

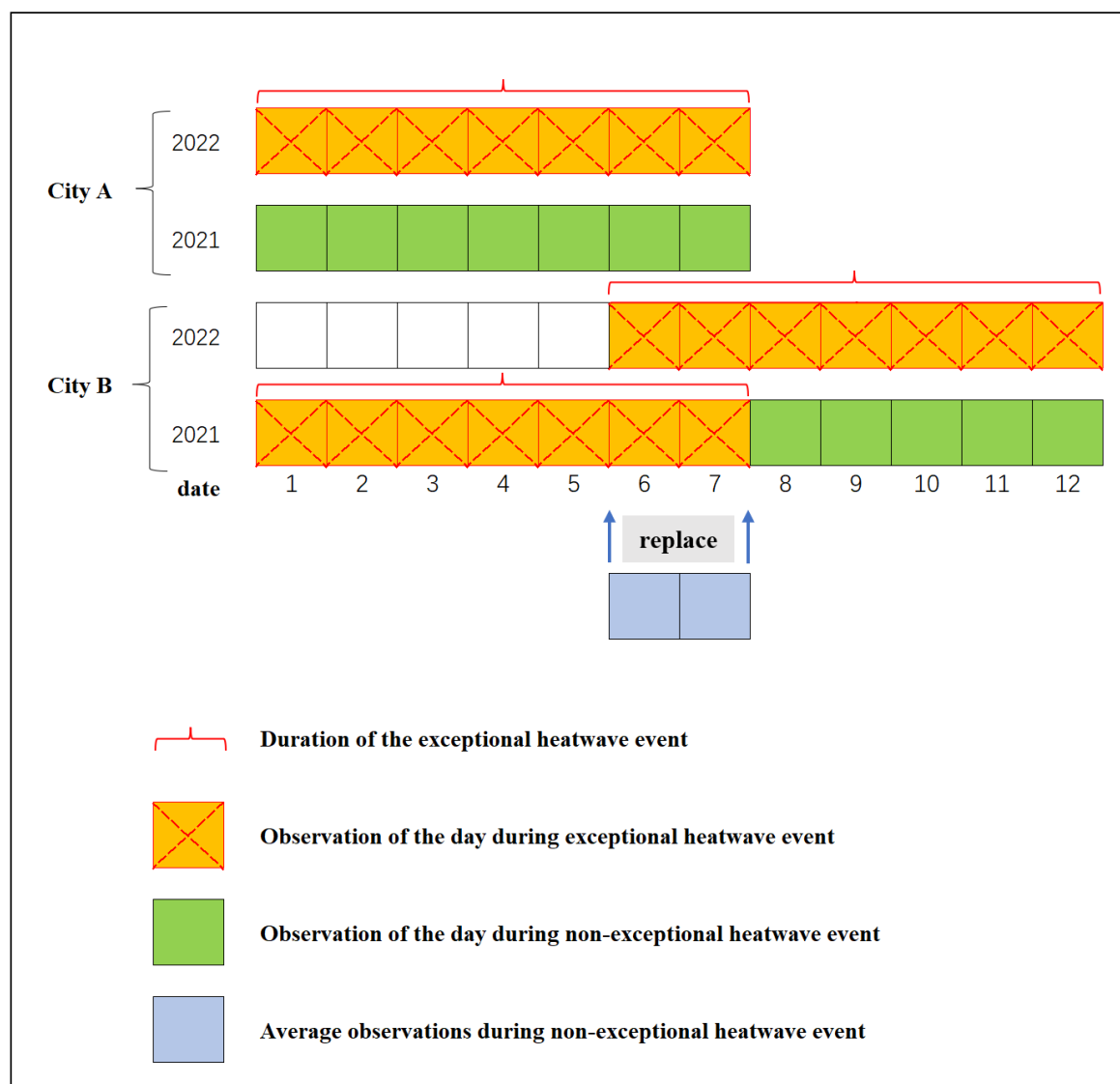
Supplementary appendix

2022 Summer record-breaking heatwave and health information-seeking behaviours: an infodemiology study in Mainland China

Contents

Supplemental Figure S1.....	2
Supplemental Figure S2.....	3
Supplemental Figure S3.....	4
Supplemental Figure S4.....	5
Supplemental Figure S5.....	6
Supplemental Figure S6.....	7
Supplemental Table S1	8
Supplemental Table S2	8
References.....	9

Supplemental Figure S1

**Figure S1. Demonstration of matching days of the exceptional heatwave event in 2022 to control days in 2021.**

The matching process was conducted for two cases. Example 1: if city A did not contain days of the exceptional heatwave event during the 2021 control period, observations (e.g., temperature) during the control period were directly included in the final analysis. Example 2: if city B included days of the exceptional heatwave event during the 2021 control period, observations of days of the exceptional heatwave event during the control period were replaced with averaged observations during non-exceptional heatwave event in the summer of 2021 (June-August).

Supplemental Figure S2

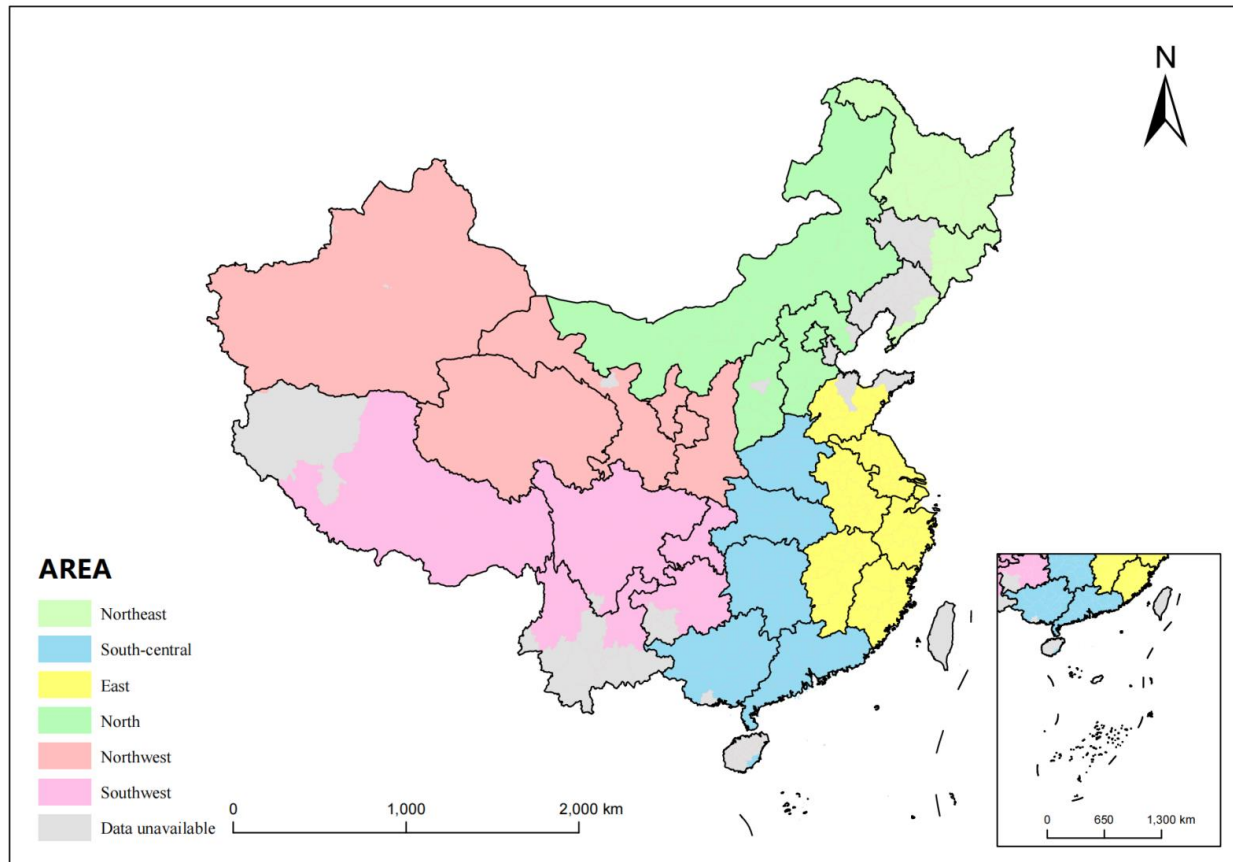


Figure S2. Distribution of the study area. “Data unavailable” indicates that the 2022 record-breaking heatwave did not occur in the area or data are missing.

Supplemental Figure S3

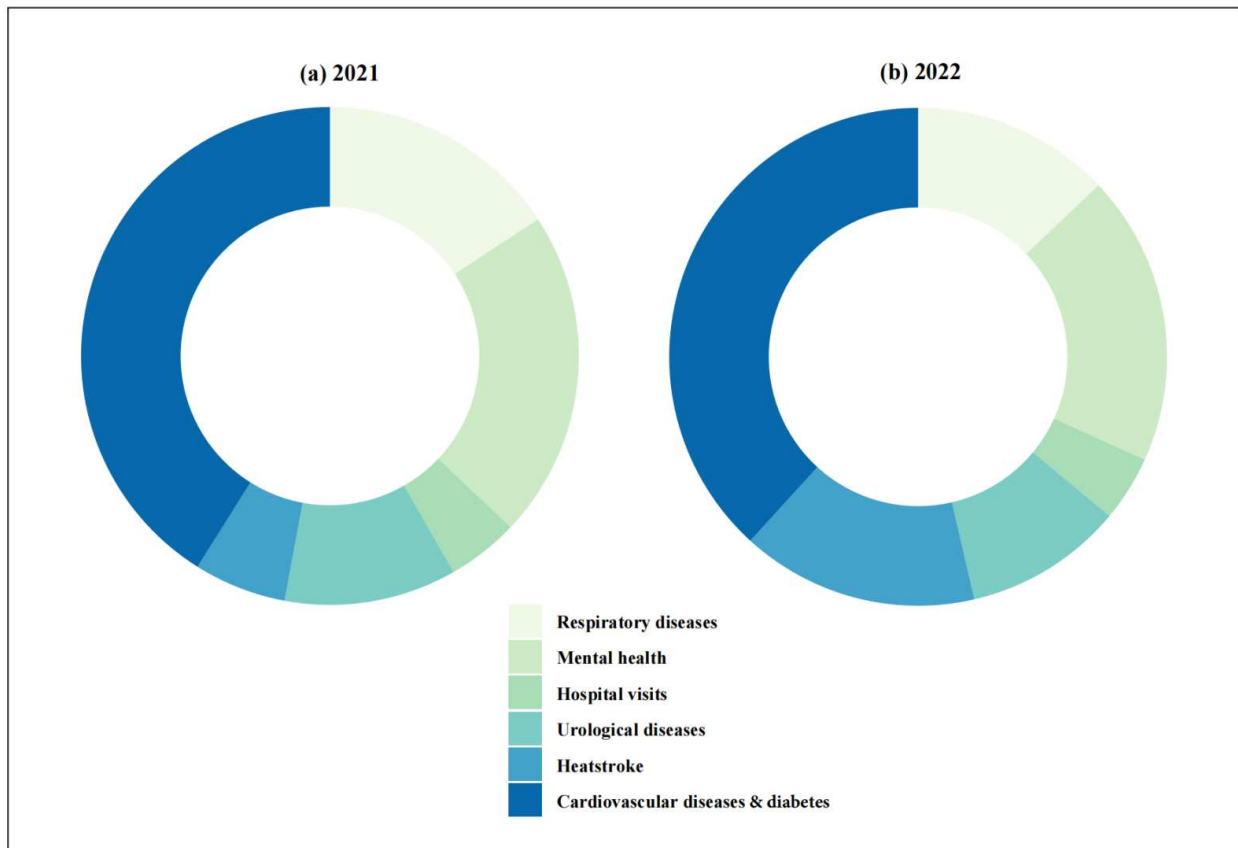


Figure S3. Composition of the Baidu search index for different health outcomes.

Supplemental Figure S4

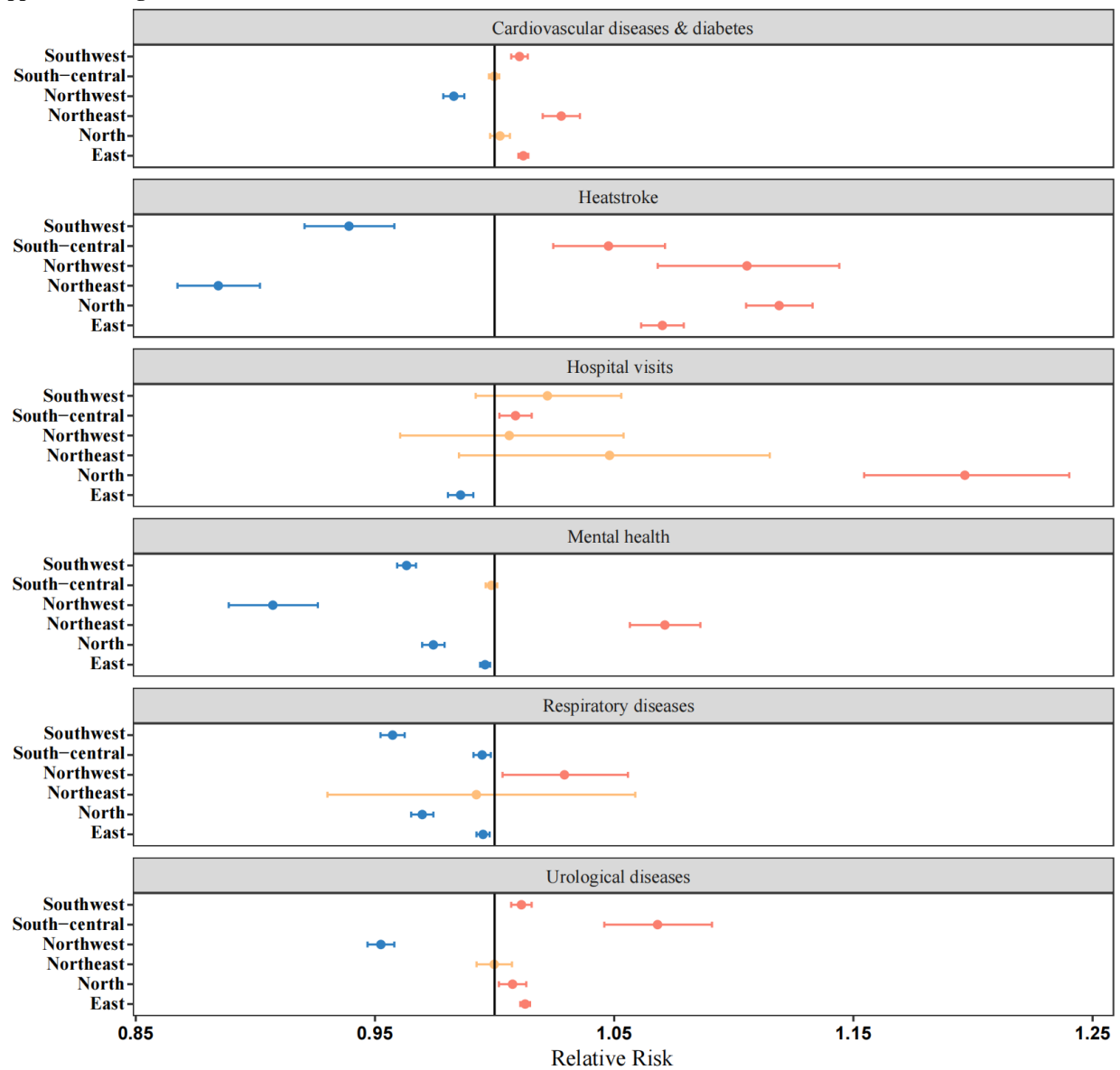


Figure S4. Effect of intensity of the 2022 heatwave on Baidu search index for different health outcomes by region.

Supplemental Figure S5

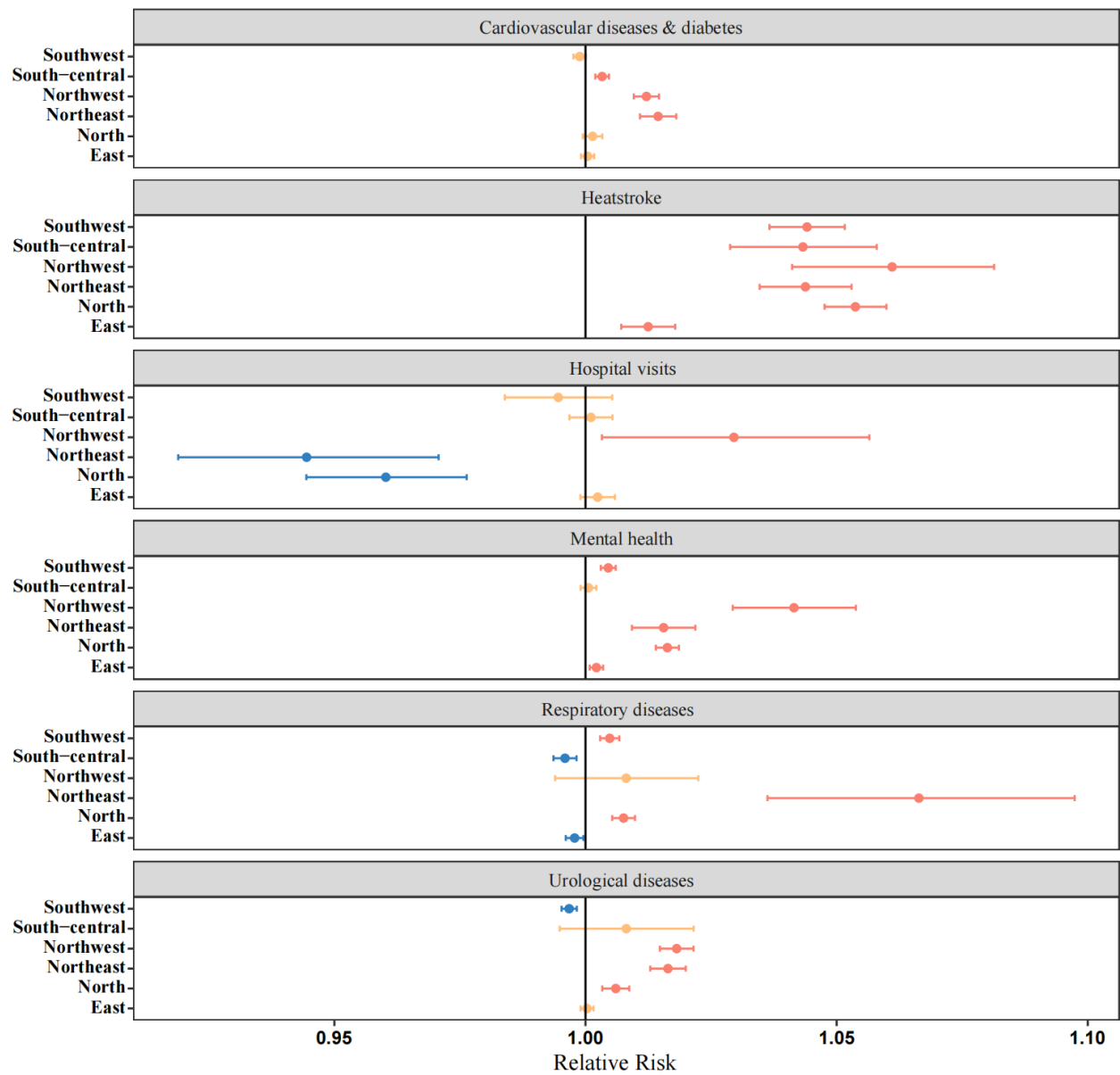


Figure S5. Effect of duration of the 2022 heatwave on Baidu search index for different health outcomes by region.

Supplemental Figure S6

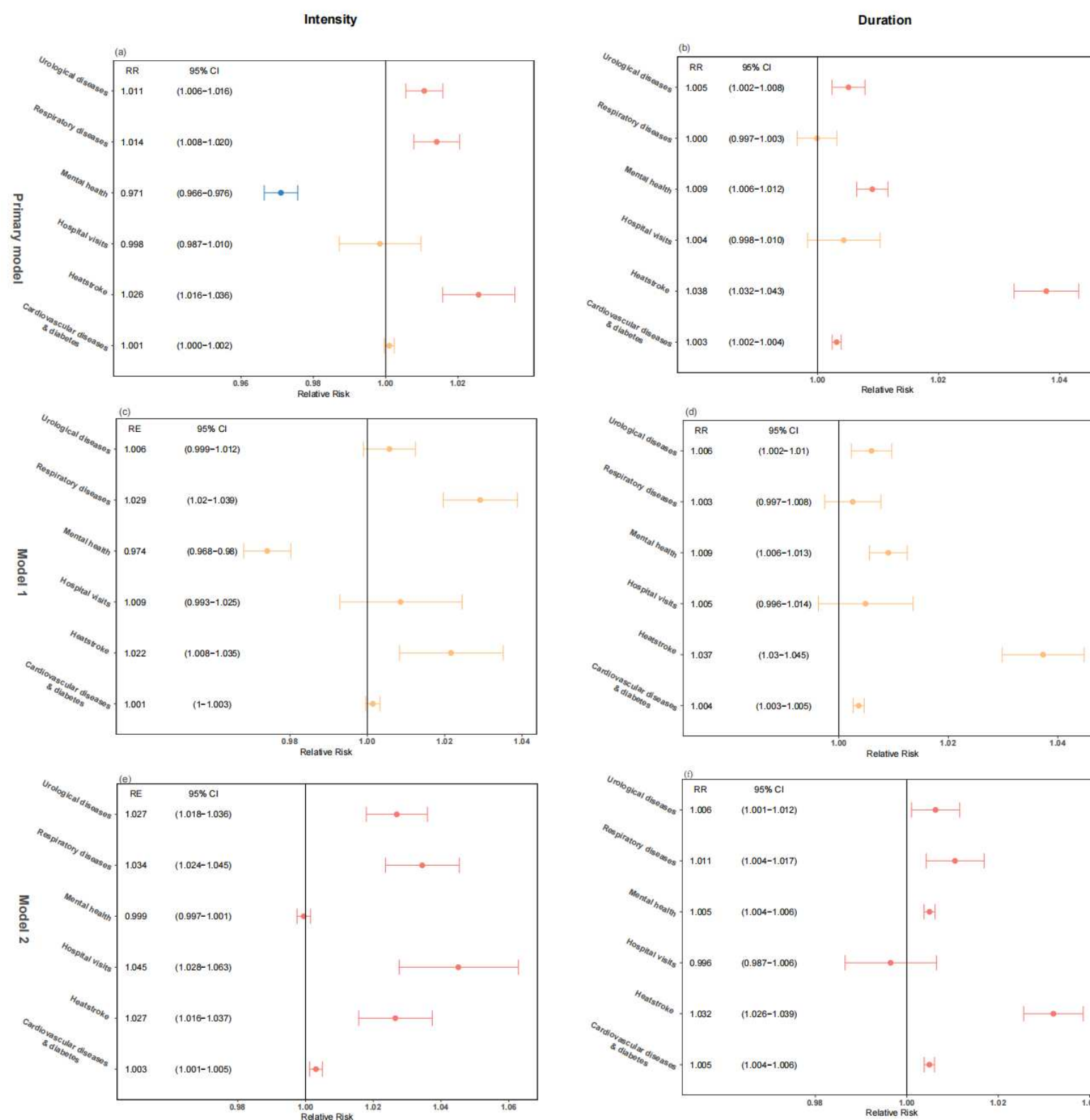


Figure S6. Effect of the 2022 heatwave using different control selections and different model specifications. Primary model is the panel spatial error regression model. Model 1 is the panel linear regression model using the same data as primary model. Model 2 is the panel linear regression model for the remaining cities after excluding those cities that experienced heatwave events during the 2021 control period. (a), (c), (e) are the effect of the intensity of the 2022 heatwave. (b), (d), (f) are the effect of the duration of the 2022 heatwave.

Supplemental Table S1

Table s1. Keywords of Baidu search index and their corresponding English translations.

Hospital visits ^{1,2}	Heatstroke ^{3,4}	Respiratory diseases ⁵⁻⁸	Urological diseases ⁹⁻¹³	Mental health ¹⁴⁻¹⁷	Cardiovascular diseases & diabetes ¹⁸⁻²¹
救护车	脱水	呼吸系统疾病	泌尿系统疾病	精神病	心血管疾病
ambulance	dehydration	respiratory diseases	urological diseases	psychiatric illness	cardiovascular diseases
医院	电解质紊乱	COPD	肾结石	精神疾病	心脏病
hospital	electrolyte abnormalities	——	kidney stone	psychiatric illness	heart disease
门诊	中暑	慢性阻塞性肺疾病	肾病	精神障碍	冠心病
outpatient	sunstroke	chronic obstructive pulmonary disease	nephropathy	psychiatric disorders	coronary heart disease
住院	热痉挛	慢阻肺	肾脏疾病	精神失常	高血压
hospitalization	heat cramp	chronic obstructive pulmonary disease	kidney disease	insane	hypertension
	热衰竭	肺炎	急性肾功能不全	心理疾病	中风
	heat exhaustion	pneumonia	acute renal insufficiency	mental illness	stroke
	热射病	哮喘	尿路感染	心理障碍	脑卒中
	thermoplegia	asthma	urinary tract infections	mental disorders	stroke
		呼吸道感染	肾衰竭	精神分裂症	脑出血
		respiratory infections	renal failure	schizophrenia	cerebral hemorrhage
		支气管炎	肾绞痛	焦虑	心肌梗死
		bronchitis	renal colic	anxiety	myocardial infarction
				抑郁	心梗
				depression	myocardial infarction
				躁狂	心肌缺血
				mania	myocardial ischemia
				自杀	心力衰竭
				suicide	heart failure
				跳楼	心衰
				jump	heart failure
				卧轨	心律失常
				lying rail	arrhythmia
				割腕	心律不齐
				cut your wrists	arrhythmia
				双向情感障碍	心绞痛
				bipolar disorder	angina
					心脏骤停
					cardiac arrest
					糖尿病
					Diabetes*

* The most common complication of diabetes is cardiovascular diseases, with more than half of deaths from diabetes ultimately attributed to cardiovascular diseases²². Therefore, we analyzed data on cardiovascular diseases and diabetes together to capture the effect of exceptional heatwave in 2022 on cardiovascular health.

Supplemental Table S2

Table S2. AICc for PSEM & PLM

BSI	PSEM_AICc	PLM_AICc	PLM - PSEM
Hospital visits	2526.58	2700.87	174.29
Respiratory diseases	1795.56	2063.68	268.12
Urological diseases	1568.77	1654.31	85.54
Cardiovascular diseases & diabetes	-47.57	71.08	118.65
Mental health	1519.01	1573.41	54.40
Heatstroke	2348.72	2483.80	135.08

AICc: the second-order Akaike's information criterion; **PSEM:** panel spatial error regression model; **PLM:** panel linear regression model; **PLM - PSEM:** Difference between PLM's AICc and PSEM's AICc

References

1. Wang YC, Sung FC, Chen YJ, Cheng CP, Lin YK. Effects of extreme temperatures, fine particles and ozone on hourly ambulance dispatches. *Sci Total Environ.* 2021;765:142706. doi:10.1016/j.scitotenv.2020.142706
2. Weinberger KR, Wu X, Sun S, et al. Heat warnings, mortality, and hospital admissions among older adults in the United States. *Environ Int.* 2021;157:106834. doi:10.1016/j.envint.2021.106834
3. Bobb JF, Obermeyer Z, Wang Y, Dominici F. Cause-specific risk of hospital admission related to extreme heat in older adults. *JAMA.* 2014;312(24):2659-2667. doi:10.1001/jama.2014.15715
4. Liu C, Yavar Z, Sun Q. Cardiovascular response to thermoregulatory challenges. *Am J Physiol Heart Circ Physiol.* 2015;309(11):H1793-1812. doi:10.1152/ajpheart.00199.2015
5. Barne C, Alexis NE, Bernstein JA, et al. Climate change and our environment: the effect on respiratory and allergic disease. *J Allergy Clin Immunol Pract.* 2013;1(2):137-141. doi:10.1016/j.jaip.2012.07.002
6. Grigorieva E, Lukyanets A. Combined Effect of Hot Weather and Outdoor Air Pollution on Respiratory Health: Literature Review. *Atmosphere.* 2021;12(6):790. doi:10.3390/atmos12060790
7. Sun S, Cao W, Mason TG, et al. Increased susceptibility to heat for respiratory hospitalizations in Hong Kong. *Sci Total Environ.* 2019;666:197-204. doi:10.1016/j.scitotenv.2019.02.229
8. Hansel NN, McCormack MC, Kim V. The Effects of Air Pollution and Temperature on COPD. *COPD.* 2016;13(3):372-379. doi:10.3109/15412555.2015.1089846
9. Johnson RJ, Sánchez-Lozada LG, Newman LS, et al. Climate Change and the Kidney. *Ann Nutr Metab.* 2019;74 Suppl 3:38-44. doi:10.1159/000500344
10. Lee WS, Kim WS, Lim YH, Hong YC. High Temperatures and Kidney Disease Morbidity: A Systematic Review and Meta-analysis. *J Prev Med Public Health.* 2019;52(1):1-13. doi:10.3961/jpmph.18.149
11. Liu J, Varghese BM, Hansen A, et al. Hot weather as a risk factor for kidney disease outcomes: A systematic review and meta-analysis of epidemiological evidence. *Sci Total Environ.* 2021;801:149806. doi:10.1016/j.scitotenv.2021.149806
12. Cervellin G, Comelli I, Comelli D, Meschi T, Lippi G, Borghi L. Mean temperature and humidity variations, along with patient age, predict the number of visits for renal colic in a large urban Emergency Department: results of a 9-year survey. *J Epidemiol Glob Health.* 2012;2(1):31-38. doi:10.1016/j.jegh.2012.01.001
13. Schlader ZJ, Hostler D, Parker MD, et al. The Potential for Renal Injury Elicited by Physical Work in the Heat. *Nutrients.* 2019;11(9):E2087. doi:10.3390/nu11092087
14. Sung TI, Chen MJ, Su HJ. A positive relationship between ambient temperature and bipolar disorder identified using a national cohort of psychiatric inpatients. *Soc Psychiatry Psychiatr Epidemiol.* 2013;48(2):295-302. doi:10.1007/s00127-012-0542-5
15. Thompson R, Hornigold R, Page L, Waite T. Associations between high ambient temperatures and heat waves with mental health outcomes: a systematic review. *Public Health.* 2018;161:171-191. doi:10.1016/j.puhe.2018.06.008
16. Liu J, Varghese BM, Hansen A, et al. Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis. *Environ Int.* 2021;153:106533. doi:10.1016/j.envint.2021.106533
17. Lee S, Lee H, Myung W, Kim EJ, Kim H. Mental disease-related emergency admissions attributable to hot temperatures. *Sci Total Environ.* 2018;616-617:688-694. doi:10.1016/j.scitotenv.2017.10.260
18. Xu Z, FitzGerald G, Guo Y, Jalaludin B, Tong S. Assessing heatwave impacts on cause-specific emergency department visits in urban and rural communities of Queensland, Australia. *Environ Res.* 2019;168:414-419. doi:10.1016/j.envres.2018.10.013
19. Cheng J, Xu Z, Bambrick H, et al. Cardiorespiratory effects of heatwaves: A systematic review and meta-analysis of global epidemiological evidence. *Environ Res.* 2019;177:108610. doi:10.1016/j.envres.2019.108610
20. Chaseling GK, Iglesias-Grau J, Juneau M, Nigam A, Kaiser D, Gagnon D. Extreme Heat and Cardiovascular Health: What a Cardiovascular Health Professional Should Know. *Can J Cardiol.* 2021;37(11):1828-1836. doi:10.1016/j.cjca.2021.08.008
21. Xu Z, Tong S, Cheng J, et al. Heatwaves and diabetes in Brisbane, Australia: a population-based retrospective cohort study. *Int J Epidemiol.* 2019;48(4):1091-1100. doi:10.1093/ije/dyz048