due to insufficient data below and above these concentrations resulting in wide confidence intervals. The GAM concentration response plots display the adjusted Log(RR) as the difference from the intercept, centred on the mean exposure. The rugplot on the x-axis shows the distribution of pollutant concentrations. The GAM plots in association with the decile analysis suggest the association between SGA and Chloroform and SGA and BDCM is fairly linear, with no clear evidence of a threshold effect.

The GAM concentration response plots display the adjusted Log(RR) as the difference from the intercept, centred on the mean exposure, and the rugplot on the x-axis shows the distribution of concentrations. We have include a reference line indicating the 10%ile and 90%ile concentrations, and recommend that concentration response plot and associated confidence limits should only be interpreted between these values due to insufficient data below and above these concentrations resulting in wide confidence intervals.

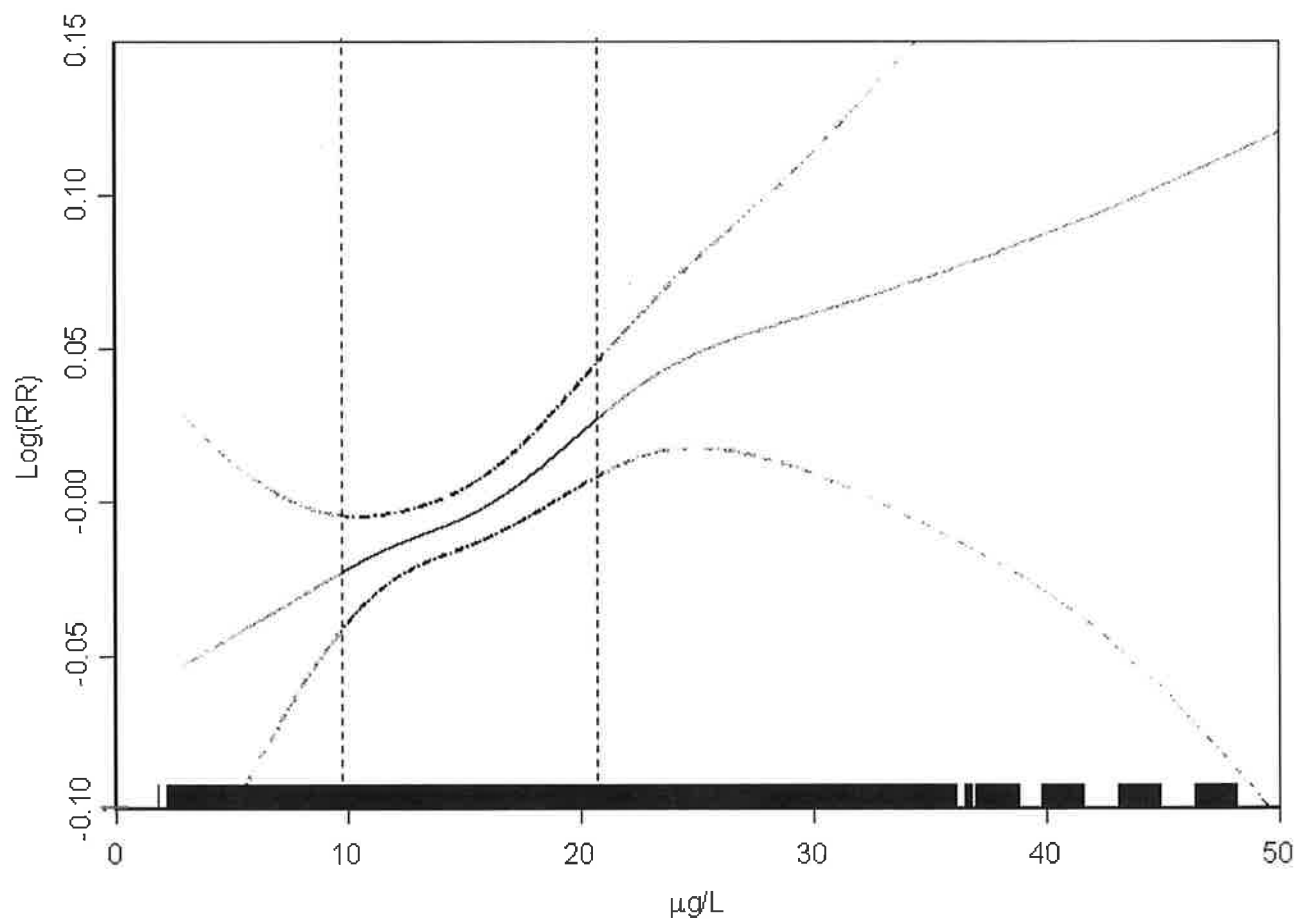
The GAM plots are presented in Figures 1-3 below.

Figure 1: Exposure response relation between SGA 10 percentile and third trimester exposure to Chloroform, Sydney/Illawarra 1998-2004



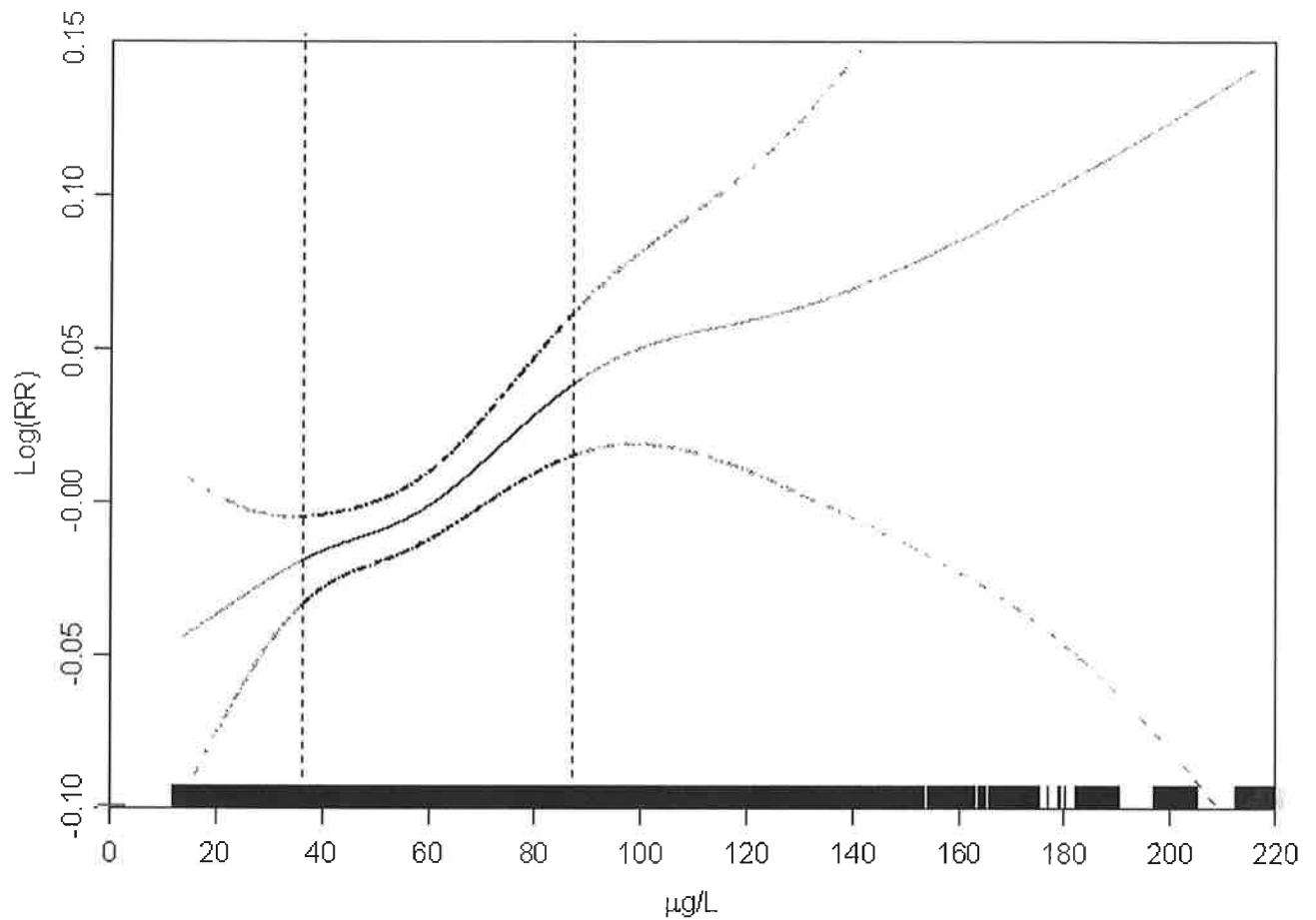
Footnote: The GAM concentration response plots display the adjusted Log(RR) as the difference from the intercept, centred on the mean exposure, and the rugplot on the x-axis shows the distribution of concentrations. We have included a reference line indicating the 10th and 90th percentile concentrations, and recommend that concentration response plot and associated confidence limits should only be interpreted between these values due to insufficient data below and above these concentrations resulting in wide confidence intervals.

Figure 2: Exposure response relation between SGA 10 percentile and third trimester exposure to BDCM, Sydney/Illawarra 1998-2004



Footnote: The GAM concentration response plots display the adjusted Log(RR) as the difference from the intercept, centred on the mean exposure, and the rugplot on the x-axis shows the distribution of concentrations. We have include a reference line indicating the 10%ile and 90%ile concentrations, and recommend that concentration response plot and associated confidence limits should only be interpreted between these values due to insufficient data below and above these concentrations resulting in wide confidence intervals.

Figure 3: Exposure response relation between SGA 10 percentile and third trimester exposure to THM4, Sydney/Illawarra 1998-2004



Footnote: The GAM concentration response plots display the adjusted Log(RR) as the difference from the intercept, centred on the mean exposure, and the rugplot on the x-axis shows the distribution of concentrations. We have include a reference line indicating the 10%ile and 90%ile concentrations, and recommend that concentration response plot and associated confidence limits should only be interpreted between these values due to insufficient data below and above these concentrations resulting in wide confidence intervals.

A-13: Adjusted Relative Risk (RR) for SGA<10% for an interquartile range increase in THM exposure Sydney/Illawarra 1998-2004 by Disinfection Type

IQR (µg/L)		10 th Percentile								
		Chloramination			Chlorination			Mixed		
		RR	Lower	Upper	RR	Lower	Upper	RR	Lower	Upper
Chloroform										
Trimester 1	25	1.03	0.98	1.07	1.07	1.03	1.12	1.04	1.00	1.08
Trimester 2	25	1.05	0.99	1.11	1.05	1.01	1.10	1.03	0.99	1.07
Trimester 3	25	1.10	1.04	1.17	1.03	0.99	1.08	1.07	1.03	1.12
Entire Pregnancy	25	1.11	1.03	1.21	1.07	1.02	1.12	1.08	1.03	1.13
BDCM										
Trimester 1	5	1.02	0.99	1.05	1.01	0.99	1.03	1.03	1.00	1.05
Trimester 2	5	1.02	0.99	1.05	1.01	0.99	1.04	1.02	1.00	1.04
Trimester 3	5	1.05	1.02	1.09	0.99	0.97	1.02	1.05	1.03	1.08
Entire Pregnancy	5	1.09	1.04	1.14	1.01	0.98	1.04	1.06	1.02	1.09
DBCM										
Trimester 1	2	1.01	0.99	1.04	0.99	0.98	1.00	1.00	0.99	1.02
Trimester 2	2	1.03	0.99	1.06	0.98	0.97	1.00	1.00	0.99	1.02
Trimester 3	2	1.06	1.02	1.09	0.97	0.96	0.99	1.02	1.00	1.04
Entire Pregnancy	2	1.07	1.03	1.12	0.97	0.96	0.99	1.01	0.99	1.04
BrTHM										
Trimester 1	5	1.01	0.99	1.03	1.00	0.99	1.01	1.01	0.99	1.02
Trimester 2	5	1.02	0.99	1.04	1.00	0.99	1.01	1.01	0.99	1.02
Trimester 3	5	1.04	1.02	1.06	0.99	0.97	1.00	1.02	1.01	1.03
Entire Pregnancy	5	1.06	1.03	1.10	0.99	0.97	1.01	1.02	1.01	1.04
TTHM										
Trimester 1	25	1.02	0.99	1.06	1.04	1.01	1.07	1.03	1.00	1.06
Trimester 2	25	1.03	0.99	1.07	1.03	1.00	1.06	1.02	0.99	1.05
Trimester 3	25	1.07	1.03	1.12	1.01	0.98	1.04	1.05	1.02	1.08
Entire Pregnancy	25	1.10	1.04	1.17	1.04	1.00	1.08	1.06	1.02	1.10

[†]Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal care visit, year of birth, season and socio-economic status

A-14: Adjusted Relative Risk (RR) of SGA<10% for an interquartile range increase in THM exposure Sydney/Illawarra; with and without estimated THM data

IQR		10 th Percentile					
(µg/L)		Estimated THM data Included			Estimated THM data Excluded		
		RR Est	Lower CI	Upper CI	RR Est	Lower CI	Upper CI
Chloroform							
Trimester 1	25	1.03	1.01	1.05	1.04	1.01	1.06
Trimester 2	25	1.03	1.00	1.05	1.02	1.00	1.04
Trimester 3	25	1.04	1.02	1.06	1.03	1.01	1.06
Entire Pregnancy	25	1.04	1.02	1.07	1.04	1.01	1.07
BDCM							
Trimester 1	5	1.01	1.00	1.03	1.02	1.00	1.03
Trimester 2	5	1.01	1.00	1.03	1.01	0.99	1.02
Trimester 3	5	1.02	1.01	1.04	1.02	1.01	1.04
Entire Pregnancy	5	1.03	1.01	1.04	1.02	1.00	1.04
DBCM							
Trimester 1	2	1.00	0.99	1.01	0.99	0.99	1.00
Trimester 2	2	1.00	0.99	1.01	0.99	0.98	1.00
Trimester 3	2	1.00	0.99	1.01	0.99	0.98	1.00
Entire Pregnancy	2	1.00	0.99	1.01	0.99	0.97	1.00
BrTHM							
Trimester 1	5	1.01	1.00	1.01	1.00	1.00	1.01
Trimester 2	5	1.00	1.00	1.01	1.00	0.99	1.01
Trimester 3	5	1.01	1.00	1.02	1.01	1.00	1.02
Entire Pregnancy	5	1.01	1.00	1.02	1.01	0.99	1.02
TTHM							
Trimester 1	25	1.02	1.01	1.04	1.02	1.01	1.04
Trimester 2	25	1.02	1.00	1.03	1.01	1.00	1.03
Trimester 3	25	1.03	1.01	1.04	1.02	1.01	1.04
Entire Pregnancy	25	1.03	1.01	1.05	1.03	1.01	1.05

[†]Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal care visit, year of birth, season and socio-economic status

A-15: Mean trimester THM concentration by Index of Relative Socio-Economic Disadvantage (IRSD) Quartiles for all births (N=314,982) Sydney/Illawarra 1998-2004

IRSD ¹ Quartile	THM	Number of Births	Trimester 1 Mean (µg/L)	Trimester 2 Mean (µg/L)	Trimester 3 Mean (µg/L)	Entire Pregnancy Mean (µg/L)
1	Chloroform	76,656	37.6	37.5	35.9	36.3
2	Chloroform	66,083	35.9	35.9	34.4	34.8
3	Chloroform	74,544	35.4	35.2	33.6	34.1
4	Chloroform	97,699	31.5	31.5	30.1	30.4
<i>variation between IRSD 1 and 4</i>			-6.1 (-16%)	-6.0 (-16%)	-5.8 (-16%)	-5.9 (-16%)
1	BDCM	76,656	17.5	17.2	16.3	16.8
2	BDCM	66,083	16.7	16.5	15.7	16.1
3	BDCM	74,544	16.4	16.1	15.3	15.8
4	BDCM	97,699	15.1	15.0	14.2	14.6
<i>variation between IRSD 1 and 4</i>			-2.4 (-14%)	-2.2 (-13%)	-2.0 (-13%)	-2.1 (-13%)
1	DBCM	76,656	7.1	6.9	6.4	6.7
2	DBCM	66,083	7.0	6.7	6.3	6.6
3	DBCM	74,544	6.7	6.6	6.2	6.4
4	DBCM	97,699	6.0	5.9	5.7	5.8
<i>variation between IRSD 1 and 4</i>			-1.1 (-15%)	-0.9 (-14%)	-0.7 (-11%)	-0.9 (-13%)
1	THM4	76,656	64.7	63.8	60.7	61.9
2	THM5	66,083	62.0	61.4	58.4	59.6
3	THM6	74,544	60.7	60.1	57.1	58.3
4	THM7	97,699	54.6	54.3	51.9	52.7
<i>variation between IRSD 1 and 4</i>			-10.1 (-16%)	-9.5 (-15%)	-8.8 (-14%)	-9.2 (-15%)

1. Index of Relative Socio-Economic Disadvantage quartiles go from most socio-economically disadvantaged (1st quartile) to least socio-economically disadvantaged (4th quartile)

We found no evidence of an interaction between IRSD and THMs.

We found differences in average THM levels during third trimester between IRSD quartiles were significant for all THMs using a Kruskal-Wallis test. Similar results were found for exposure across the entire pregnancy.

- chloroform H = 4126.58, $p < .0001$
- BDCM H = 5582.47, $p < .0001$
- DBCM H = 6123.32, $p < .0001$
- THM4 H = 5342.89, $p < .0001$

A-16: Mean trimester THM concentration by Smoking Status for all births (N=314,982)

Smoking anytime during pregnancy	THM	Number of Births	Trimester 1 Mean (µg/L)	Trimester 2 Mean (µg/L)	Trimester 3 Mean (µg/L)	Entire Pregnancy Mean (µg/L)
No	Chloroform	278,837	34.5	34.3	32.8	33.2
Yes	Chloroform	36,145	37.9	38.2	36.9	37.0
<i>Variation (var%)</i>			3.4 (10%)	3.9 (11%)	4.2 (13%)	3.8 (11%)
No	BDCM	278,837	16.2	16.0	15.2	15.6
Yes	BDCM	36,145	17.3	17.2	16.3	16.7
<i>Variation (var%)</i>			1.1 (7%)	1.2 (7%)	1.1 (7%)	1.1 (7%)
No	DBCM	278,837	6.6	6.4	6.1	6.3
Yes	DBCM	36,145	7.2	6.9	6.4	6.7
<i>Variation (var%)</i>			0.6 (10%)	0.5 (8%)	0.4 (6%)	0.5 (7%)
No	THM4	278,837	59.4	58.8	55.9	57.1
Yes	THM5	36,145	64.9	64.6	61.7	62.5
<i>Variation (var%)</i>			5.4 (9%)	5.8 (10%)	5.7 (10%)	5.4 (10%)

We found differences in average THM levels during third trimester between smokers and non-smokers were significant for all THMs using a Wilcoxon test (z statistic). Similar results were found for exposure across the entire pregnancy.

- chloroform $z = 40.6854$, $p < .0001$
- BDCM $z = 38.9415$, $p < .0001$
- DBCM $z = 25.7267$, $p < .0001$
- BrTHM $z = 41.1242$, $p < .0001$
- THM4 $z = 43.3683$, $p < .0001$

A-17: Association¹ between SGA and third trimester exposure to chloroform, BDCM and DBCM – primary analysis, non smokers only, smokers only, Sydney/Illawarra 1998 to 2004.

THM	Trimester	IQR	All Births Main Effect			Main Effect – Non-Smokers			Main Effect – Smokers		
			RR EST	Lower	Upper	RR EST	Lower	Upper	RR EST	Lower	Upper
Chloroform	1	25	1.03	1.01	1.05	1.04	1.01	1.06	1.00	0.96	1.04
	2	25	1.03	1.00	1.05	1.04	1.01	1.06	0.99	0.95	1.03
	3	25	1.04	1.02	1.06	1.07	1.04	1.10	0.95	0.91	0.99
	Term	25	1.04	1.02	1.07	1.07	1.04	1.10	0.98	0.93	1.02
BDCM	1	5	1.01	1.00	1.03	1.02	1.01	1.04	0.99	0.97	1.02
	2	5	1.01	1.00	1.03	1.02	1.01	1.04	0.98	0.96	1.01
	3	5	1.02	1.01	1.04	1.05	1.03	1.06	0.95	0.93	0.98
	Term	5	1.03	1.01	1.04	1.05	1.03	1.07	0.97	0.94	1.00
DBCM	1	2	1.00	0.99	1.01	1.00	0.99	1.01	1.00	0.98	1.01
	2	2	1.00	0.99	1.01	1.00	0.99	1.01	0.99	0.97	1.00
	3	2	1.00	0.99	1.01	1.01	1.00	1.02	0.97	0.95	0.99
	Term	2	1.00	0.99	1.01	1.00	0.99	1.02	0.98	0.96	1.00
BrTHM	1	5	1.01	1.00	1.01	1.01	1.00	1.02	1.00	0.99	1.01
	2	5	1.00	1.00	1.01	1.01	1.00	1.02	0.99	0.98	1.01
	3	5	1.01	1.00	1.02	1.02	1.01	1.03	0.98	0.96	0.99
	Term	5	1.01	1.00	1.02	1.02	1.01	1.03	0.98	0.96	1.00
THM4	1	25	1.02	1.01	1.04	1.03	1.01	1.04	1.00	0.97	1.03
	2	25	1.02	1.00	1.03	1.03	1.01	1.04	0.99	0.96	1.02
	3	25	1.03	1.01	1.04	1.05	1.03	1.07	0.96	0.93	0.98
	Term	25	1.03	1.01	1.05	1.05	1.03	1.07	0.97	0.94	1.01

¹Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal care visit, year of birth, season and socio-economic status

A-18: Multi-Pollutant Model for Chloroform and DBCM in Trimester 3 SGA 10% births Sydney/Illawarra 1998-2004

		Trimester 3					
		Chloroform			Chloroform-DBCM		
		Estimate	STDERR	RR	L95%CI	U95%CI	
Chloroform	0.0015	0.0004	1.04	1.02	1.06	DBCM	
						Chloroform	
					-0.0040	0.0027	1.00
					0.0017	0.0005	1.04
							0.99
							1.00
							1.07

		BDCM					
		BDCM			BDCM-DBCM		
		Estimate	STDERR	RR	L95%CI	U95%CI	
BDCM	0.0044	0.0013	1.02	1.01	1.04	DBCM	
						BDCM	
					-0.0117	0.0036	0.99
					0.0088	0.0019	1.25
							0.98
							1.14
							1.37

As Chloroform and BDCM are highly correlated ($r>0.87$) we were not able to assess if there associations with SGA were independent of each other in two pollutant models. The correlations of both chloroform and BDCM with DBCM were low ($r<0.27$). Even though there was generally no association between SGA and DBCM we investigated if the associations between Chloroform and BDCM with SGA were independent of the effects of DBCM in two pollutant model. The results suggest that the effects of Chloroform on SGA are independent of the effects of DBCM, while the results for BDCM and DBCM are less clear .

A-19: Linear regression on THM exposure and birthweight, Sydney/Illawarra 1998-2004¹

THM	Inter-quartile Range (IQR $\mu\text{g/L}$)	Mean difference in birthweight (grams)	Lower 95% Confidence Interval (grams)	Upper 95% Confidence Interval (grams)
Chloroform				
Trimester 1	25	-4.0	-7.0	-1.1
Trimester 2	25	-3.4	-6.4	-0.3
Trimester 3	25	-2.6	-5.8	0.6
Entire Pregnancy	25	-5.0	-8.6	-1.4
BDCM				
Trimester 1	5	-1.0	-2.8	0.8
Trimester 2	5	-0.6	-2.6	1.3
Trimester 3	5	-0.6	-2.6	1.5
Entire Pregnancy	5	-1.5	-3.9	0.8
DBCM				
Trimester 1	2	2.0	0.9	3.0
Trimester 2	2	2.8	1.5	4.0
Trimester 3	2	2.9	1.4	4.3
Entire Pregnancy	2	3.5	2.0	5.0
BrTHM				
Trimester 1	5	0.3	-0.6	1.3
Trimester 2	5	0.8	-0.2	1.9
Trimester 3	5	0.7	-0.5	2.0
Entire Pregnancy	5	0.9	-0.6	2.3
TTHM				
Trimester 1	25	-1.7	-3.8	0.4
Trimester 2	25	-1.0	-3.2	1.2
Trimester 3	25	-0.8	-3.1	1.5
Entire Pregnancy	25	-2.2	-4.8	0.5

¹Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal care visit, year of birth, season and socio-economic status.

A-20: Methodology for LGA-wide Exposure Estimation

Introduction

Our exposure assessment is based on geocoding mother's usual residential address to the water distribution system. Many previous studies have not had access to such detailed location data and investigated the effect of assigning exposure at a larger spatial unit. To further investigate the influence on our results of assigning exposure at larger spatial units we reanalysed our data using the mother's place of usual residence allocated to Local Government Area (LGA), a large administrative spatial unit often used for health studies of in Australia.

Method

The LGA analysis included 47 LGAs with an average area of 303 km² (range: 6 to 2,776 km²) compared to the 33 distribution systems with an average area of 84 km² (range: 13 To 349 km²). Most LGAs straddle two or more distribution systems and one distribution system can cover part of two or more LGAs. To cope with these spatial anomalies we calculated area weighted average THM concentrations for LGAs from the distribution systems they covered, where the weights were the proportions of the LGA area that they covered. We used ArcGIS (ESRI 2008) to determine the area coverage of LGAs by the distribution systems. We obtained the list of LGAs supplied in full or in part for each distribution system from the Sydney Water Corporation (SWC) website (<http://www.sydneywater.com.au/WaterQuality/FiveYearDrinkingWaterQualityManagementPlan/>).

For all births within an LGA we calculated the average concentration of THMs for an LGA, by taking the weighted average of the average concentrations in all the distribution systems that overlapped the LGA, using the area of coverage of the LGA by each distribution system as its weight. We only included distribution systems in the calculation that were reported by SWC as servicing that LGA.

Results

The LGA based analysis included 5,576 (1.8%) additional births not included in the distribution system analysis. The mean THM concentrations were marginally larger in the LGA average estimates compared with the distribution system estimates except for BDCM which was slightly lower (eAppendix A-29). The LGA based results showed similar magnitude associations between SGA and THM's compared to the distribution system based results and these are summarised in eAppendix A-30. The standard error estimates (and the width of the associated 95% confidence intervals) for chloroform and BDCM were around 15% larger for the LGA based analysis compared to the distribution system based analysis, while there was little change in the DBCM estimates. Because the exposure is measured with more error at the LGA spatial unit we would expect the SE's of the THM exposure effect estimates to be larger..

A-21: Exclusion criteria for Sydney/Illawarra births based on Mother's LGA of residence at delivery

Scope Characteristics	Exclusion		Inclusion	
	N	%	N	%
Initial Sydney/Illawarra LGA birth population (a)			362,013	100
Geocoded to Distribution System	-	-	-	-
Study Period January 1998 to December 2004	-	-	-	-
Birth defects present	5,702	1.6	356,311	98.4
Stillborn	1,954	0.5	354,357	97.9
Multiple births	11,545	3.2	342,812	94.7
Missing birthweight or gestational age	91	0.0	342,721	94.7
Extreme birth weight (b)	127	0.0	342,594	94.6
Extreme gestational age (c)	646	0.2	341,948	94.5
Pre-term births	17,208	4.8	324,740	89.7
Missing covariate data	4,182	1.2	320,558	88.5
Missing exposure data	0	0.0	320,558	88.5
Total subjects in Study	41,455	11.5	320,558	88.5

(a) 47 LGA Local Government Areas (City, Municipality, Shire)

(b) <> 5 standard deviations from mean birthweight for gestational age

(c) births outside 22 to 42 gestational weeks inclusive

(d) <37 weeks gestation

A-22: Descriptive statistics of births included in the analysis of term SGA<10% births and maternal exposure to THM's, Sydney Illawarra 1998-2004 based on Mother's LGA of Residence.

Characteristics	Total Births N	SGA<10% N	row%	AGA ≥10% ^a N	row%
Maternal Age					
<20yrs	9,590	1,443	15.0	8,147	85.0
20-24yrs	41,706	5,513	13.2	36,193	86.8
25-29yrs	94,207	9,858	10.5	84,349	89.5
30-34yrs	110,208	9,721	8.8	100,487	91.2
35+yrs	64,847	5,695	8.8	59,152	91.2
Indigenous Mother					
No	317,973	31,820	10.0	286,153	90.0
Yes	2,585	410	15.9	2,175	84.1
Country of Birth					
Australia	200,351	17,652	8.8	182,699	91.2
Asia	50,335	7,540	15.0	42,795	85.0
Other	69,872	7,038	10.1	62,834	89.9
Gender					
Male	164,570	16,572	10.1	147,998	89.9
Female	155,988	15,658	10.0	140,330	90.0
Smoking anytime during pregnancy					
No	283,476	25,651	9.0	257,825	91.0
Yes	37,082	6,579	17.7	30,503	82.3
First pregnancy					
No	181,158	14,491	8.0	166,667	92.0
Yes	139,400	17,739	12.7	121,661	87.3
Maternal Hypertension					
No	317,831	31,930	10.0	285,901	90.0
Yes	2,727	300	11.0	2,427	89.0
Maternal Diabetes					
No	319,085	32,114	10.1	286,971	89.9
Yes	1,473	116	7.9	1,357	92.1
Pre-eclampsia					
No	302,199	29,838	9.9	272,361	90.1
Yes	18,359	2,392	13.0	15,967	87.0
Gestational Diabetes					
No	305,310	30,764	10.1	274,546	89.9
Yes	15,248	1,466	9.6	13,782	90.4
First Ante-natal Care Visit					
<12 wks	169,605	14,872	8.8	154,733	91.2
12+ wks	150,953	17,358	11.5	133,595	88.5
Year of Birth					
1998	12,050	1,179	9.8	10,871	90.2
1999	51,095	5,122	10.0	45,973	90.0
2000	51,763	5,063	9.8	46,700	90.2
2001	50,511	5,058	10.0	45,453	90.0
2002	51,014	5,272	10.3	45,742	89.7
2003	52,125	5,346	10.3	46,779	89.7
2004	52,000	5,190	10.0	46,810	90.0
Season of Birth					
Summer	78,890	7,955	10.1	70,935	89.9
Autumn	77,764	7,907	10.2	69,857	89.8
Winter	77,188	7,645	9.9	69,543	90.1
Spring	86,716	8,723	10.1	77,993	89.9
Index of Relative Socio-Economic Disadvantage (IRSD) ^b					
1st quartile	77,030	10,152	13.2	66,878	86.8
2nd quartile	67,278	7,292	10.8	59,986	89.2
3rd quartile	76,820	7,074	9.2	69,746	90.8
4th quartile	99,430	7,712	7.8	91,718	92.2
TOTAL	320,558	32,230	10.1	288,328	89.9

(a) AGA average for gestational age ≥10th percentile birthweight

(b) Quartiles go from most socio-economically disadvantaged (1st quartile) to least socio-economically disadvantaged (4th quartile)

Results

There was minimal difference in covariates between the LGA based-analysis compared to the geocoded analysis (Table 1).

A-23: Average THM (µg/L) Exposure across entire pregnancy for all births based on LGA-wide average for Mother's LGA of Residence for Sydney Illawarra 1998-2004

THM	Number of Births	Mean µg/L	Std Dev µg/L	Min. µg/L	25 th % µg/L	Median µg/L	75 th % µg/L	Max. µg/L
LGA-wide average THM exposure for all births								
Trimester 1								
Chloroform	320,558	34.9	16.3	7.9	21.1	33.2	46.0	134.0
BDCM	320,558	16.3	4.7	4.6	12.5	15.8	19.0	51.0
DBCM	320,558	6.8	2.9	2.2	5.2	6.0	7.4	29.3
BrTHM	320,558	25.4	7.8	13.7	20.2	23.9	27.5	102.6
THM4	320,558	60.3	21.3	23.0	42.3	58.7	73.8	177.8
Trimester 2								
Chloroform	320,558	34.8	16.4	7.9	21.0	32.9	46.0	134.0
BDCM	320,558	16.1	4.6	4.6	12.3	15.7	18.9	51.0
DBCM	320,558	6.6	2.6	2.2	5.2	6.0	7.2	28.6
BrTHM	320,558	24.9	7.2	14.9	20.1	23.6	27.1	102.6
THM4	320,558	59.7	21.2	23.3	41.5	57.8	73.3	177.8
Trimester 3								
Chloroform	320,558	33.4	16.5	6.2	19.3	30.8	44.5	155.6
BDCM	320,558	15.3	4.6	3.6	11.7	14.7	18.1	55.4
DBCM	320,558	6.2	2.2	1.8	5.0	5.8	6.9	31.0
BrTHM	320,558	23.5	6.5	11.5	19.3	22.4	26.1	111.5
THM4	320,558	56.9	21.4	18.3	39.1	54.0	70.3	193.1
Entire Pregnancy								
Chloroform	320,558	34.9	15.1	7.9	21.1	33.2	46.0	134.0
BDCM	320,558	15.7	4.1	7.0	12.4	15.5	18.3	39.2
DBCM	320,558	6.5	2.2	2.8	5.2	5.9	7.0	23.2
BrTHM	320,558	24.2	5.7	15.2	20.2	23.2	26.3	61.2
THM4	320,558	58.0	19.1	27.4	41.9	56.8	70.2	147.4

Average THM (µg/L) Exposure across entire pregnancy for all births based Distribution System average for geocoded births, Sydney Illawarra 1998-2004

THM	Number of Births	Mean µg/L	Std Dev µg/L	Min. µg/L	25 th % µg/L	Median µg/L	75 th % µg/L	Max. µg/L
Distribution System average THM exposure for Geocoded Births								
Trimester 3								
Chloroform	314,982	33.3	17.6	1.7	18.7	30.2	44.1	147.9
BDCM	314,982	15.3	5.0	3.0	11.5	14.4	18.1	52.6
DBCM	314,982	6.1	2.3	0.5	1.9	5.4	6.9	38.1
BrTHM	314,982	23.4	7.2	5.5	19.0	22.0	26.1	133.9
THM4	314,982	56.6	23.1	13.6	38.1	52.7	69.3	216.5
Entire Pregnancy								
Chloroform	314,982	33.6	16.0	3.4	20.4	30.9	43.9	121.5
BDCM	314,982	15.8	4.5	5.7	12.2	15.3	18.1	33.8
DBCM	314,982	6.3	2.2	0.7	5.1	5.9	7.0	25.6
BrTHM	314,982	24.1	6.2	8.1	20.1	22.7	26.1	67.1
THM4	314,982	57.7	20.5	23.2	41.0	55.5	69.0	154.9

The concentrations of THMs were marginally larger in the LGA average estimates compared with the distribution system estimates except for BDCM which was slightly lower.

A-24: Adjusted Relative Risks (RR) for LGA-wide Average and Distribution System Average Exposure Estimates

		LGA - wide Exposure Estimation						Distribution System Exposure Estimation						%dif between Estimates	%dif between Standard Errors
		Estimate	Standard Error	PVal	RR	Lower 95% CI	Upper 95% CI	Estimate	Standard Error	PVal	RR	Lower 95% CI	Upper 95% CI		
TRIMESTER	IQR														
Chloroform															
Trimester 1	25	0.001453	0.000471	0.002046	1.04	1.01	1.06	0.00122	0.000415	0.003261	1.03	1.01	1.05	0.59	13.68
Trimester 2	25	0.001513	0.000505	0.002723	1.04	1.01	1.06	0.001018	0.000435	0.019321	1.03	1.00	1.05	1.25	15.99
Trimester 3	25	0.001703	0.000502	0.000693	1.04	1.02	1.07	0.00148	0.000435	0.000669	1.04	1.02	1.06	0.56	15.42
Entire Preg.	25	0.002129	0.000573	0.000201	1.05	1.03	1.08	0.001686	0.000496	0.000681	1.04	1.02	1.07	1.11	15.41
BDCM															
Trimester 1	5	0.00352	0.001487	0.017884	1.02	1.00	1.03	0.002945	0.001273	0.020655	1.01	1.00	1.03	0.29	16.82
Trimester 2	5	0.003274	0.00156	0.035864	1.02	1.00	1.03	0.002522	0.001333	0.058366	1.01	1.00	1.03	0.38	17.08
Trimester 3	5	0.004285	0.001525	0.004959	1.02	1.01	1.04	0.004354	0.001332	0.001083	1.02	1.01	1.04	-0.03	14.47
Entire Pregnancy	5	0.005771	0.001867	0.001996	1.03	1.01	1.05	0.004997	0.0016	0.001786	1.03	1.01	1.04	0.39	16.72
DBCm															
Trimester 1	2	0.002446	0.002001	0.221403	1.00	1.00	1.01	4.78E-05	0.001876	0.979678	1.00	0.99	1.01	0.48	6.66
Trimester 2	2	0.002677	0.002297	0.243819	1.01	1.00	1.01	-0.0008	0.002191	0.715873	1.00	0.99	1.01	0.70	4.83
Trimester 3	2	0.002045	0.002497	0.41267	1.00	0.99	1.01	-0.0003	0.002457	0.903767	1.00	0.99	1.01	0.47	1.62
Entire Pregnancy	2	0.003073	0.002665	0.248963	1.01	1.00	1.02	-0.00078	0.002666	0.769293	1.00	0.99	1.01	0.77	-0.03
BrTHM															
Trimester 1	5	0.001836	0.000761	0.015886	1.01	1.00	1.02	0.001092	0.00065	0.093249	1.01	1.00	1.01	0.37	17.08
Trimester 2	5	0.001894	0.000848	0.025573	1.01	1.00	1.02	0.000984	0.000723	0.173705	1.00	1.00	1.01	0.46	17.26
Trimester 3	5	0.002107	0.000901	0.01932	1.01	1.00	1.02	0.001814	0.000772	0.018728	1.01	1.00	1.02	0.15	16.74
Entire Pregnancy	5	0.003117	0.001112	0.005049	1.02	1.00	1.03	0.002102	0.000975	0.03112	1.01	1.00	1.02	0.51	13.98
THM4															
Trimester 1	25	0.00113	0.000341	0.000924	1.03	1.01	1.05	0.000825	0.000292	0.0047	1.02	1.01	1.04	0.76	16.87
Trimester 2	25	0.001093	0.000358	0.002234	1.03	1.01	1.05	0.000668	0.000304	0.027776	1.02	1.00	1.03	1.07	17.73
Trimester 3	25	0.001174	0.000354	0.00093	1.03	1.01	1.05	0.001009	0.000305	0.000952	1.03	1.01	1.04	0.41	16.12
Entire Pregnancy	25	0.001635	0.000426	0.000123	1.04	1.02	1.06	0.001193	0.000363	0.001011	1.03	1.01	1.05	1.11	17.25

¹Adjusted for maternal age, indigenous status, country of birth, gender, smoking anytime during pregnancy, parity, hypertension, maternal diabetes, pre-eclampsia, gestational diabetes, antenatal care visit, year of birth, season and socio-economic status

