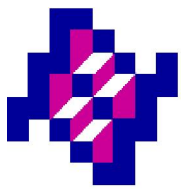


# Climate Change, Air Quality and Health: a Mexican Perspective

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Environmental Health  
National Institute of Public Health

April 2008

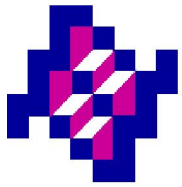


# Potential Relationships between exposure situations and disease conditions

Health condition of concern	Exposure situations					
	Polluted Air	Excreta and household wastes	Polluted water or deficiencies in water management	Polluted food	Unhealthy housing	Climate Change
Acute respiratory infections	②				②	②
Diarrhoeal diseases		②	②	②		②
Malaria and other vector-borne diseases		②	②	②		②
Other infections		②	②	②	②	②
Cancer	②			②		②
Cardiovascular diseases	②					②
Mental disorders					②	②
Chronic respiratory diseases	②					②
Injuries and poisonings	②		②	②	②	②

Source: The World Health Report 1998. Life in the 21st Century – A Vision for All (last column modified )





# Climate change and human health Needs of Research

- **Needs assessment**

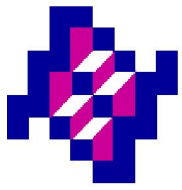
Identification of research needs and knowledge gaps

- **Health impacts research**

Development of quantitative estimates of health risks associated with climate change

- **Assessment and adaptation/decision support**

Development of information and tools that help public health officials ameliorate global change health impacts



# Climate change and variability Health impacts research

## Retrospective Studies

## Prospective Studies

Associations climate and Health

County Analysis

Climate Change  
Scenarios by Region

Vulnerability for  
ecological regions:  
case studies

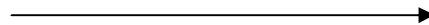
Impact of climate  
variability on the  
incidence of  
malaria in  
Chiapas's  
municipalities

Impact of climate  
variability on the  
incidence of  
dengue in  
Veracruz's  
municipalities

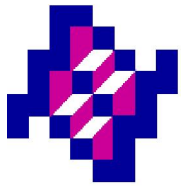
Scenarios to  
evaluate the  
impact of climate  
change on  
human health in  
Mexican territory

Characterization of  
the vulnerability  
associated with  
climate change in  
Mexico and it's  
local health effects

Diagnostic study of  
climate change  
effects in Mexican  
population health



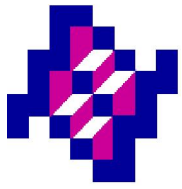
Health risk scenarios associated with climate change in the Olmeca region of Veracruz



## Diagnostic study of climate change effects in Mexican population health

### **Objective**

To make a national diagnosis of the potential impact of climate change in human health, selecting diseases and death causes that [in the scientific literature] had reported any association with climate and are relevant [in terms of public health] in Mexico



# Acute respiratory diseases in large cities

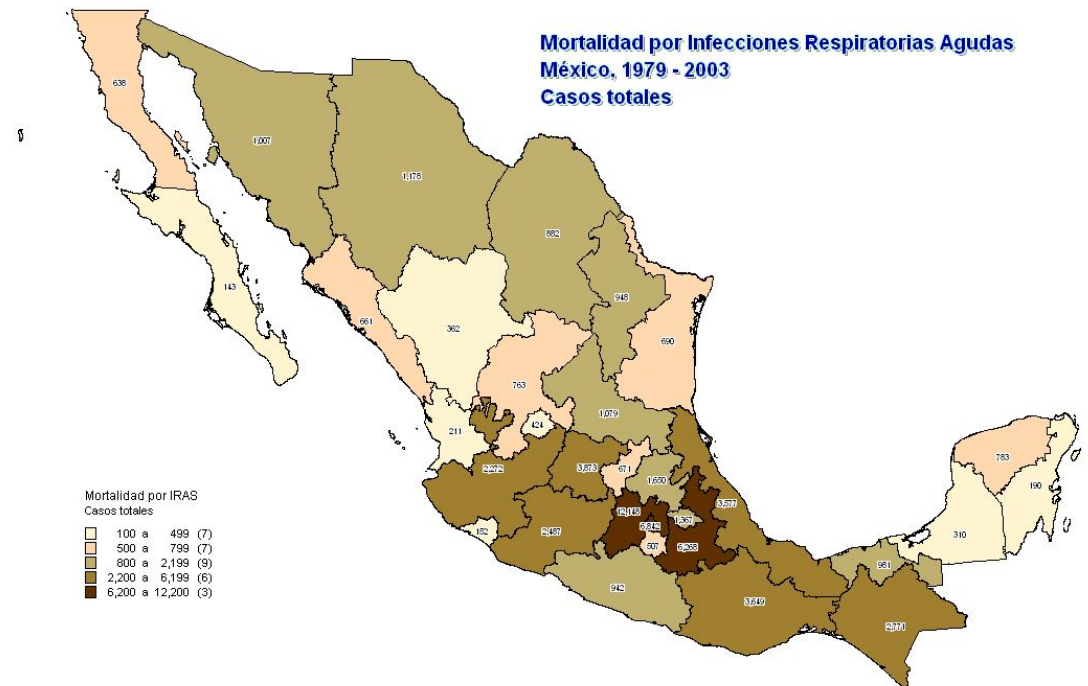
Many large cities have high levels of **air pollution**, which interact with **high temperatures** increasing mortality and morbidity

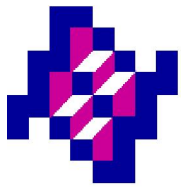


Health effect assessment for air pollution and climate



Epidemiologic studies



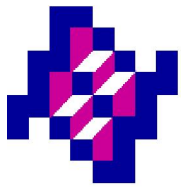


# Metropolitan Areas



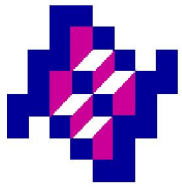
Source: INEGI, CONAPO, SEDESOL, 2000





# Basic study designs in climate and air pollution epidemiology

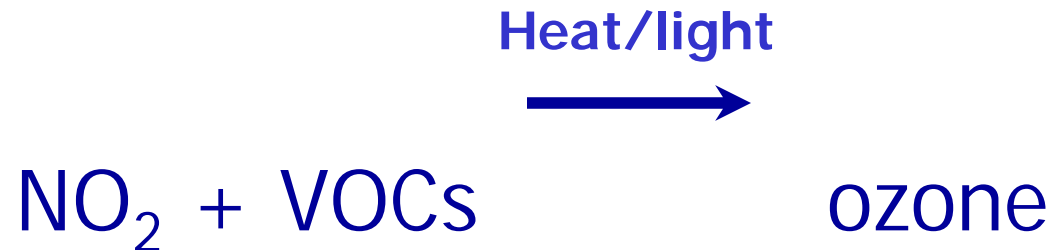
		Exposure	
		Acute	Chronic
Unit of observation	Aggregated	<b>Time Series (counts):</b> Mortality, Hospital Admissions Emergencies Episodes, interventions	Ecological (rates): Mortality Morbidity Cross-sectional
	Individual	Panel studies: Symptoms/Diseases Lung Function  Cohort studies	Cohort studies: Mortality Symptoms/Disease Lung Function Cross-sectional



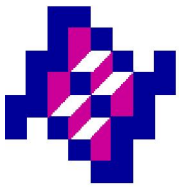
## Ozone formation and temperature

- Ozone is the primary component of smog

- Ozone formation:

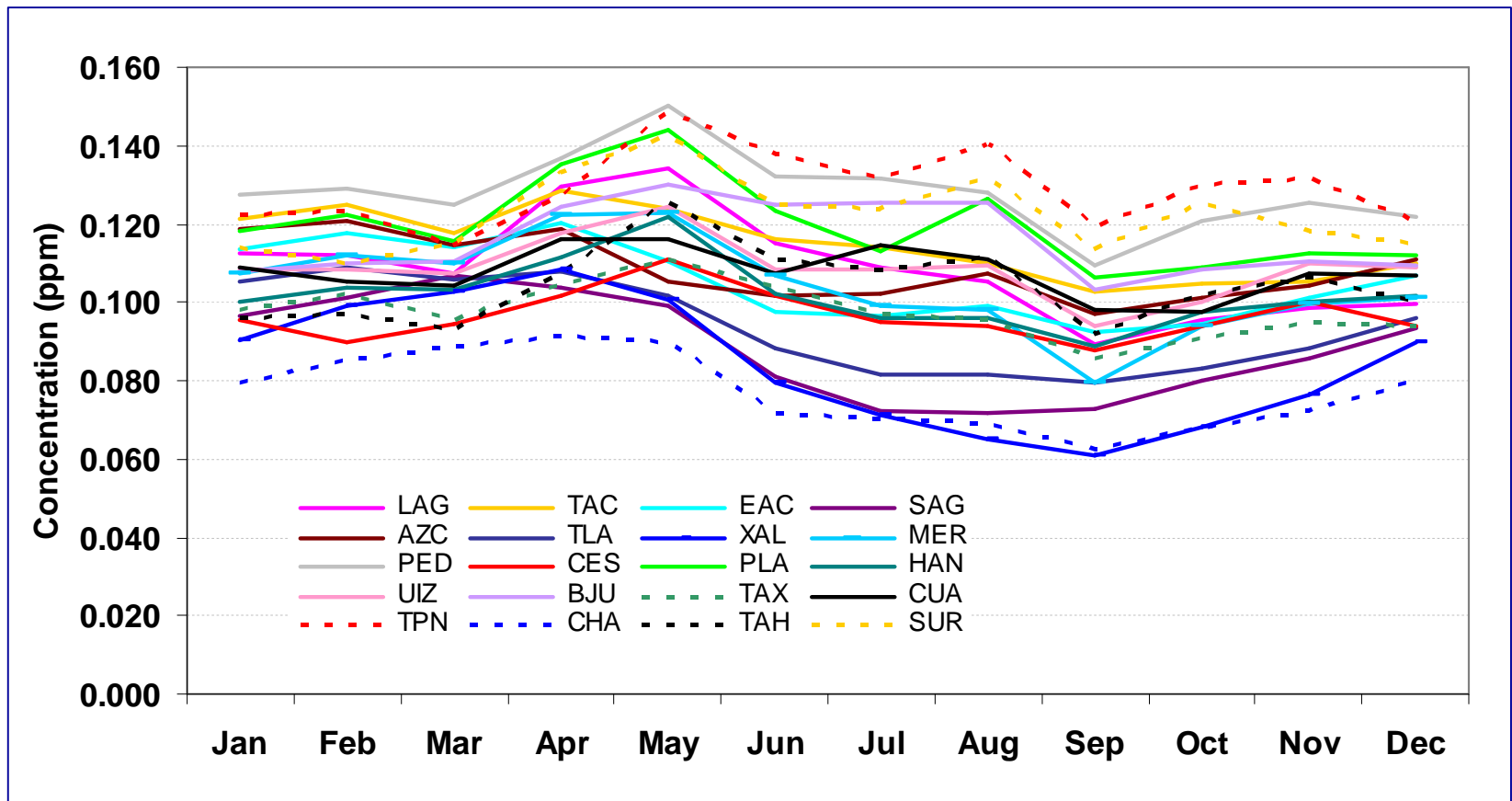


- Warmer temperatures favor ozone formation

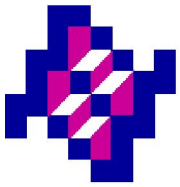


## O<sub>3</sub> (daily data, Maximum 1-h), Mexico City: Month average, period 1997 – 2004

Completeness daily data: at least 75 % of the hours from 6:00 to 19:00 (above 10 hours)



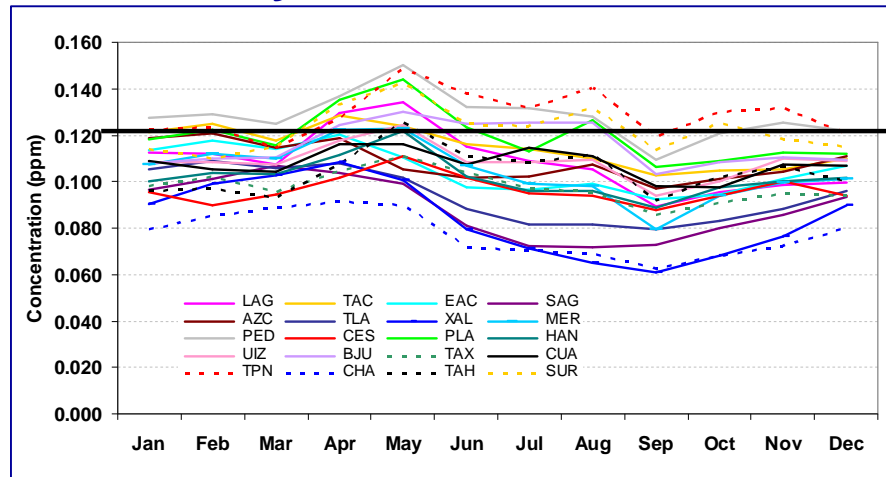
Source: ESCALA Project



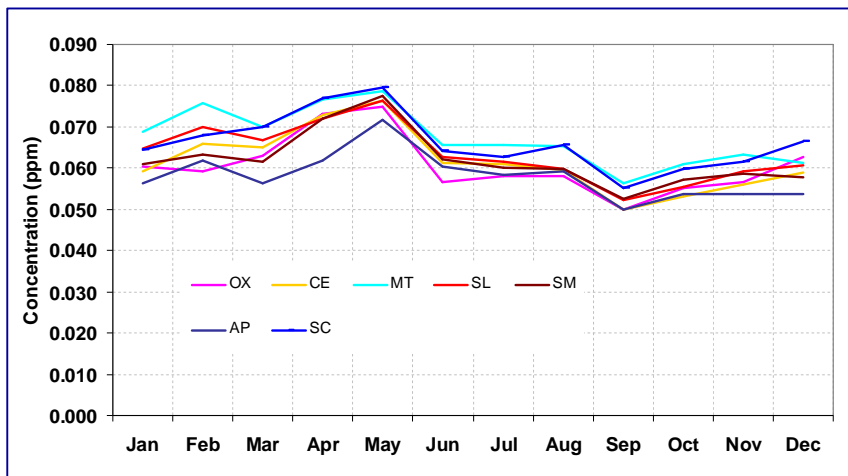
## O<sub>3</sub> (daily data, Maximum 1-h): Month average, period 1997 – 2004

Completeness daily data: at least 75 % of the hours from 6:00 to 19:00 (above 10 hours)

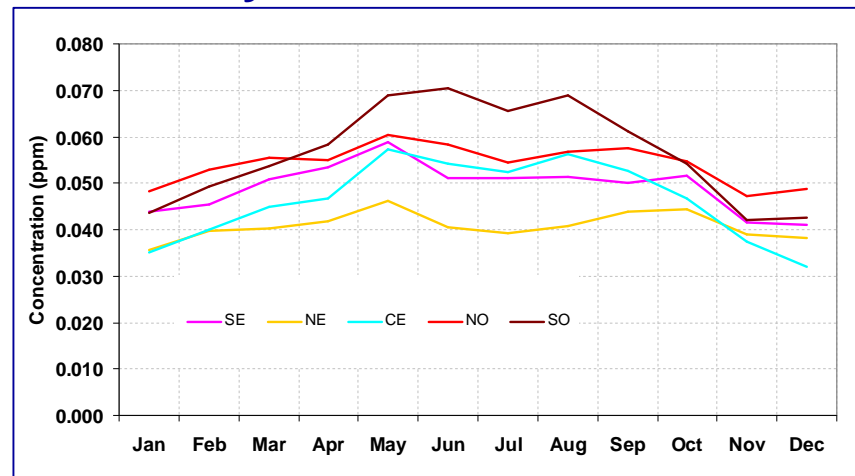
### Mexico City



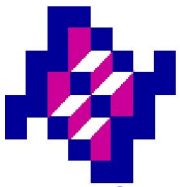
### Toluca



### Monterrey

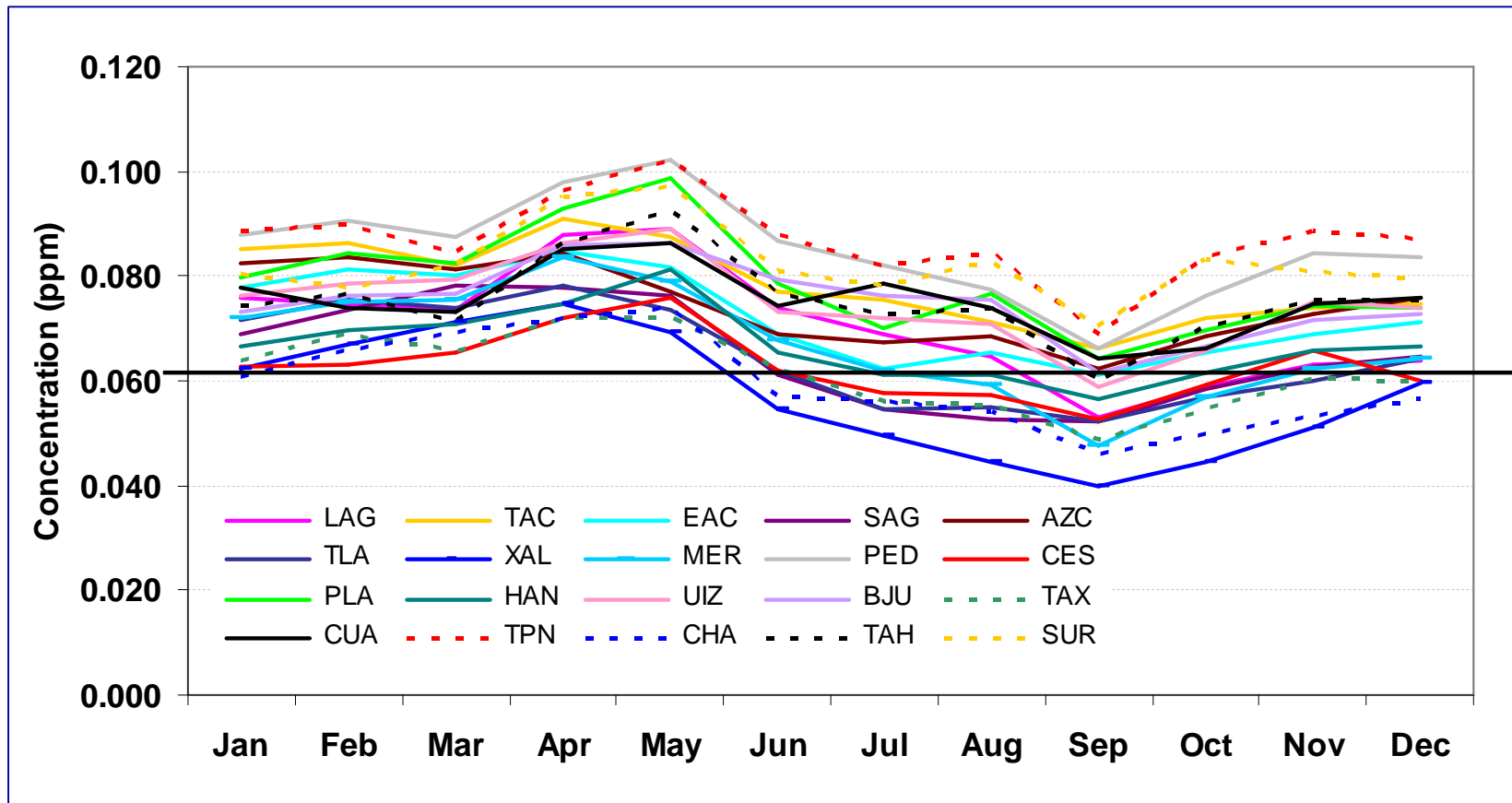


Source: ESCALA Project

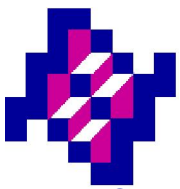


## O<sub>3</sub> (daily data, Maximum 8-h moving average), Mexico City: Month average, 2000

Completeness daily data: at least 75 % of the hours from 6:00 to 19:00 (above 10 hours)

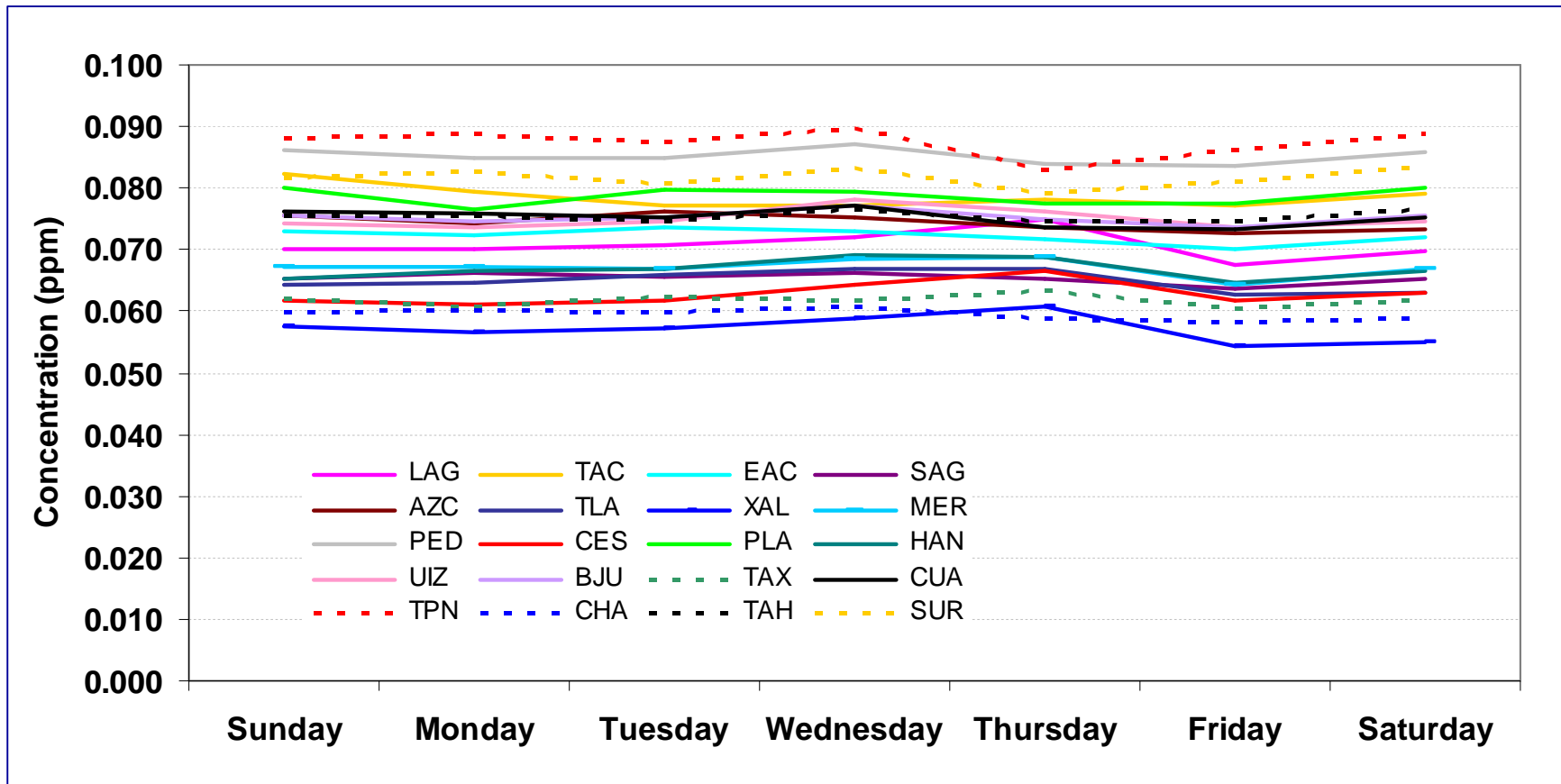


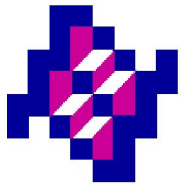
Source: ESCALA Project



## O<sub>3</sub> (daily data, Maximum 8-h moving average), Mexico City: Week average, 2000

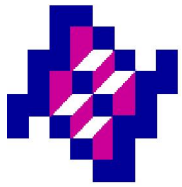
Completeness daily data: at least 75 % of the hours from 6:00 to 19:00 (above 10 hours)





# Health effects of ozone

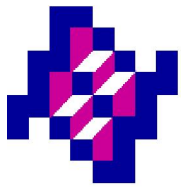
- Known to cause inflammation in respiratory tract (Devlin et al., 1997)
- Reduces ability to breathe (lung function) for some people (Kleinman et al., 1989, Kulle et al.)
- Increases hospitalization for asthma, other lung diseases (Burnett et al., 1994, Thurston et al., 1997 )
- New US study finds Ozone mortality effects\* (Domenchi et. al 2004)



# Health effects of ozone and interactions with climate

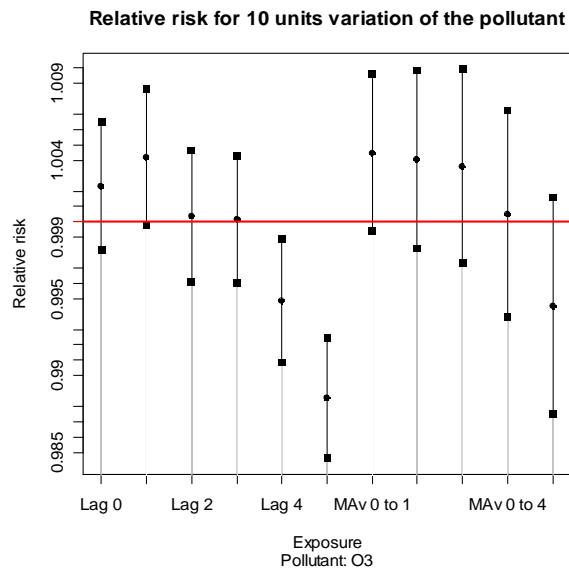
- Increase in the occurrence of
  - asthma attacks
  - respiratory infections
  - and with changes in lung function
- Short-term effects on children with mild-to-moderate asthma (Just J. et al; 2002)
- Ozone concentrations associated with daily deaths in the warm months (Schwartz 2004)



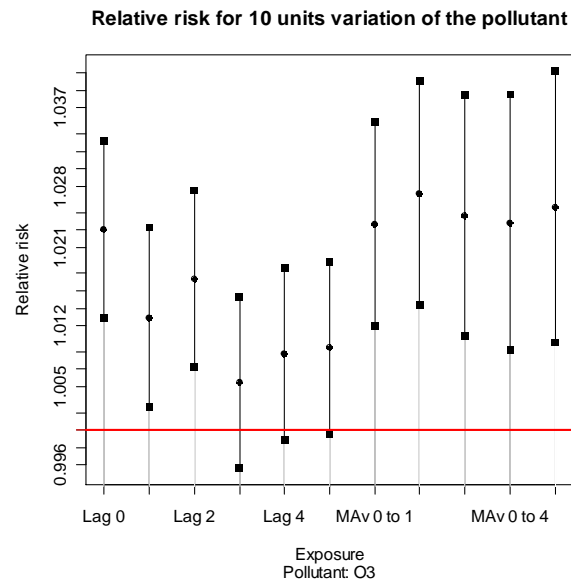


# Relative risk of all causes all ages for O3 in MCMA, Monterrey and Toluca (1997- 2005)

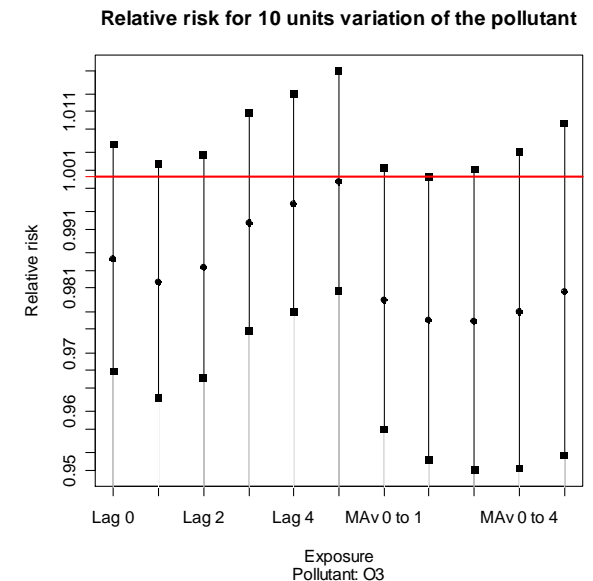
## MCMA

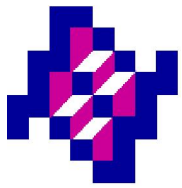


## Monterrey



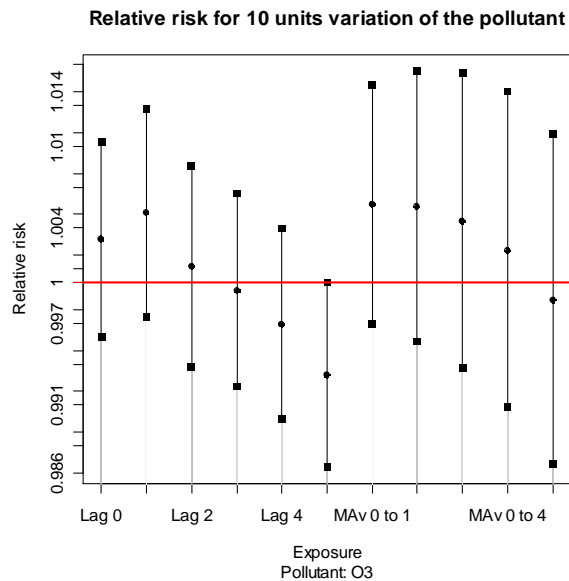
## Toluca



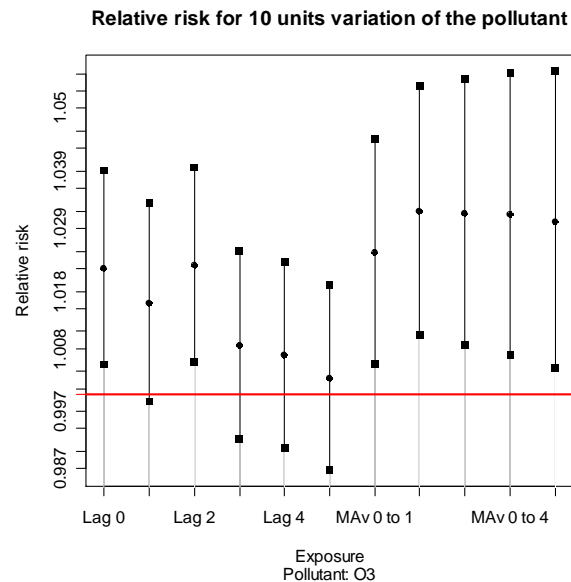


# Relative risk of Cardiovascular causes all ages for O<sub>3</sub> in MCMA, Monterrey and Toluca (1997- 2005)

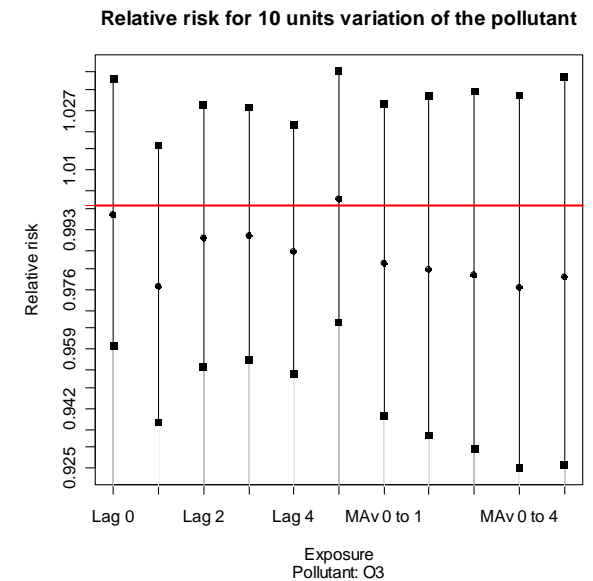
## MCMA



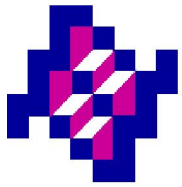
## Monterrey



## Toluca







# Climate change and human health Gaps and problems

- Lack of data of required resolution and quality at county level
- Many social-economic data are inaccessible for analysis
- Highly technical and complex
- Beyond anyone's experience
- Misinformation actively disseminated