Smoke-free Air Policy: Changing What's in the Air and in the Body

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- Co-authors
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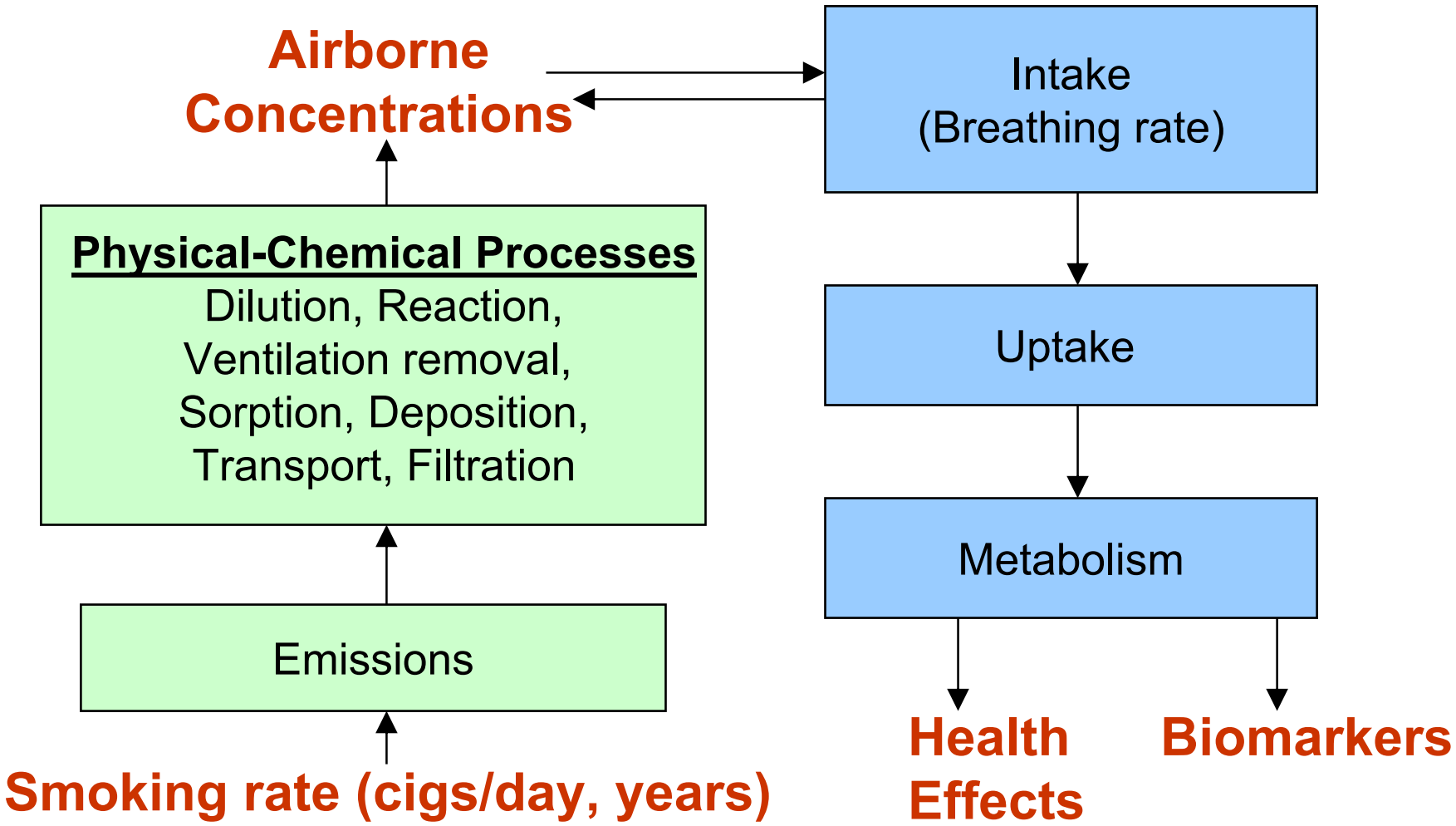
SHS Health Hazard Assessment



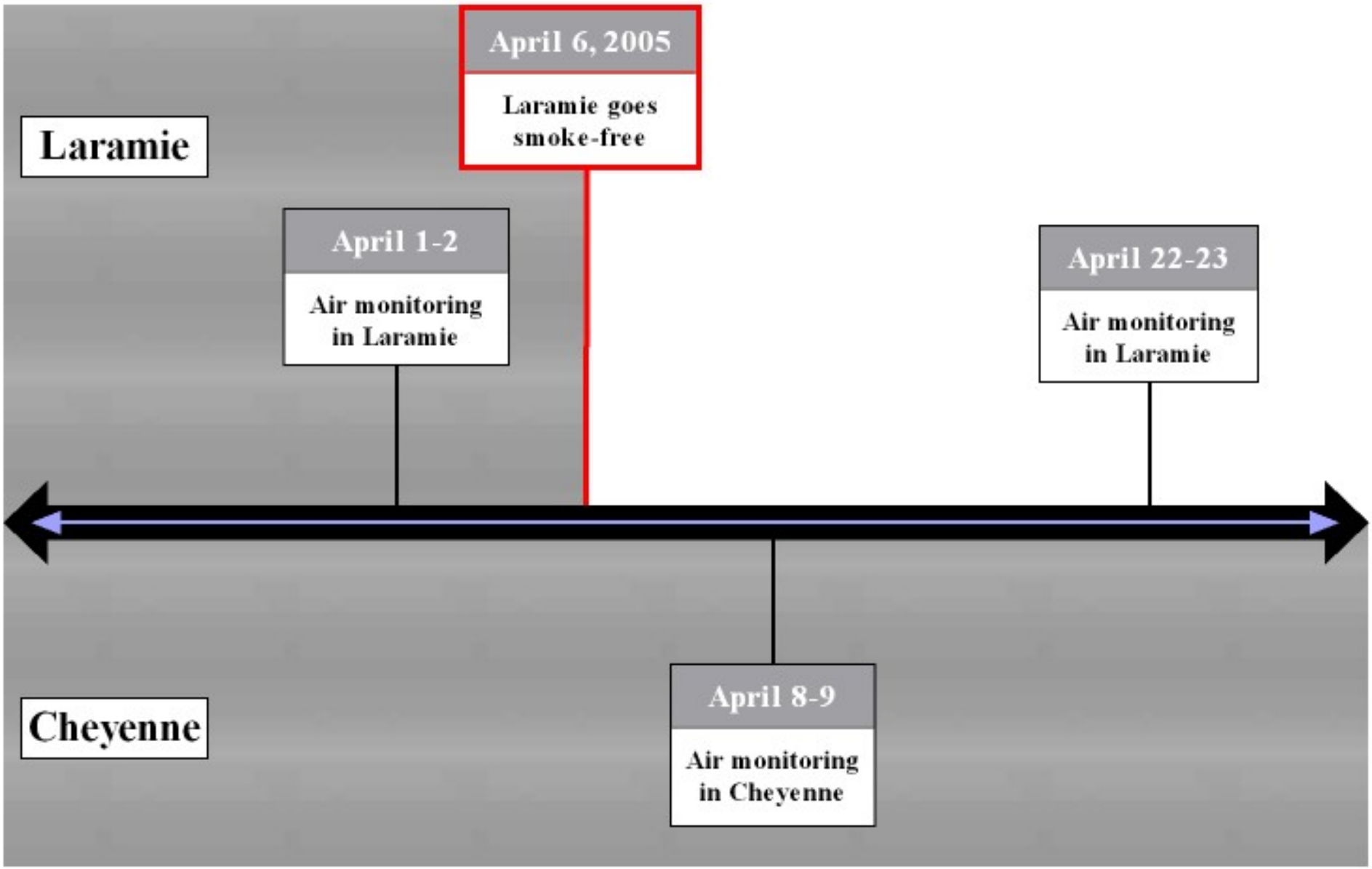
Measuring Air Quality

- Cigarettes, cigars and pipes are major emitters of respirable suspended particles less than 2.5 microns ($PM_{2.5}$) in diameter that are easily inhaled deep into the lungs
- **TSI SidePak AM510 Personal Aerosol Monitor (weight: 1 lb)**

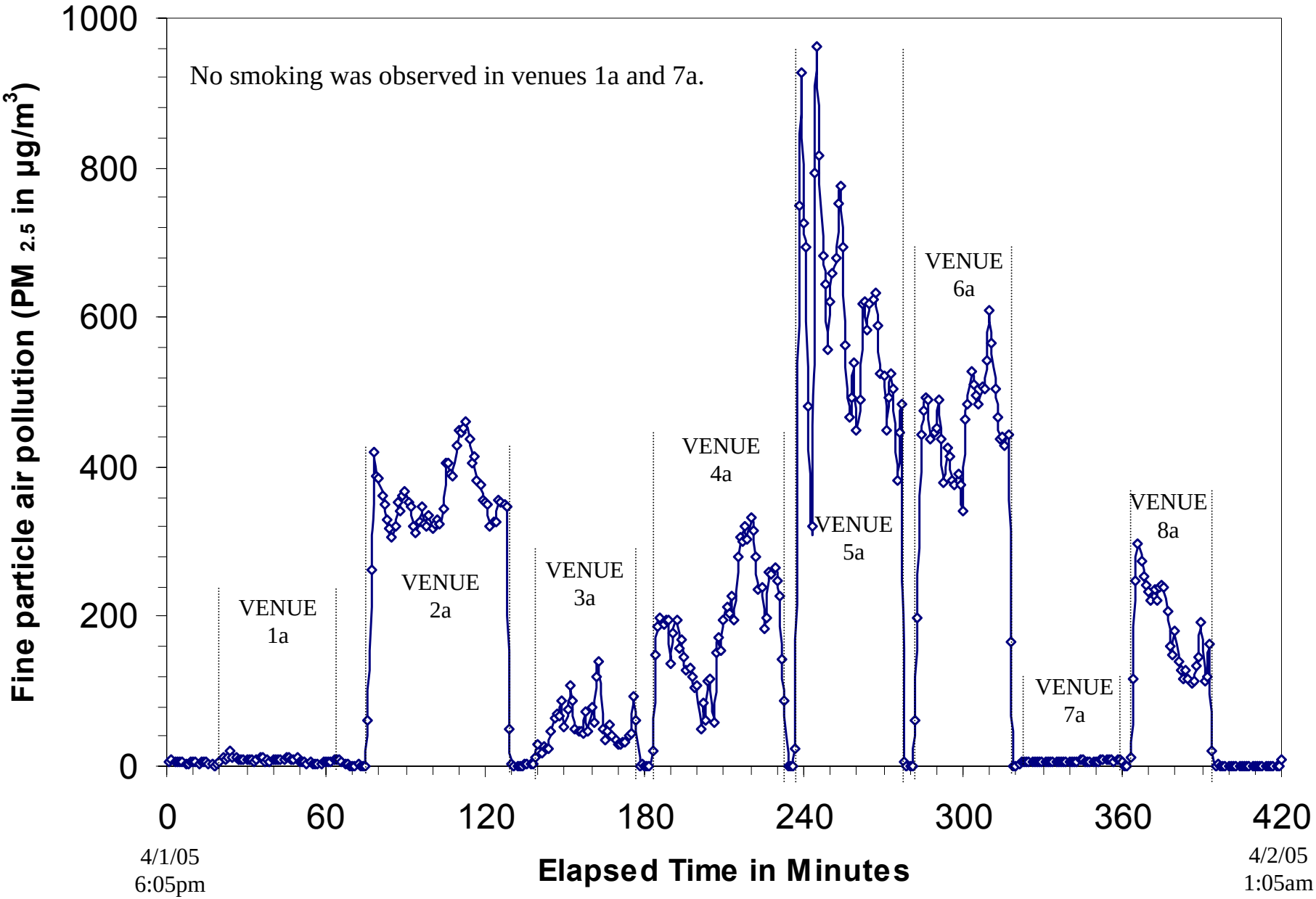
Why $PM_{2.5}$?

- Very sensitive marker of ETS
- Can monitor and record data in real time
- Relatively inexpensive equipment
- Marker of the more than 4,000 chemical in ETS
  - E.g. 2,000:1, $PM_{2.5}$:PAH
- Meaningful measure: there are $PM_{2.5}$ standards in place to protect public health
  - The EPA has set standards of 15 $\mu g/m^3$ as the average annual level of $PM_{2.5}$ exposure and 65 $\mu g/m^3$ 24-hour exposure in order to protect the public health

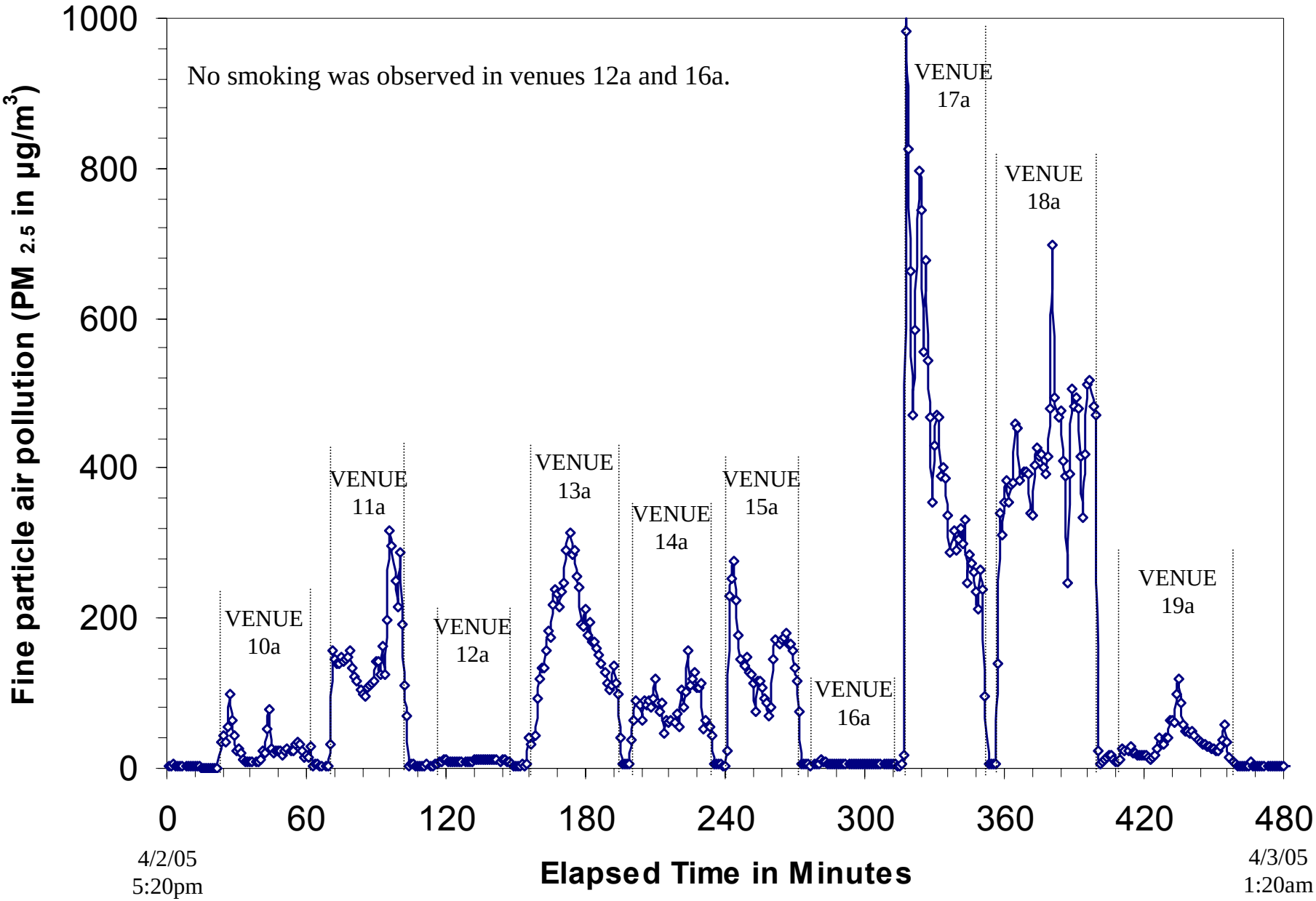
Timeline 1: Wyoming Air Monitoring Study



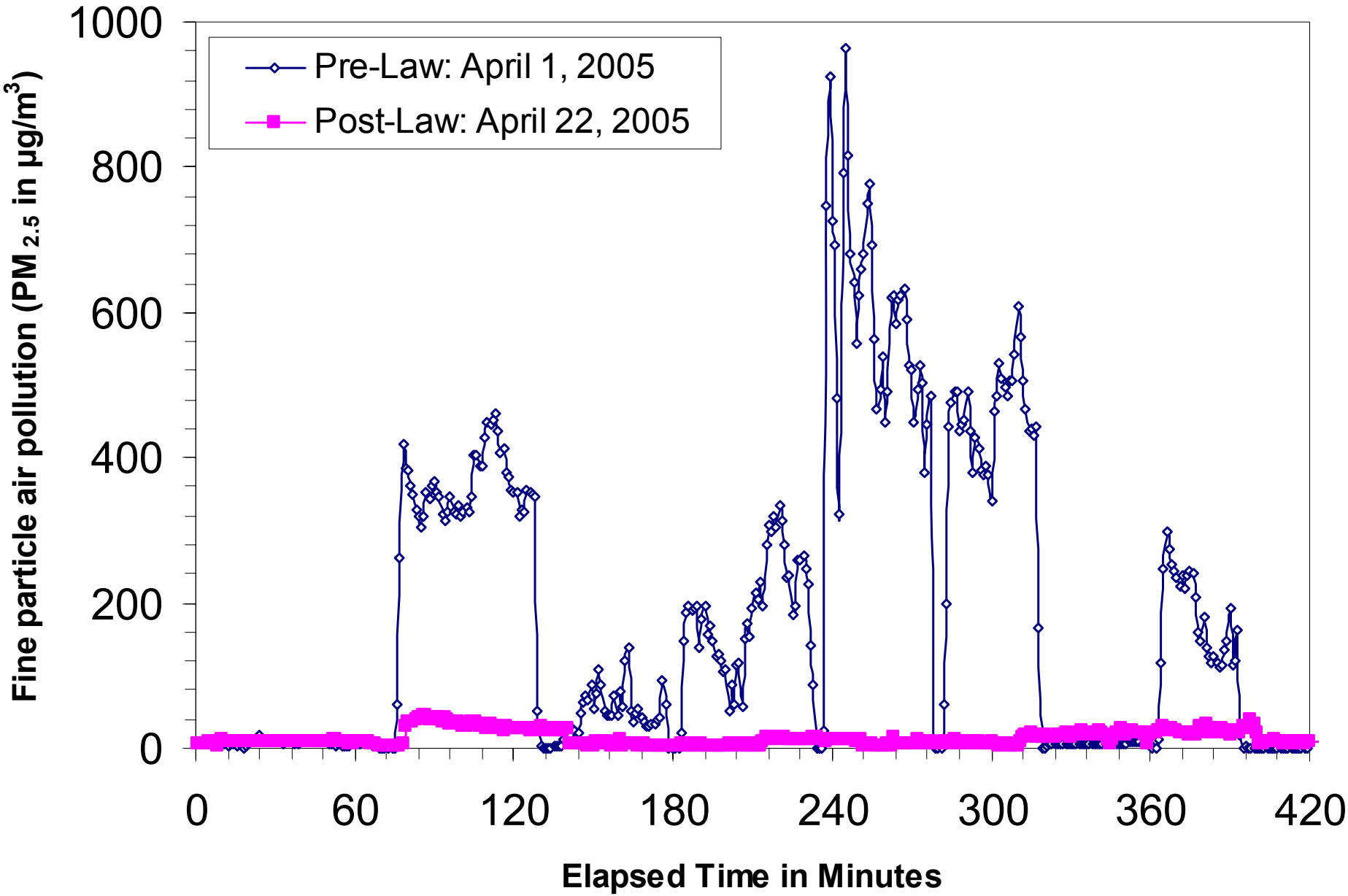
Wyoming Air Monitoring Study: Laramie, WY, April 1, 2005



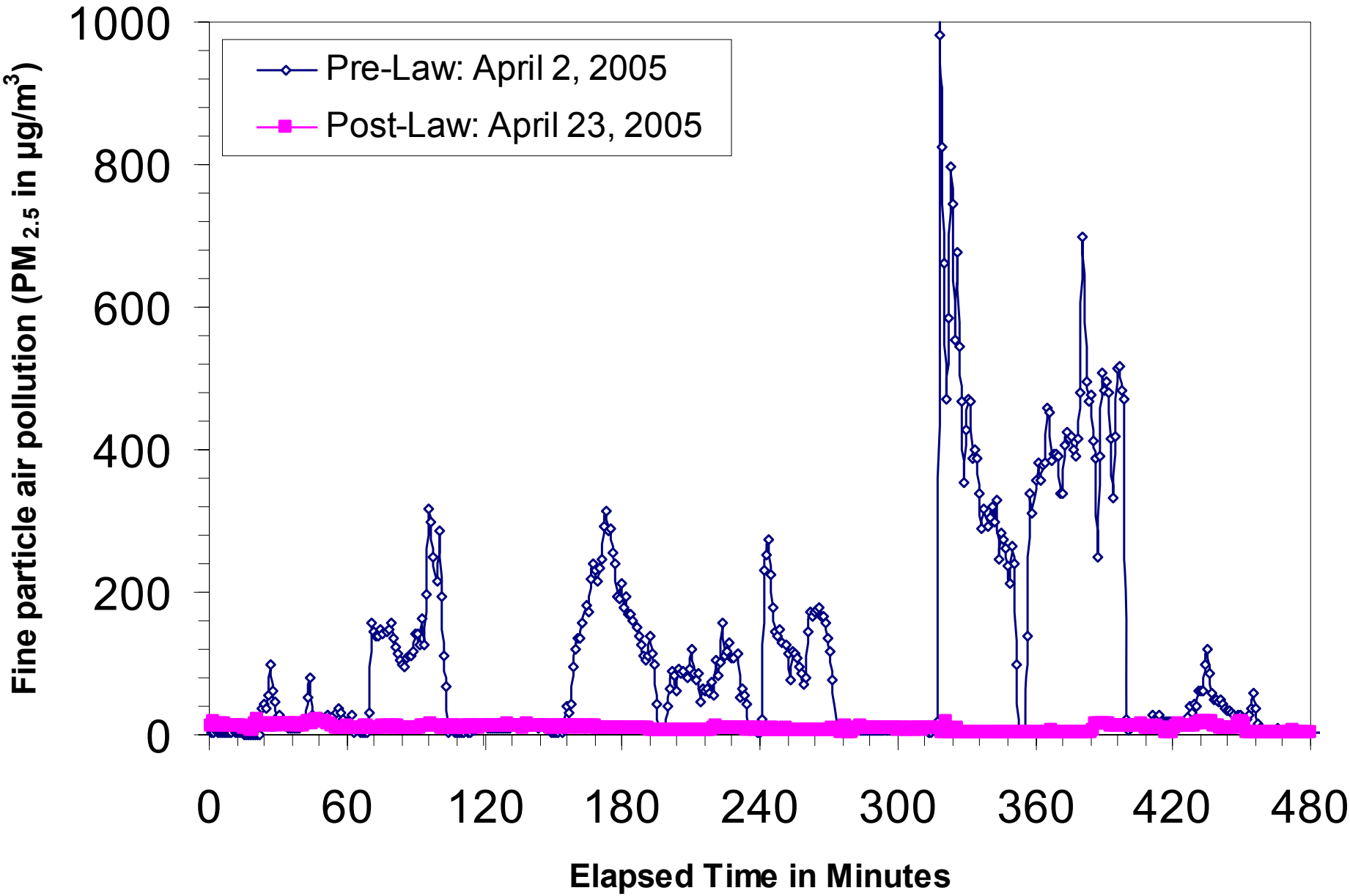
Wyoming Air Monitoring Study: Laramie, WY, April 2, 2005



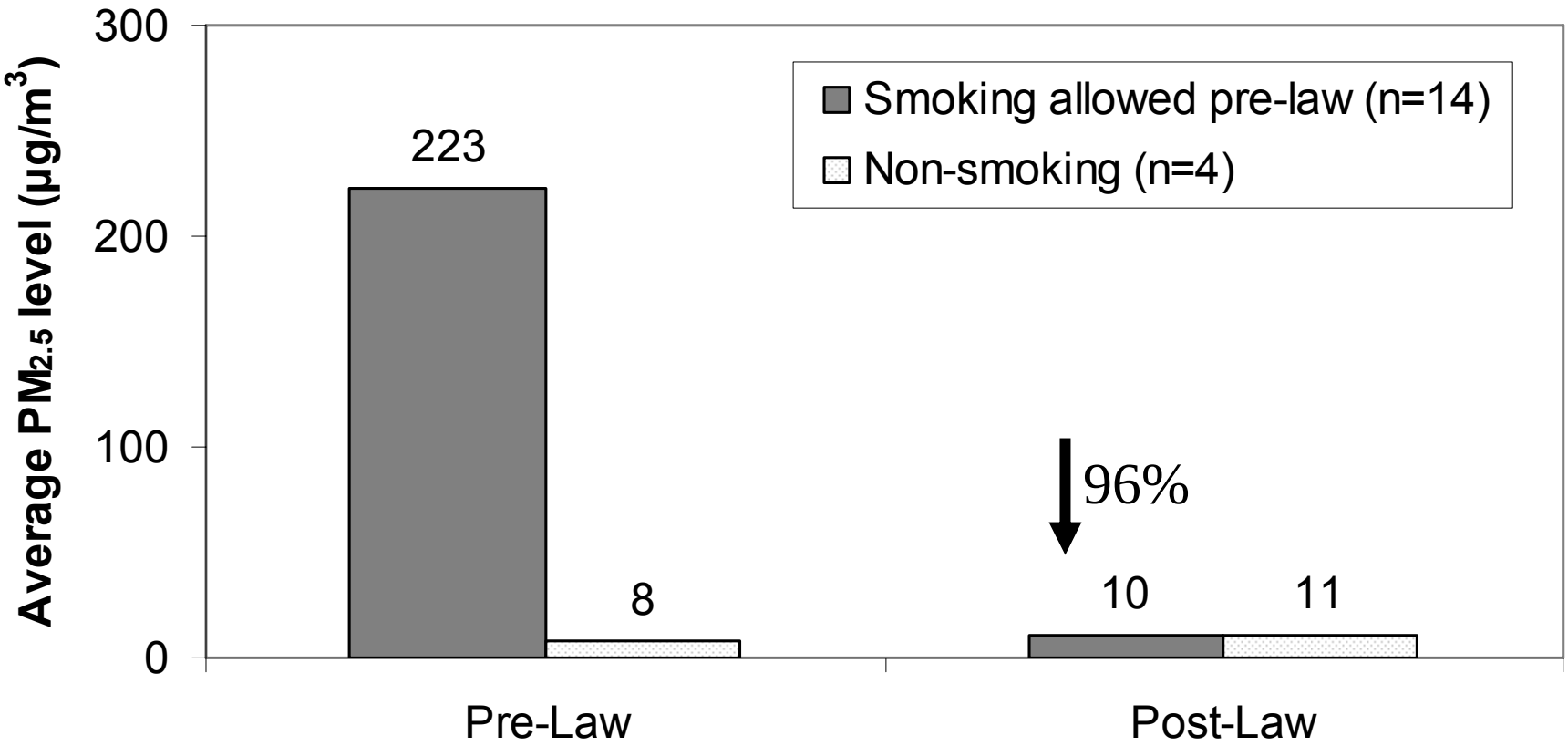
Laramie, WY Before and After Clean Indoor Air Law (1 of 2)



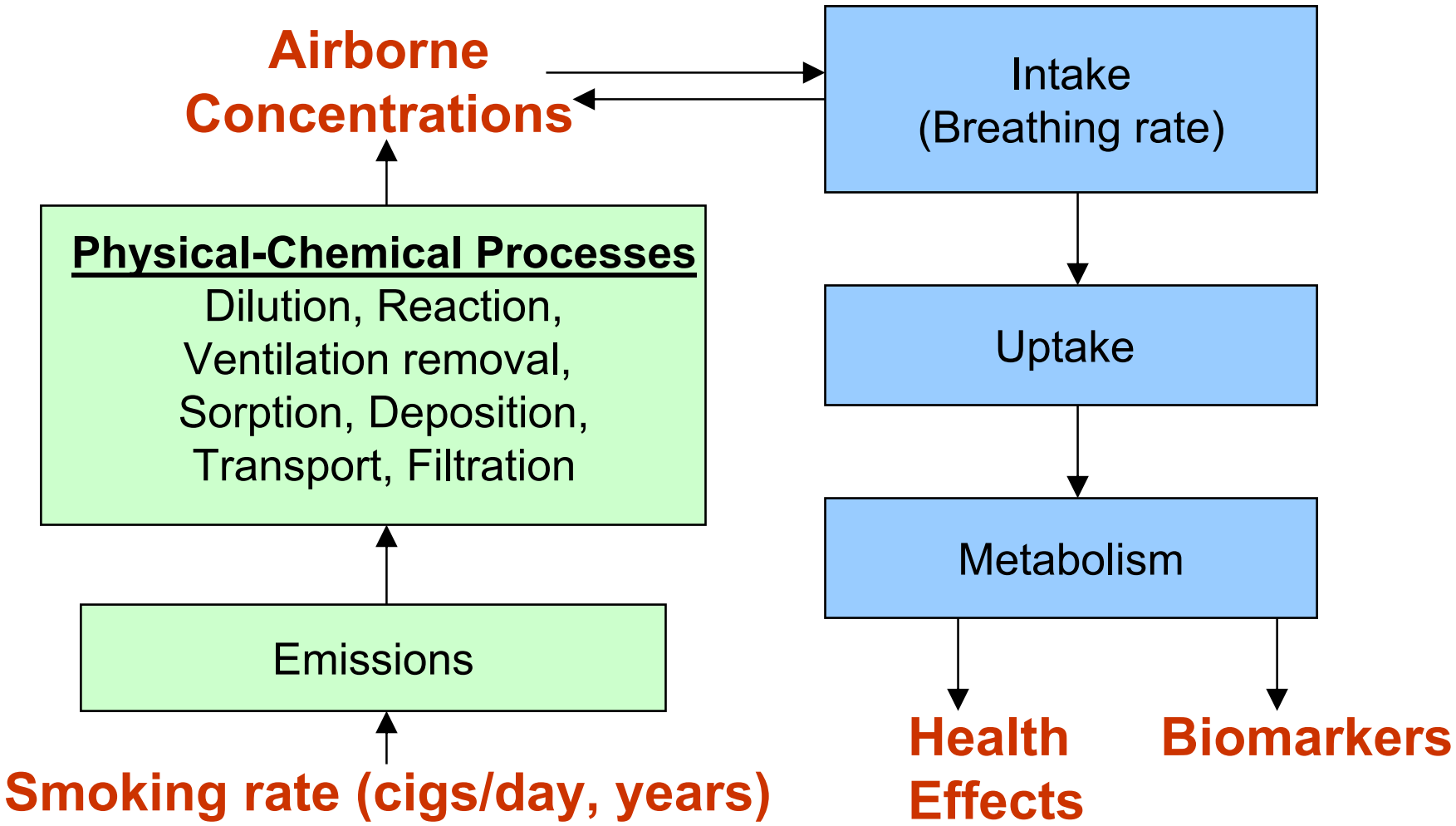
Laramie, WY Before and After Clean Indoor Air Law (2 of 2)



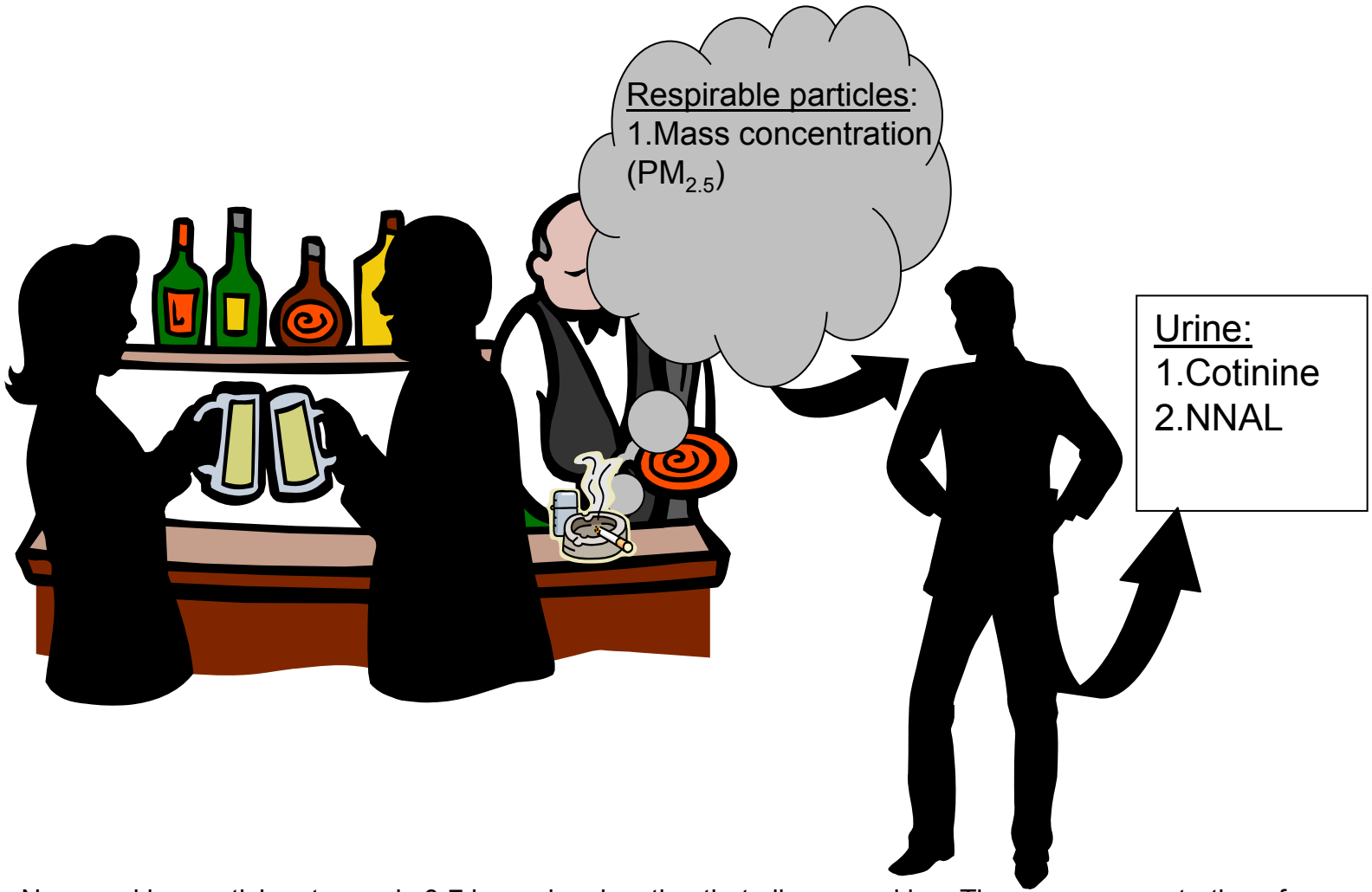
Average Level of Indoor Air Pollution Before and After Implementation of Smoke-free Air Legislation, Laramie, WY



SHS Health Hazard Assessment

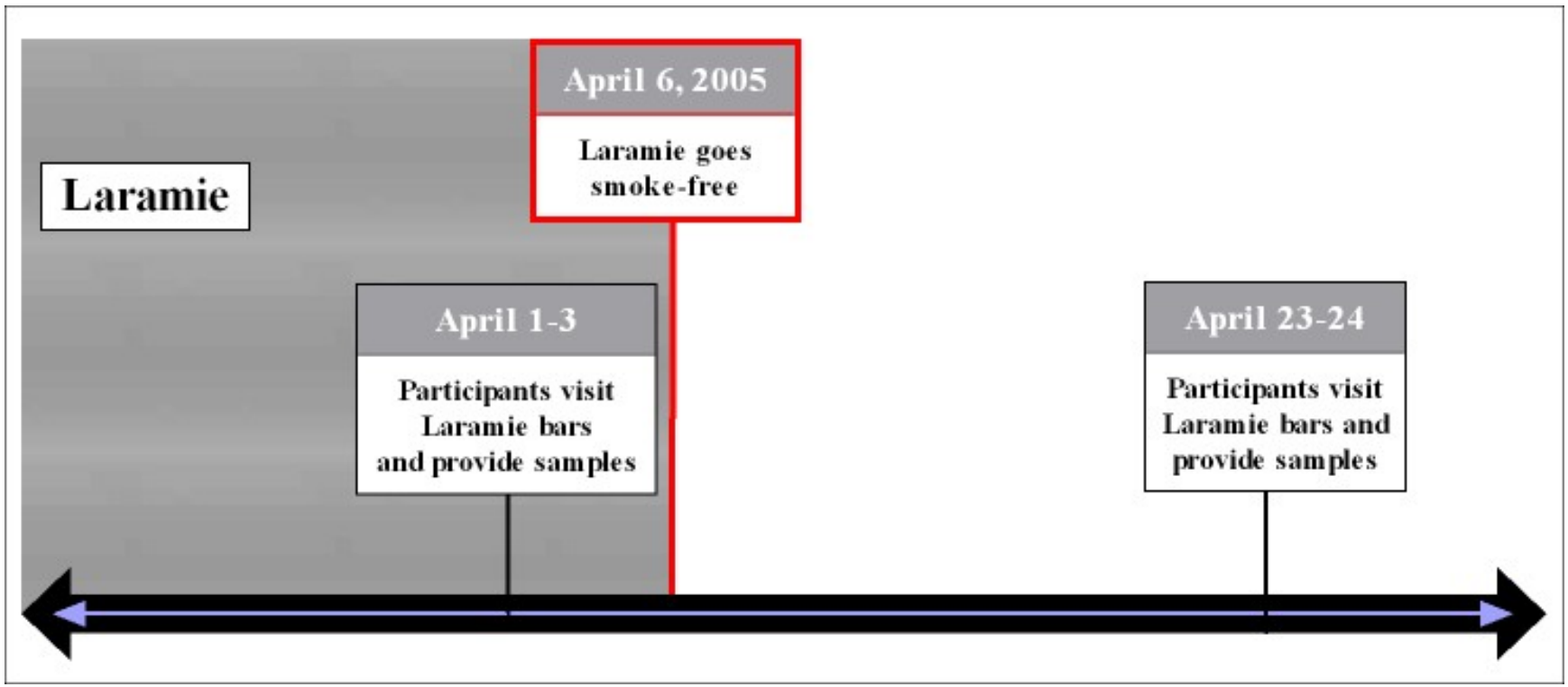


Air Monitoring and Biomarker Pilot Study



Non-smoking participant spends 6-7 hours in a location that allows smoking. The mass concentration of respirable particles ($PM_{2.5}$) in the air is measured. In addition, the participant's change in urinary cotinine and NNAL before and after the visit is measured. This is repeated after the location goes smoke-free.

SHS Exposure Study
Laramie, WY

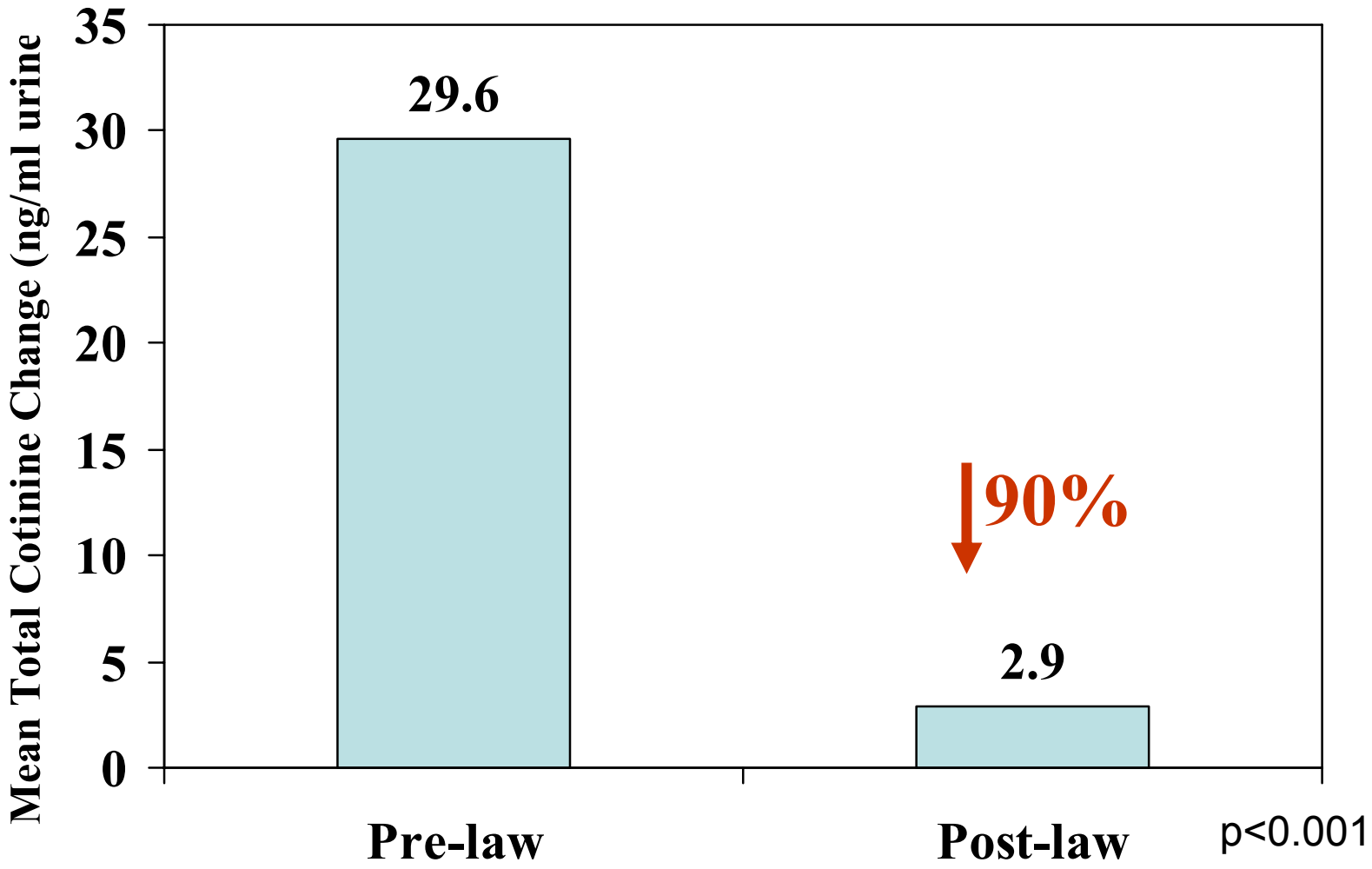


Laramie, WY SHS Exposure Study

- 14 participants visited 7 different locations in groups of 2
- Locations included bars, restaurants, a dance hall, and a bowling alley

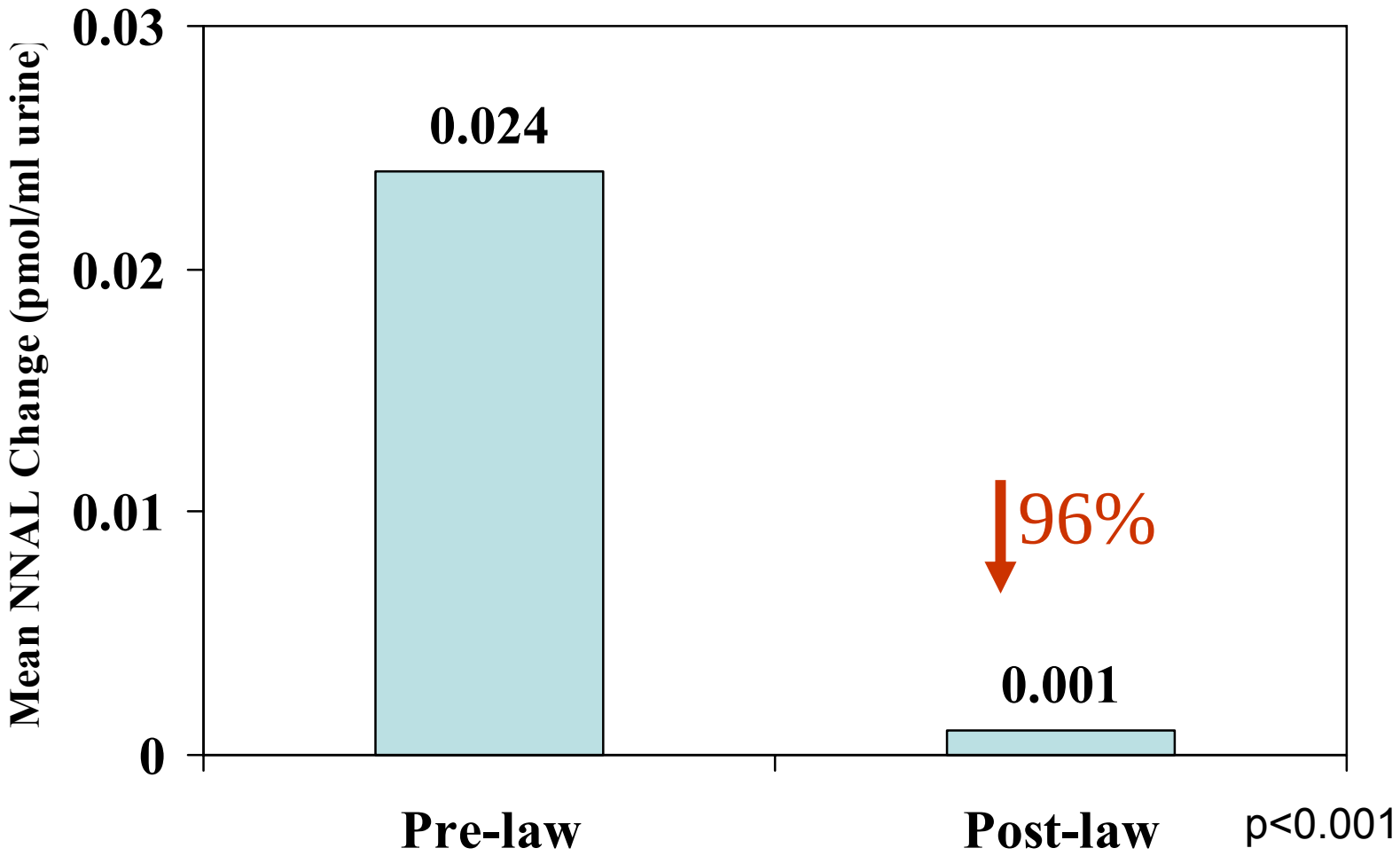
Size (m^3)	Average # people in venue	Active smoker density*	Average $PM_{2.5}$ level ($\mu g/m^3$)	Average duration of exposure (mins)
1,270	58	0.67	245	449
* average number of burning cigarettes per 100 m^3				

Affect of Smoke-free Air Policy on Mean Total Cotinine Change



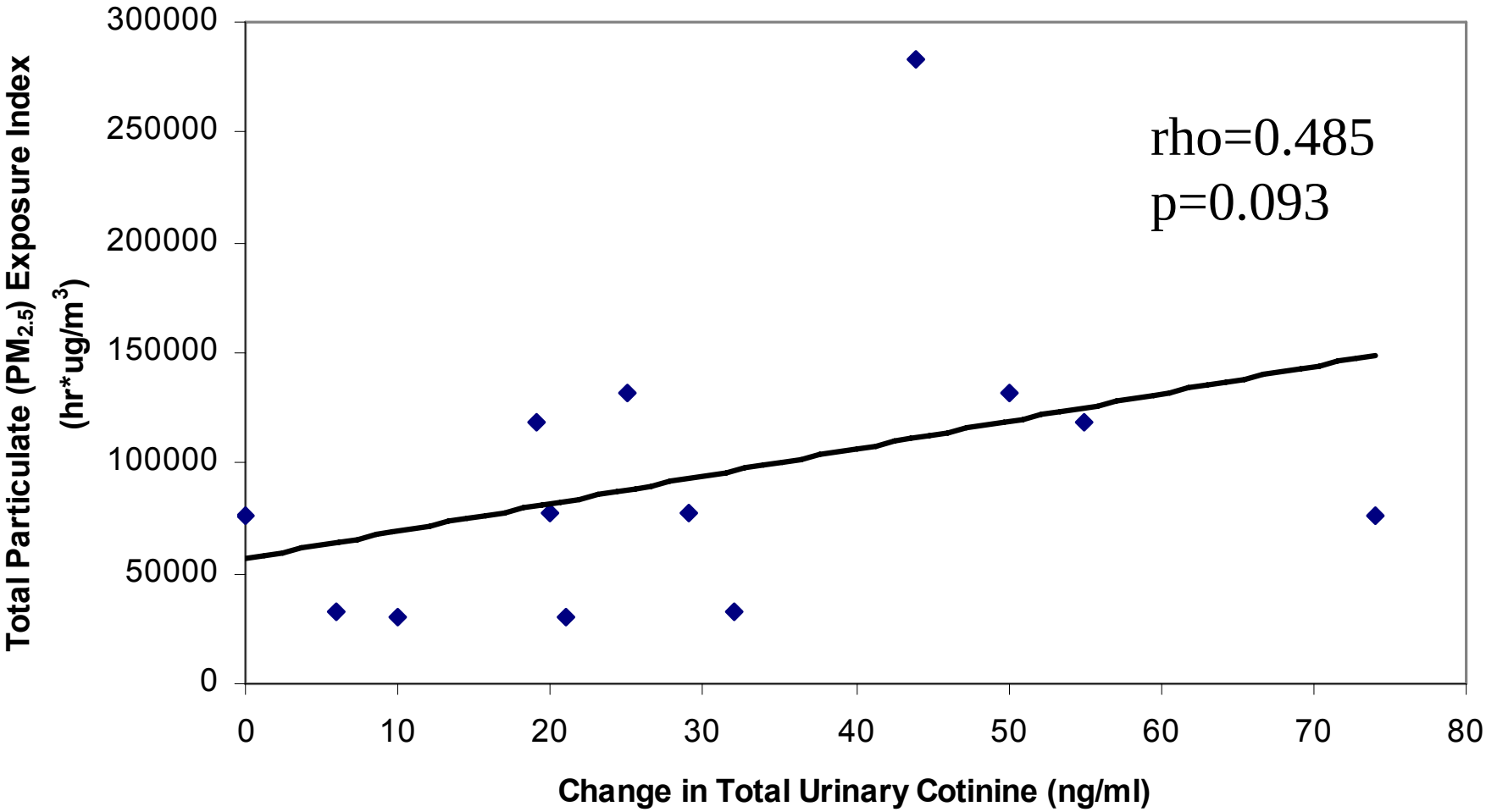
n=13, one participant was excluded for anomalous cotinine levels

Affect of Smoke-free Air Policy on Mean Total NNAL Change



n=13, one participant was excluded for anomalous cotinine/NNAL levels

Secondhand Smoke Exposure and Change in Urinary Cotinine



Average $PM_{2.5}$ Exposure was 245 µg/m^3 for 449 minutes

Conclusions

- A comprehensive smoke-free air law significantly improved air quality as measured by $PM_{2.5}$
- In addition, this law also resulted in significantly lower levels of two important biomarkers of SHS exposure, cotinine and NNAL, in the bodies of exposed nonsmokers
- The level of biomarkers in exposed non-smokers is correlated with the amount of exposure in the air, although this relation was not statistically significant in this study. (sample size needed = 28)