6th Regional EST Forum, New Delhi, India

HEALTH BENEFIT OF ESHUT ACTIVITIES IN CHANGWON, REPUBLIC OF KOREA

Sanghyuk Bae, MD, MSc, Yun-Chul Hong, MD, PhD

Department of Preventive Medicine,
College of Medicine, Seoul National University

SEOUL
NATIONAL
UNIVERSITY

Health Impact Assessment

- Bicycle that is near and useful, a fun and enjoyable allurement.
- How good is it?
- Especially in terms of public health?

Health Impact Assessment

- "a combination of **procedures, methods, and tools** by which a policy, program, or project may be judged as to its **potential effects on the health of a population**, and the **distribution of those effects within the population**"

Three Domains

1. Decreased mortality due to increased physical activity
2. Decreased traffic accident death
3. Decreased mortality due to decreased air pollution

Data

1. Computer assisted telephone survey for 250 adults
2. Mortality data from vital statistics extracted from Korean Statistical Information Service
3. The daily ambient level of five air pollutants (PM_{10}, NO_2, SO_2, CO and O_3) from monitoring stations

Analyses

1. Health Economic Assessment Tool (HEAT)
2. Time-series analysis using generalized additive model (GAM)
3. AirQ: Health impact analysis tool

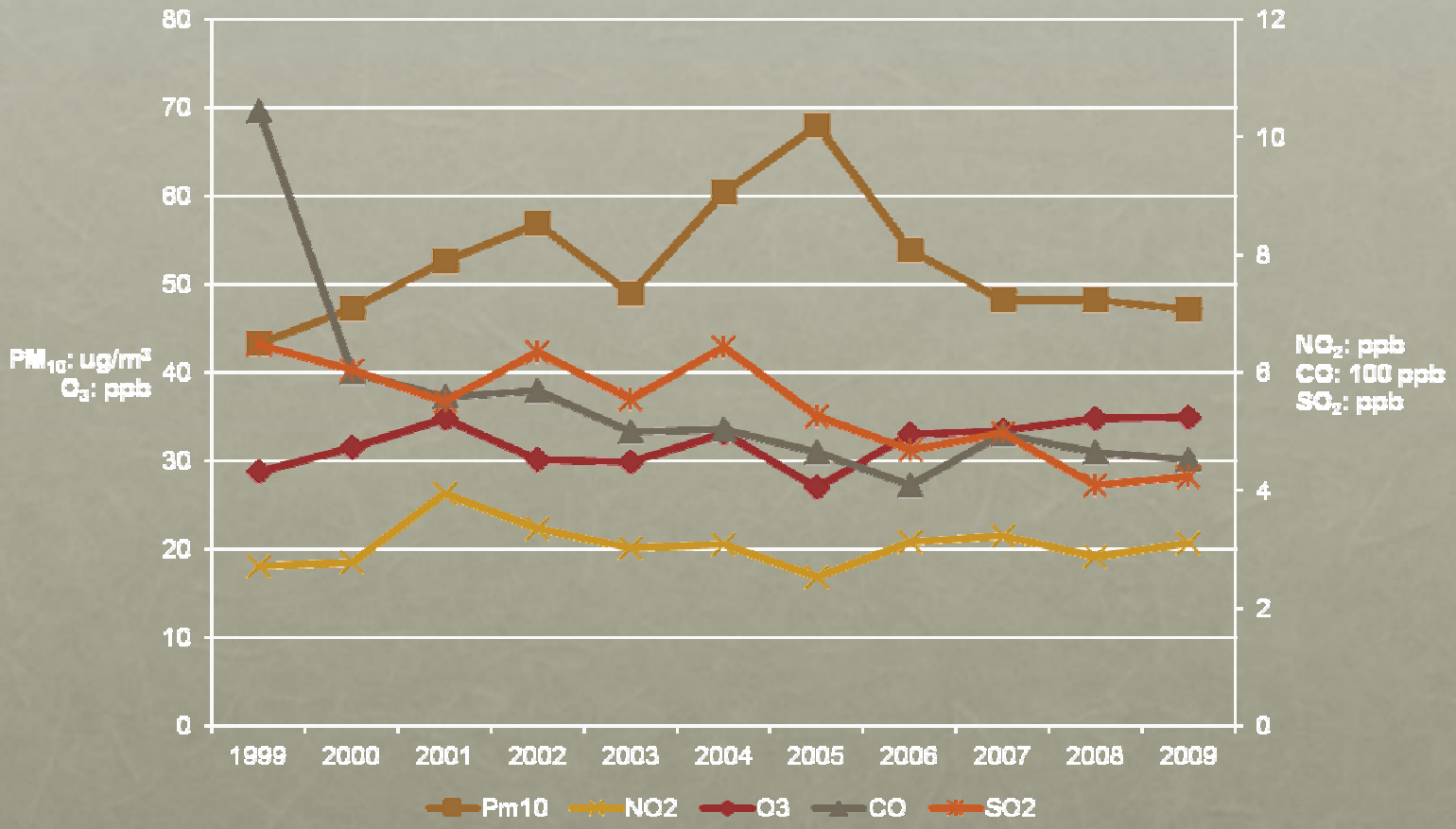
Due to the Increase of Physical Activity

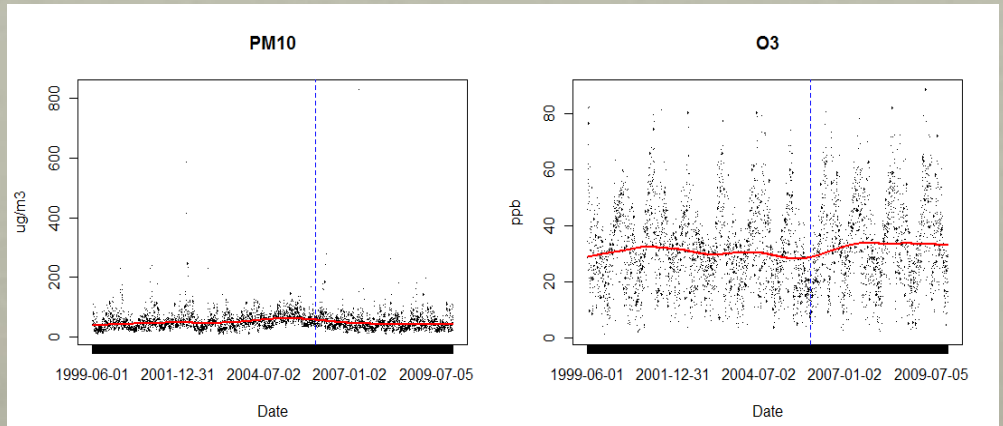
	Observed	Projected
Assumed effect of the policy	66%	75%
Bicycle usage	110.3	
Estimated protective benefit compared to non-cyclist	28.50%	
No. of bicycles in Changwon	12,138	50,000
No. of deaths per year that are prevented	9.96	46.62
Average annual benefit (KRW)	2,274,166,000	10,645,411,000
Total benefit over 5 year (KRW)	11,370,832,000	53,227,054,000

Decreasing Traffic Accident Death

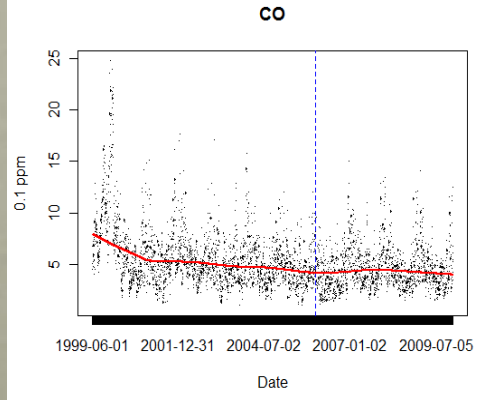
Type of accident	Traffic Accident Death			Interaction with implementation		
	Beta	SE	*P*-value	Beta	SE	*P*-value
Pedestrian	0.0000003	0.0000065	0.9576	0.0000417	0.0000248	0.0929
Bicycle	0.0000622	0.0000267	0.0199	-0.0000578	0.0000625	0.3557
Motor Cycle	-0.0000066	0.0000099	0.5058	-0.0000108	0.0000395	0.7854
Motor Vehicle	0.0000575	0.0000072	<0.0001	-0.0001091	0.0000260	<0.0001
Total	0.0000200	0.0000041	<0.0001	-0.0000266	0.0000157	0.0910

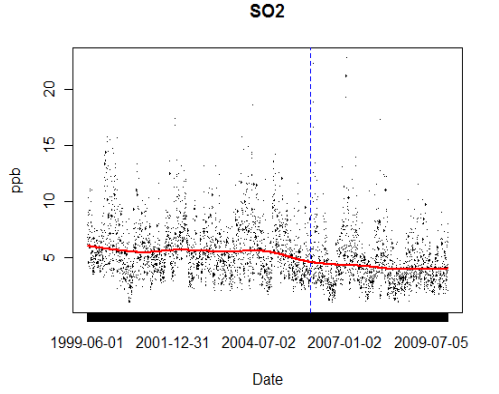
Trends of the Level of Air Pollutants

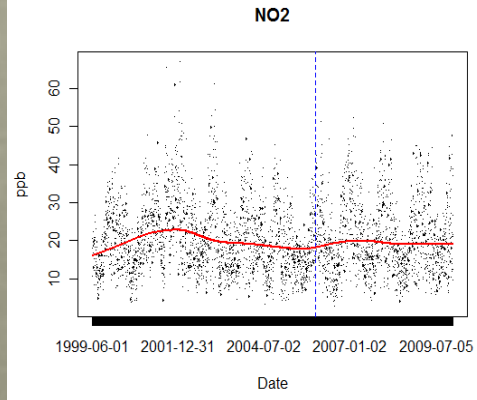



PM10
ug/m3
0
200
400
600
800
1999-06-01
2001-12-31
2004-07-02
2007-01-02
2009-07-05
Date

O3
ppb
0
20
40
60
80
1999-06-01
2001-12-31
2004-07-02
2007-01-02
2009-07-05
Date


CO
0.1 ppm
5
10
15
20
25
1999-06-01
2001-12-31
2004-07-02
2007-01-02
2009-07-05
Date


SO2
ppb
5
10
15
20
1999-06-01
2001-12-31
2004-07-02
2007-01-02
2009-07-05
Date


NO2
ppb
10
20
30
40
50
60
1999-06-01
2001-12-31
2004-07-02
2007-01-02
2009-07-05
Date

Before and After 2006

	Mean(SD)		*P*-Value*
	Jun. 1991 ~ Dec. 2005	Jan. 2006 ~ Dec. 2009	
$PM_{10}(\mu g/m^3)$	54.6(29.6)	49.3(32.8)	<0.0001
CO(ppm)	0.57(0.30)	0.45(0.20)	<0.0001
O_3(ppb)	30.8(13.8)	34.0(15.0)	<0.0001
SO_2(ppb)	5.9(2.4)	4.5(2.3)	<0.0001
NO_2(ppb)	20.5(8.9)	20.5(9.2)	0.9588

* Student's t-test

Trends of Air Pollutants

	Pollutant			Interaction with implementation		
	Beta	SE	p-Value	Beta	SE	p-Value
PM10	0.0085	0.0009	<0.0001	-0.0150	0.0021	<0.0001
CO	-0.0002	0.0001	<0.0001	0.0018	0.0002	<0.0001
O3	-0.0017	0.0004	<0.0001	0.0025	0.0009	0.0090
SO2	-0.0003	0.0001	<0.0001	-0.0049	0.0002	0.0027
NO2	-0.0011	0.0002	<0.0001	0.0003	0.0006	0.5950

Due to the Reduction of Air Pollution

Reference level		50 µg/m^3	20 µg/m^3
Attributable cases (95% CI)	In 2005	17.1 (3.7-30.3)	40.4 (8.2-71.7)
	In 2009	5.4 (1.2-9.6)	23.0 (4.6-41.1)
Reduction	Cases per year	11.7	17.4
	%	68.4	43.1

Summary and Discussion

- Decreased mortality due to the increase of physical activity, the reduction of traffic accident death and the reduction of air pollution
- Limitations
  - Assumptions on the effect of the policy
  - No risk was considered
  - Reduction of air pollution cannot be directly linked to the pro-bicycle policy

Acknowledgement

- WHO WPRO has provided funds for the research and the travel of the presenter.

Thank You!

SEOUL
NATIONAL
UNIVERSITY