Human Health Adaptation

from Heat wave in South Korea

Mar 19, 2013

Jongsik Ha, Ph.D.

Korea Environment Institute

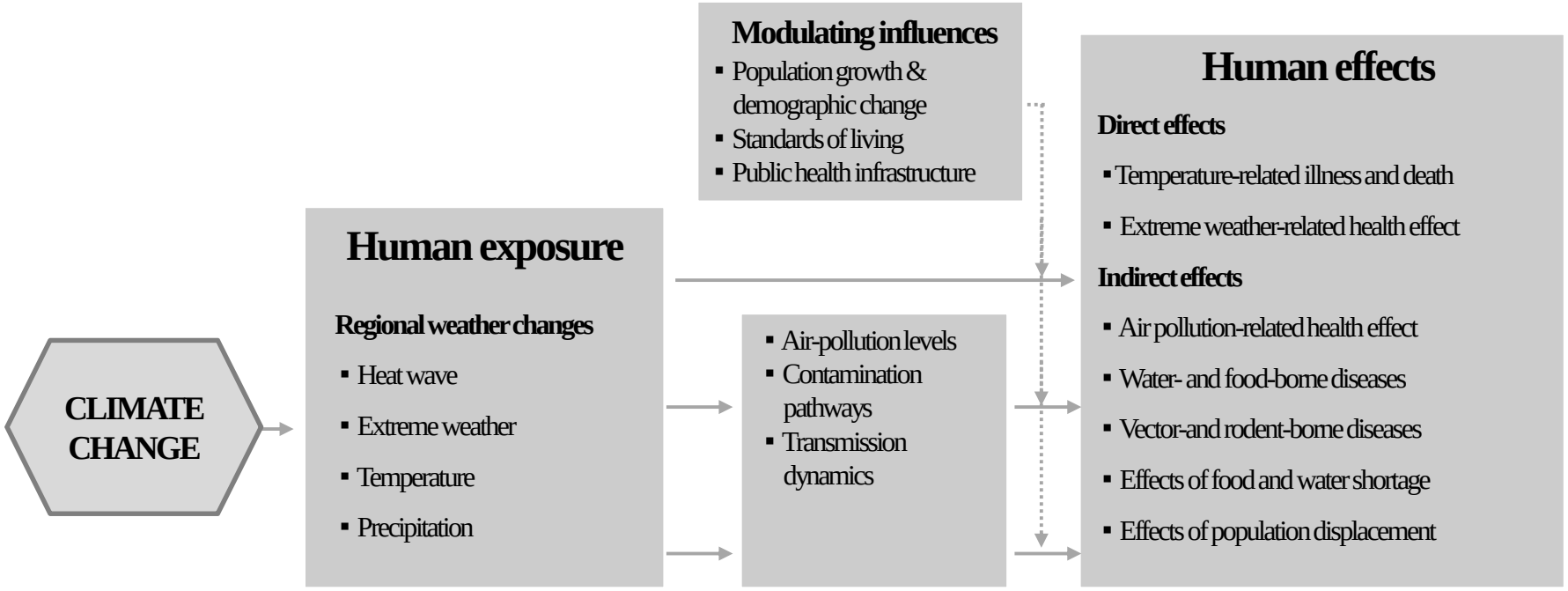
Outline

1. Climate change impacts on health

2. Health adaptation strategy & tools for heat wave

Potential health impacts from climate change

- **Climate change is the biggest global health threat of the 21st century**
  (source: The UCL-Lancet commission, 2009)
- **Most expected health impacts from climate change will be adverse**
  - Mainly, changes in frequency or severity of familiar health risks



(Source: Based on Patz et al, 2000, EHP; IPCC, 2007; Haines et al, 2004, JAMA)

Why is heat wave a public health threat?

More intense and frequent hot weather events are expected as a consequence of predicted climate change (source : IPCC, 2007)

Fig. 1. The changes of temperature distribution in the future from climate change (source: McMichael AJ et al., 2006, Lancet)

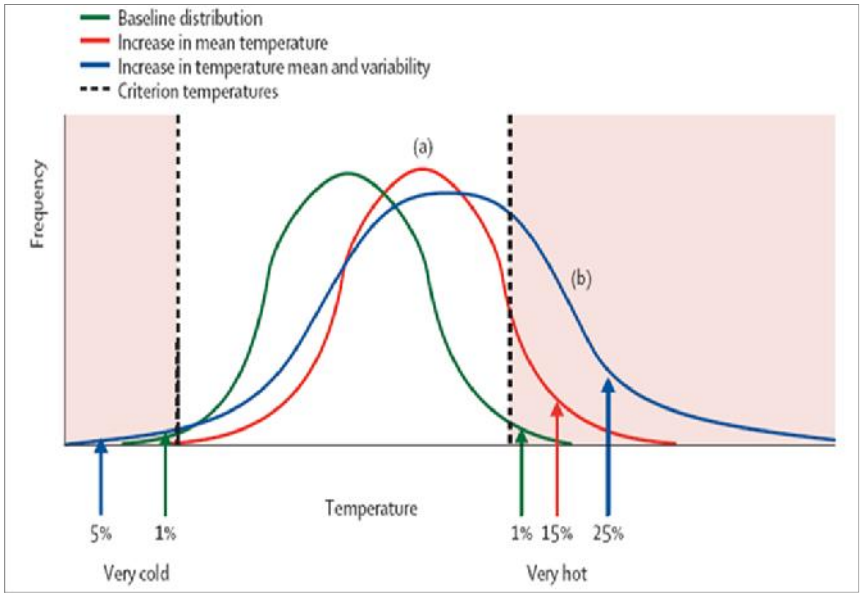
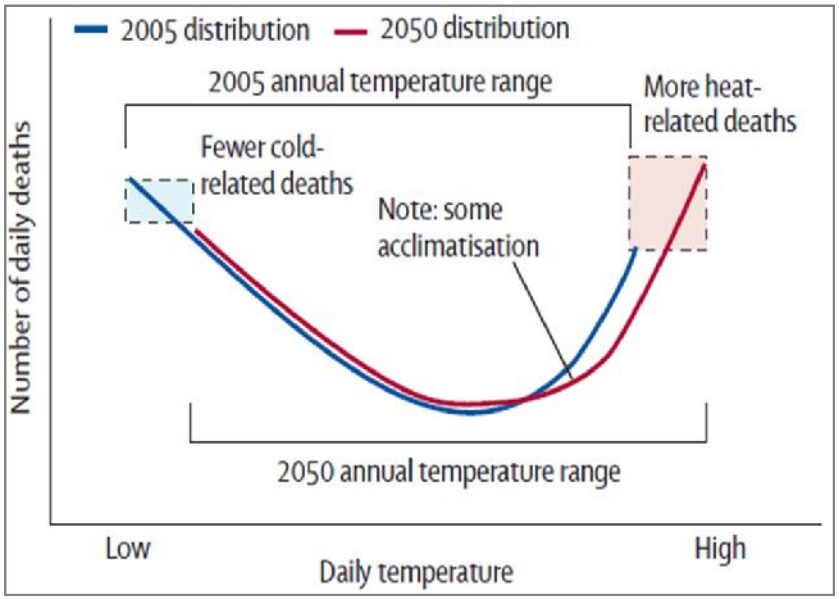


Fig. 2. Schematic representation of how high temperature from climate change would affect annual total of temperature-related deaths (source: McMichael AJ et al., 2006, Lancet)



Evidences in South Korea

Health impacts from high temperature due to climate change

Researches in South Korea	
The current associations between high temperature and deaths	Kim YM et al. 2011. Comparison of Temperature Indexes for the Impact Assessment of Heat Stress on Heat-Related Mortality. Environmental Health and Toxicology 26:e2011009 Jongsik Ha, Ho Kim. Changes in the association between summer temperature and mortality in Seoul, South Korea. International Journal Biometeorol. 2012 DOI:10.1007/s00484-012-0580-4 Jongsik Ha, YongSeong Shin, and Ho Kim. Distributed Lag Effects in the Relationship between Temperature and Mortality in Three Major Cities in South Korea. Science of the Total Environment. 2011;409:3274−3280. Jongsik Ha, Ho Kim, and Shakoor Hajat. Effect of Previous-Winter Mortality on the Association between Summer Temperature and Mortality in South Korea. Environmental Health Perspectives. 2011;119(4):542−546. Ho Kim, Jongsik Ha, and Jeongim Park. High Temperature, Heat Index, and Mortality in 6 Major Cities in South Korea. Archives of Environmental & Occupational Health. 2006;61:265−270.
Current death burden of high temperature	Jongsik Ha. The Changes in the Attributable Burden of High Temperature on Deaths. Journal of Environmental Health Sciences. 2012; 38(6):460-471.
Future death burden of high temperature due to climate change	Jihoon Yang, Jongsik Ha*. Estimation for future Death Burden of High Temperature from Climate Change. Journal of Environmental Health Sciences. 2013; 39(1):19-31.

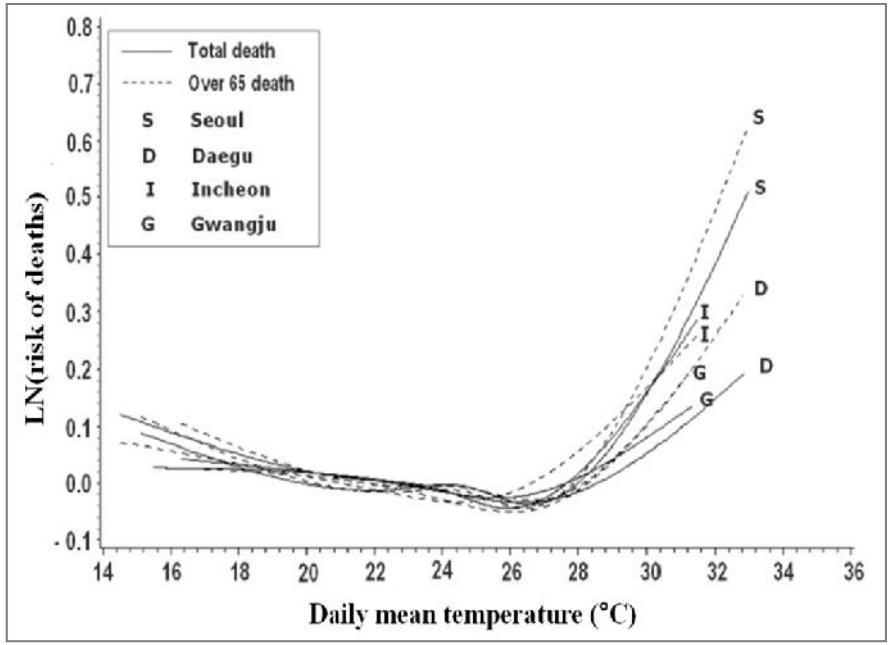
Evidences in South Korea

The current associations between high temperature and deaths

• **The goal :** The examination of the current associations between daily temperature and daily deaths in South Korea

• Main results

Fig. Temperature-mortality risk functions in South Korea
(source: Kim et al., 2006, STOTEN)



• Implications

- **High temperature is an important predictor of deaths in summer** (Kim et al., 2006, STOTEN)

- High temperature has an effect on mortality, not advancing the date of adverse events by a few days (Ha J et al, 2011, STOTEN)

- Health effects of high temperature is higher in low mortality of previous winter than in high mortality of previous winter (Ha J et al, 2011, EHP)

- Health effects of high temperature is decreasing in Seoul, particularly during late summer (Ha J et al, 2012, IJB)

Evidences in South Korea

Current death burden of high temperature

- **The goal :** The estimation of the current death burden of high temperature, considering current climate, population, and incidence

• Main results

Table. Yearly death burden of high temperature in Seoul and Daegu
(source: Ha J, 2012, JEHS)

City	Definition of study period	Yearly attributable death and burden of high temperature on deaths		
		Population	Attributable death counts (95% CI)	Attributable burden (95% CI) per 100,000
Seoul	**1996-2010**	**10,066,343**	**60 (39 - 82)**	**0.60 (0.38 - 0.81)**
	1996-2000	10,095,278	85 (48 - 121)	0.85 (0.48 - 1.20)
	2001-2005	10,041,178	72 (35 - 108)	0.72 (0.35 - 1.08)
	2006-2010	10,062,574	27 (-11 - 64)	0.27 (-0.11 - 0.63)
Daegu	**1996-2010**	**2,503,126**	**28 (16 - 40)**	**1.13 (0.63 - 1.60)**
	1996-2000	2,505,501	18 (-3 - 38)	0.73 (-0.10 - 1.51)
	2001-2005	2,526,268	42 (20 - 62)	1.66 (0.80 - 2.47)
	2006-2010	2,477,609	17 (-7 - 39)	0.68 (-0.29 - 1.59)

※ definitions of threshold: 80th percentile of daily mean temperature in summers of study period

• Implication

- Adaptation strategies and policies should be a priority in communities, where death burden is high
(source: Ha J, 2012, JEHS)

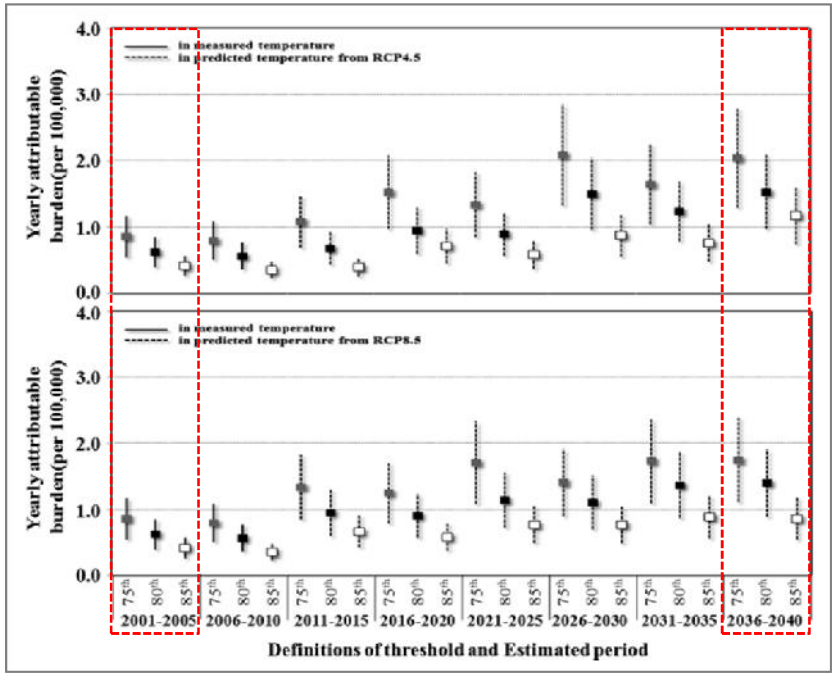
Evidences in South Korea

Future death burden of high temperature due to climate change

- **The goal :** The prediction of the future death burden of high temperature from climate change, considering future climate, population, incidence, and adaptation

• Main results

Fig. Yearly death burden of high temperature in Seoul, based on the relationship in 1996-2010 (source: Yang J and Ha J*, 2013, JEHS)



• Implication

- In the future, high temperature would be a risk factor on deaths due to climate change

(source: Yang J and Ha J*, 2013, JEHS)

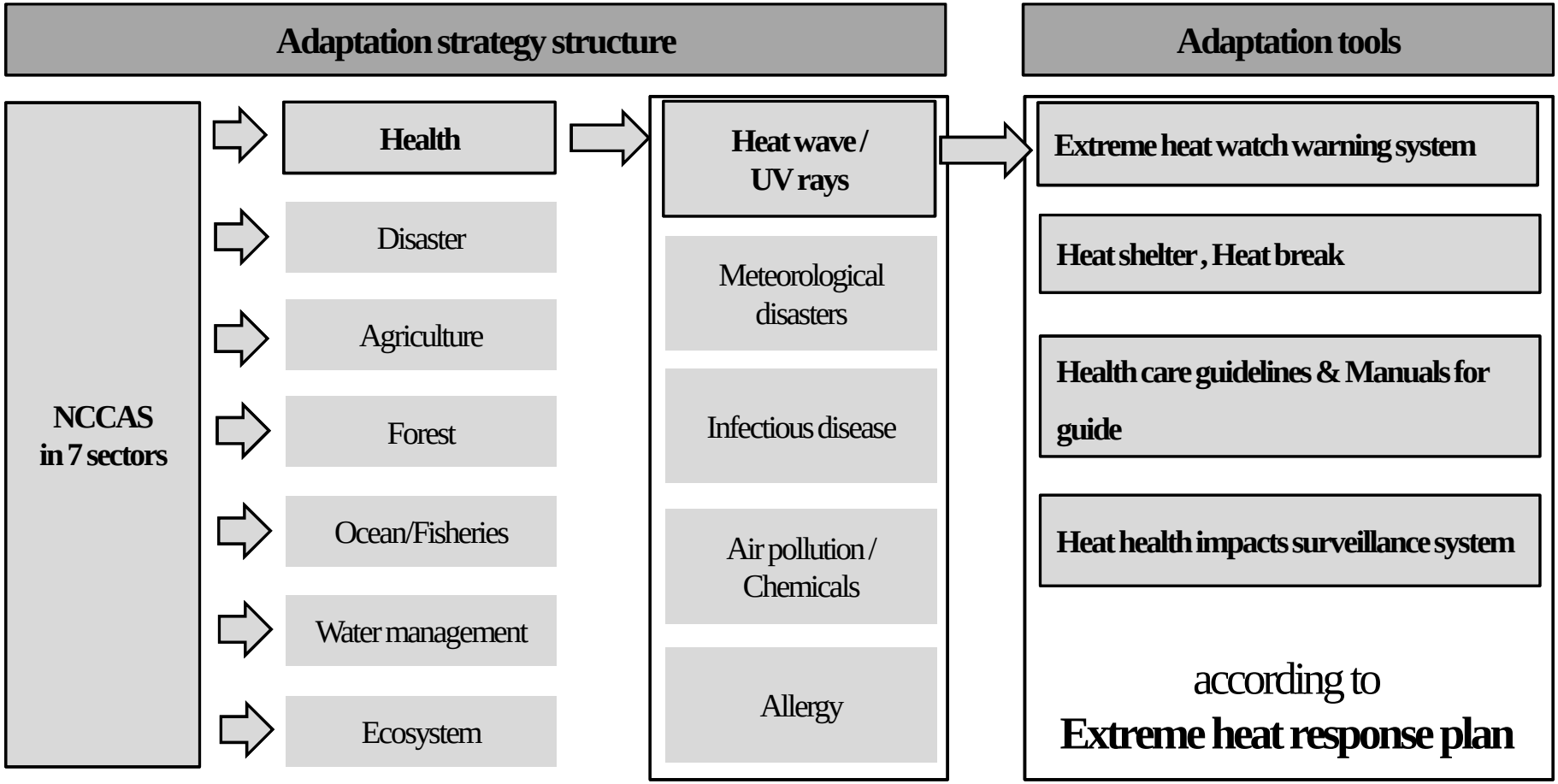
Outline

1. Climate change impacts on health

2. Health adaptation strategy & tools for heat wave

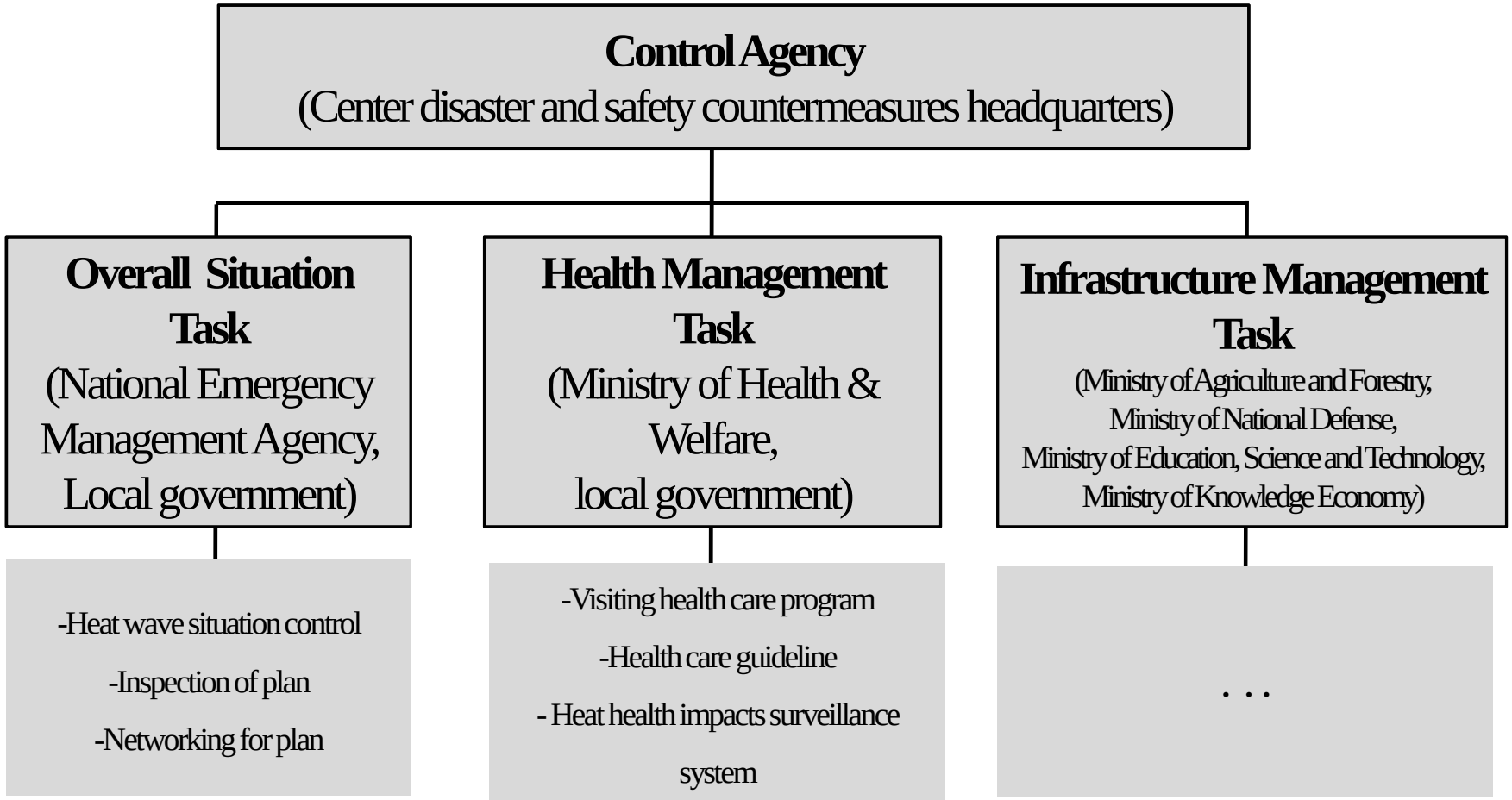
National Climate Change Adaptation Strategies (NCCAS)

Extreme heat response plan to prevent impacts from heat wave



Extreme heat response plan when heat wave hits

Organization chart of Extreme heat response plan



Definition of Heat wave

Extreme heat watch/warning system

- Operation by **Korea Meteorological Administration from 2007**
- Temporal resolution : daily (June 1 ~ September 30)
- Spatial resolution : lower level local government (si / gun / gu)
- Watch & Warning criteria

	Criteria
Watch	In case of being expected to hold out 2 days **in ≥ 33℃** of daily max temperature from June to September
Warning	In case of being expected to hold out 2 days **in ≥ 35℃** of daily max temperature from June to September

- **Main actions**
  - **Breaking news on public TV**
  - **Notification to the related agency**

Fig. Breaking news in public TV

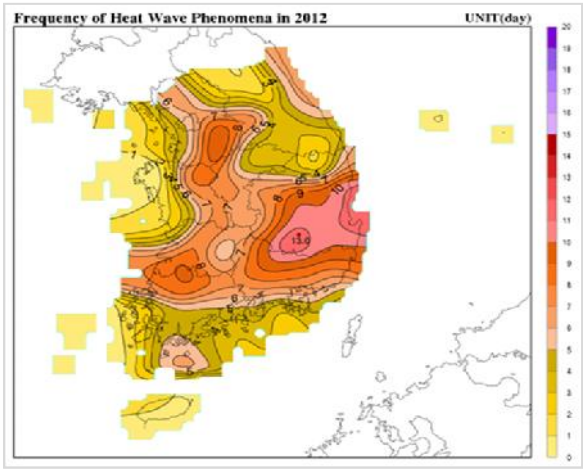


Fig. frequency of heat wave in 2012

Main adaptation tools of Ministry of Health & Welfare and Local government

Materials to prevent health impacts from heat wave

Health care guidelines for general population

Health care guidelines for the elderly

Manuals for guide on how to deal with heat waves

For elderly nursing homes

For child care teacher

For heat wave guide

Main adaptation tools of Ministry of Health & Welfare and Local government

Visiting health care program for the elderly

- Management by **public health center in lower level local government** (si/gun/gu)

  (※Visiting health care worker, elderly helper)

- Operating period : when heat wave hits in June 1 ~ September 30

- **Visiting health subjects (154,000 people in 2012)**

  · **Single elderly, disabled**

- **Main actions**

  · **Calling to subjects**

  · **A personal visit for health care**

  · **Network of emergency contacts**

  (recipient– elderly helper – recipient relative)

Fig. visiting health care for the elderly

Main adaptation tools of Ministry of Health & Welfare and Local government

Heat health impacts surveillance system

- **Surveillance based on emergency medical treatment center (458 in 2012)**
- Operating period : June 1 ~ September 30
- **Reported information : daily thermal patient counts with sex, age, address, job etc**

(※ Thermal disease: heat stroke, heat exhaustion, heat cramps, heat edema, heat syncope)

- Report system: Emergency medical treatment center → Public health center → Ministry of health & welfare → Center disaster and safety countermeasures headquarters

- **Information utilization**
  - **Characteristics analysis of heat health impacts**
  - **Attention inspiration of heat health impacts**
  - **Development of new adaptation tools**

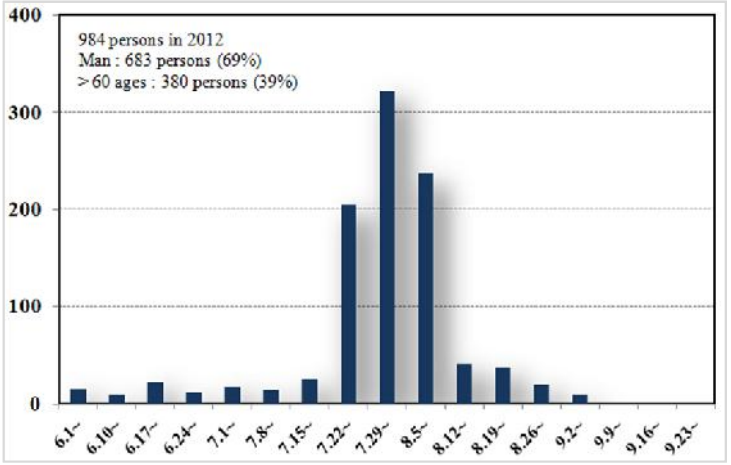
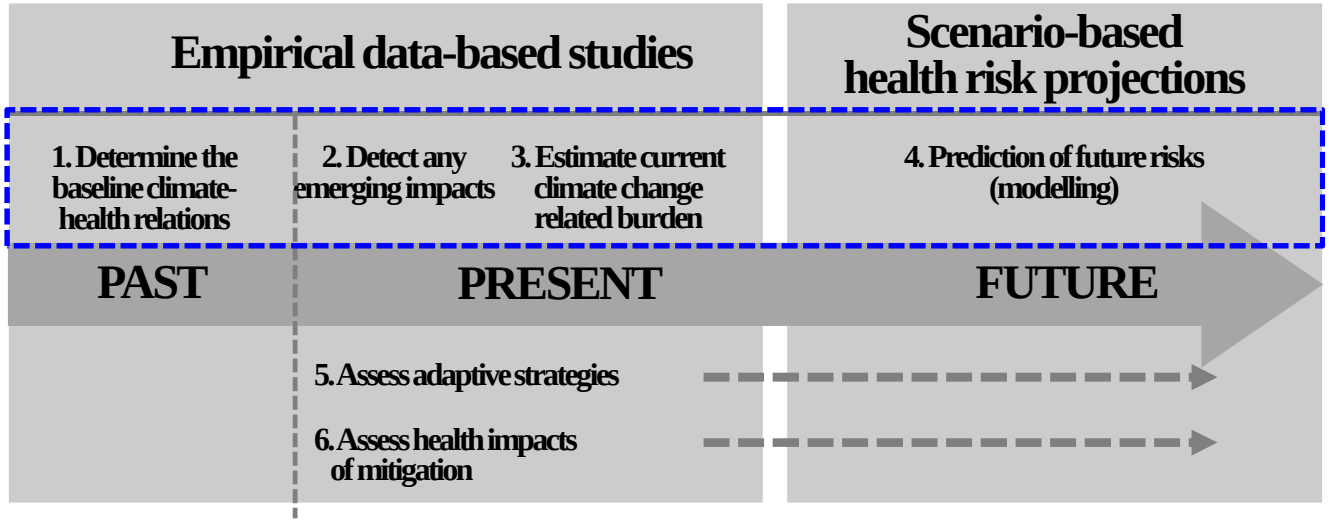


Fig. results of surveillance system in 2012
(modified in source :Ministry of Health & welfare)

Future direction or next researches

Policy related researches to protect human health from climate change(source: WHO, 2009)



Climate change mitigation

Adaptation strategies

Researches for more specific policies

- Identification of vulnerable population (e.g. vulnerability in geographical level)
- Detection of emerging health impact (e.g. mental health from heat wave)

Researches for improvement of policies

- Identification of the most effective adaptive strategies (e.g. cost-effectiveness analysis)

Thank you !

Korea Environment Institute
Jongsik Ha PhD
jsha@kei.re.kr