

Impact of Heat Wave on Mortality in Nanjing, China

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Outline

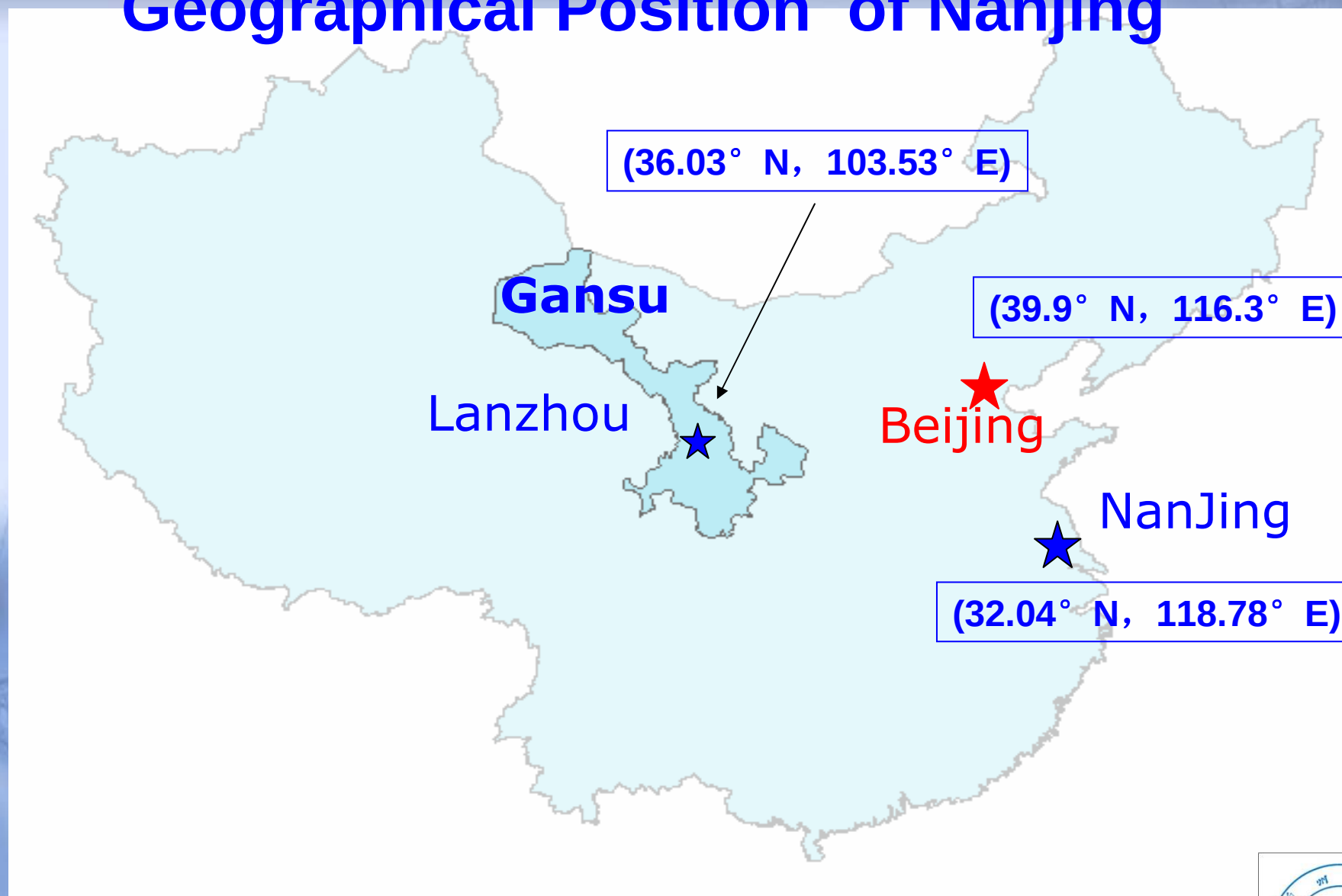
- **Geographic Position**
- **Materials and Methods**
- **Heat wave and mortality**
- **Summary**





1. Geographic Position

Geographical Position of Nanjing



Geographical Position of Nanjing in China





2. Materials and Methods

Materials

- **Daily mortality data ,including all causes and daily death cases from Jan 1th ,2005 to Dec 31th ,2008.**
- **Meteorological data ,including temperatures, air pressure, humidity and rainfall from Jan 1th,1981 to Dec 31th,2011.**

Methods

(1) Heat days: the daily maximum temperature is above 35° C (95° F).

No-heat days: the daily maximum temperature is lower than 35° C (95° F).

(2) Heat wave: the duration of maximum temperature above 35° C (95° F) is more than 3 days.

(3) Extra mortality

$$EM = (D - D_{\text{No-heat}}) / D_{\text{No-heat}} \quad (\text{June to August})$$

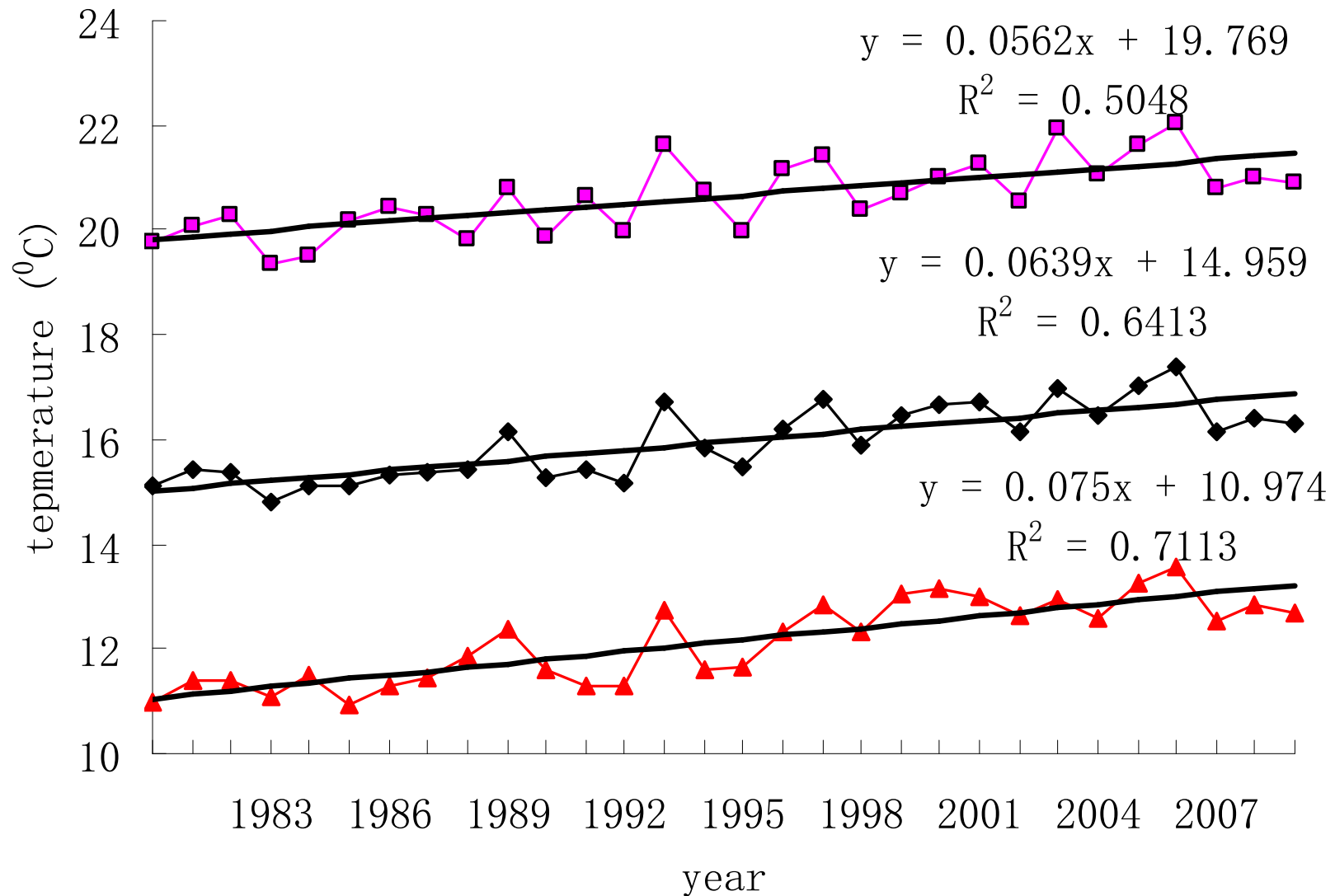
EM refers to the extra mortality,
D is daily death cases

No-heat days: the daily maximum temperature is lower than 35° C (95° F).

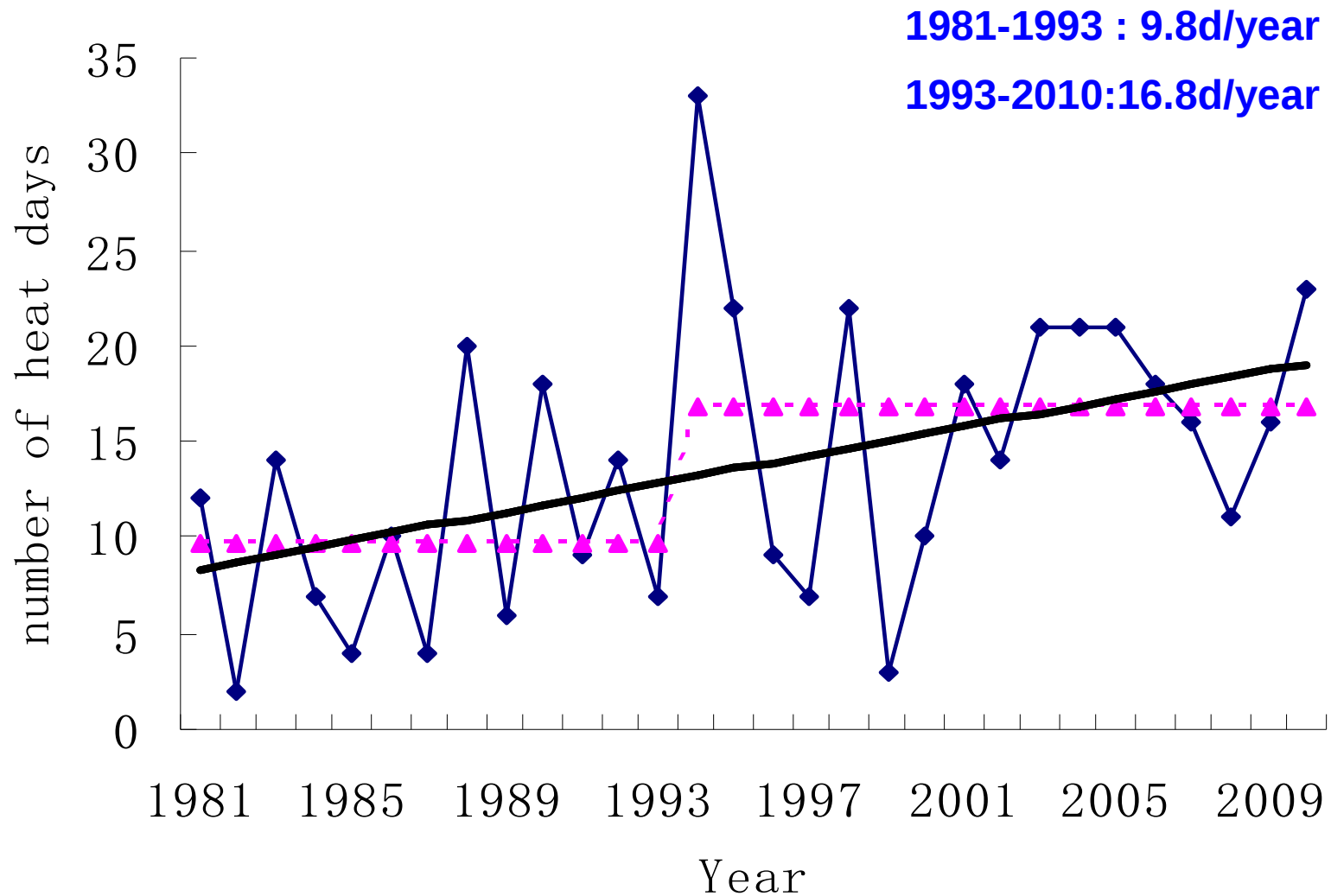
The background of the slide is a light blue gradient. At the top and bottom, there are horizontal borders with a repeating pattern of small, dark, rectangular shapes. In the upper right and lower left corners, there are faint, stylized illustrations of city buildings and structures, possibly representing a city affected by a heat wave.

3. Heat wave and mortality

Inter-annual change of temperatures



Inter-annual change of hot days



Heat waves during 2005-2008 in Nanjing

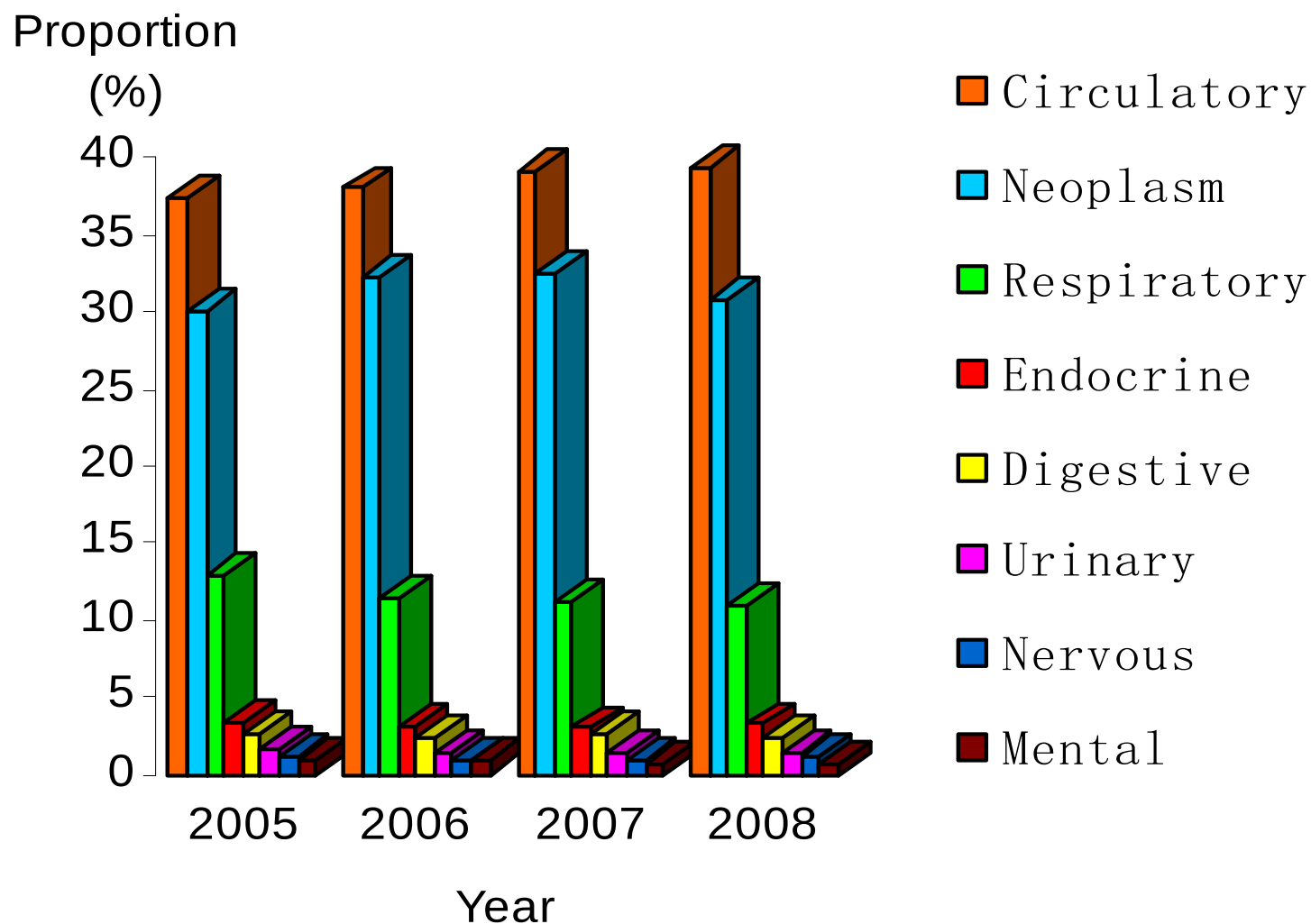
year	Heat wave	Duration (days)	Extreme maximum t (°C)	Average t (°C)	Average minimum t (°C)	Average humidity(%)
2005	6/22-25	4	37.1	36.1	24.5	54
	8/10-12	3	36.6	35.9	27.4	72
	8/15-17	3	36.9	36.3	25.3	67
2006	6/18-21	4	37.1	36.6	25.0	64
	7/28-8/1	5	36.9	35.9	26.7	67
	8/12-15	4	37.8	37.2	28.2	71
2007	7/25-8/2	9	38.2	37.3	26.9	66
2008	7/4-7/7	4	37.3	36.1	26.8	63
	7/15-18	4	35.9	35.5	26.9	76

Death causes during 2005-2008

Death causes	2005 Order p(%)		2006 Order p(%)		2007 Order p (%)		2008 Order p (%)	
Circulatory	1	37.44	1	37.96	1	39.04	1	39.19
Neoplasm 肿瘤	2	30.02	2	32.14	2	32.40	2	30.78
Respiratory	3	12.99	3	11.49	3	11.29	3	11.03
Endocrine	4	3.28	4	3.25	4	3.02	4	3.26
Digestive	5	1.04	5	0.84	5	0.66	5	0.60
Urinary	6	0.92	6	0.94	6	0.78	6	0.69
Nervous	7	0.16	7	0.18	7	0.19	7	0.23
Mental	8	8.86	8	8.32	8	7.82	8	9.3
Infectious	9	0.92	8	0.94	8	0.78	8	0.69
Blood	10	0.16	10	0.18	10	0.19	10	0.23
Other		8.86		8.32		7.82		9.3
Total		100		100		100		100

The top three are: 37.44%-39.19%、
30.02%-30.78%、11.03%-12.99%, respectively.
Three causes attribute 80.05%.

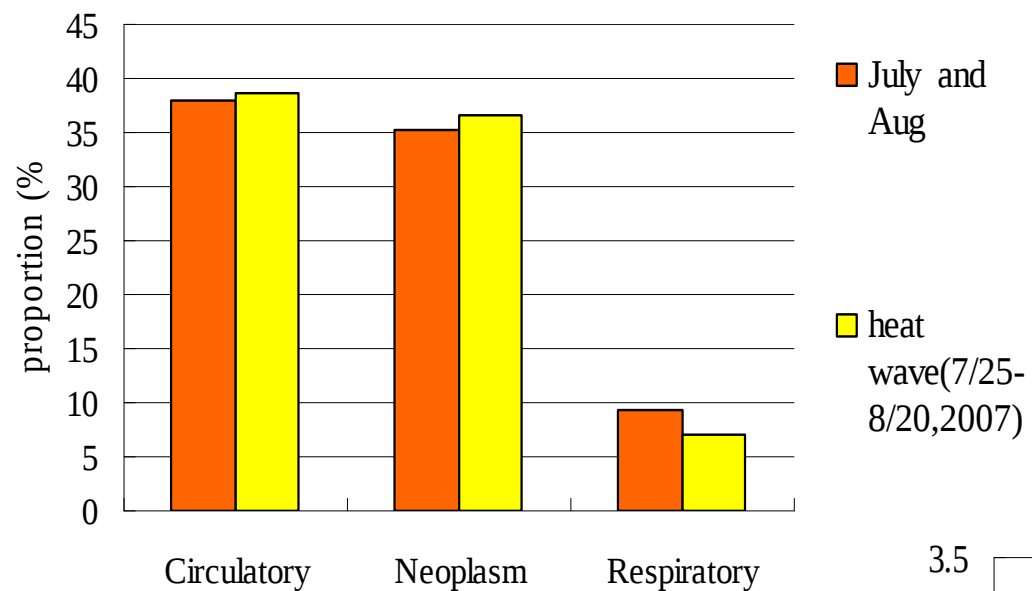
Proportion of death causes during 2005-2008



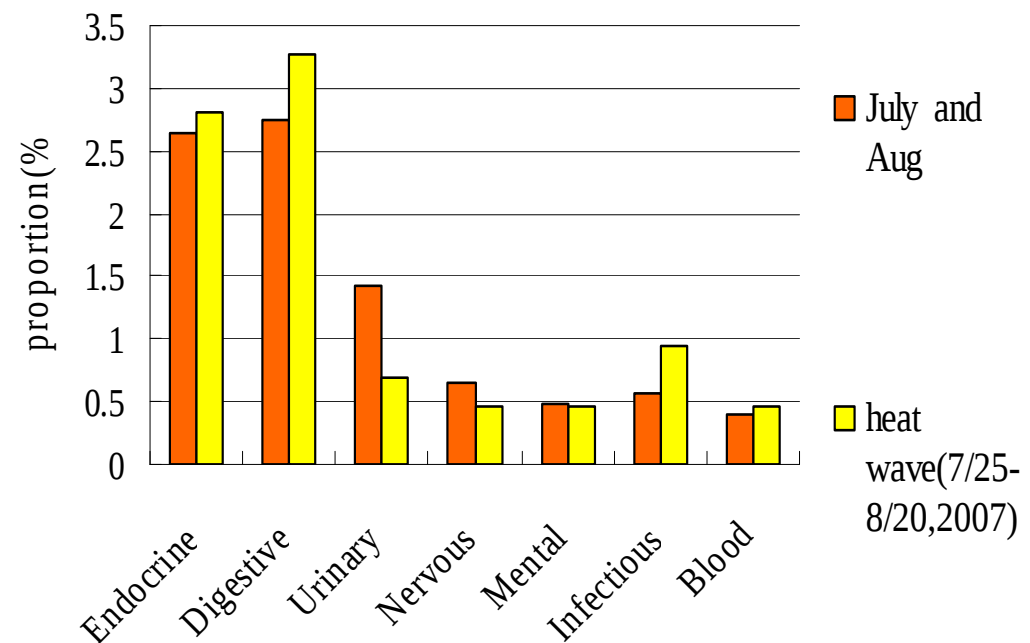
Orders of death causes during heat wave

Causes	2007 order %		5-10 order %		7-8 order %		Heat wave 2007(7/25-8/20)	
Circulatory	1	39.04	1	38.21	1	38.02	1	38.64
Neoplasm	2	32.40	2	35.06	2	35.33	2	36.53
Respiratory	3	11.29	3	9.26	3	9.31	3	7.02
Endocrine	4	3.02	4	2.79	5 ↓	2.64	5 ↓	2.81
Digestive	5	2.69	5	2.84	4 ↑	2.74	4 ↑	3.27
Urinary	6	1.33	6	1.29	6	1.42	7 ↓	0.70
Nervous	7	0.97	7	0.82	7	0.65	8 ↓	0.47
Infectious	8	0.78	8	0.81	8	0.56	8	0.94
Mental	9	0.66	9	0.49	9	0.49	6 ↑	0.47
Blood	10	0.19	10	0.29	10	0.40	8 ↑	0.47

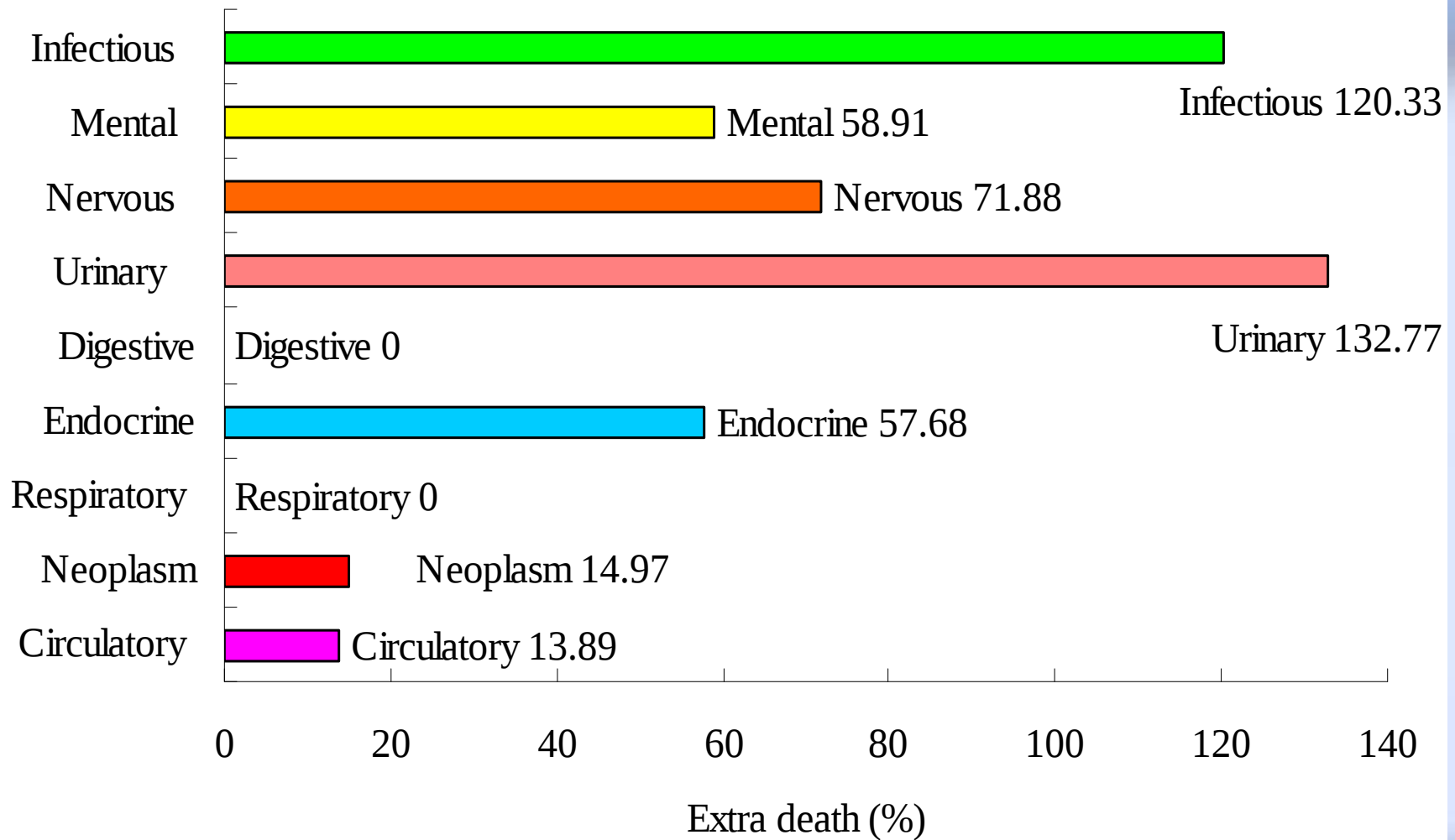
Proportion(%) changes during heat wave



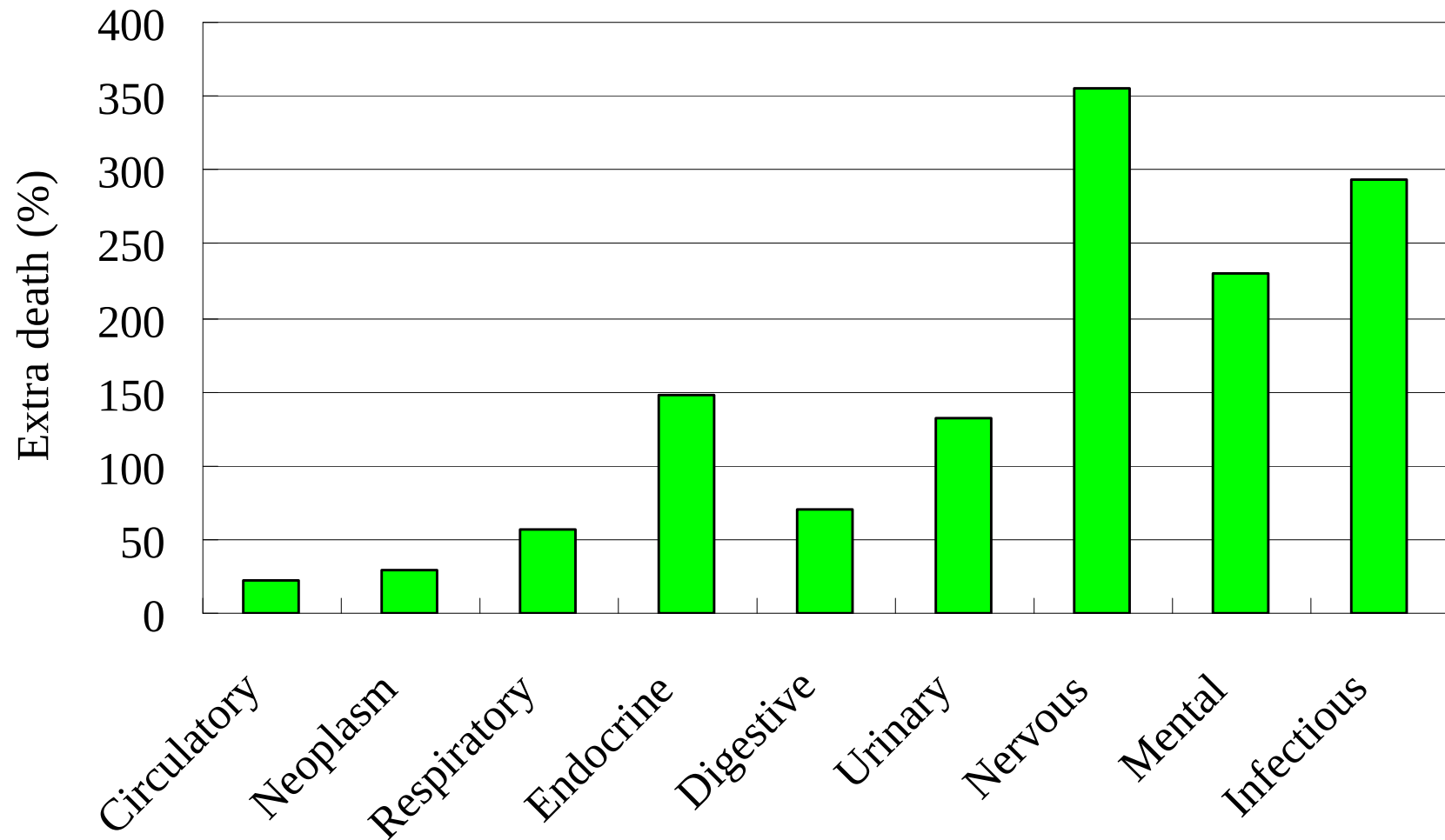
Jul,25-Aug,2, 2007



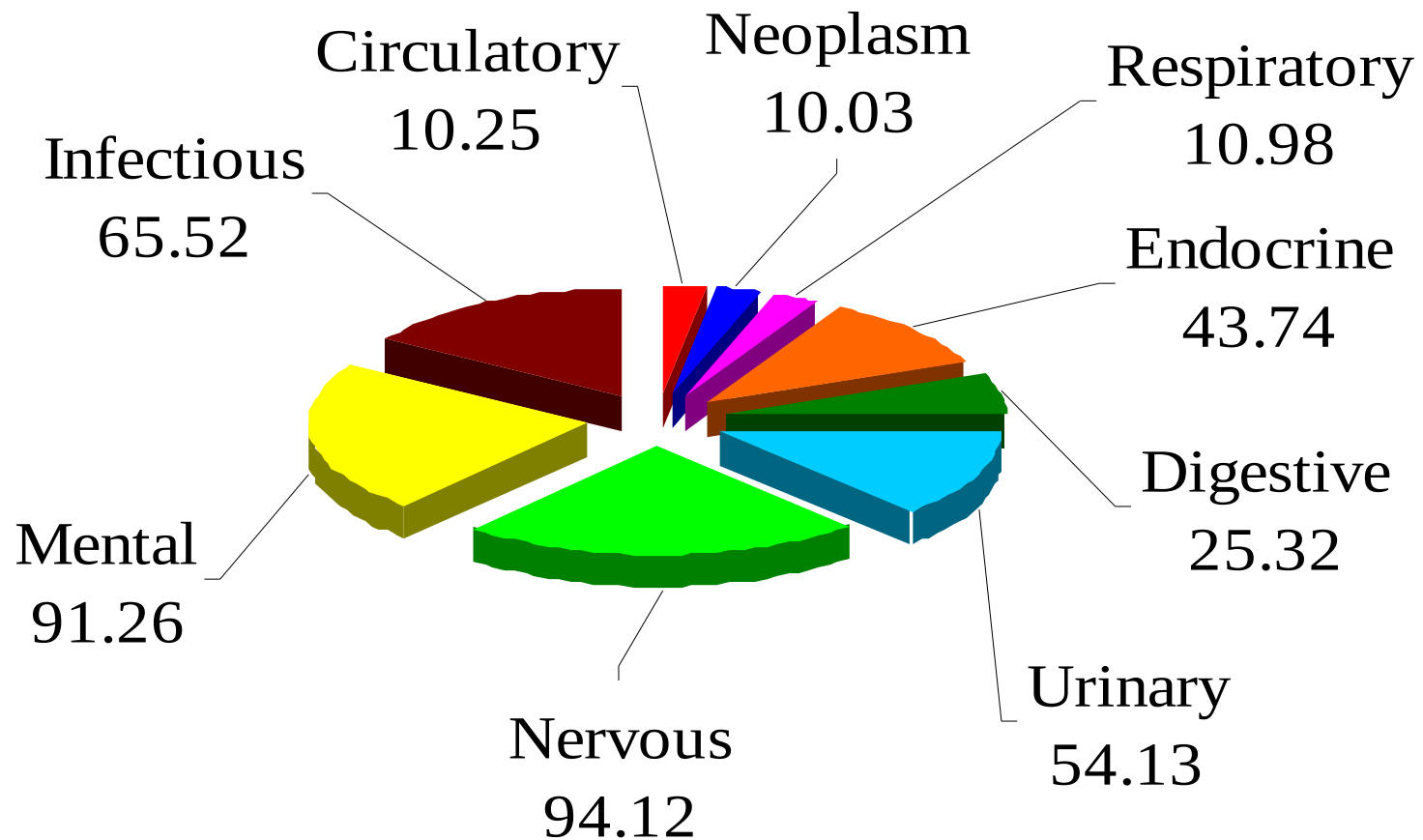
Extra death rate (%) during heat wave on 8/12-15,2006



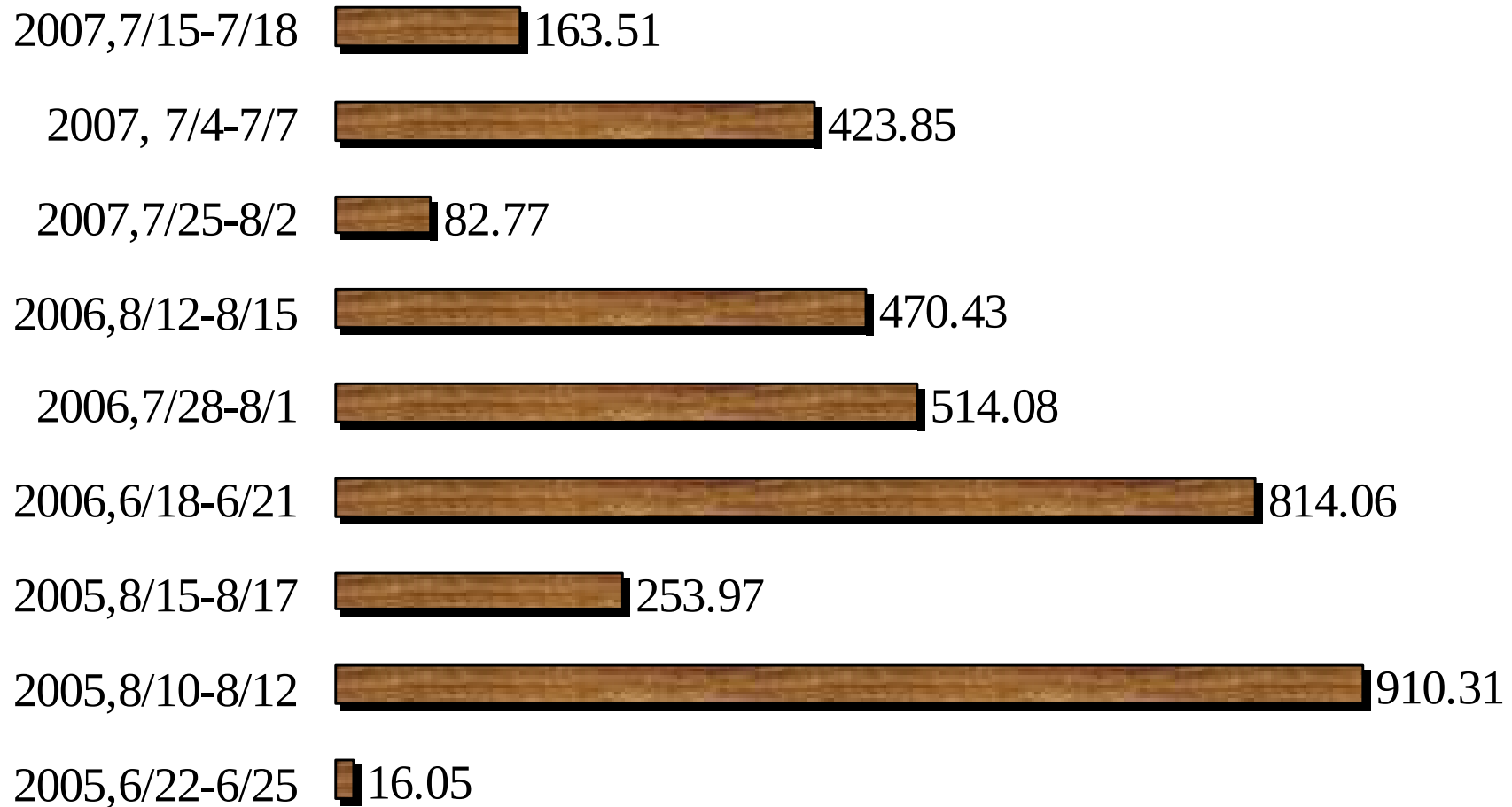
The maximum extra death rate(%) in 9 heat waves during 2005-2008



Average extra death rate(%) of different causes in heat waves during 2005-2008



Total extra death rate(%) of 9 causes in heat waves



Extra death(%)

Summary

- There were 9 heat waves during 2005-2008. Heat waves occurred with high temperature and humidity .
- In the causes of death in Nanjing , the top three are Circulatory, Neoplasm and Respiratory systems , accounting for 37.44%-39.19%、 30.02%-30.78% and 11.03%-12.99%, respectively.

Summary

- Extra death occurred during heat waves. The top three of the maximum extra death in 9 heat waves are Nervous, Infectious and Mental systems.
- High extra death were accompanied with high maximum temperature, high average temperature and high humidity.



Thank you!

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