



The Impact of the Smoke-Free Ontario Act on Air Quality and Biomarkers of Exposure in Casinos: A Quasi-Experimental Study

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SFOA Casino Research Team

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The Smoke-Free Ontario Act (SFOA)



- ◆ Effective May 31, 2006
- ◆ Prohibits smoking in:
 - enclosed workspaces
 - public places
 - includes casinos
- ◆ First Nations casinos voluntarily went smoke-free

Background

- ◆ Casinos: last bastion
 - ◆ Economic concerns
 - ◆ Exemptions
 - ◆ Exemptions leave workers and patrons unprotected
- ◆ Recent attempts to create smoke-free casinos (Nevada, Atlantic City, Ohio)

Research Objectives

To measure the impact of the Smoke-Free Ontario Act in casinos by measuring changes in:

- (1)** tobacco smoke pollution, and
- (2)** biomarkers of exposure to tobacco smoke.

Study Design

- ◆ Quasi-experimental design:

Ontario Casino - SFOA: **O - X - O**

NY Casino - control: **O - - - O**

- ◆ 4-hour casino visit by 14 research assistants
- ◆ Continuous air quality measurements of PM_{2.5}
- ◆ Event Log: Every 15 minutes: Record # of people, and # of burning cigarettes/cigars
- ◆ Urine samples collected for biomarker assays (Ontario only)

Methods - Air Quality Measures



- ◆ TSI Sidepak AM510 Personal Aerosol monitors
- ◆ Link continuous $PM_{2.5}$ with event log
- ◆ Baseline collection outside casino
- ◆ $PM_{2.5}$ levels plotted over time
- ◆ Levels averaged in each casino

Methods - Biomarkers of Exposure



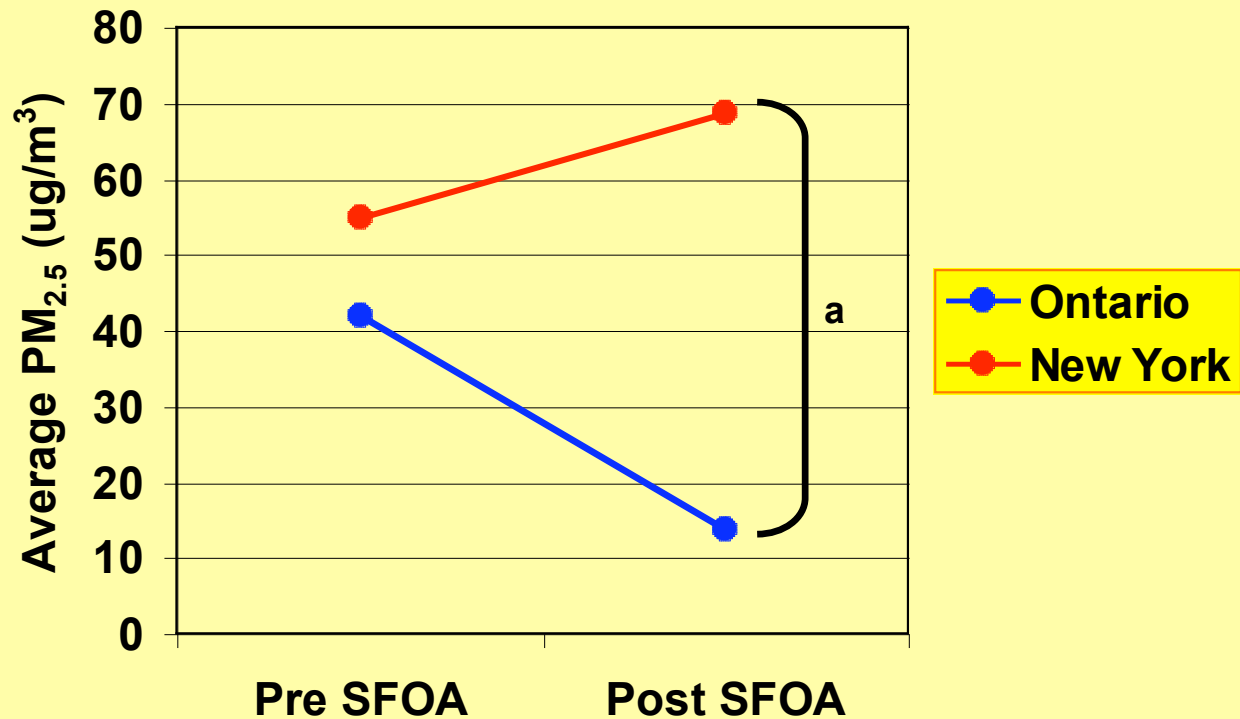
- ◆ Urine samples collected before and after ban (pre and post - visit)
- ◆ Samples frozen and sent to University of Minnesota
- ◆ Analyzed using technique described by Anderson et al. (2003)¹
 - NNAL: a metabolite of NNK, a potent tobacco-specific carcinogen
 - Cotinine: metabolite of nicotine



¹ Anderson, K. E., Kliris, J., Murphy, L., Carmella, S. G., Han, S., Link, C., Bliss, R. L., Puumala, S., Murphy, S. E., & Hecht, S. S. (2003). Metabolites of a tobacco-specific lung carcinogen in nonsmoking casino patrons. *Cancer Epidemiology, Biomarkers & Prevention*, 12, 1544-1546.

Air Quality: Overall

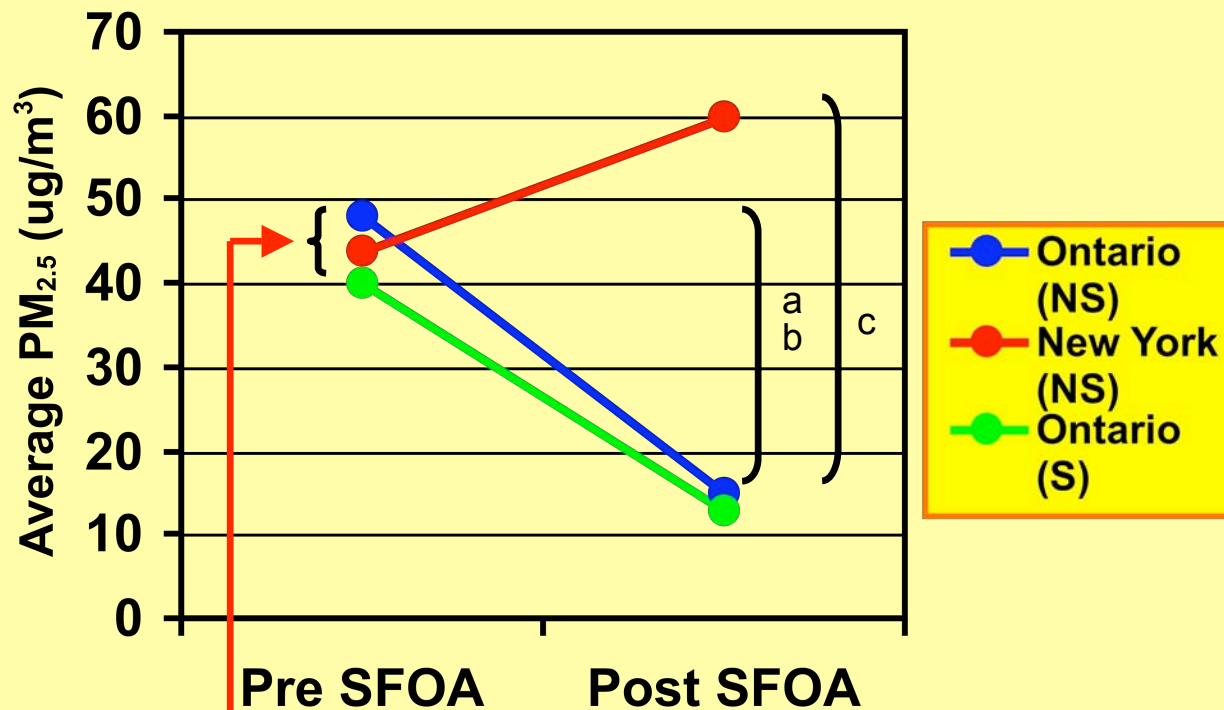
Average Casino PM_{2.5} Levels Before and After the SFOA



a: $p < .0001$ comparing Ontario and New York casino PM_{2.5} levels after the SFOA

Air Quality: Non-smoking vs. smoking areas

Comparing the Effectiveness of Nonsmoking Areas to SFOA by Ave PM_{2.5}



No difference between Ontario and New York no-smoking areas at pre-SFOA

a: $p < .0001$ comparing Ontario no-smoking area pre vs post SFOA

b: $p = .0002$ comparing Ontario smoking area pre vs post SFOA

c: $p < .0001$ comparing Ontario casino (ave. of S and NS) to New York no-smoking area at post-SFOA

The Ontario casino's no-smoking section had higher levels of PM_{2.5} than did its smoking section before the SFOA

Results - Biomarkers of Exposure: NNAL

Before SFOA–May 2006

		After 4-Hour Casino Visit		
		None	Detected	
Before Casino Visit	None	1	11	12
	Detected	0	1	1
		1	12	13

McNemar test: $p < .001$

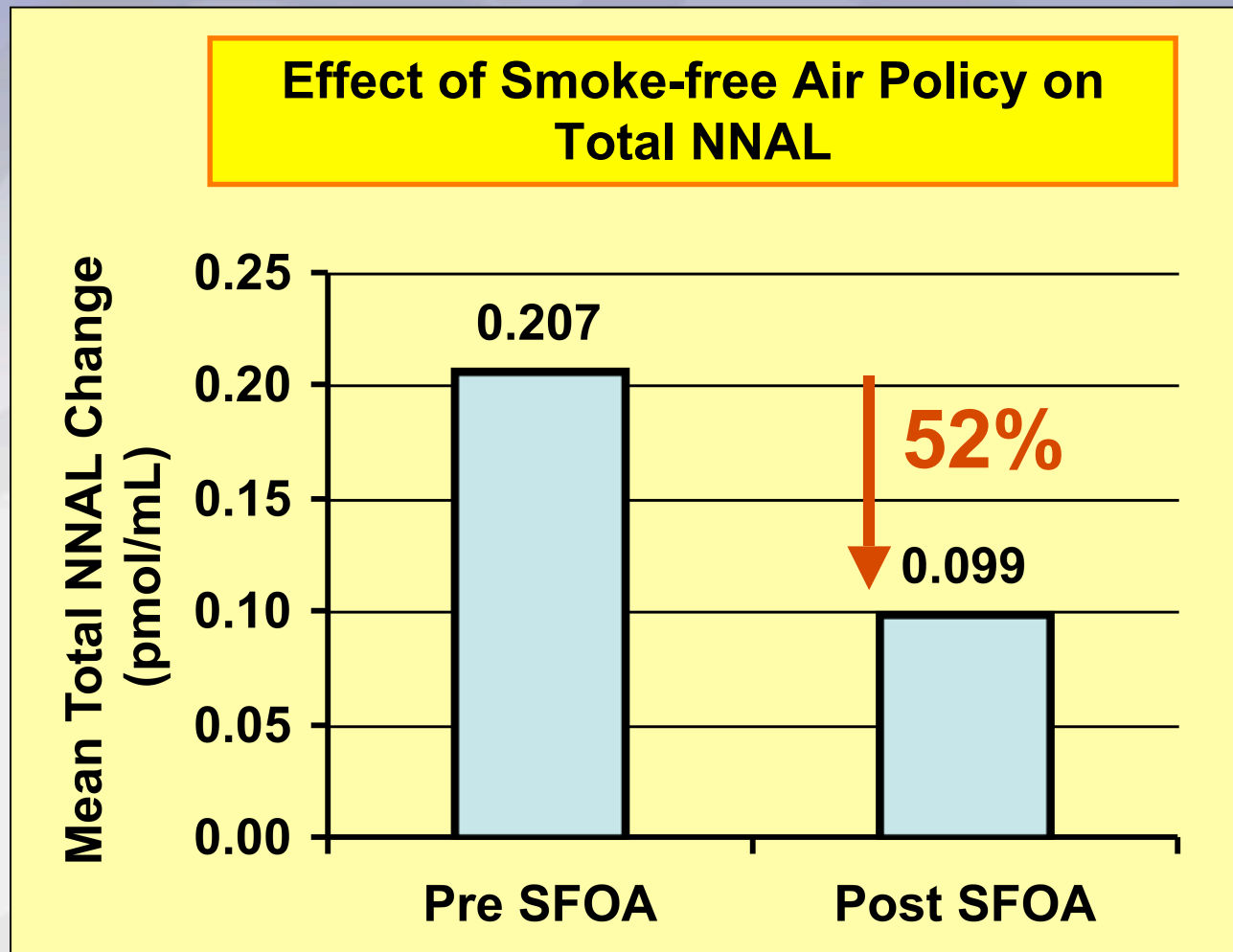
After SFOA–Sept 2006

		After 4-Hour Casino Visit		
		None	Detected	
Before Casino Visit	None	8	4	12
	Detected	1	0	1
		9	4	13

McNemar test: $p = .375$

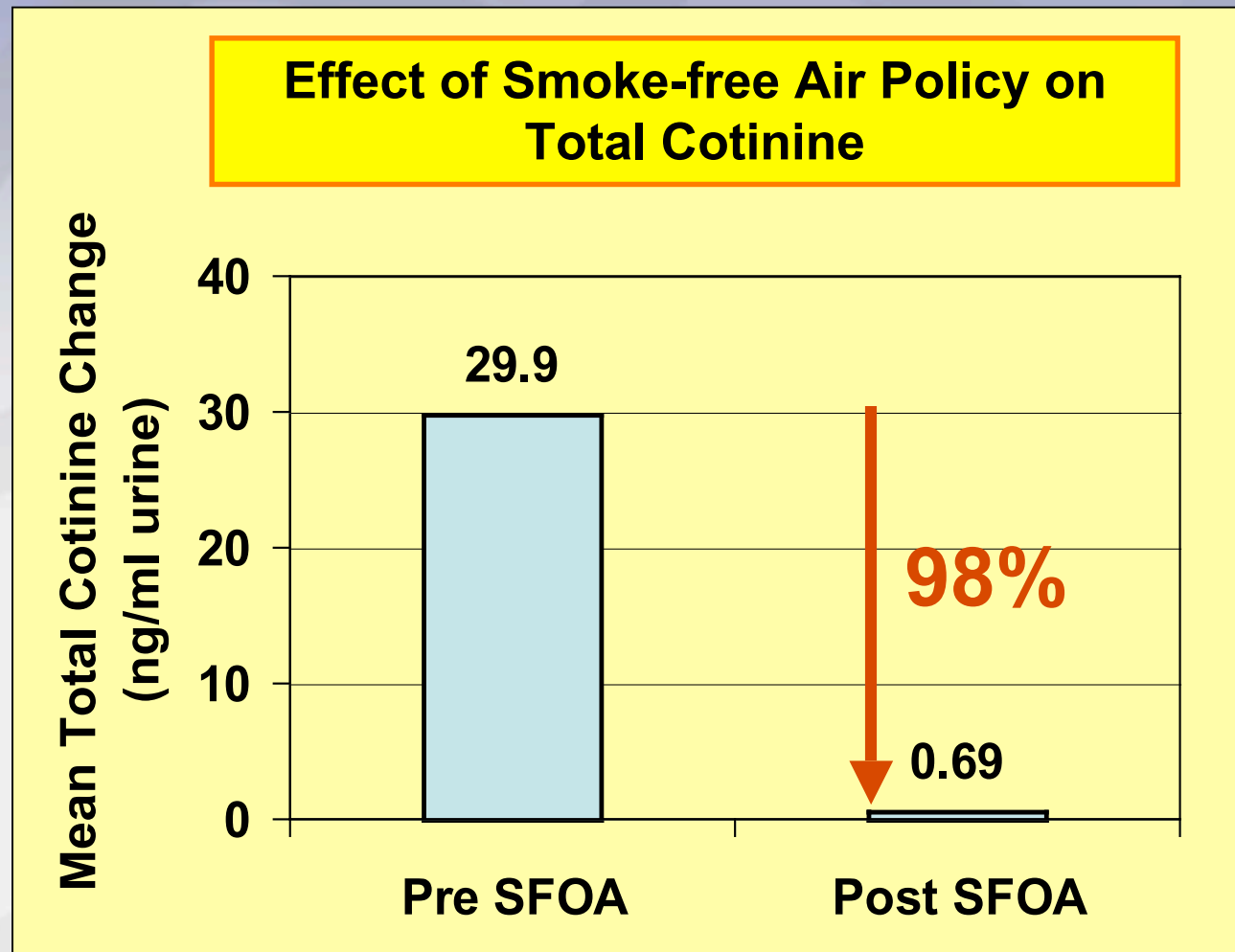
**Before the SFOA: 12/13 (92%) of participants had detectable levels of NNAL after a 4-hour visit to the casino.
After the SFOA: this decreased to 4/13 (31%)**

Results - Biomarkers of Exposure: NNAL



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

Results - Biomarkers of Exposure: Cotinine



$p < 0.001$ (n=13; one participant was excluded for anomalous cotinine levels)

Key Findings

- ◆ Air quality improved by 67% in the Ontario casino following SFOA
- ◆ Tobacco smoke biomarkers reduced following SFOA:
 - Mean total NNAL reduced by 52%
 - Mean total Cotinine reduced by 98%
- ◆ Support effect of smoke-free policies on reducing exposure
- ◆ Demonstrates ineffectiveness of non-smoking areas

Future Research

- ◆ Public support
- ◆ Economic impact
- ◆ Casino ventilation
- ◆ Casino designated smoking rooms

Support for the SFOA Casino Study



Graduate Student Support

CIHR Strategic Training Program
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It would've worked too, if his idiot partner hadn't switched on the exhaust fan.

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