
Clearing the Air in Flagstaff, AZ

Best of the West Conference

September 7, 2006

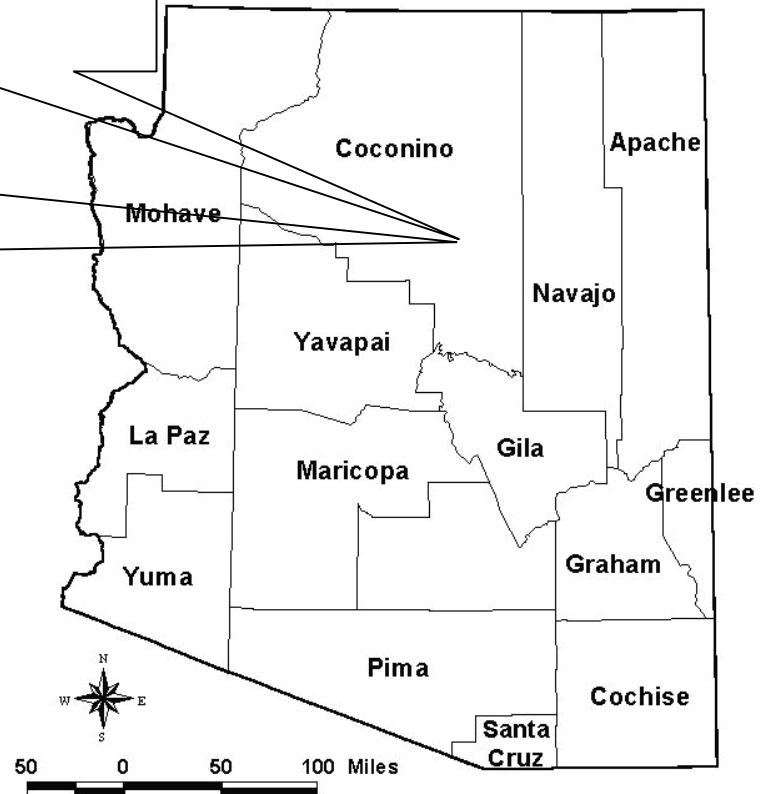
*TEPP Evaluation Unit, University of Arizona;
Social Research Laboratory, Northern Arizona University;
Department of Psychology, George Mason University*

Flagstaff, Arizona

Estimated
population:
57,000

Home of the Lumberjacks
(Northern Arizona
University)
13,000 undergraduates
6,000 graduate students

Arizona Counties



County Boundaries State Boundary

Evidence

There is a great deal of evidence to support the effects of second hand smoke on worker's, patrons, and children. ^{3, 4, 5}

Purpose of Ordinance

- To protect the public health and welfare by prohibiting smoking in public places and places of employment
- To provide the opportunity for all individuals to breath smoke-free air

How much difference has
the ordinance made?

Are the people of Flagstaff breathing
cleaner air?

What We Did...

Identified “accessory bars” (bar/restaurants) and “stand-alone bars” in Flagstaff

- ❑ Worked with staff from Coconino County Department of Health Services, and with staff at the NAU Social Research Laboratory to select appropriate venues
- ❑ Selected seven campus venues, seven downtown venues and one “family establishment” covered by the ban

Why bars?

Particularly high exposure for employees
in those worksites

Meta-analysis of Indoor Air Concentrations on Nicotine ($\mu\text{g}/\text{m}^3$) in a Variety of Workplaces in the U.S., Focusing on Rates in the Hospitality Industry

| Type of workplace | Number of Studies | Number of Establishments | Ave. Nicotine Values ($\mu\text{g}/\text{m}^3$) | Range | Ratio of Mean Compared to Offices/Residences |
|-------------------|-------------------|--------------------------|---|-----------|--|
| Offices | 22 | 940 | 4.1 | 0.8-22.1 | 1 |
| Residences | 7 | 91 | 4.3 | 1.6-21.0 | 1 |
| Restaurants | 17 | 402 | 6.5 | 3.4-34.0 | 1.6 |
| Betting Establ. | 3 | 4 | 9.8 | 8.0-10.7 | 2.4 |
| Bowling Alleys | 2 | 6 | 10.5 | 10.1-10.7 | 2.6 |
| Billiard Halls | 2 | 4 | 13 | 9.8-19.4 | 3.2 |
| Bars | 10 | 27 | 31.1 | 7.5-105.4 | 7.6 |

Serum Cotinine Levels in Blood by Occupational Category Non-smokers who Reported No Home Exposure in U.S.

Data from Third National Health and Nutrition Examination Survey (NHANES III)

| Job Groups | Number (Total = 4952) | mean ng/mL* | % of people in group with > 0.1 ng/mL** |
|--------------------------------------|--------------------------|----------------|---|
| Managerial/Professional | 1157 | 0.12 | 55.0% |
| Sales | 480 | 0.18 | 66.5% |
| Technical/Administrative | 940 | 0.14 | 60.8% |
| Service | 889 | 0.19 | 66.1% |
| Waiters/Waitresses | 50 | 0.47 | 90.2% |
| Farming/Forestry | 209 | 0.09 | 41.4% |
| Mechanics/Repairers/Craft/Production | 472 | 0.21 | 73.7% |
| Operators/Fabricators/Laborers | 805 | 0.22 | 75.7% |
| Construction Laborers | 43 | 0.20 | 67.1% |
| Laborers, except construction | 44 | 0.44 | 93.1% |
| Motor Vehicle Operators | 132 | 0.24 | 84.1% |

* ng/mL = nanogram per milliliter

** = 0.1 ng/mL is Healthy People 2010 cutoff
indicating exposure to SHS

Food and Drink Industry Facts

| | Establishments | Annual sales | Annual payroll | Paid employees |
|-------------------|----------------|---------------|----------------|----------------|
| Flagstaff City | 189 | \$131 million | \$38.5 million | 3900 |
| Greater Flagstaff | 305 | \$220 million | \$62 million | 5822 |
| State of Arizona | 8655 | \$6 billion | \$1.7 billion | 163,131 |

Effects of small particles

There is evidence that even relatively small increases in particle exposure can have serious consequences.

An example from one study of particle exposure across years in six cities¹⁵:

- Most polluted, Steubenville, OH, air had mean of 29.6 PM2.5 $\mu\text{g}/\text{m}^3$
- Least polluted, Portage, WI had mean of 18.6 PM2.5 $\mu\text{g}/\text{m}^3$
 - The 11 $\mu\text{g}/\text{m}^3$ difference was associated with an increased death rate of 126% in Steubenville over Portage
- Results supported in a 2005 re-analysis¹⁶

An Evaluation Unit staff member, Michael Menke, was trained in air monitoring at Roswell Park Cancer Center, one of the leading centers for air monitoring work.

Michael trained four NAU students and one Coconino County LP staff person, each over 21, in using air monitoring equipment and in documenting data.

Equipment

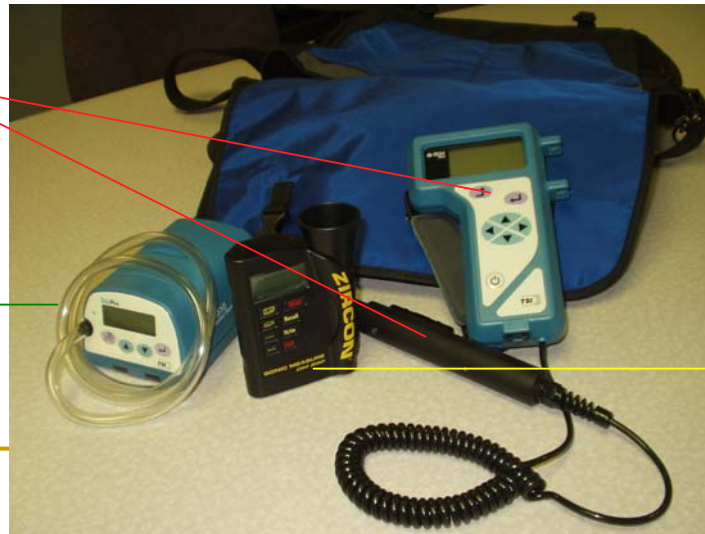


Air wand for
CO, CO₂,
RH, Temp



AM510
Smoke
inlet

AM510 for
particulate matter
counts



Zircon ultrasound
measuring "tape"

Data collection

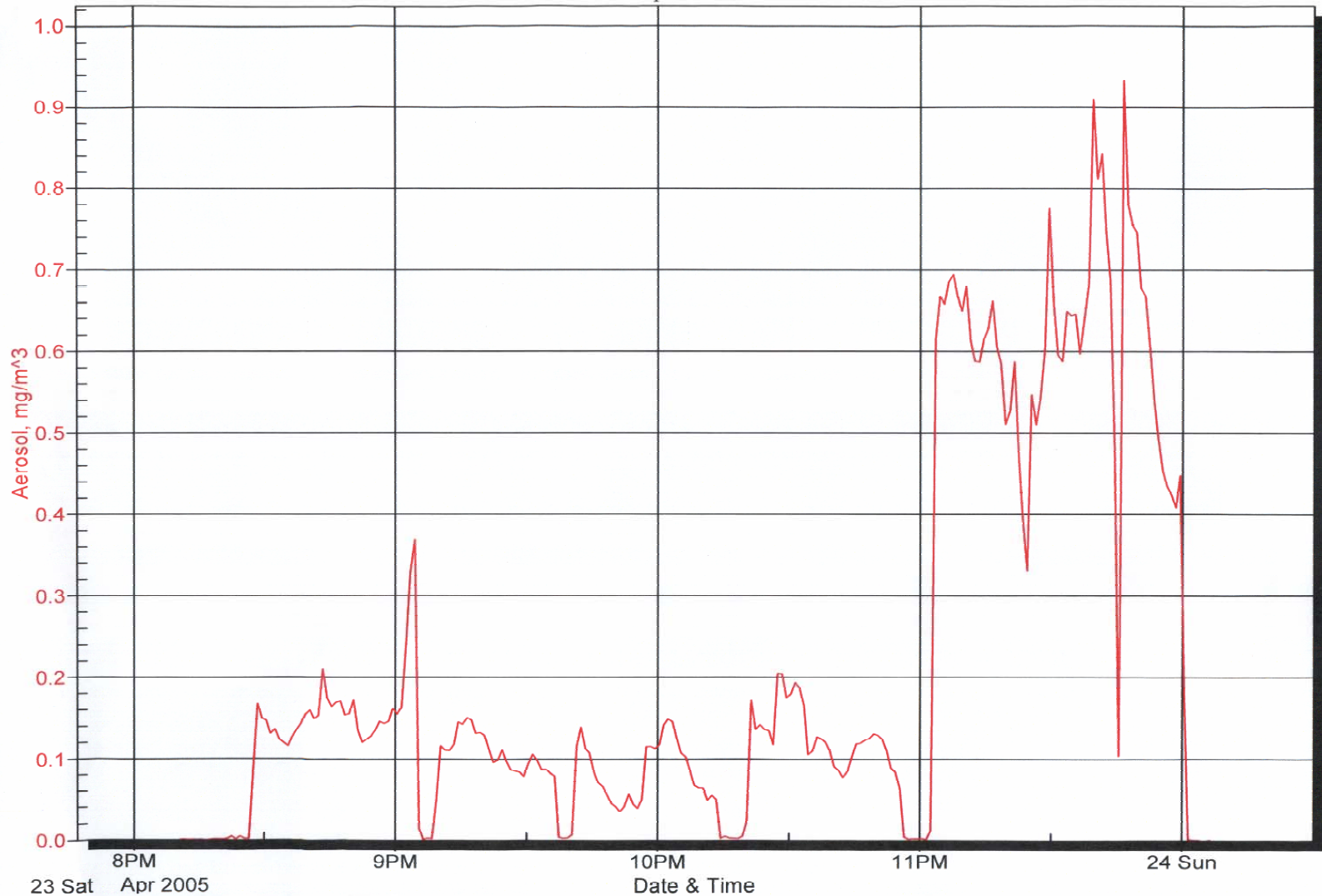
- Data for Friday and Saturday evenings:
 - Two consecutive weekends before the ban;
 - Four weekends after the ban over the next two months.
- Two teams of 2 NAU graduate students sampled air in 8 establishments each evening from around 7 PM to midnight.
- Sixteen (16) establishments total were monitored for ≥ 30 minutes.
- Establishments in two regions: downtown and near campus (8 in each region)
- Monitors ran continuously within and between establishments.
- The primary room dimensions were recorded with Zircon device.
- Every 15 minutes, count of the number of lit cigarettes and patrons.

The pre-ordinance air quality of selected bars in Flagstaff

Weekends of April 22-23 and April 29-30, 2005

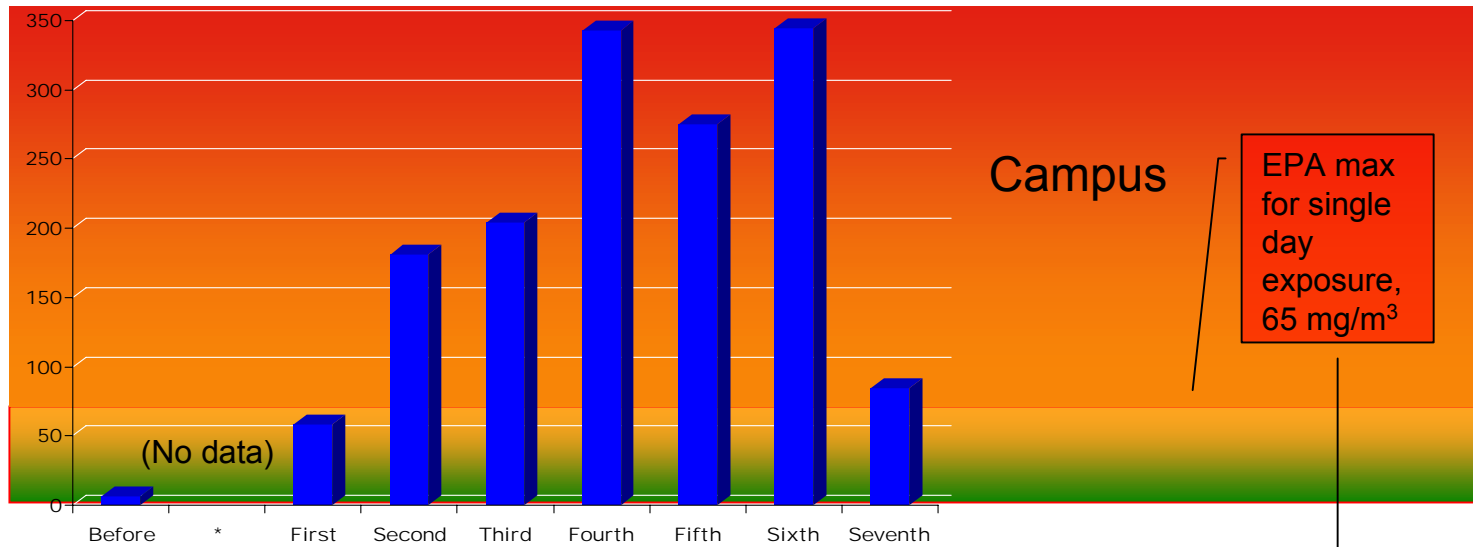
SidePak Particle Data From a Typical Evening

SidePak Team 1 Venue C
Sat April 23 2005

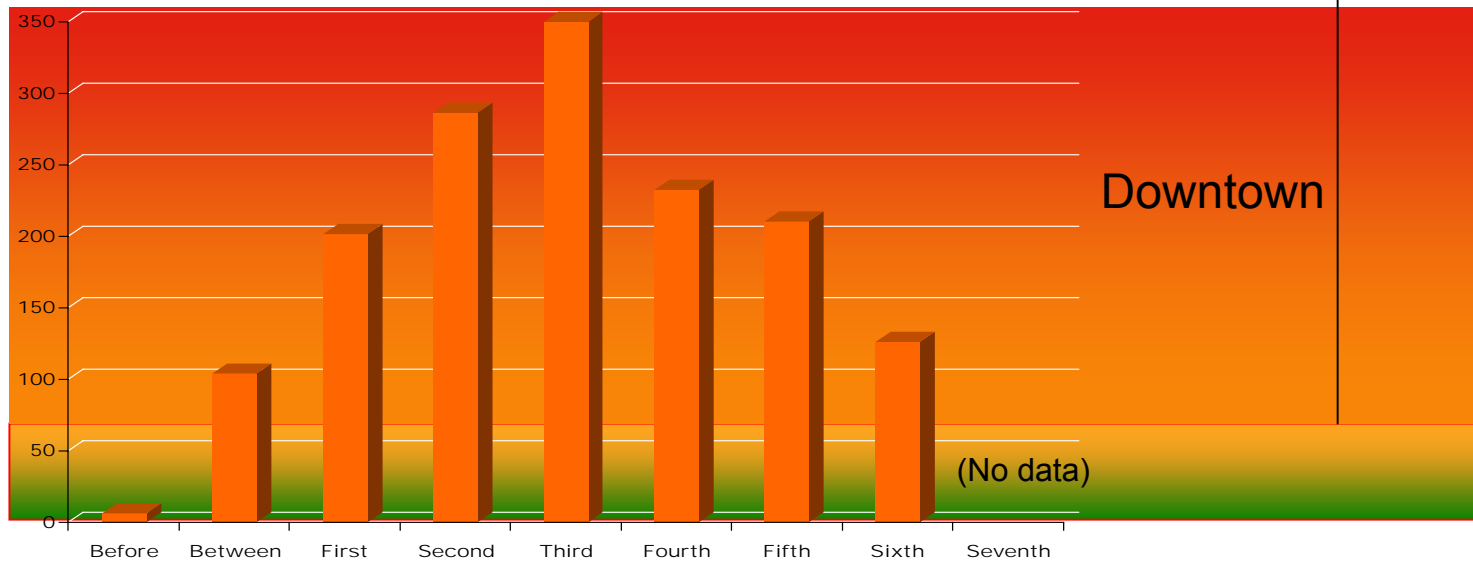


Pre-ordinance Air Particle Levels in Establishments

PM_{2.5} mg/m³

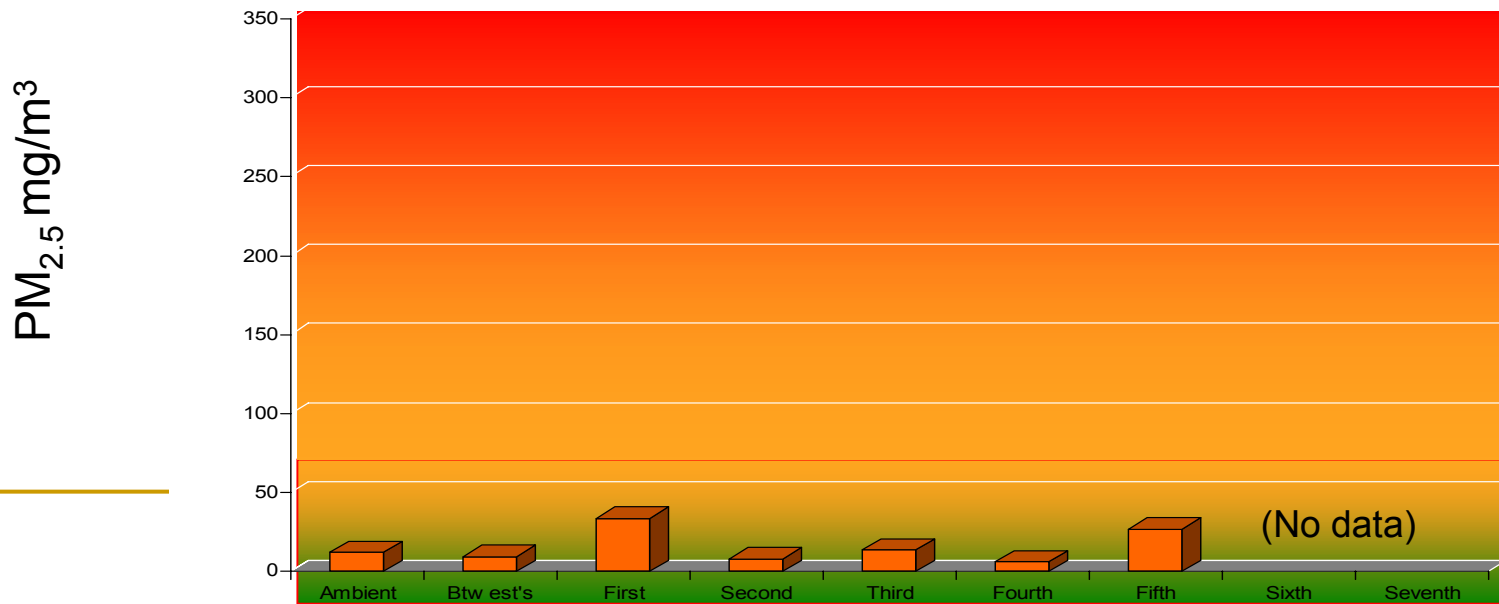
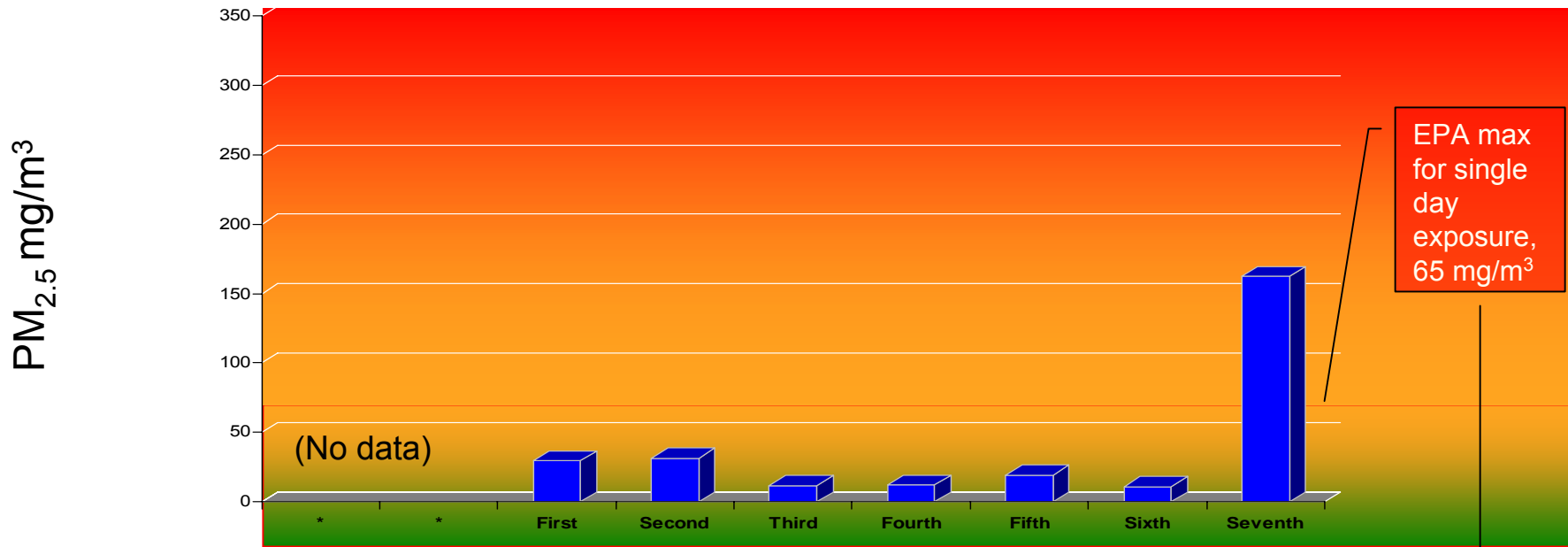


PM_{2.5} mg/m³

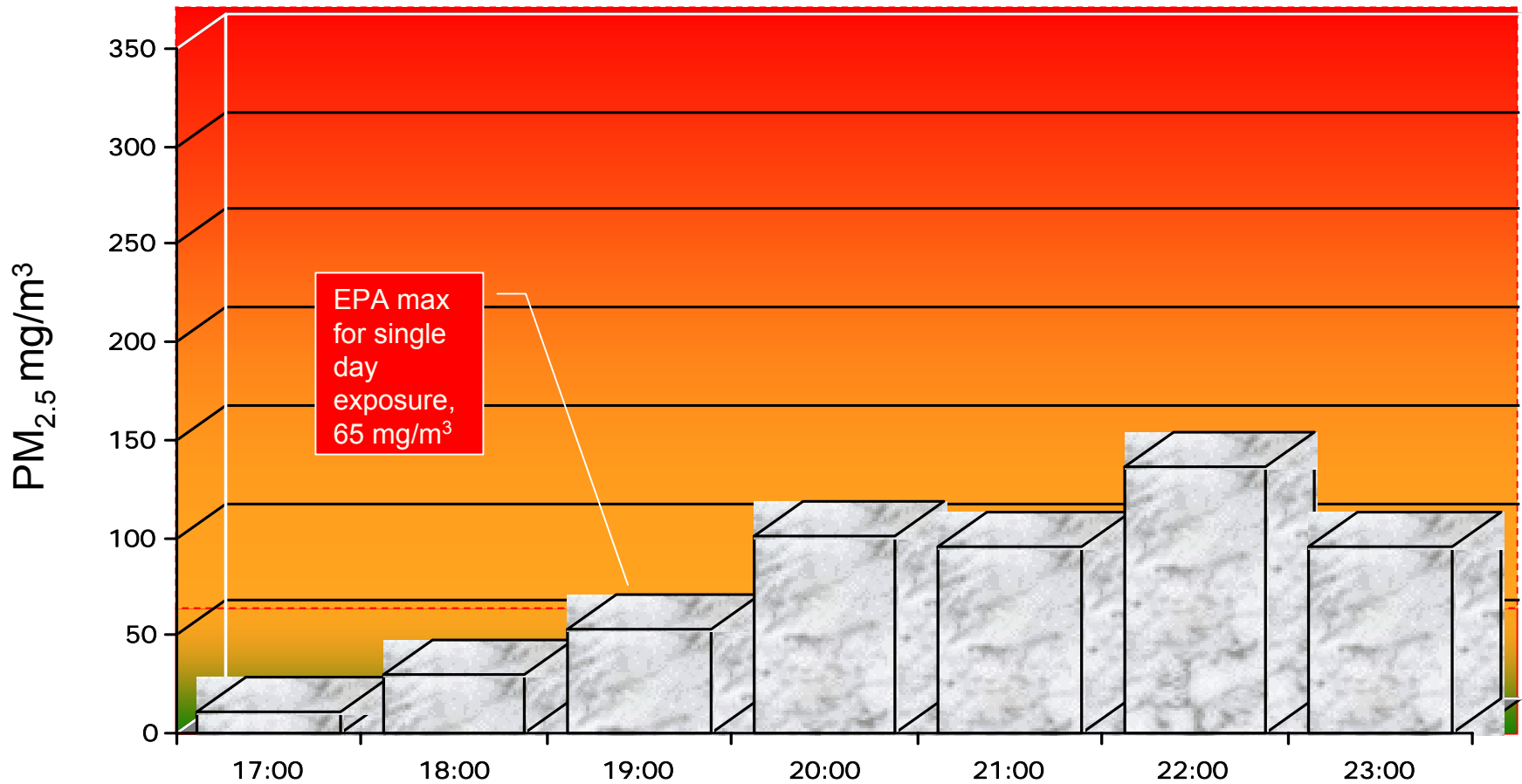


Air quality and behavior after the ordinance

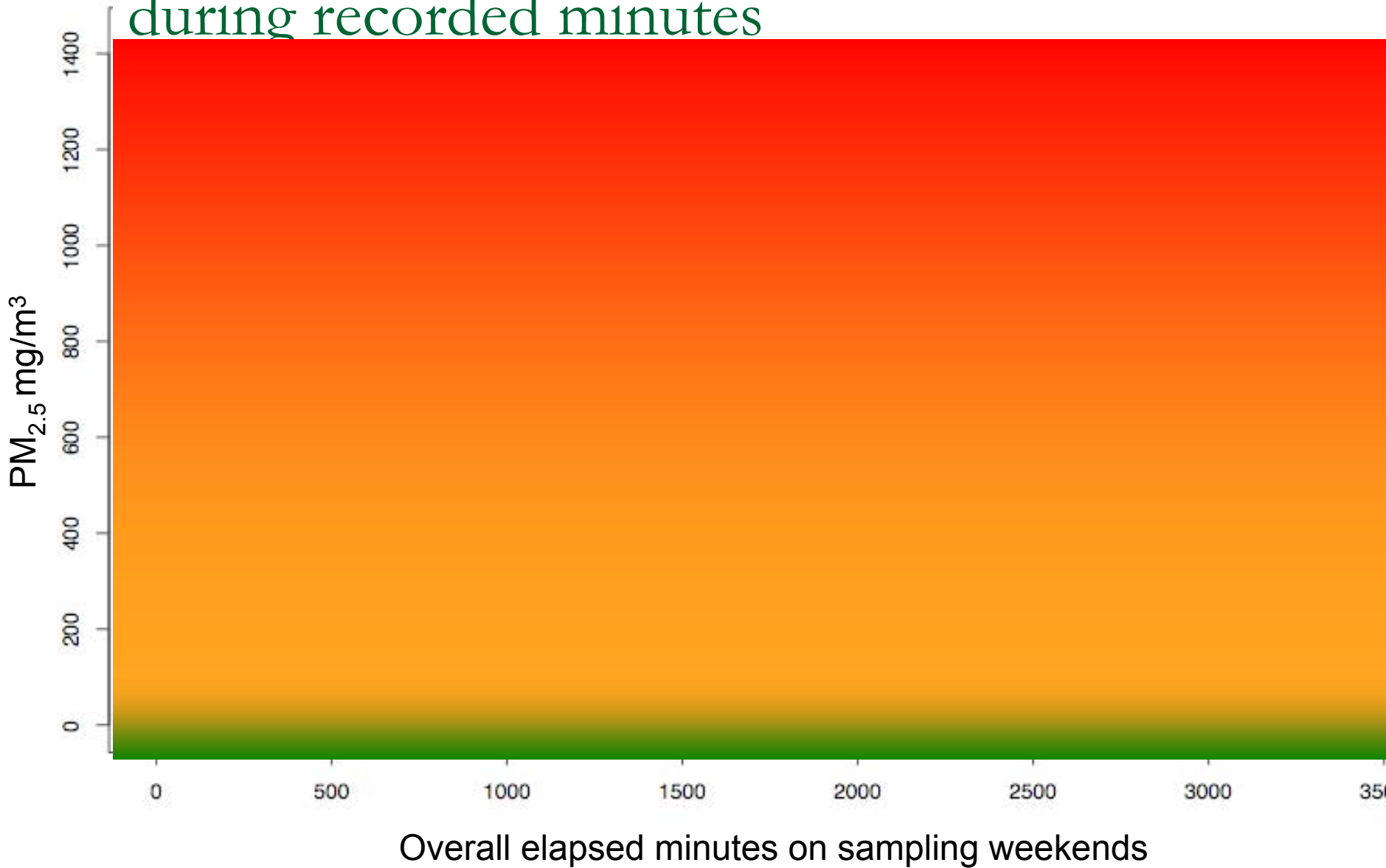
Average Particle-levels in Establishments, Post-ban



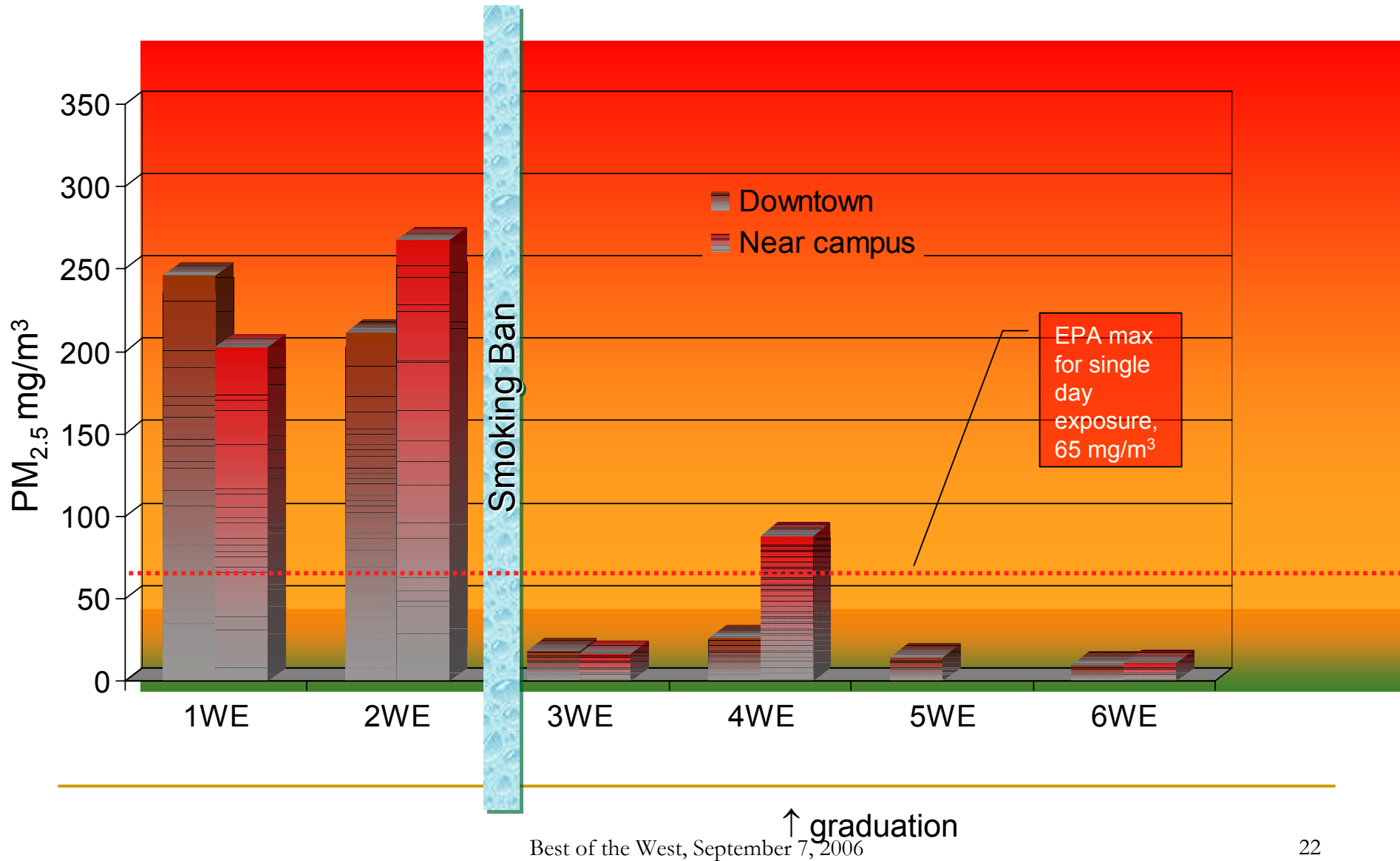
Average Number of PM_{2.5} Particles in Establishment Air Each Hour, Pre-Ordinance



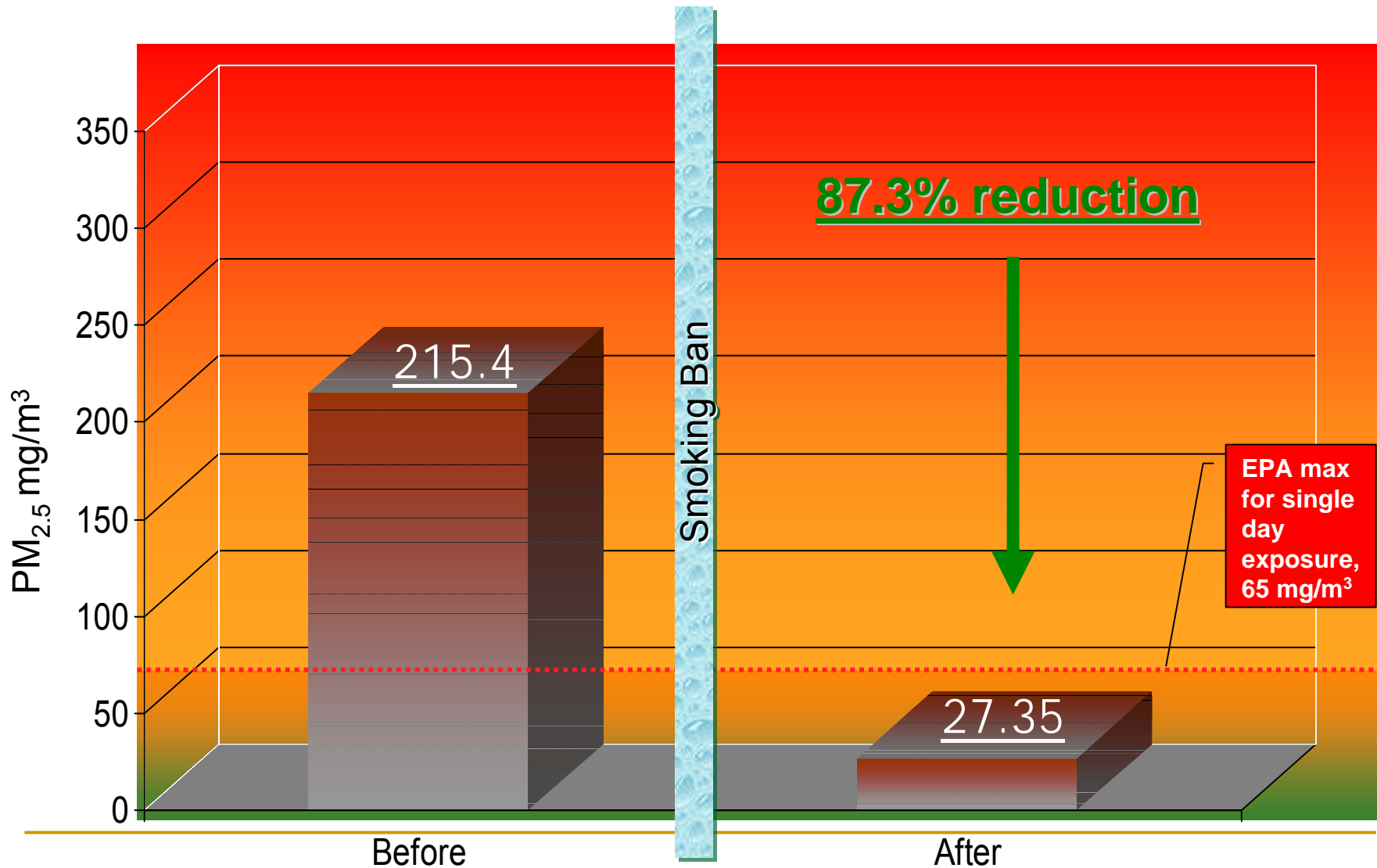
Air quality: raw data plot of pre to post ban during recorded minutes



Air particles in Establishments on Weekends



Average PM_{2.5} Particles Before and After Ban



The Air Quality Index (AQI)

AQI is computed as an aggregate measure of 6 air criteria:

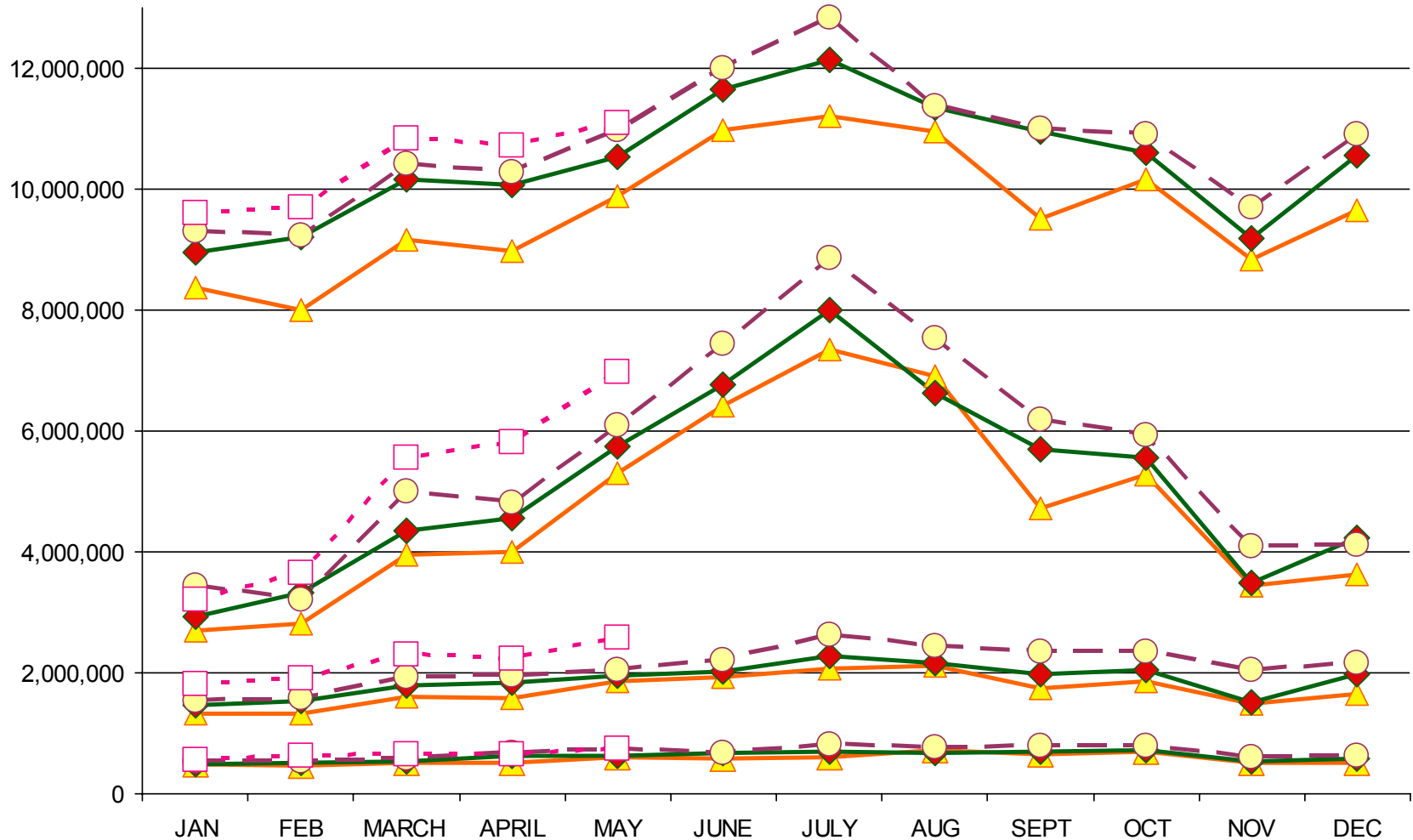
1. Ozone
2. Nitrogen dioxide
3. Particulate matter
4. Carbon dioxide
5. Sulfur dioxide
6. Lead

| 0-50 | Good | None |
|---------|--------------------------------|--|
| 51-100* | Moderate | Unusually sensitive people should consider reducing prolonged or heavy exertion. |
| 101-150 | Unhealthy for Sensitive Groups | People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion. |
| 151-200 | Unhealthy | People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion. |
| 201-300 | Very Unhealthy | People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion. |
| 301-500 | Hazardous | People with heart or lung disease, older adults, and children should remain indoors and keep activity levels low. Everyone else should avoid all physical activity outdoors. |

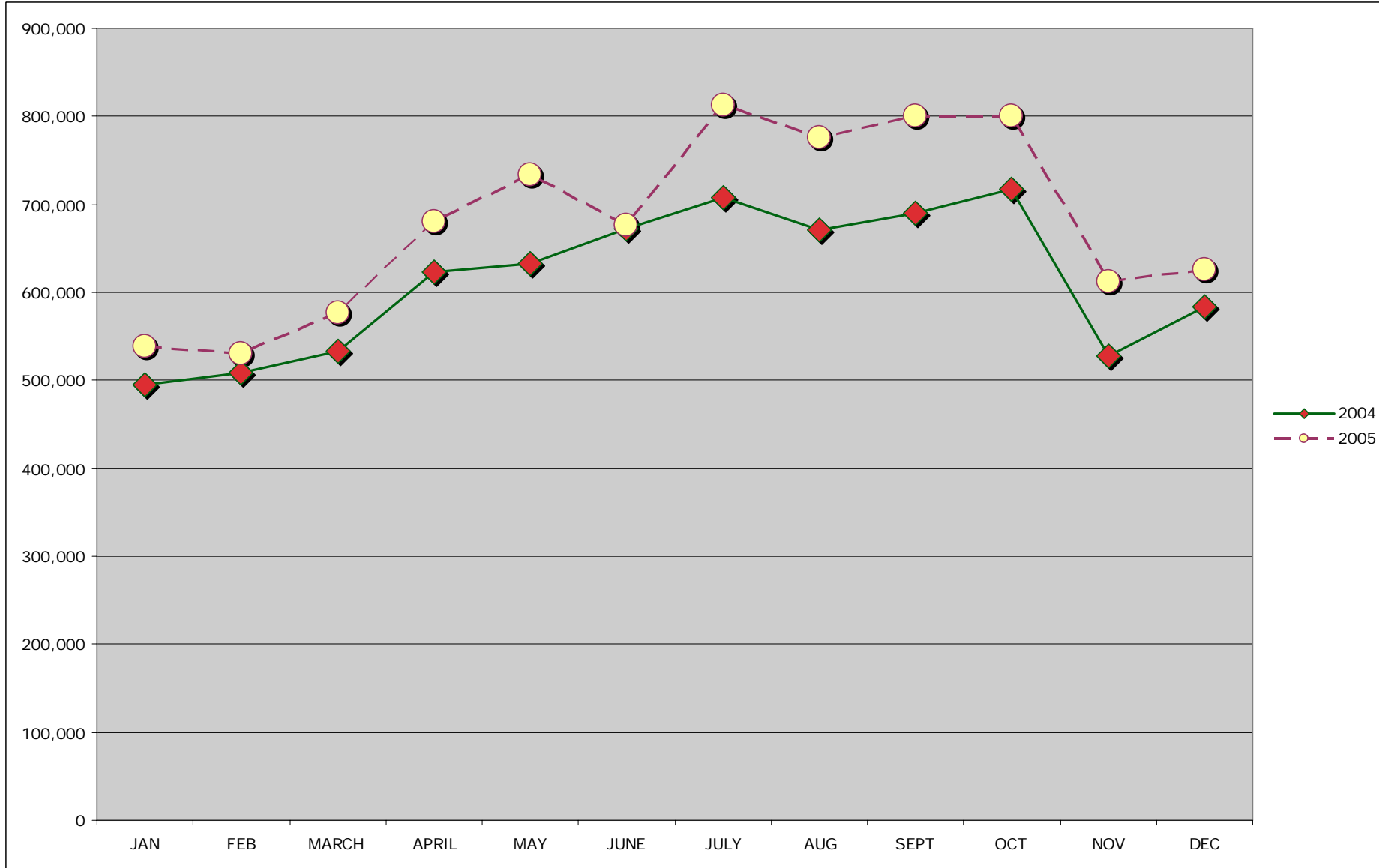
Has the ban had any effect on sales?

- Monthly sales data from City of Flagstaff - Tax, Licensing & Revenue Division
- Coconino County smoking ordinance is equally as strict as that of the city.
 - All hotels, restaurants and bars in Coconino County have the same restrictions.
 - Therefore, local businesses do not face competition from nearby businesses that can allow smoking.

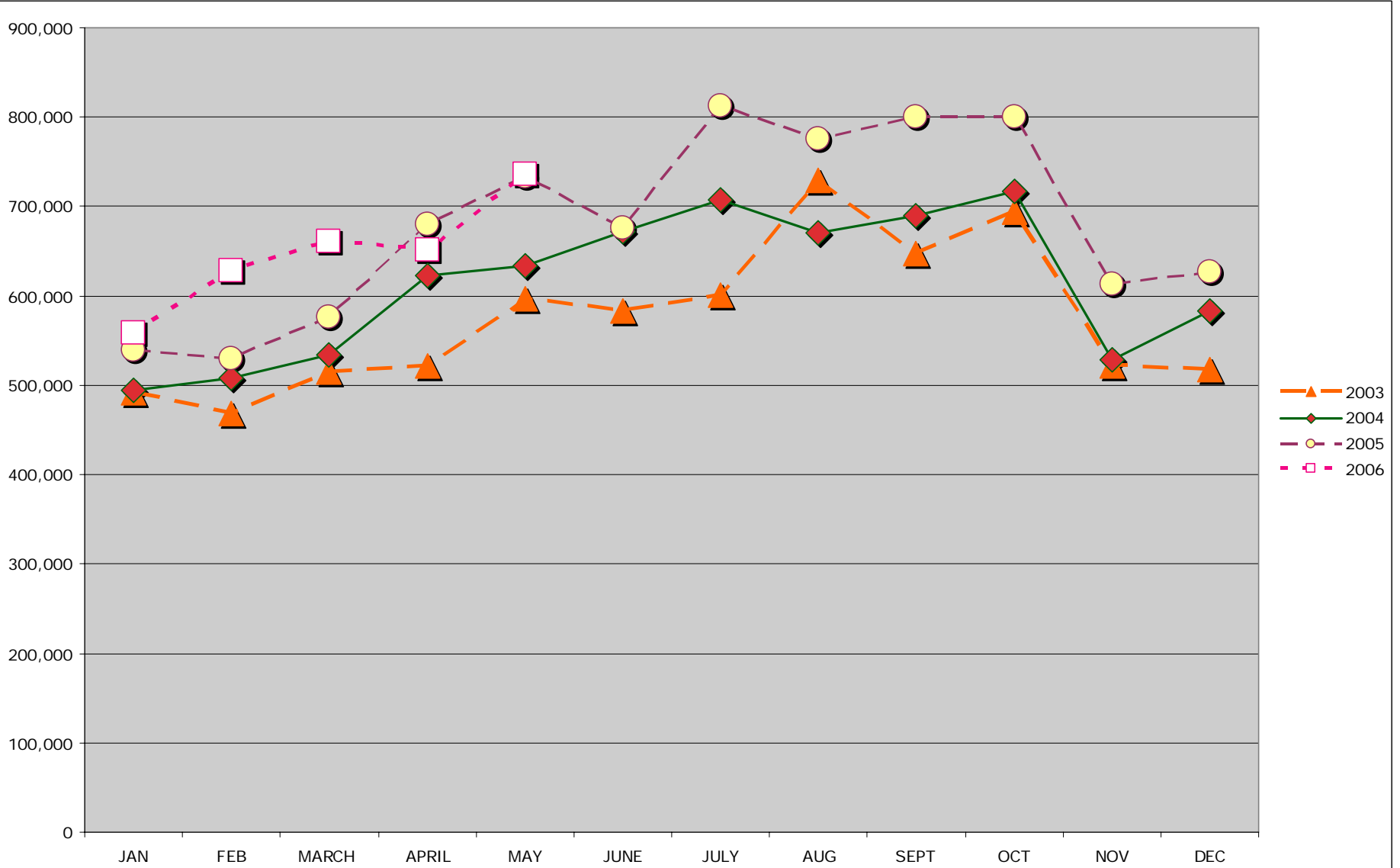
Dollars Spent at Establishments 2003 – 2006



Close up: stand-alone bars: II



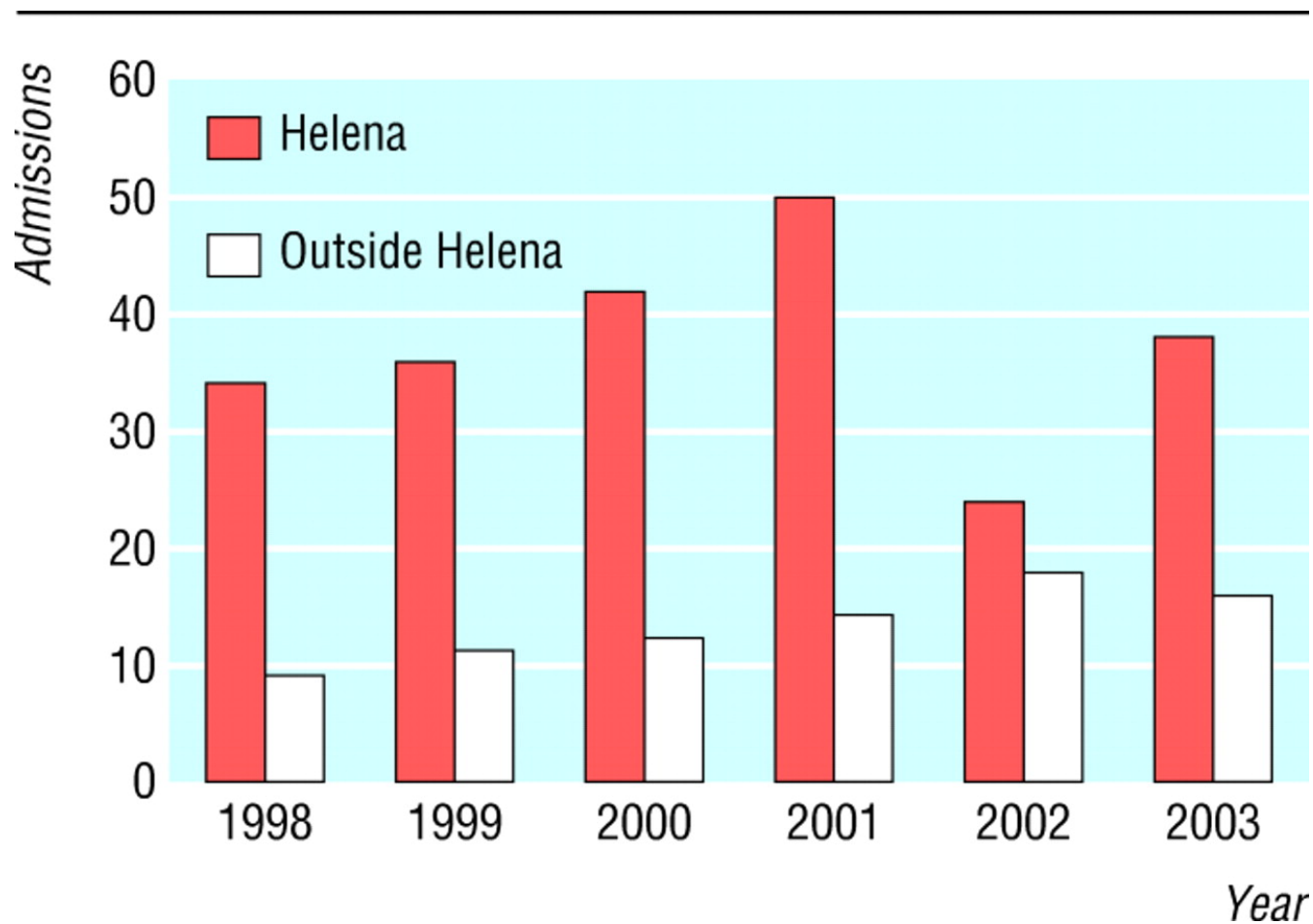
Close-up: stand alone bars: I



Expected public health impact

- Have estimated a 27% decrease in mortality due to cardiopulmonary and lung cancer over two decades if no exposure to secondhand smoke (Dockery et al, 1993)
- Have documented a 40% reduction in local ER admissions from acute myocardial infarction (heart attack) for the 6 months a ban was in place before it was repealed (Sargent et al, 2004)
- City of Pueblo, CO found a 27% decrease in AMI heart attacks within months sustained through 1.5 year follow up (Bartecchi et al 2005)

Admissions for acute myocardial infarction during six month periods June-November before, during (2002), and after smoke-free ordinance was implemented in Helena alone on 5 June 2002



Sargent et al, 2004

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Arizona adults' attitudes towards secondhand smoke

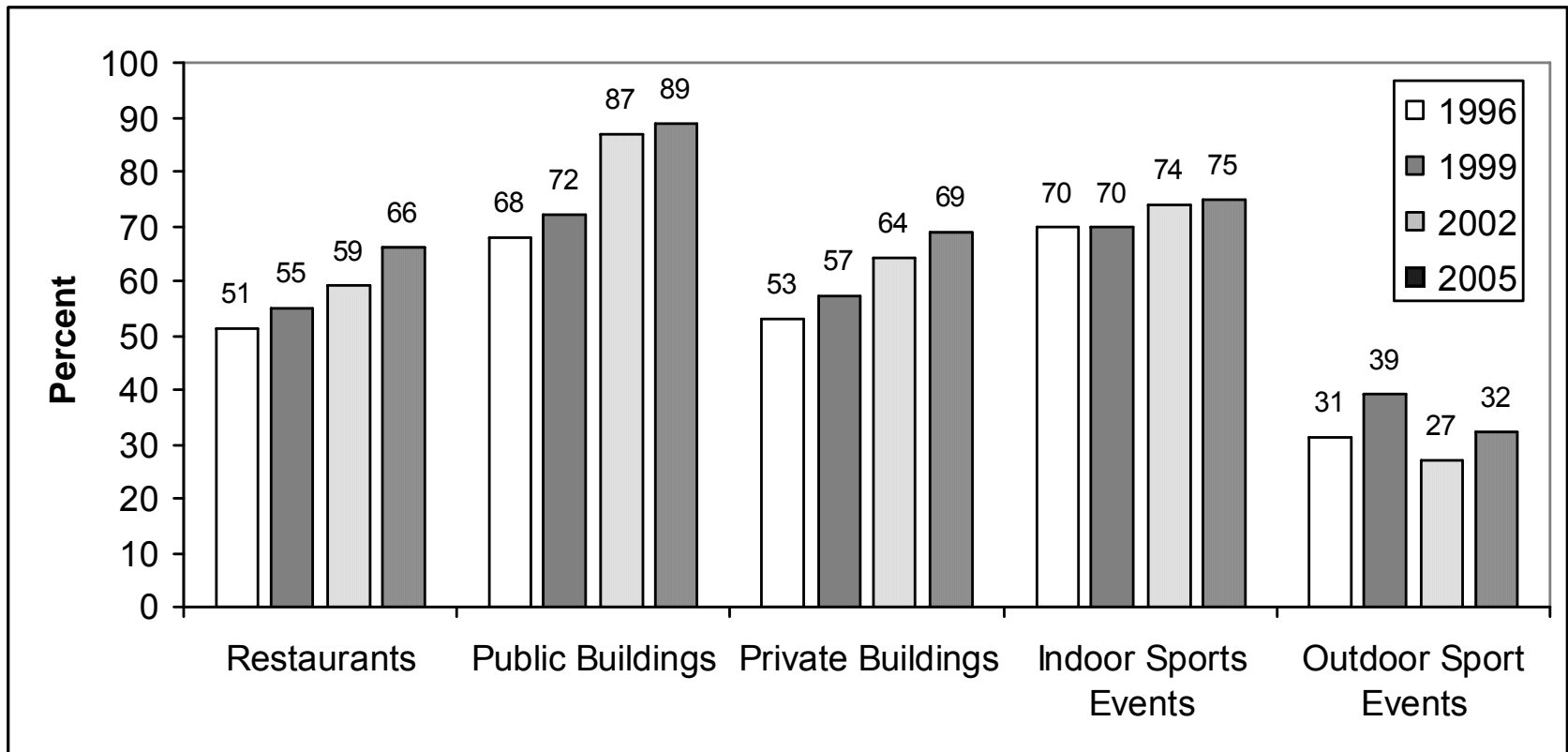
- Sixty-three percent (63%) of all respondents think that breathing other people's smoke is **very** harmful to one's health. Thirty percent (30%) think it is somewhat harmful.
- In the last 12 months, 25% of all respondents reported having asked a stranger not to smoke around them.
- Forty-three percent (43%) of all respondents said they are "bothered a lot" by other people's tobacco smoke. Twenty-three percent (23%) said they are bothered "some" by other people's smoke.

Reported workplace bans in Arizona

- Fifty-one (51%) of respondents who were currently employed stated that their place of work has an official policy that bans indoor smoking. This is an increase of nearly 10% over the 2002 rate of 42%.
- There was little change in the percentage of reported exposure to tobacco smoke at work in the 7 days prior to the survey (of those who work primarily indoors) from 2002 (15%) to 2005 (14%).
 - Respondents who work primarily outdoors (55%), or both indoors and outdoors (37%), have higher reported rates than those who primarily work indoors

Source: Arizona Adult
Tobacco Survey Data,
2002 and 2005

Arizona public support for bans is increasing

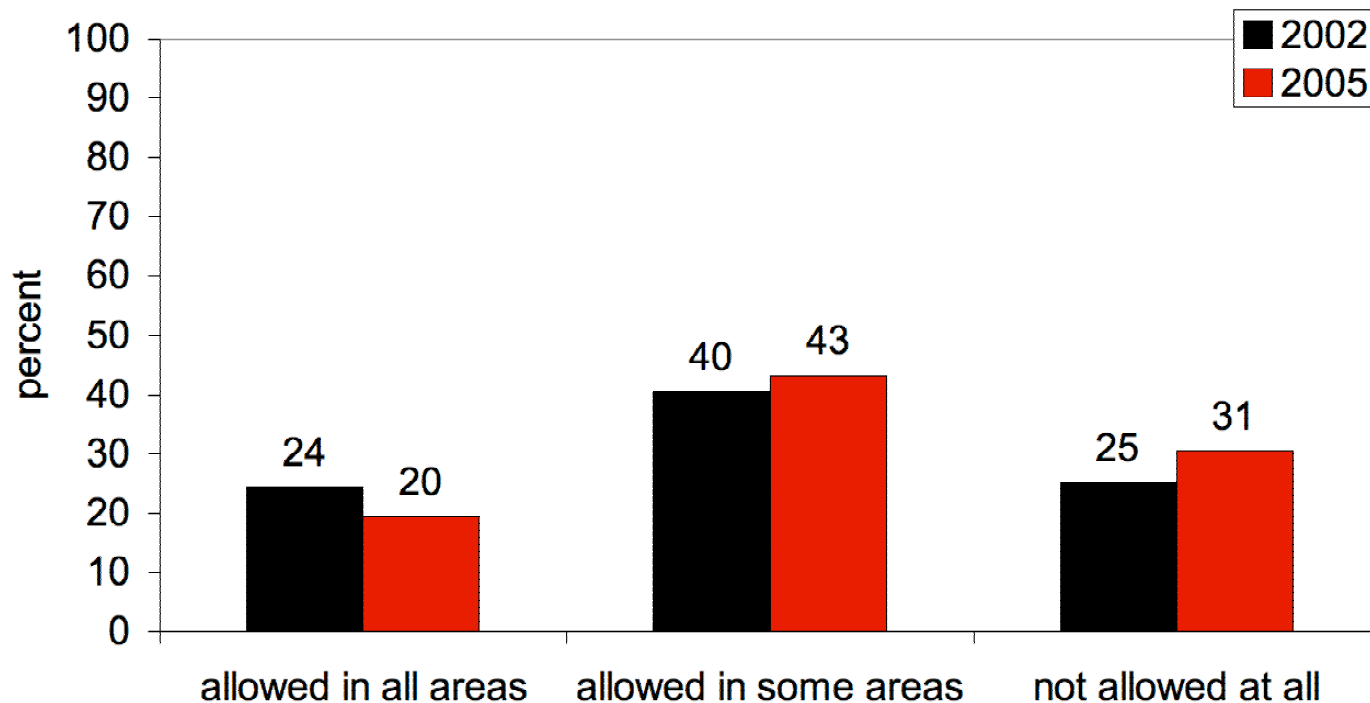


Percent of respondents reporting that smoking should be "NOT allowed at all" by type of location

Source: Arizona Adult Tobacco Survey Data, 1996-2005

Bars

In bars and cocktail lounges, do you think smoking should be allowed in all areas, some areas or not at all?



Source: Arizona Adult Tobacco Survey Data, 2002 and 2005

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Results of Flagstaff ban

- Particulate air matter reduced by 87% during the period studied
- No effect on business patronage in \$
- Unknown:
 - Effect on hospital admissions

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- ¹⁰ Skeer M, Siegel M. The descriptive epidemiology of local restaurant smoking regulations in Massachusetts: an analysis of the protection of restaurant customers and workers. *Tobacco Control*, 2003 Jun;12(2):221-6.
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- ¹⁴ Moller W, Haussinger K, Winkler-Heil R et al. Mucociliary and long-term particle clearance in the airways of healthy nonsmoker subjects. *J Appl Physiol*. 2004;97:2200-2206.
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- ¹⁶ Krewski D, Burnett RT, Goldberg M, Hoover K, Siemiatycki J, Abrahamowicz M, White W. Reanalysis of the Harvard Six Cities Study, part I: validation and replication. *Inhal Toxicol*. 2005 Jun-Jul;17(7-8):335-42.