Comparison of Area Samplers With Personal Samplers for the Determination of Markers of ETS in Bars and Restaurants

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Study Objective

- Early initial examination of personal exposure of waiters, waitresses, and bartenders.

- 16 City study had limited subjects in this occupational group.

Institutional Responsibilities

- Oak Ridge National Laboratory
  - Overall study design and implementation
  - Field operations
  - Air marker analyses
  - Data management and interpreation
- The Tombras Group/Amick Research
  - Subject recruiting
  - Assistance with field operations
  - Final data coding
- Labstat-Canada
  - Salivary cotinine analyses

Experimental Design

- 80 servers and 80 non-smoking bartenders recruited.

- 4 hr minimum workshift.

- 25-seat minimum, no fast-food.

- Area samples in selected restaurants.

- Field operations: Nov. '96 - Jan. '97.

- Recruited thru managers/owners.

- Subjective information on exposure

Sampling System

Area Samplers Placed in Most Facilities

Detail

Overview

Classification of area samplers

- Bars (49)
- Smoking areas in restaurants (9)
- Non-smoking areas in restaurants (15)
- Boundary areas (8)

Classification by type of facility

- Single room bars
- Single room restaraunt/bar
- Restaurant only
- Multi-room restaurant/bar

Area Samples in Bars

Area Samples in Bars

Area Samples in Restaurants

Multiroom Restaurants

"Volunteers"

Area Samples
4 - 10 hr. Samples, ug/m^3

	3-EP	*Nicotine*	*RSP*	*FPM*	*Sol-PM*
N	85	85	85	85	85
Median	**0.78**	**2.77**	**66**	**28**	**0.81**
Mean	2.70	11.2	112	70	53
80th %ile	5.42	24.7	191	121	75
95th %ile	9.14	41.6	310	287	224

Levels of ETS constituents in various areas(ug/m^3)

Area type	Nicotine	Sol-PM
Bars	10.612	45.947
Smoking areas	7.789	40.565
Boundary areas	1.226	13.874
Non Smoking	0.827	14.516

Comparison of ETS Levels: Personal Sampling vs Area Samples: Single Room Bars

4 - 9 hr samples, ug/m^3

		3-EP	Nicotine	RSP	FPM	Sol-PM
Median	Area	5.3	19.8	172	122	99
Median	Bartenders	4.9	20.6	213	140	134
80th %ile	Area	8.8	35.8	296	169	165
80th %ile	Bartenders	8.1	34.5	372	325	229

COMPARISON OF PERSONAL AND AREA SAMPLERS, GAS PHASE ANALYTES, (uG/M^3)

Subject Category	Summary Statistic	3-EP		Nicotine	
		Subject Samples	Area Samples	Subject Samples	Area Samples
Bartender	N	74	43	74	43
	Median	1.17	3.26	4.08	8.45
	Mean	2.90	3.97	12.82	15.60
Server	N	74	38	74	38
	Median	0.58	0.59	1.04	1.25
	Mean	1.38	1.51	4.08	7.15
Bartender + Server	N	148	81	148	81
	Median	0.93	0.87	3.26	2.92
	Mean	2.14	2.81	8.45	11.64

COMPARISON OF PERSONAL AND AREA SAMPLERS, PARTICULATE PHASE ANALYTES, (uG/M^3)

Subject Category	Summary Statistic	RSP Subject Samples	RSP Area Samples	Sol-PM Subject Samples	Sol-PM Area Samples	FPM Subject Samples	FPM Area Samples
	N	74	43	74	43	74	43
Bartender	Median	118.07	71.61	25.48	29.71	38.99	44.71
	Mean	160.48	143.93	82.75	85.15	100.34	99.94
	N	74	38	74	38	74	38
Server	Median	74.65	68.59	6.20	7.73	17.35	15.71
	Mean	113.98	84.35	20.33	20.72	32.52	34.21
Bartender	N	148	81	148	81	148	81
+	Median	94.28	70.88	15.55	17.21	27.98	28.16
Server	Mean	137.23	115.98	51.54	54.93	66.43	69.11

Personal vs. Area Samples, RSP
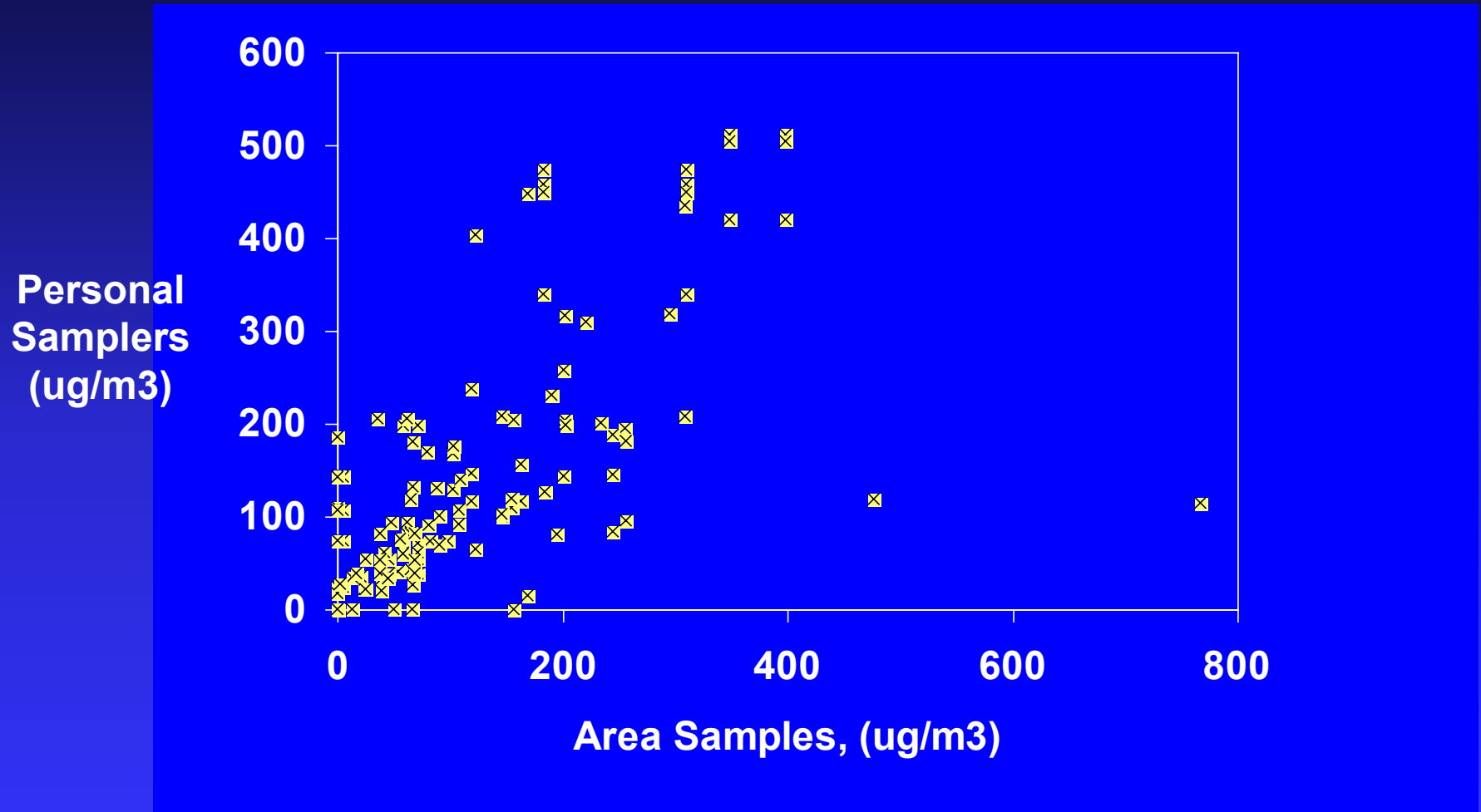
Correlation Between Personal and Area Samples

ETS Marker	Correlation
RSP	0.78
Solanesol	0.90
UVPM	0.89
FPM	0.91
3-EP	0.80
Nicotine	0.79

Comparison With Previous Work

	ORNL				*Seigel*	
	Single Room Bar	Single Room Bar/Rest-aurant	Rest-aurant only	Multi-room Bar/Rest-aurant	Bars	Rest-aurants
Nicotine (ug/m3)	22.3	10.4	1.76	5.27	19.7	6.5
RSP (ug/m3)	180	78	69	78	348	117

Source: Seigel, JAMA, July 28, 1993, vol. 270, No. 4

Observations and Conclusions

- Area samples in bars had the highest concentration of ETS markers, followed by smoking areas, boundary areas, and non-smoking areas.

- Wide range of ETS levels encountered.

- Area samples provide relatively good estimate of personal exposure.

- Particulate phase markers give higher correlations between area samples and personal samplers than do gas-phase analytes.

- Reasonable comparability with previous work.