

## Supplementary appendix

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**Table S1.** Estimated relative risks (RRs) for hospitalizations for mental and behavioral disorders across alternative cold spell definitions and lag period.

Definitions	Max lag days	Lag day	RR (95% confidence interval)
P2.5_2d	2	0	2.234 (1.997, 2.499)
		1	0.395 (0.341, 0.457)
		2	1.127 (0.994, 1.278)
	3	0	1.853 (1.663, 2.064)
		1	0.679 (0.620, 0.745)
		2	0.607 (0.555, 0.663)
		3	1.320 (1.171, 1.487)
	4	0	1.527 (1.382, 1.687)
		1	0.923 (0.877, 0.972)
		2	0.712 (0.654, 0.776)
		3	0.825 (0.785, 0.867)
		4	1.220 (1.095, 1.358)
P2.5_3d	2	0	3.168 (2.801, 3.584)
		1	0.235 (0.196, 0.283)
		2	1.553 (1.332, 1.809)
	3	0	2.596 (2.297, 2.935)
		1	0.547 (0.491, 0.608)
		2	0.487 (0.440, 0.539)
		3	1.840 (1.600, 2.115)
	4	0	1.979 (1.759, 2.227)
		1	0.895 (0.844, 0.949)
		2	0.604 (0.544, 0.670)
		3	0.793 (0.751, 0.838)
		4	1.553 (1.367, 1.765)
P2.5_4d	2	0	3.690 (3.236, 4.208)
		1	0.187 (0.153, 0.228)
		2	1.465 (1.236, 1.738)
	3	0	2.952 (2.586, 3.370)
		1	0.489 (0.434, 0.550)
		2	0.411 (0.368, 0.460)
		3	1.761 (1.506, 2.058)
	4	0	2.258 (1.983, 2.570)
		1	0.841 (0.788, 0.899)
		2	0.513 (0.456, 0.576)
		3	0.708 (0.667, 0.752)
		4	1.598 (1.382, 1.849)
P5_2d	2	0	1.565 (1.416, 1.728)
		1	0.476 (0.417, 0.542)
		2	1.194 (1.073, 1.328)

		0	1.403 (1.285, 1.533)
		1	0.613 (0.573, 0.657)
	3	2	0.664 (0.620, 0.710)
		3	1.780 (1.628, 1.946)
		0	1.093 (1.012, 1.181)
		1	0.850 (0.818, 0.882)
	4	2	0.787 (0.740, 0.837)
		3	0.978 (0.942, 1.014)
		4	1.447 (1.343, 1.558)
		0	2.669 (2.390, 2.980)
	2	1	0.268 (0.227, 0.317)
		2	1.341 (1.170, 1.537)
		0	2.168 (1.947, 2.416)
	3	1	0.561 (0.511, 0.615)
		2	0.509 (0.466, 0.556)
		3	1.621 (1.434, 1.833)
		0	1.662 (1.506, 1.835)
		1	0.854 (0.814, 0.896)
	4	2	0.619 (0.566, 0.677)
		3	0.795 (0.761, 0.831)
		4	1.441 (1.291, 1.609)
		0	2.925 (2.604, 3.285)
	2	1	0.235 (0.197, 0.281)
		2	1.368 (1.185, 1.579)
		0	2.290 (2.042, 2.570)
	3	1	0.547 (0.495, 0.606)
		2	0.484 (0.440, 0.532)
		3	1.581 (1.383, 1.806)
		0	1.715 (1.543, 1.908)
		1	0.860 (0.816, 0.907)
	4	2	0.610 (0.553, 0.672)
		3	0.768 (0.733, 0.805)
		4	1.368 (1.211, 1.544)

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P5\_3d

P5\_4d

**Table S2.** Akaike information criterion (AIC) values for models using different cold spell definitions.

<b>Definitions</b>	<b>AIC</b>
P7.5_2d	5787.978
P7.5_3d	5792.253
P7.5_4d	5781.861
P7.5_5d	5771.858
P5_2d	5791.678
P5_3d	5761.985
P5_4d	5763.670
P5_5d	5751.961
P2.5_2d	5737.494
P2.5_3d	5693.159
P2.5_4d	5697.888
P2.5_5d	5778.322

**Table S3.** Estimated relative risks (RRs) of hospitalizations for mental and behavioral disorders associated with cold spells.

<b>Group</b>	<b>RR (95% confidence interval)</b>	<b><i>P</i>-value</b>
<b>All case</b>	1.710 (1.541, 1.897)	-
<b>Disease</b>		
Schizophrenia	1.746 (1.503, 2.029)	0.001*
Bipolar disorder	1.032 (0.756, 1.407)	0.636
Depressive disorder	0.920 (0.642, 1.319)	Reference
<b>Sex</b>		
Male	1.853 (1.603, 2.141)	0.068
Female	1.525 (1.311, 1.775)	Reference
<b>Urbanization of residence</b>		
Urban	2.408 (2.085, 2.781)	<0.001*
Rural	1.145 (0.980, 1.339)	Reference
<b>Age (year)</b>		
≤ 42	1.278 (1.093, 1.495)	Reference
> 42	2.113 (1.829, 2.442)	<0.001*

Asterisk (\*) indicates that the effect value is statistically significant.

-Indicates that no *P* value was calculated for the overall estimate, as *P* values were derived from tests for differences between subgroups.

**Table S4.** Relative risks (RRs) of hospitalizations for mental and behavioral disorders associated with cold spells defined by different temperature thresholds and duration days.

<b>Definitions</b>	<b>RR (95% confidence interval)</b>
P7.5_2d	0.934 (0.875, 0.997)
P7.5_3d	1.003 (0.937, 1.073)
P7.5_4d	1.128 (1.049, 1.213)*
P7.5_5d	1.202 (1.110, 1.301)*
P5_2d	1.030 (0.955, 1.110)
P5_3d	1.258 (1.160, 1.363)*
P5_4d	1.262 (1.160, 1.373)*
P5_5d	1.326 (1.216, 1.445)*
P2.5_2d	1.438 (1.308, 1.581)*
P2.5_3d	1.710 (1.541, 1.897)*
P2.5_4d	1.759 (1.571, 1.970)*
P2.5_5d	0.731 (0.619, 0.863)

Asterisk (\*) indicates that the effect value is statistically significant.

**Table S5.** Sensitivity analysis of the associations between cold spells and hospitalizations for mental and behavioral disorders after additional adjustment for NO<sub>2</sub> and atmospheric pressure.

<b>Model</b>	<b>RR (95% confidence interval)</b>
Main model (Cold spell, Relative Humidity, PM <sub>2.5</sub> )	1.710 (1.541, 1.897)
NO <sub>2</sub>	1.183 (1.009, 1.386)
Atmospheric pressure	1.250 (1.045, 1.495)

**Table S6.** Sensitivity analysis of the associations between cold spells and hospitalizations for mental and behavioral disorders after changing the degree of freedom (*df*).

Variables		RR (95% confidence interval)		
		Relative humidity		
		<i>df</i> =2	<i>df</i> =3	<i>df</i> =4
<b>PM<sub>2.5</sub></b>	<i>df</i> =2	1.706 (1.183, 2.459)	1.727 (1.216, 2.453)	1.621 (1.149, 2.288)
	<i>df</i> =3	1.694 (1.170, 2.451)	1.710 (1.199, 2.439)	1.597 (1.126, 2.265)
	<i>df</i> =4	1.630 (1.126, 2.360)	1.633 (1.144, 2.329)	1.521 (1.072, 2.158)

**Table S7.** Sensitivity analysis of using city average exposure versus area-specific average exposure in regression model.

<b>Exposure</b>	<b>Group</b>	<b>Relative risk (95% confidence interval)</b>
City average exposure	Urban	2.408 (2.085, 2.781)
	Rural	1.145 (0.980, 1.339)
Area-specific average exposure	Urban	2.333 (2.024, 2.690)
	Rural	1.147 (0.981, 1.341)