

Supplementary Materials

Identifying critical periods of susceptibility for maternal exposure to biothermal stress and the risks of stillbirth and spontaneous preterm birth in Western Australia

Sylvester Dodzi Nyadanu*^{1,2}, Gizachew A. Tessema^{1,3,4}, Ben Mullins¹, Antonio Gasparrini⁵, Gavin Pereira^{1,4,6}

¹Curtin School of Population Health, Curtin University, Perth, Kent Street, Bentley, Western Australia 6102, Australia.

²Education, Culture, and Health Opportunities (ECHO) Ghana, ECHO Research Group International, Aflao, Ghana.

³School of Public Health, University of Adelaide, Adelaide, South Australia 5000, Australia

⁴enAble Institute, Curtin University, Perth, Kent Street, Bentley, Western Australia 6102, Australia

⁵Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, London, UK.

⁶WHO Collaborating Centre for Climate Change and Health Impact Assessment. Faculty of Health Science, Curtin University, WA, Australia.

*Correspondence: Curtin School of Population Health, Curtin University, Perth, Kent Street, Bentley, Western Australia 6102, Australia.

E-mail: sylvester.nyadanu@curtin.edu.au (SD Nyadanu)

Table of Contents

Appendix Table S1.	3
Appendix Table S2.	4-5
Appendix Table S3.	6-7
Appendix Table S4.	8
Appendix Figure S1.	9
Appendix Figure S2.	10
Appendix Figure S3.	11
Appendix Figure S4.	12
Appendix Figure S5.	13
Appendix Figure S6.	13
Appendix Figure S7.	14
Appendix Figure S8.	14
Appendix Figure S9.	15
Appendix Figure S10.	16
Appendix Figure S11.	17

Table S1. Descriptive statistics of the average UTCI (°C) during twelve weeks preconception through to gestational weeks at delivery exposure periods for sPTB cohort in Western Australia, 2000-2015 (N= 400,867 births)

Exposure periods	Min	Mean ± SD	Median	1 st	5 th	10 th	IQR	90 th	95 th	99 th	Max
Preconception to pregnancy	7.3	14.5 ± 2.5	14.2	10.2	11.9	12.8	1.2	15.4	17.4	26.0	31.2
Preconception	1.4	14.4 ± 5.2	14.0	5.8	7.6	8.2	8.8	20.9	22.0	29.5	35.8
Pregnancy	4.9	14.6 ± 2.9	14.2	9.6	11.3	11.9	2.9	16.7	18.3	26.7	34.1
1 st Trimester	1.7	14.6 ± 5.2	14.2	5.9	7.7	8.3	8.8	20.9	22.0	29.6	36.0
2 nd Trimester	1.6	14.6 ± 5.2	14.2	6.1	7.8	8.5	8.7	20.9	22.0	29.8	36.1
3 rd Trimester	-1.1	14.5 ± 5.2	14.0	5.8	7.7	8.4	8.7	20.8	22.0	29.7	35.7

Note: UTCI, Universal Thermal Climate Index; SD, standard deviation; P1 to P99, first to 99th centiles; IQR, interquartile range= P75-P25; sPTB, spontaneous preterm birth.

Table S2. Weekly-specific UTCI exposure over 12-week preconception (-11 to 0) through to gestational week at delivery (1 to 42) at different thresholds of UTCI using a median of 14.2 °C as a reference and the adjusted hazard ratios of Stillbirth in Western Australia, 2000–2015.

Week	P1			P5			P10			P90			P95			P99		
	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI
-11	1.01	0.93	1.09	1.00	0.95	1.05	1.00	0.97	1.02	1.01	0.98	1.04	1.03	0.96	1.10	1.04	0.97	1.12
-10	1.00	0.93	1.08	1.00	0.96	1.04	1.00	0.98	1.02	1.01	0.98	1.03	1.02	0.96	1.09	1.04	0.97	1.10
-9	1.00	0.94	1.06	0.99	0.96	1.03	1.00	0.98	1.01	1.01	0.99	1.03	1.02	0.97	1.08	1.03	0.98	1.09
-8	0.99	0.94	1.05	0.99	0.96	1.03	0.99	0.98	1.01	1.01	0.99	1.03	1.02	0.97	1.07	1.03	0.99	1.08
-7	0.99	0.94	1.04	0.99	0.96	1.02	0.99	0.98	1.01	1.01	0.99	1.02	1.01	0.97	1.06	1.03	0.99	1.07
-6	0.99	0.94	1.04	0.98	0.96	1.01	0.99	0.98	1.01	1.01	0.99	1.02	1.01	0.97	1.05	1.03	0.99	1.06
-5	0.98	0.94	1.03	0.98	0.95	1.01	0.99	0.98	1.00	1.01	0.99	1.02	1.01	0.97	1.05	1.03	0.99	1.06
-4	0.98	0.94	1.03	0.98	0.95	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.97	1.05	1.02	0.99	1.06
-3	0.98	0.93	1.03	0.98	0.95	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.97	1.05	1.02	0.99	1.05
-2	0.98	0.93	1.03	0.98	0.95	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.97	1.05	1.02	0.99	1.05
-1	0.98	0.93	1.03	0.97	0.95	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.96	1.05	1.02	0.98	1.06
0	0.98	0.93	1.03	0.97	0.94	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.96	1.05	1.02	0.98	1.06
1	0.98	0.93	1.03	0.97	0.94	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.96	1.05	1.02	0.98	1.06
2	0.98	0.93	1.03	0.97	0.94	1.01	0.99	0.97	1.00	1.00	0.99	1.02	1.01	0.96	1.05	1.02	0.98	1.06
3	0.98	0.93	1.03	0.98	0.95	1.01	0.99	0.97	1.00	1.01	0.99	1.02	1.01	0.96	1.05	1.02	0.98	1.06
4	0.98	0.93	1.03	0.98	0.95	1.01	0.99	0.97	1.00	1.01	0.99	1.02	1.01	0.97	1.05	1.02	0.98	1.06
5	0.98	0.94	1.03	0.98	0.95	1.01	0.99	0.97	1.00	1.01	0.99	1.02	1.01	0.97	1.05	1.02	0.98	1.06
6	0.99	0.94	1.04	0.98	0.96	1.01	0.99	0.98	1.00	1.01	0.99	1.02	1.01	0.97	1.05	1.02	0.98	1.05
7	0.99	0.95	1.04	0.99	0.96	1.01	0.99	0.98	1.00	1.01	0.99	1.02	1.02	0.98	1.06	1.02	0.99	1.05
8	1.00	0.95	1.04	0.99	0.96	1.02	0.99	0.98	1.00	1.01	0.99	1.02	1.02	0.98	1.06	1.02	0.99	1.05
9	1.00	0.96	1.05	0.99	0.97	1.02	0.99	0.98	1.01	1.01	0.99	1.02	1.02	0.99	1.06	1.02	0.99	1.05
10	1.01	0.96	1.05	1.00	0.97	1.02	1.00	0.98	1.01	1.01	1.00	1.02	1.02	0.99	1.06	1.02	0.99	1.05
11	1.01	0.97	1.05	1.00	0.97	1.03	1.00	0.98	1.01	1.01	1.00	1.02	1.03	0.99	1.07	1.02	0.99	1.05
12	1.01	0.97	1.06	1.00	0.98	1.03	1.00	0.99	1.01	1.01	1.00	1.03	1.03	0.99	1.07	1.02	0.99	1.06
13	1.02	0.97	1.07	1.01	0.98	1.03	1.00	0.99	1.01	1.01	1.00	1.03	1.03	0.99	1.07	1.02	0.99	1.06
14	1.02	0.98	1.07	1.01	0.98	1.04	1.00	0.99	1.02	1.01	1.00	1.03	1.03	0.99	1.07	1.02	0.99	1.06
15	1.03	0.98	1.08	1.01	0.99	1.04	1.00	0.99	1.02	1.01	0.99	1.03	1.03	0.99	1.07	1.02	0.99	1.06
16	1.03	0.99	1.08	1.02	0.99	1.05	1.01	0.99	1.02	1.01	0.99	1.03	1.03	0.99	1.08	1.02	0.99	1.06

17	1.04	0.99	1.09	1.02	1.00	1.05	1.01	0.99	1.02	1.01	0.99	1.03	1.03	0.99	1.08	1.02	0.99	1.06
18	1.04	0.99	1.09	1.03	1.00	1.05	1.01	1.00	1.02	1.01	0.99	1.03	1.03	0.99	1.08	1.02	0.99	1.06
19	1.05	1.00	1.09	1.03	1.00	1.06	1.01	1.00	1.02	1.01	0.99	1.03	1.04	0.99	1.08	1.02	0.99	1.06
20	1.05	1.00	1.10	1.03	1.01	1.06	1.01	1.00	1.03	1.01	0.99	1.03	1.04	1.00	1.08	1.02	0.99	1.06
21	1.05	1.01	1.10	1.04	1.01	1.06	1.02	1.00	1.03	1.01	0.99	1.03	1.03	1.00	1.08	1.02	0.99	1.06
22	1.06	1.01	1.11	1.04	1.02	1.07	1.02	1.01	1.03	1.01	0.99	1.02	1.03	1.00	1.07	1.02	0.99	1.05
23	1.06	1.02	1.11	1.05	1.02	1.07	1.02	1.01	1.03	1.01	0.99	1.02	1.03	1.00	1.07	1.02	0.99	1.05
24	1.07	1.02	1.11	1.05	1.02	1.08	1.02	1.01	1.03	1.01	0.99	1.02	1.03	1.00	1.07	1.02	0.99	1.05
25	1.07	1.03	1.12	1.05	1.03	1.08	1.02	1.01	1.04	1.01	0.99	1.02	1.03	1.00	1.07	1.02	0.99	1.05
26	1.08	1.03	1.12	1.06	1.03	1.08	1.03	1.01	1.04	1.01	0.99	1.02	1.03	0.99	1.07	1.02	0.99	1.05
27	1.08	1.04	1.13	1.06	1.04	1.09	1.03	1.02	1.04	1.01	0.99	1.02	1.03	0.99	1.07	1.02	0.99	1.05
28	1.08	1.04	1.13	1.06	1.04	1.09	1.03	1.02	1.04	1.01	0.99	1.02	1.03	0.99	1.07	1.02	0.99	1.05
29	1.09	1.04	1.14	1.07	1.04	1.10	1.03	1.02	1.05	1.00	0.99	1.02	1.03	0.99	1.07	1.02	0.98	1.05
30	1.09	1.04	1.14	1.07	1.04	1.10	1.04	1.02	1.05	1.00	0.99	1.02	1.03	0.98	1.07	1.02	0.98	1.05
31	1.10	1.04	1.15	1.08	1.05	1.11	1.04	1.02	1.05	1.00	0.98	1.02	1.02	0.98	1.07	1.01	0.98	1.05
32	1.10	1.05	1.16	1.08	1.05	1.11	1.04	1.02	1.06	1.00	0.98	1.02	1.02	0.97	1.07	1.01	0.98	1.05
33	1.11	1.05	1.17	1.08	1.05	1.12	1.04	1.03	1.06	1.00	0.98	1.02	1.02	0.97	1.08	1.01	0.97	1.06
34	1.11	1.04	1.18	1.09	1.05	1.13	1.04	1.03	1.06	1.00	0.98	1.02	1.02	0.96	1.08	1.01	0.97	1.06
35	1.11	1.04	1.19	1.09	1.05	1.13	1.05	1.03	1.07	1.00	0.97	1.02	1.02	0.96	1.08	1.01	0.96	1.06
36	1.12	1.04	1.20	1.10	1.05	1.14	1.05	1.03	1.07	1.00	0.97	1.03	1.01	0.95	1.08	1.01	0.96	1.06
37	1.12	1.04	1.21	1.10	1.05	1.15	1.05	1.03	1.07	1.00	0.97	1.03	1.01	0.94	1.09	1.01	0.95	1.07
38	1.13	1.04	1.22	1.11	1.05	1.16	1.05	1.03	1.08	1.00	0.96	1.03	1.01	0.94	1.09	1.01	0.95	1.07
39	1.13	1.03	1.24	1.11	1.05	1.17	1.06	1.03	1.08	0.99	0.96	1.03	1.01	0.93	1.10	1.01	0.94	1.08
40	1.13	1.03	1.25	1.11	1.06	1.17	1.06	1.03	1.09	0.99	0.96	1.03	1.01	0.92	1.10	1.00	0.93	1.08
41	1.14	1.03	1.26	1.12	1.06	1.18	1.06	1.03	1.09	0.99	0.95	1.03	1.00	0.91	1.10	1.00	0.93	1.08
42	1.14	1.03	1.27	1.12	1.06	1.19	1.06	1.03	1.09	0.99	0.95	1.03	1.00	0.90	1.11	1.00	0.92	1.09

Note: Models were fitted from distributed lag non-linear Cox proportional hazards models with adjustment for infant sex, maternal age, race or ethnicity, marital status, smoking status, parity, remoteness, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; LCI, 95% lower confidence interval; UCI, 95% upper confidence interval; UTCI, Universal Thermal Climate Index; P1-P99; 1st-99th centile of UTCI

Table S3. Weekly-specific UTCI exposure over 12-week preconception (-11 to 0) through to gestational week at delivery (1 to 36) at different thresholds of UTCI using the median of 14.2 °C as a reference and the adjusted hazard ratios of sPTB in Western Australia, 2000–2015.

Week	P1			P5			P10			P90			P95			P99		
	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI	HR	LCI	UCI
-11	0.96	0.94	0.99	0.97	0.95	0.99	0.98	0.97	1.00	1.01	1.00	1.02	1.01	0.99	1.04	1.05	1.02	1.08
-10	0.97	0.95	1.00	0.98	0.96	1.00	0.99	0.98	1.00	1.01	1.00	1.01	1.01	0.99	1.04	1.04	1.01	1.07
-9	0.98	0.96	1.00	0.98	0.97	1.00	0.99	0.98	1.00	1.01	1.00	1.01	1.01	0.99	1.03	1.03	1.01	1.06
-8	0.99	0.97	1.01	0.99	0.97	1.00	0.99	0.98	1.00	1.00	1.00	1.01	1.01	0.99	1.03	1.03	1.01	1.05
-7	0.99	0.98	1.01	0.99	0.98	1.01	1.00	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.03	1.02	1.00	1.04
-6	1.00	0.98	1.02	1.00	0.99	1.01	1.00	0.99	1.01	1.00	1.00	1.01	1.01	1.00	1.03	1.01	1.00	1.03
-5	1.01	0.99	1.03	1.00	0.99	1.02	1.00	0.99	1.01	1.00	1.00	1.01	1.01	1.00	1.02	1.01	1.00	1.02
-4	1.01	1.00	1.03	1.01	0.99	1.02	1.00	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.00	0.99	1.01
-3	1.02	1.00	1.04	1.01	1.00	1.02	1.00	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.00	0.99	1.01
-2	1.02	1.00	1.04	1.01	1.00	1.03	1.01	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.98	1.01
-1	1.03	1.01	1.05	1.02	1.00	1.03	1.01	1.00	1.02	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.98	1.01
0	1.03	1.01	1.05	1.02	1.00	1.03	1.01	1.00	1.02	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.98	1.00
1	1.03	1.01	1.05	1.02	1.00	1.03	1.01	1.00	1.02	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.97	1.00
2	1.03	1.01	1.05	1.02	1.00	1.03	1.01	1.00	1.02	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.97	1.00
3	1.03	1.01	1.05	1.01	1.00	1.03	1.01	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.97	1.00
4	1.02	1.00	1.04	1.01	1.00	1.03	1.01	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.98	1.01
5	1.02	1.00	1.04	1.01	1.00	1.02	1.00	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	0.99	0.98	1.01
6	1.02	1.00	1.03	1.01	0.99	1.02	1.00	0.99	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.00	0.98	1.01
7	1.01	0.99	1.03	1.00	0.99	1.01	1.00	0.99	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.00	0.99	1.01
8	1.01	0.99	1.02	1.00	0.99	1.01	1.00	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.00	0.99	1.01
9	1.00	0.98	1.02	1.00	0.98	1.01	1.00	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.01	0.99	1.02
10	1.00	0.98	1.01	0.99	0.98	1.01	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.01	1.00	1.02
11	0.99	0.98	1.01	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.01	1.00	1.02
12	0.99	0.98	1.01	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.01	1.00	1.02
13	0.99	0.97	1.01	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.01	1.00	1.03
14	0.99	0.97	1.01	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
15	0.99	0.97	1.01	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
16	0.99	0.97	1.01	0.99	0.98	1.00	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03

17	0.99	0.97	1.01	0.99	0.98	1.01	0.99	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
18	0.99	0.98	1.01	0.99	0.98	1.01	1.00	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
19	1.00	0.98	1.01	1.00	0.98	1.01	1.00	0.99	1.00	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
20	1.00	0.98	1.02	1.00	0.99	1.01	1.00	0.99	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
21	1.00	0.99	1.02	1.00	0.99	1.01	1.00	0.99	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
22	1.01	0.99	1.02	1.01	0.99	1.02	1.00	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.02	1.00	1.03
23	1.01	0.99	1.03	1.01	1.00	1.02	1.01	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.01	1.00	1.03
24	1.01	1.00	1.03	1.01	1.00	1.03	1.01	1.00	1.01	1.00	1.00	1.01	1.01	0.99	1.02	1.01	1.00	1.02
25	1.02	1.00	1.03	1.02	1.01	1.03	1.01	1.00	1.02	1.00	1.00	1.00	1.01	0.99	1.02	1.01	1.00	1.02
26	1.02	1.01	1.04	1.02	1.01	1.03	1.01	1.01	1.02	1.00	0.99	1.00	1.01	0.99	1.02	1.01	1.00	1.02
27	1.03	1.02	1.05	1.03	1.02	1.04	1.02	1.01	1.02	1.00	0.99	1.00	1.01	0.99	1.02	1.01	1.00	1.02
28	1.04	1.02	1.05	1.03	1.02	1.05	1.02	1.01	1.03	1.00	0.99	1.00	1.01	0.99	1.02	1.01	0.99	1.02
29	1.04	1.03	1.06	1.04	1.03	1.05	1.02	1.02	1.03	1.00	0.99	1.00	1.01	0.99	1.02	1.00	0.99	1.02
30	1.05	1.03	1.07	1.05	1.03	1.06	1.03	1.02	1.03	1.00	0.99	1.00	1.01	0.99	1.02	1.00	0.99	1.01
31	1.06	1.04	1.08	1.05	1.04	1.07	1.03	1.02	1.04	1.00	0.99	1.00	1.01	0.99	1.02	1.00	0.98	1.01
32	1.06	1.04	1.08	1.06	1.04	1.07	1.03	1.03	1.04	0.99	0.99	1.00	1.00	0.99	1.02	1.00	0.98	1.01
33	1.07	1.05	1.09	1.06	1.05	1.08	1.04	1.03	1.04	0.99	0.99	1.00	1.00	0.99	1.02	0.99	0.98	1.01
34	1.08	1.05	1.10	1.07	1.05	1.09	1.04	1.03	1.05	0.99	0.99	1.00	1.00	0.98	1.03	0.99	0.97	1.01
35	1.09	1.06	1.11	1.08	1.06	1.10	1.04	1.03	1.05	0.99	0.98	1.00	1.00	0.98	1.03	0.99	0.97	1.01
36	1.09	1.06	1.12	1.08	1.06	1.11	1.05	1.04	1.06	0.99	0.98	1.00	1.00	0.98	1.03	0.99	0.96	1.01

Note: Models were fitted from distributed lag non-linear Cox proportional hazards models with adjustment for infant sex, maternal age, race or ethnicity, marital status, smoking status, parity, remoteness, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; LCI, 95% lower confidence interval; UCI, 95% upper confidence interval; UTCI, Universal Thermal Climate Index; P1-P99; 1st-99th centile of UTCI.

Table S4. The exposure-response association between maternal cumulative UTCI exposures over twelve weeks preconception through to birth by subgroup in the 1st and 99th exposure centile as compared with median in Western Australia, 2000–2015.

Subgroup	Category	UTCI Centile	Stillbirth			sPTB		
			HR	LCI	UCI	HR	LCI	UCI
Year of birth	2000-2007	P1	1.39	1.08	1.79	1.08	0.95	1.24
		P99	0.89	0.64	1.22	1.00	0.89	1.11
	2008-2015	P1	1.24	0.97	1.57	1.05	0.93	1.20
		P99	0.79	0.55	1.14	0.95	0.84	1.07
Sex of baby	Male	P1	1.27	0.99	1.63	1.14	1.00	1.30
		P99	0.82	0.58	1.17	1.04	0.92	1.17
	Female	P1	1.31	1.02	1.68	1.03	0.91	1.17
		P99	0.97	0.71	1.33	0.91	0.82	1.02
Race/ethnicity	Caucasian	P1	1.32	1.06	1.63	1.02	0.91	1.13
		P99	0.94	0.66	1.36	0.94	0.83	1.06
	Non-Caucasian	P1	1.31	0.76	2.28	1.20	1.03	1.39
		P99	1.02	0.78	1.33	0.98	0.86	1.13
Maternal age at birth	< 35 years old	P1	1.36	1.12	1.64	1.00	0.91	1.10
		P99	0.92	0.71	1.18	1.00	0.92	1.09
	≥ 35 years old	P1	1.01	0.67	1.52	1.00	0.80	1.25
		P99	1.09	0.60	1.97	1.00	0.79	1.26
Socioeconomic status (SES)	High	P1	1.18	0.98	1.41	1.08	0.95	1.23
		P99	1.01	0.71	1.42	0.92	0.81	1.04
	Low/Moderate	P1	1.22	1.00	1.49	1.02	0.92	1.12
		P99	0.84	0.58	1.19	0.99	0.88	1.12
Remoteness	Urban	P1	0.98	0.82	1.17	1.09	0.99	1.20
		P99	1.04	0.91	1.18	0.90	0.84	0.97
	Rural	P1	1.34	1.09	1.65	1.11	0.99	1.26
		P99	1.02	0.75	1.39	0.92	0.83	1.03
Smoked during pregnancy	No	P1	1.34	1.09	1.64	1.02	0.91	1.13
		P99	0.96	0.73	1.27	0.94	0.85	1.04
	Yes	P1	1.22	0.85	1.74	1.18	0.98	1.42
		P99	0.88	0.54	1.45	0.85	0.73	1.01
Parity	Nulliparity	P1	1.36	1.04	1.78	1.11	0.97	1.28
		P99	0.88	0.61	1.28	1.00	0.88	1.14
	Multiparity	P1	1.24	0.99	1.56	1.03	0.92	1.16
		P99	0.97	0.71	1.32	0.99	0.89	1.10
Pregnancy complications	No	P1	1.29	0.90	1.85	1.14	0.98	1.32
		P99	0.98	0.58	1.66	0.92	0.79	1.05
	Yes	P1	1.27	1.04	1.56	1.10	0.98	1.23
		P99	0.91	0.70	1.19	1.01	0.91	1.12

Note: HR, hazard ratio; LCI, 95% lower confidence interval; UCI, 95% upper confidence interval; UTCI, Universal Thermal Climate Index; P1 and P99; 1st and 99th centile of UTCI; sPTB, spontaneous preterm birth; SES, socioeconomic status.

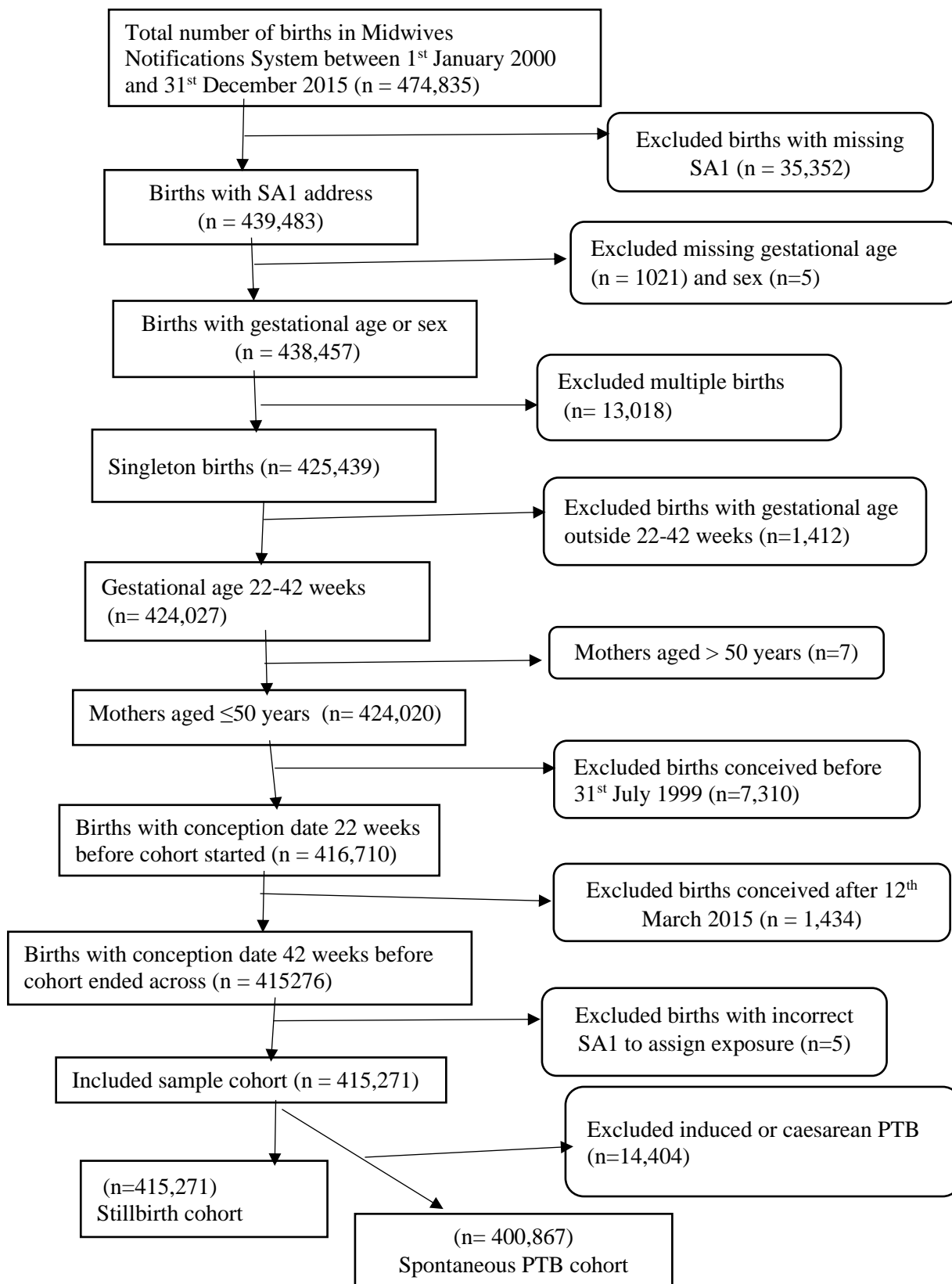


Figure S1 Flow chart for selecting the eligible births included in this study, Western Australia, 2000-2015. Note: SA1, statistical area level 1; PTB, preterm birth.

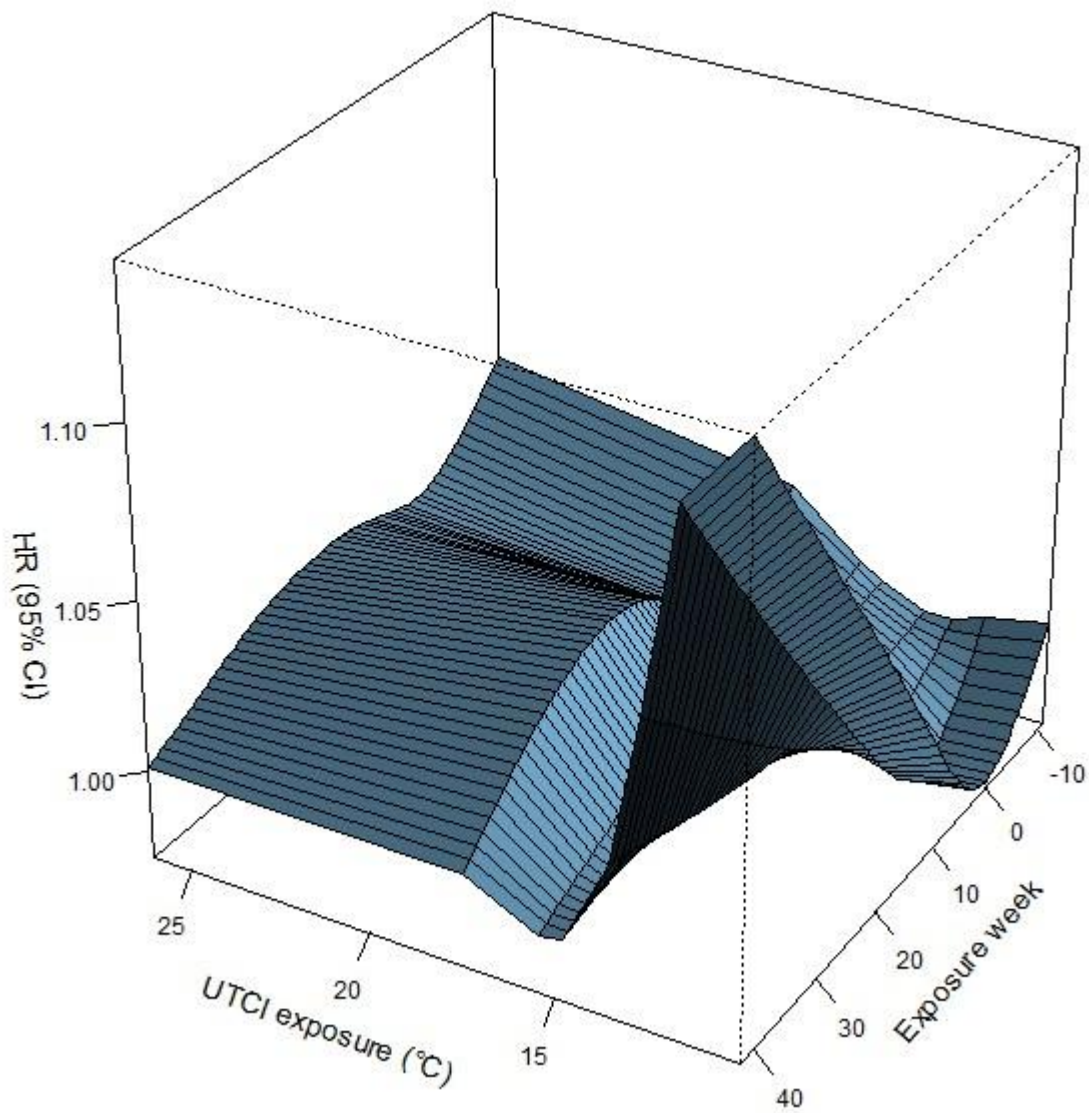


Figure S2. A three-dimensional surface plot of the adjusted hazard ratios of stillbirth associated with weekly-specific UTCI exposure over 12-week preconception (-11 to 0) through to gestational week at delivery (1 to 42) UTCI using the median of 14.2 °C as a reference in Western Australia, 2000-2015.

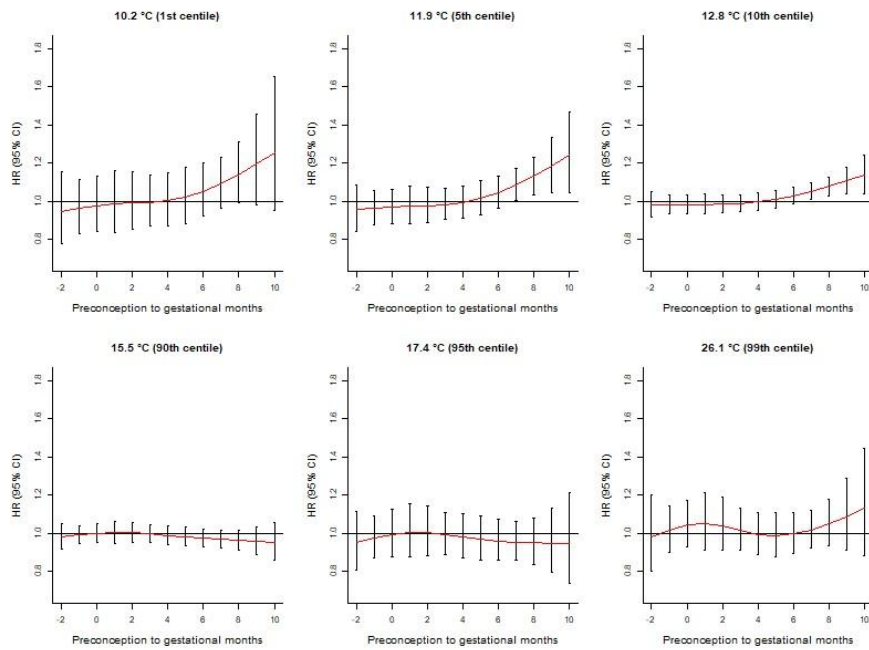


Figure S3. Adjusted hazard ratios of stillbirth associated with monthly-specific UTCI over from three months preconception (-2 to 0) to birth (1 to 10) at different thresholds of UTCI using the median of 14.2 °C as a reference in Western Australia, 2000–2015. Solid horizontal red lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were fitted from distributed lag non-linear Cox proportional hazards models with adjustment for infant sex, maternal age, race or ethnicity, marital status, smoking status, parity, remoteness, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; UTCI, Universal Thermal Climate Index.

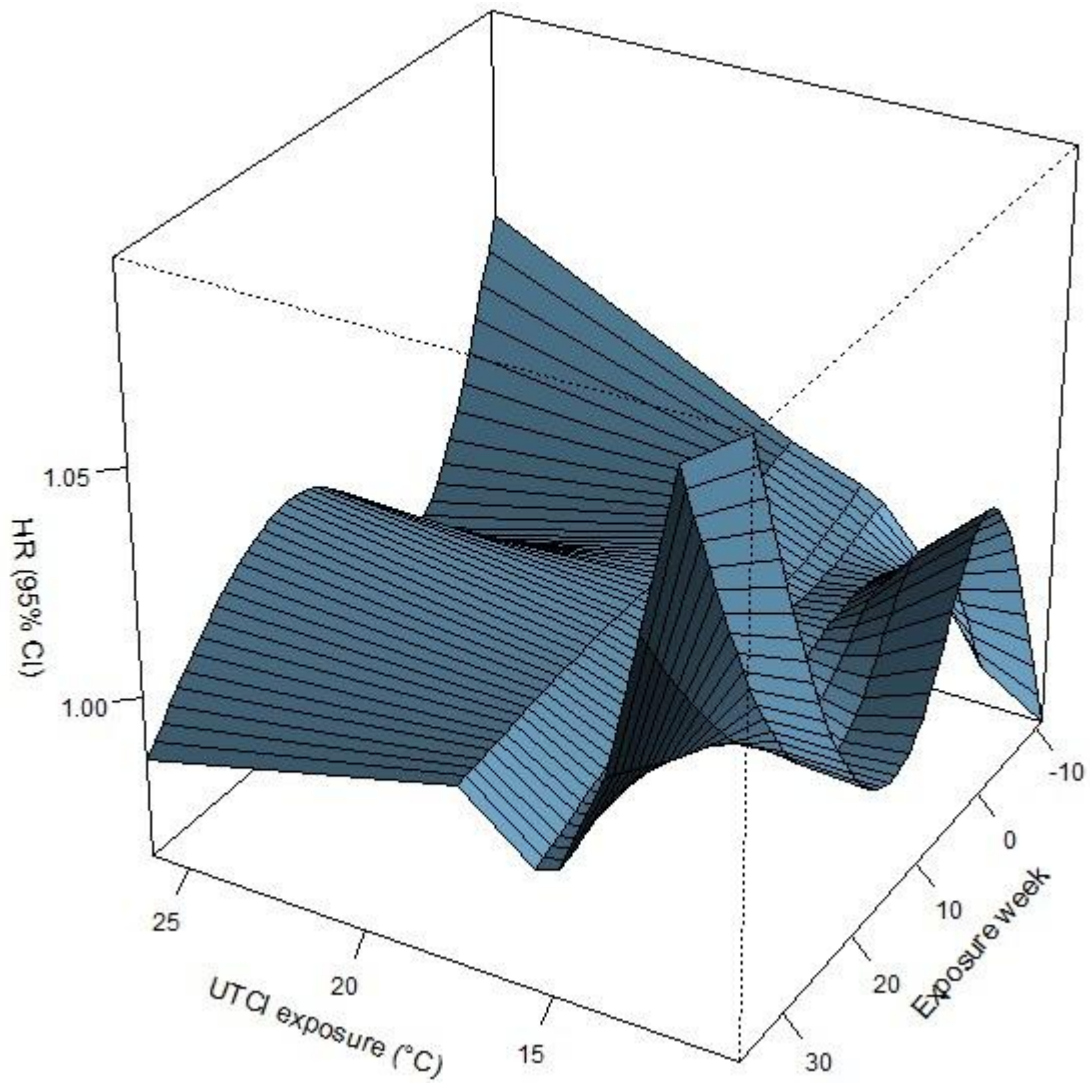


Figure S4. A three-dimensional surface plot of the adjusted hazard ratios of spontaneous preterm birth associated with weekly-specific UTCI exposure over 12-week preconception (-11 to 0) through to gestational week at delivery (1 to 36) UTCI using the median of 14.2 °C as a reference in Western Australia, 2000-2015.

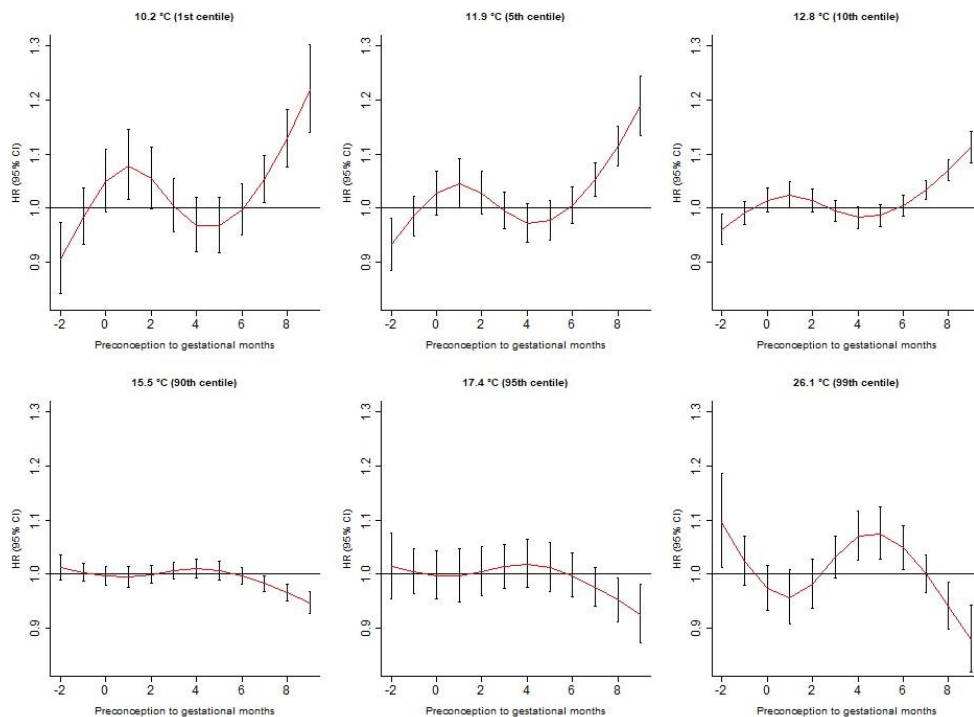


Figure S5. Adjusted hazard ratios of sPTB associated with monthly-specific UTCI over from three months preconception (-2 to 0) to birth (1 to 9) at different thresholds of UTCI using the median of 14.2 °C as a reference in Western Australia, 2000–2015. Solid horizontal red lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were fitted from distributed lag non-linear Cox proportional hazards models with adjustment for infant sex, maternal age, race or ethnicity, marital status, smoking status, parity, remoteness, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; sPTB, spontaneous preterm birth; UTCI, Universal Thermal Climate Index.

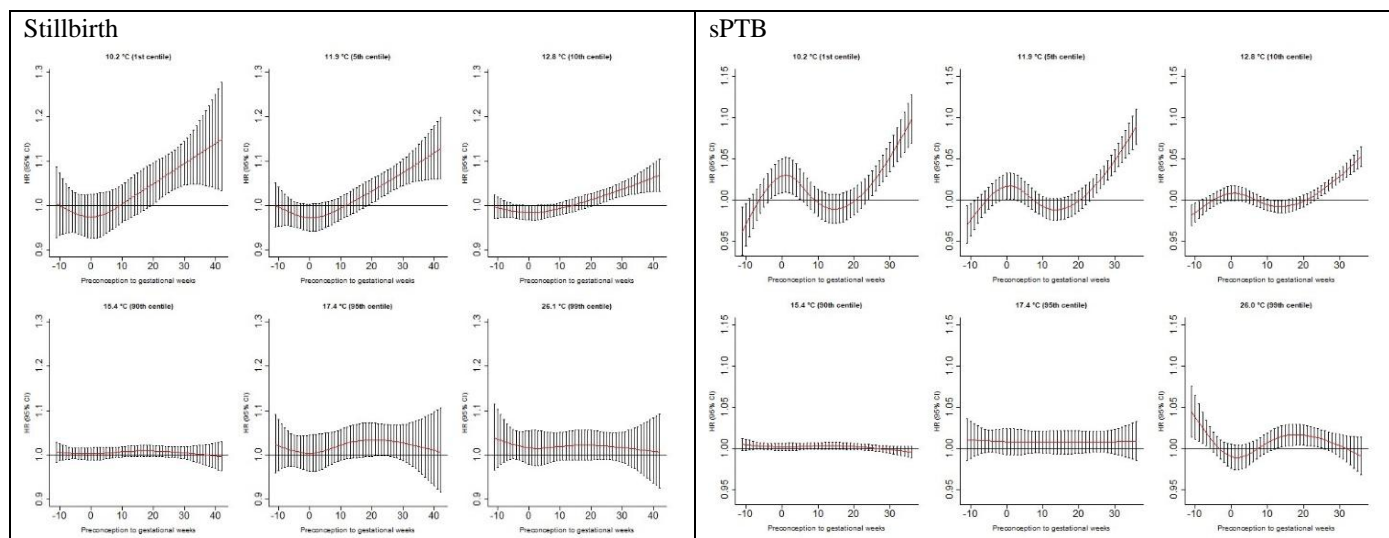


Figure S6. The exposure-response association between maternal cumulative average UTCI exposures over twelve weeks preconception through to gestational weeks at birth with reference to mean 14.5 °C and the hazard ratios HR (95% CI) of stillbirth and sPTB. Mean rather than median UTCI was used as reference. Solid horizontal lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were adjusted for race or ethnicity, infant sex, maternal age, smoking status, remoteness, marital status, parity, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; sPTB, spontaneous preterm birth; UTCI, Universal Thermal Climate Index

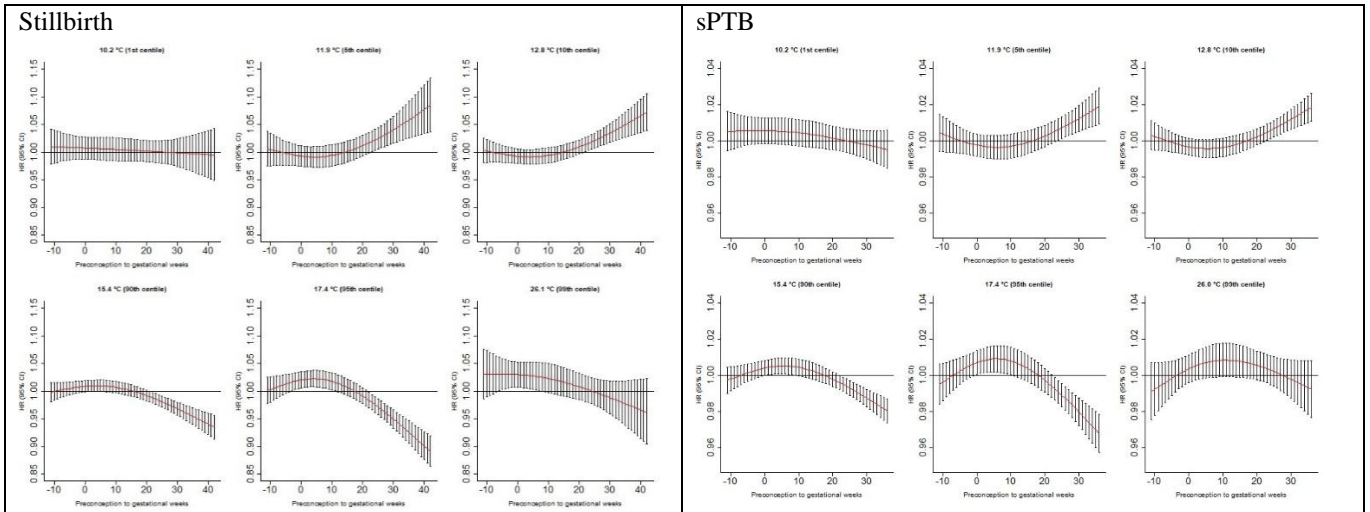


Figure S7. The exposure-response association between maternal cumulative average UTCI exposures over twelve weeks preconception through to gestational weeks at birth with reference to mean 14.2 °C and the hazard ratios HR (95% CI) of stillbirth and sPTB. Degrees of freedom in constructing the crossbasis matrix were decreased by one for both exposure (that is 5 *df*) and exposure period (that is 3 *df*). Solid horizontal lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were adjusted for race or ethnicity, infant sex, maternal age, smoking status, remoteness, marital status, parity, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; sPTB, spontaneous preterm birth; UTCI, Universal Thermal Climate Index; *df*, degree of freedom.

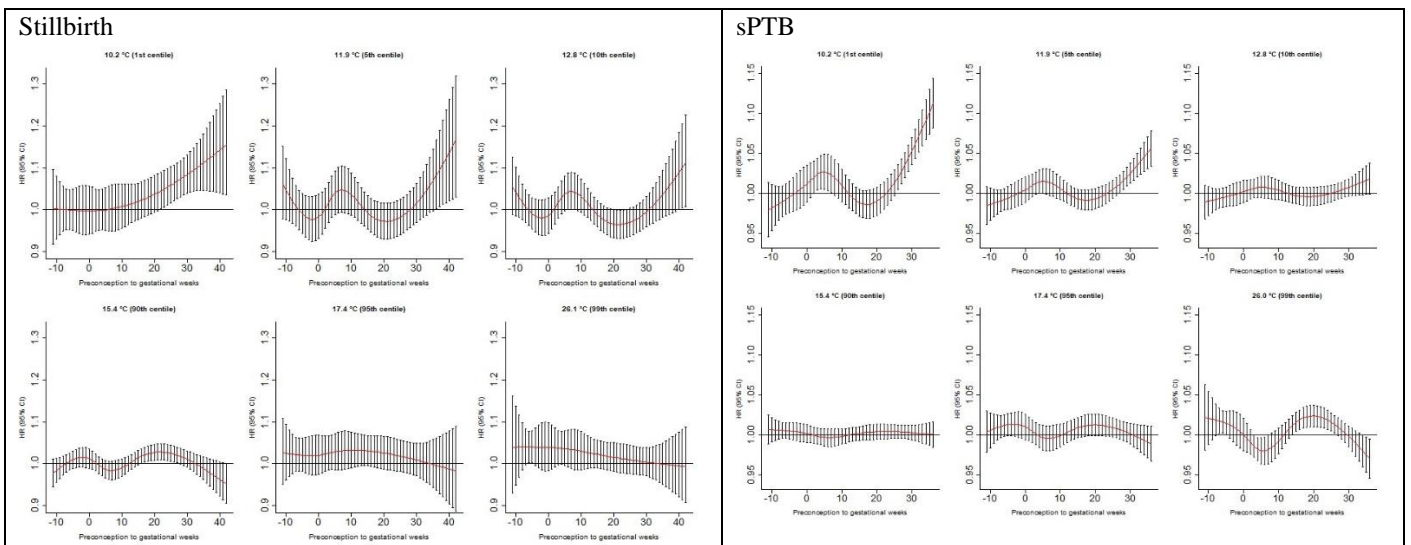


Figure S8. The exposure-response association between maternal cumulative average UTCI exposures over twelve weeks preconception through to gestational weeks at birth with reference to mean 14.2 °C and the hazard ratios HR (95% CI) of stillbirth and sPTB. Degrees of freedom in constructing the crossbasis matrix were increased by one for both exposure (that is 7 *df*) and exposure period (that is 5 *df*). Solid horizontal lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were adjusted for race or ethnicity, infant sex, maternal age, smoking status, remoteness, marital status, parity, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; sPTB, spontaneous preterm birth; UTCI, Universal Thermal Climate Index; *df*, degree of freedom.

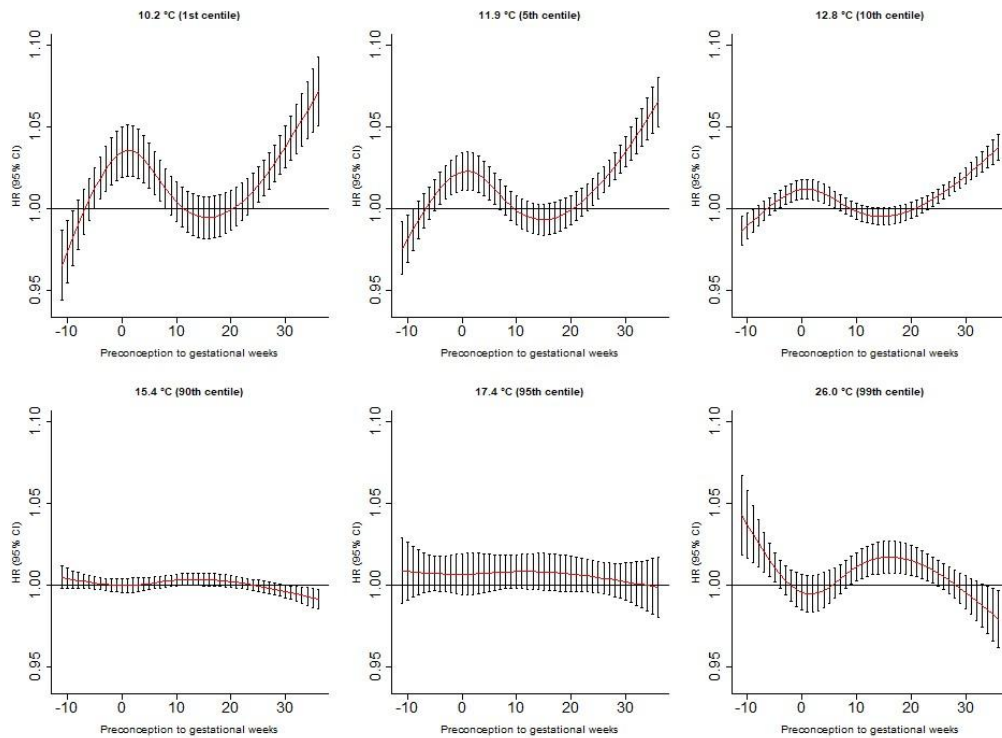


Figure S9. The exposure-response association between maternal cumulative average UTCI exposures over twelve weeks preconception through to gestational weeks at birth with reference to mean 14.2 °C and the hazard ratios HR (95% CI) of preterm birth. Analysed singleton births (N= 413,348 births). Solid horizontal lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were adjusted for race or ethnicity, infant sex, maternal age, smoking status, remoteness, marital status, parity, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; UTCI, Universal Thermal Climate Index.

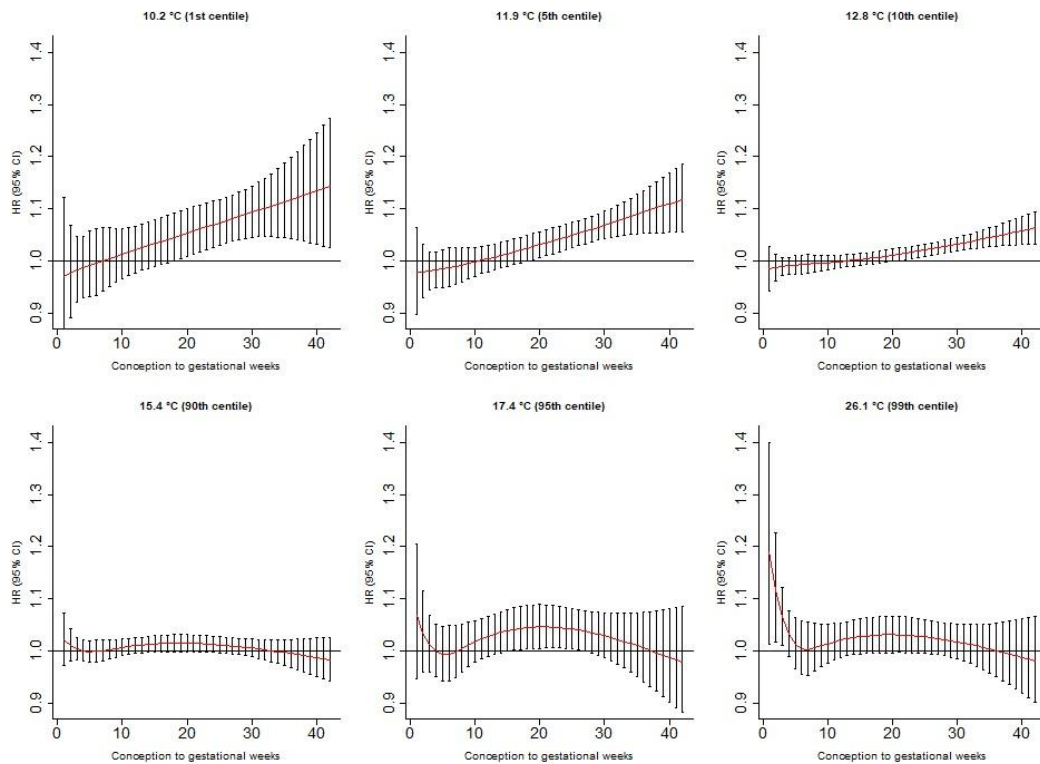


Figure S10. Adjusted hazard ratios of stillbirth associated with weekly-specific UTCI over 12-week conception through to gestational week at delivery (1 to 42) at different thresholds of UTCI using the median of 14.2 °C as a reference in Western Australia, 2000–2015. Solid horizontal red lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were fitted from distributed lag non-linear Cox proportional hazards models with adjustment for infant sex, maternal age, race or ethnicity, marital status, smoking status, parity, remoteness, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; UTCI, Universal Thermal Climate Index.

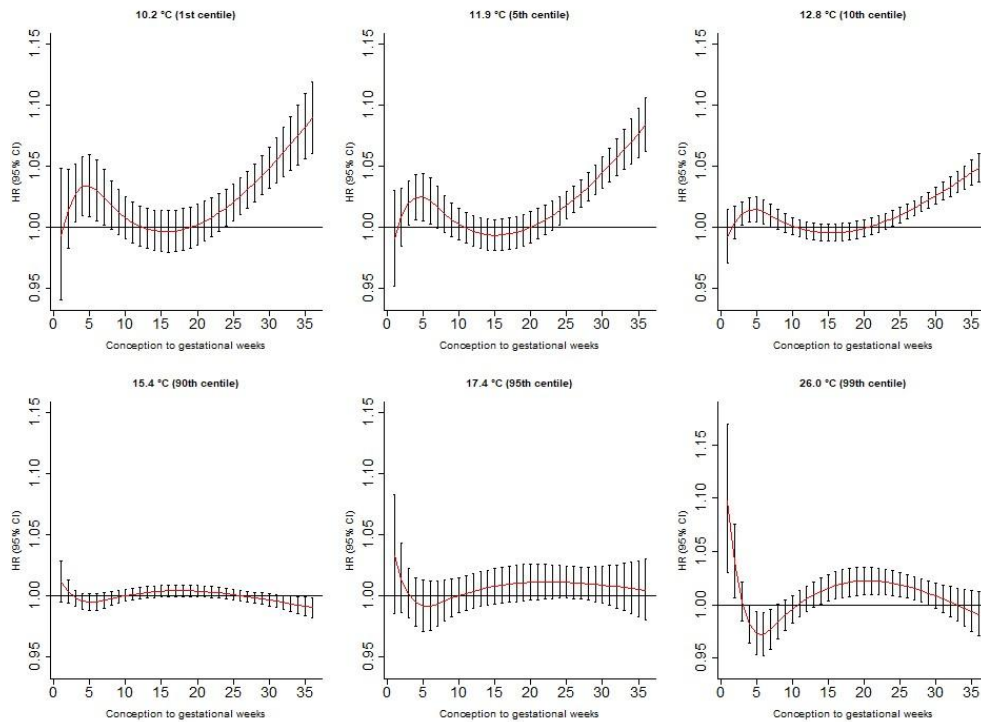


Figure S11. Adjusted hazard ratios of sPTB associated with weekly-specific UTCI over 12-week conception through to gestational week at delivery (1 to 36) at different thresholds of UTCI using the median of 14.2 °C as a reference in Western Australia, 2000–2015. Solid horizontal red lines represent point estimates, and the vertical bars represent 95% confidence intervals. Models were fitted from distributed lag non-linear Cox proportional hazards models with adjustment for infant sex, maternal age, race or ethnicity, marital status, smoking status, parity, remoteness, socioeconomic status, and year and season of conception. Note: HR, hazard ratio; CI, confidence interval; sPTB, spontaneous preterm birth; UTCI, Universal Thermal Climate Index.