Development of an Asthma – Air Quality Data Linkage Tool

New Mexico Department of Health
Office of Epidemiology
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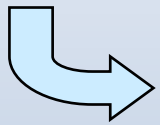
Asthma Data Linkage Project

- ***Purpose: demonstrate a general process for linking particulate matter & ozone data with asthma data to develop a model for preventing exacerbations of asthma.***
  - Exposure to pollutants, such as airborne particulate matter and ozone



associated with increases in mortality and hospital admissions due to respiratory and cardiovascular disease

Special Study Area: Four Corners of NM
Determine the relationship between the daily number of ED visits for asthma and ozone levels

Asthma Data Linkage Project Description

Examine the relationship between daily ozone & PM concentrations & ED visits for asthma & other respiratory outcomes

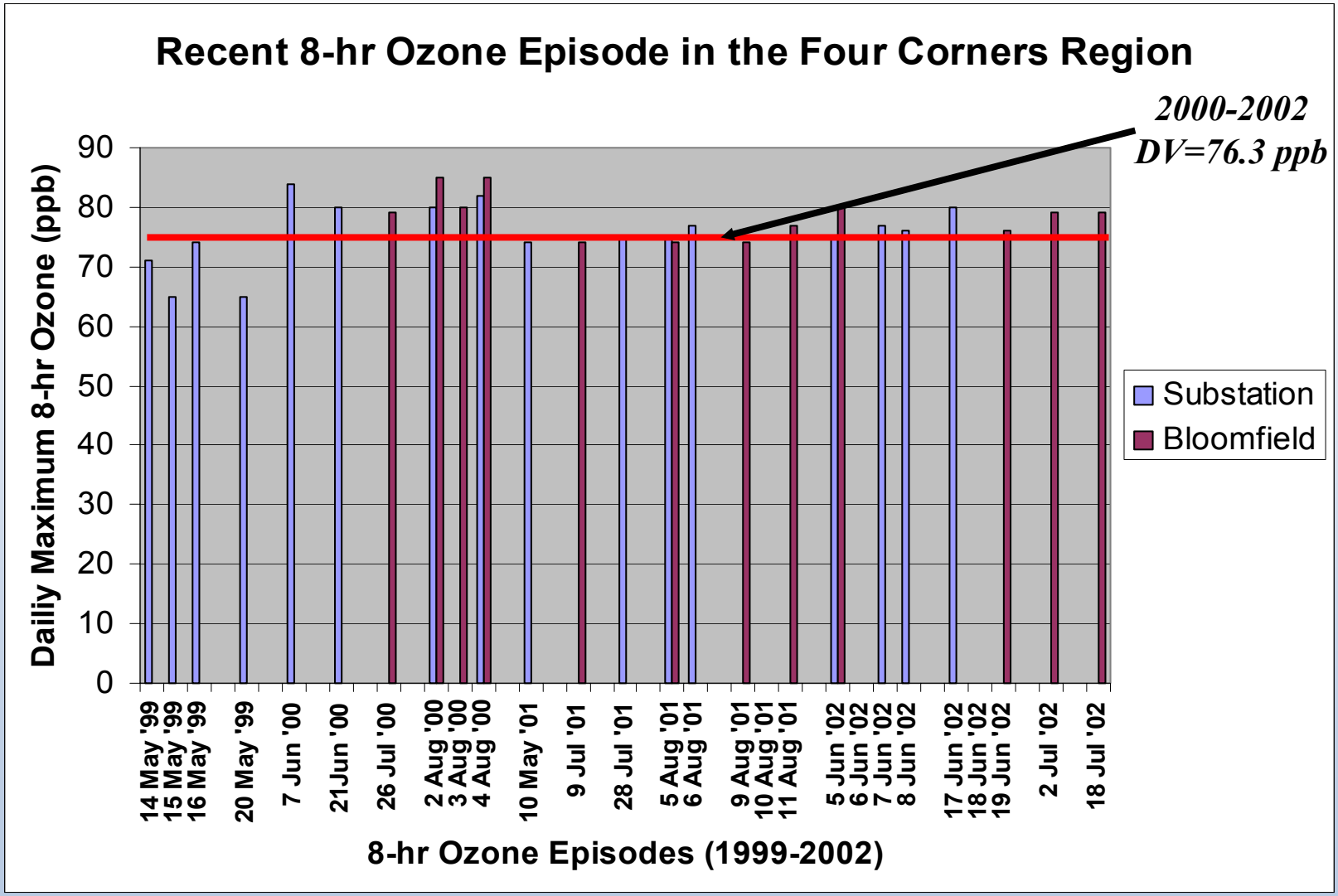
- Conduct time-series analysis
- Analysis of linked data sets to examine associations between exposure & disease
- Demonstrate the utility of the linked data analyses in guiding public health practice & policy regarding public concerns about ozone, PM and asthma/respiratory ailments

Why Farmington, New Mexico?

- High ozone levels (near non-attainment)
- Community concerns about asthma due to ozone
- Early Action Compact committee
- Prevention
- Policy

Average Sunny Days: 273
Average Rainfall: 7.5 in.
Average Snowfall: 12.3 in.
Farmington Altitude: 5,395 ft.

8-hr Ozone Episodes (1999-2002)



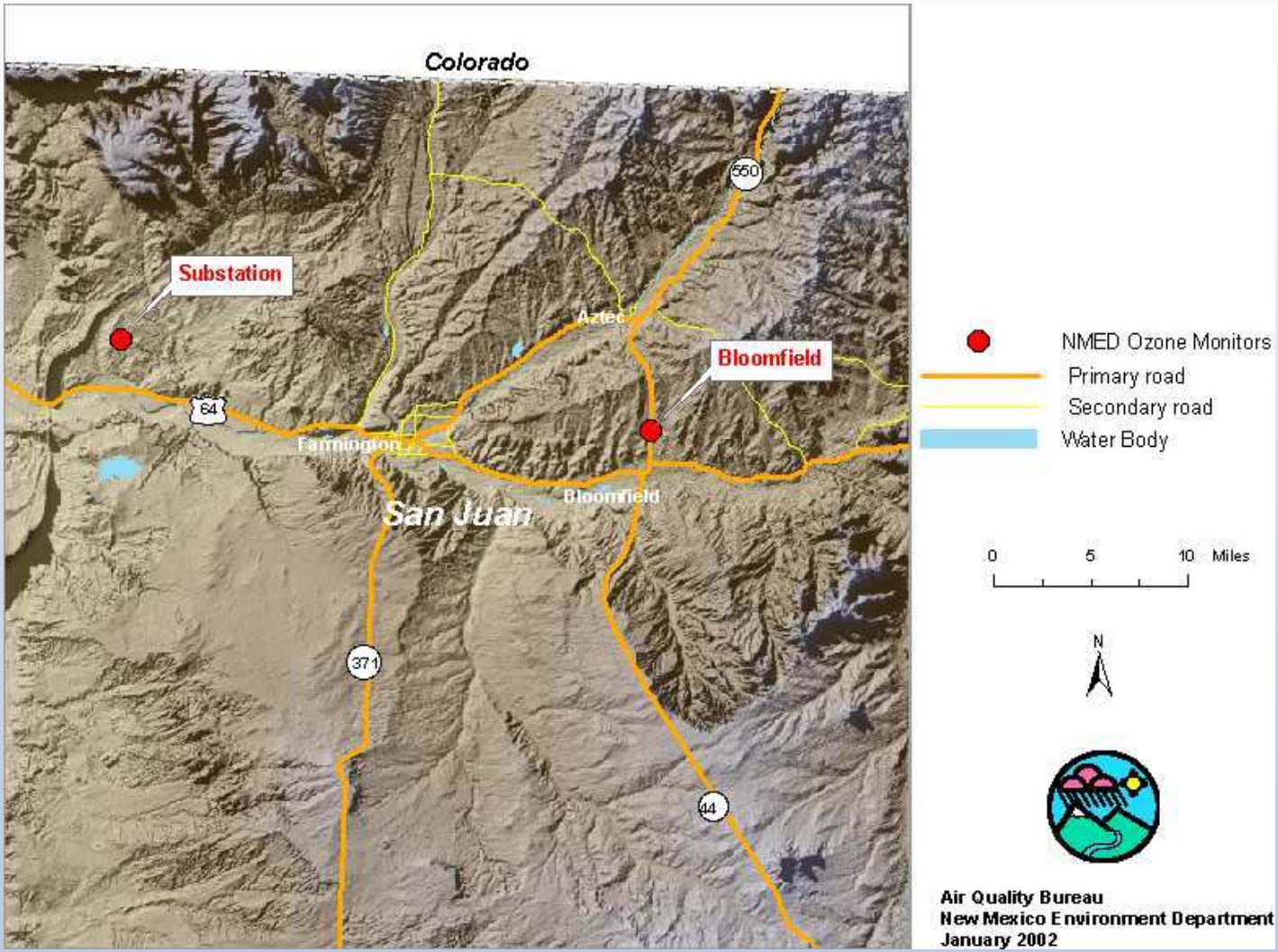
Project Components

Environmental Data:

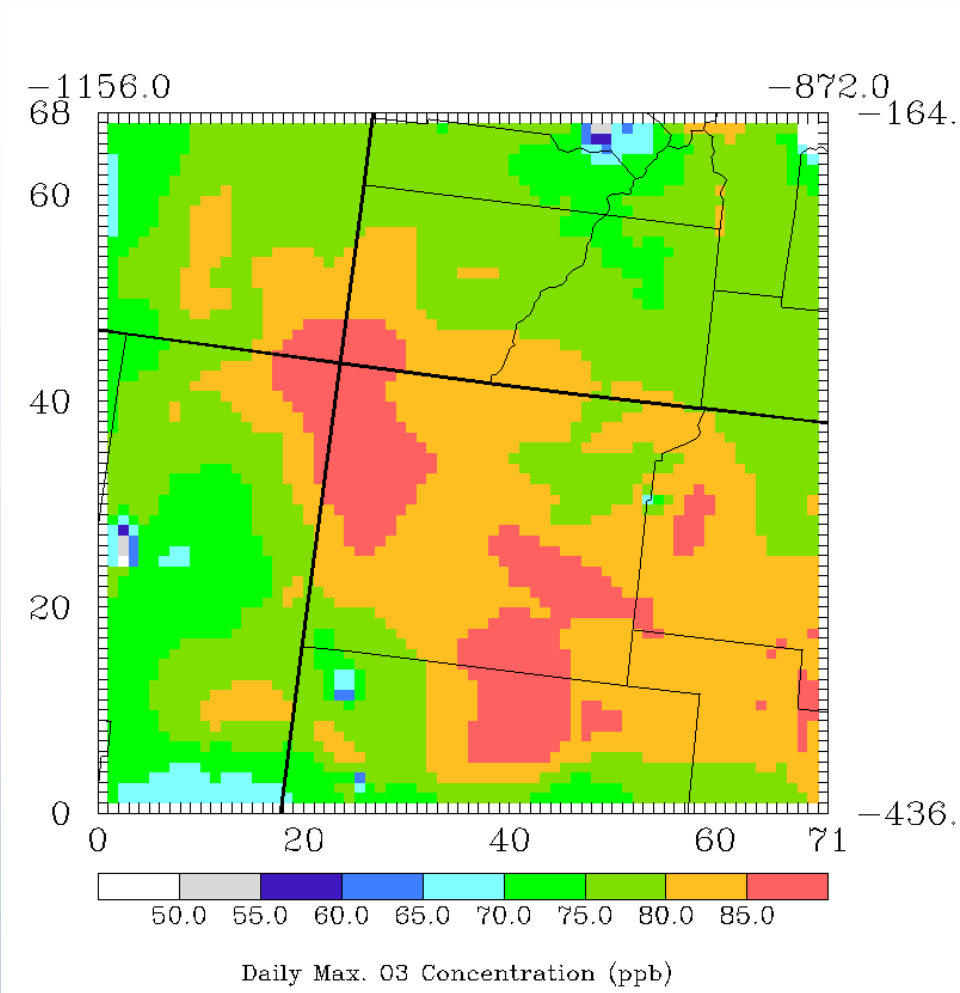
- Air pollution monitoring data (hourly reading for each day for 2000-2003)
- Ozone, nitrogen dioxide, sulrful dioxide, meteorological data
- PM 10 collected every 6 days
- PM 2.5 every 3 days

Data Use: use both daily hourly maximums for ozone and daily maximum 8 hour ozone levels

Environmental Data, cont:



Local Scale Ozone Tile Plots

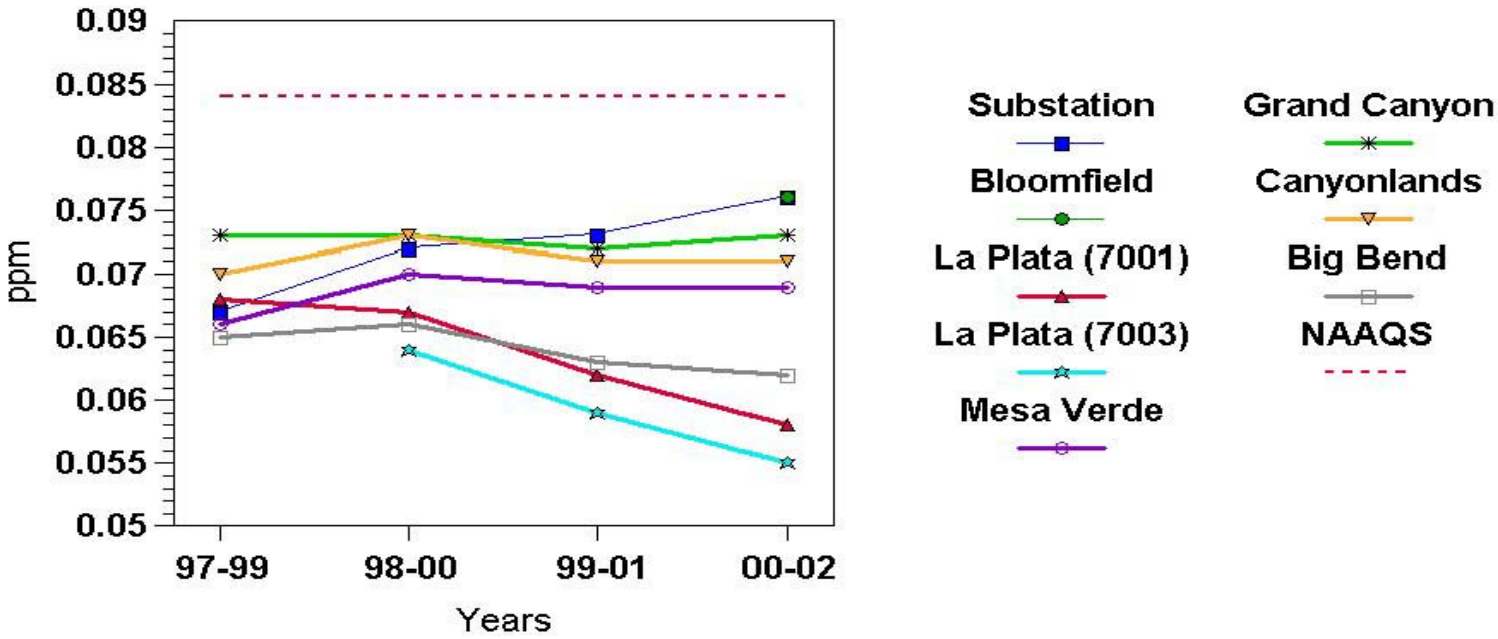


Daily Maximum 8-hr Ozone Concentrations (ppb) on 3 Aug 2000 Over The San Juan Basin/Four Corners Region: 4 km CAMx Grid Domain

Environmental Data, cont:

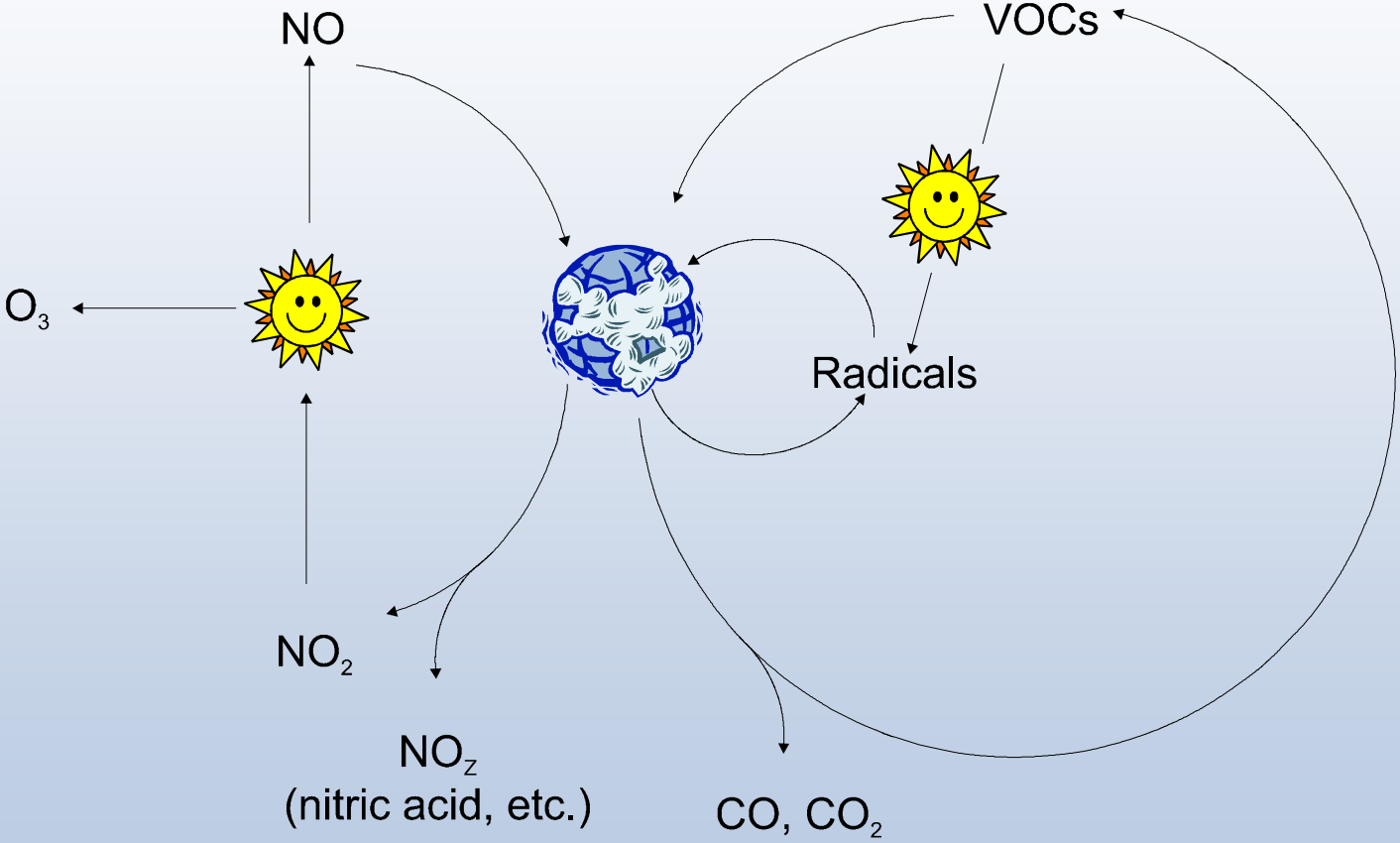
8-hour Ozone Trends

Substation/Bloomfield Sites in San Juan Co., NM
Compared to other Regional Sites
3-year running design values



2000-2002 Design Values for Substation & Bloomfield = 0.076 ppm
Substation ozone monitoring began 5/8/97
Bloomfield ozone monitoring began 6/7/2000

Ozone Formation from VOC and NOx



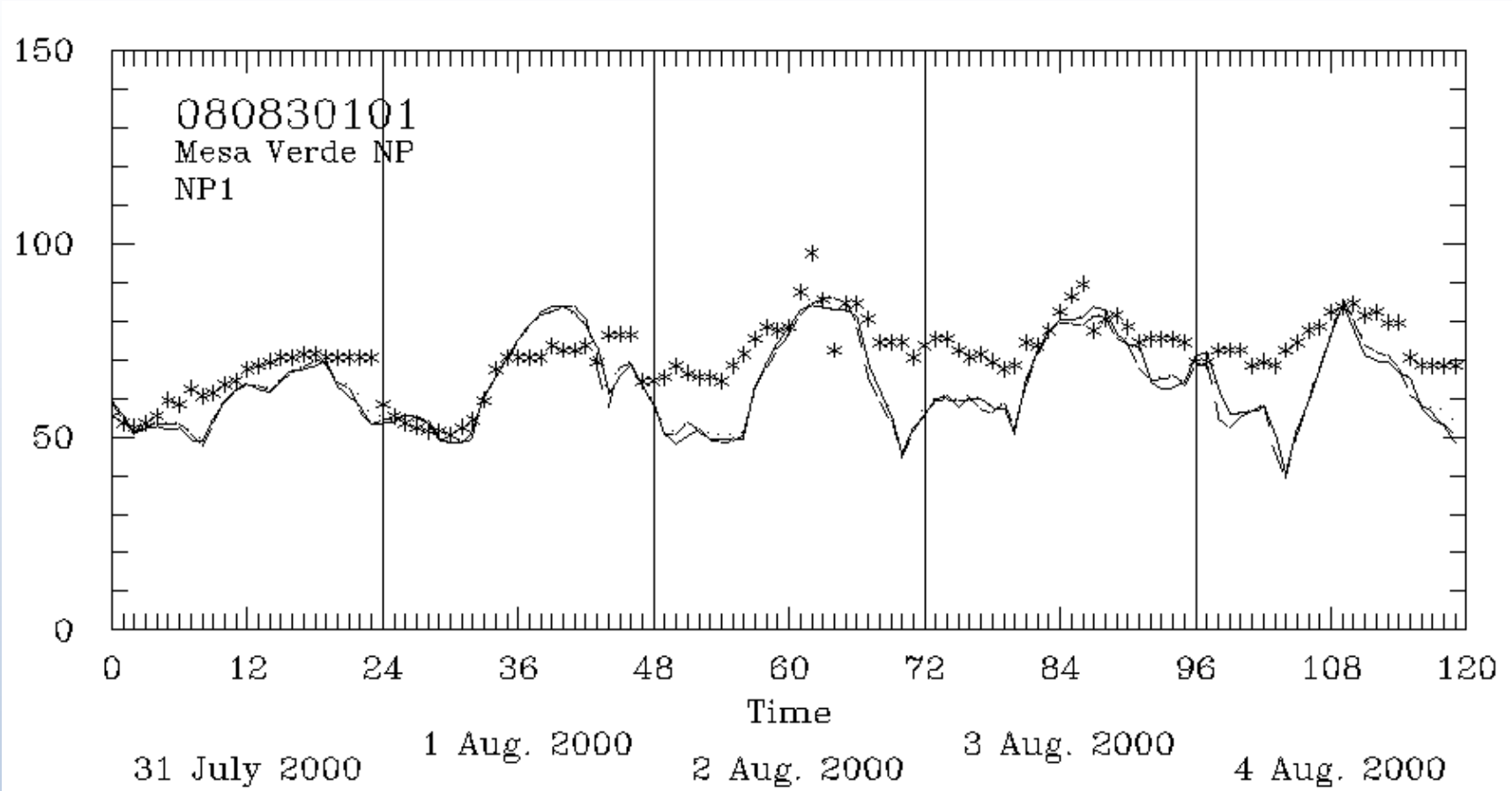
no sunlight ⇨ no ozone production
no NOx⇨ no ozone production
no VOC ⇨ no ozone production

Implications of VOC/NOx Chemistry

- *Highest on hot, summer days*
- *Maximum level in the afternoon*
- *Clinical effects*
  - Reductions in lung function, inflammation
  - Increased exercise-related wheezing, coughing, and chest tightness

Average Sunny Days: 273

Ozone Time Series Plots



Hourly Ozone Concentrations (ppb) on at Mesa Verde National Park
For 31 July – 4 August 2000 Over the San Juan Basin/Four Corners Region

Project Components cont.

Health Outcome Data

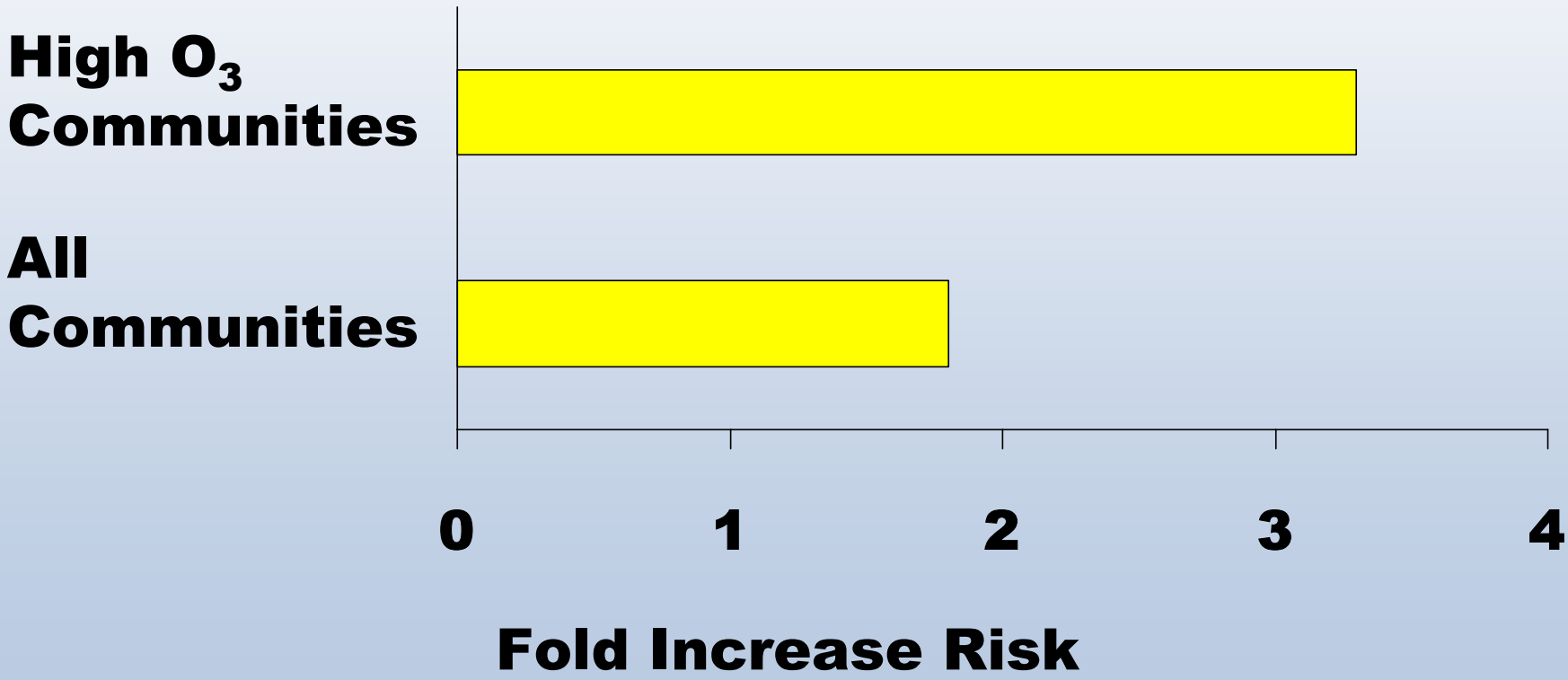
- Asthma data from area hospitals
  - – San Juan Regional Medical Center, Presbyterian Urgent Care, Durango Hospital in Durango, CO, Northern Navaho Medical
- ER data to be collected
  - Acute Respiratory (croup, acute bronchitis, pneumonia)
  - Chronic Respiratory (asthma, COPD, emphysema, chronic bronchitis
  - Age 5 year age groups if won't release single ages
  - Year: 2000 through 2003

Children's Health Study

- 10 year study, began in 1992
- Funded by the CA EPA's Air Resources Board and conducted by USC
- Large, long-term study of health effects of children's chronic exposure to S. CA air pollution
- 12 communities chosen because they have different patterns of high and low levels of Ozone, Nitrogen Oxide, Acid Vapor and PM

Risk to Develop Asthma

Children Playing ≥ 3 Sports



Lancet Feb 2, 2002

Health Effects

- **Asthma Exacerbations and Exposure to Ozone**
  - May trigger asthma exacerbations at levels much lower than the federal ambient air quality standards (8-hour average = 0.084 ppm and 1-hour average – 0.12 ppm)
- **Effect of Ozone on Hospital Admissions, ER Visits and Medications Use**
  - Increased hospital admissions occur a day after an increase in ozone levels
  - Increase in ER visits is associated with an increase in ozone levels
  - Increased need for asthma medications use is associated with an increase in ozone

Project Components cont.

Exposure and Analysis Issues

- Determining spatial units and time period for linkage – likely establish temporal trends using generalized linear mixed model analysis and generalized additive models
- Daily ED visit frequencies will need to be filtered to remove day of the week and long wave trends – filtered values will likely be regressed on air pollution and weather variable for the same day and the 3 previous days
- Determining whether ozone effect is confounded by other pollution and weather variables – assessment of these impacts
- Small population – sufficient power?

Guiding Public Health Practice and Policy

Public Health

- *Air quality reports*
- *Stay indoor on O_3 alert days*
- *Avoid exercise on O_3 alert days*
- *Expansion of health outcome datasets statewide (ER, Medicaid, HMO)*
- *Education to child care givers*

Policy

- *Control Strategies for Ozone Formation*

Who We Are

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