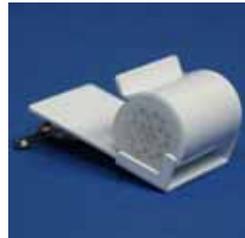


US EPA ARCHIVE DOCUMENT

DEARS Exposure Relationships VOCs, EC and NO₂

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Passive Samplers



- Diffusive samplers - 25 VOCs + NO₂
- Aromatics/HCs (9)
- Halogenated HCs (16)
- Detection limits
 - VOCs ~ 50 pptv
 - NO₂ ~ 5 ppbv

VOCs Measured in DEARS

Aromatics/HCs

Benzene

Toluene

Ethylbenzene

m,p-Xylene

o-Xylene

1,3-Butadiene

4-Ethyltoluene

1,3,5-Trimethylbenzene

Styrene

Chlorinated Aromatics/HCs

Carbon tetrachloride

1,1-Dichloroethane

1,2-Dichloroethane

1,1,1-Trichloroethane

1,1-Dichloroethylene

cis-1,2-Dichloroethylene

Trichloroethylene

Perchloroethylene

1,2-Dichloropropane

Chlorobenzene

m-Dichlorobenzene

o-Dichlorobenzene

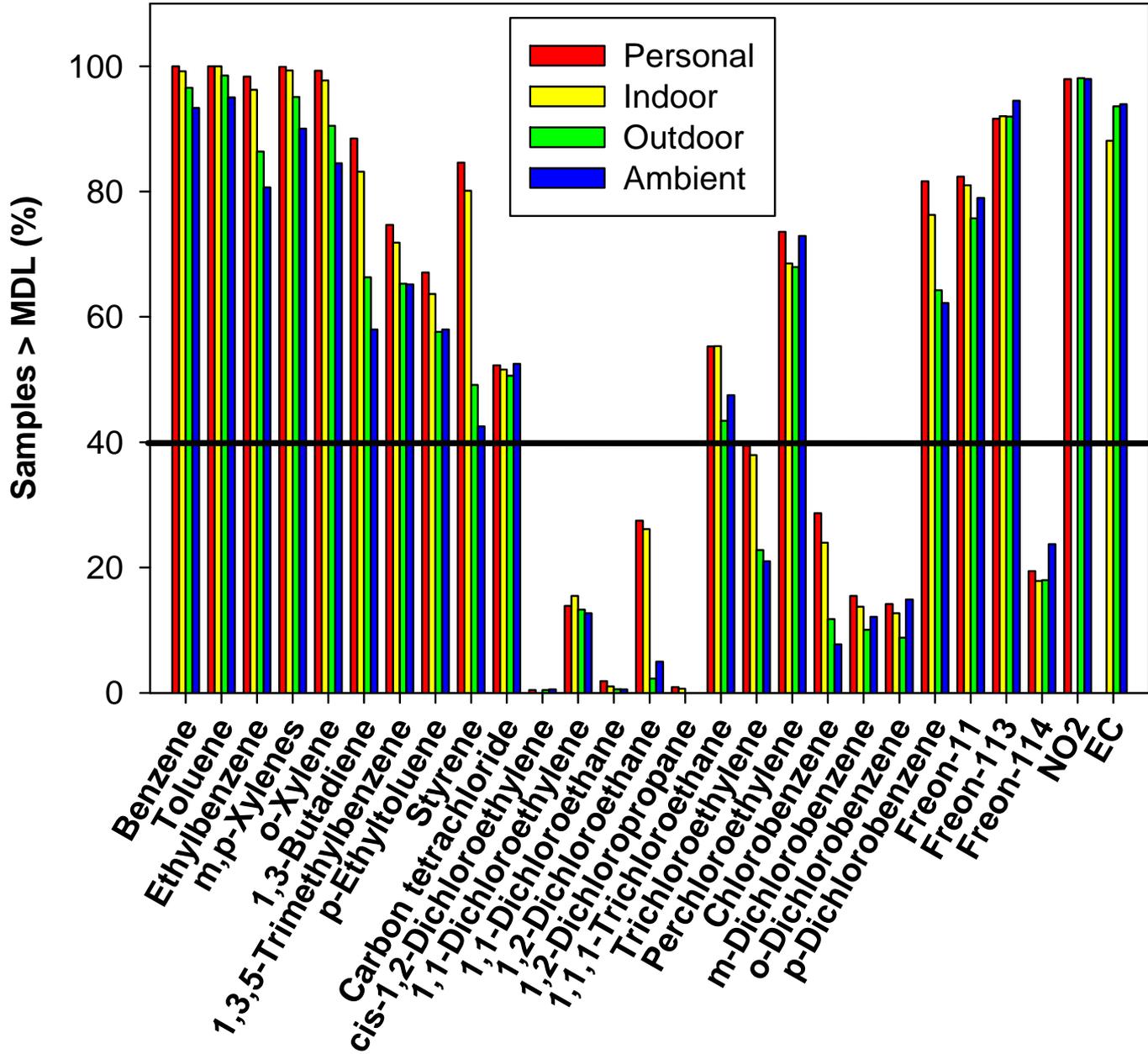
p-Dichlorobenzene

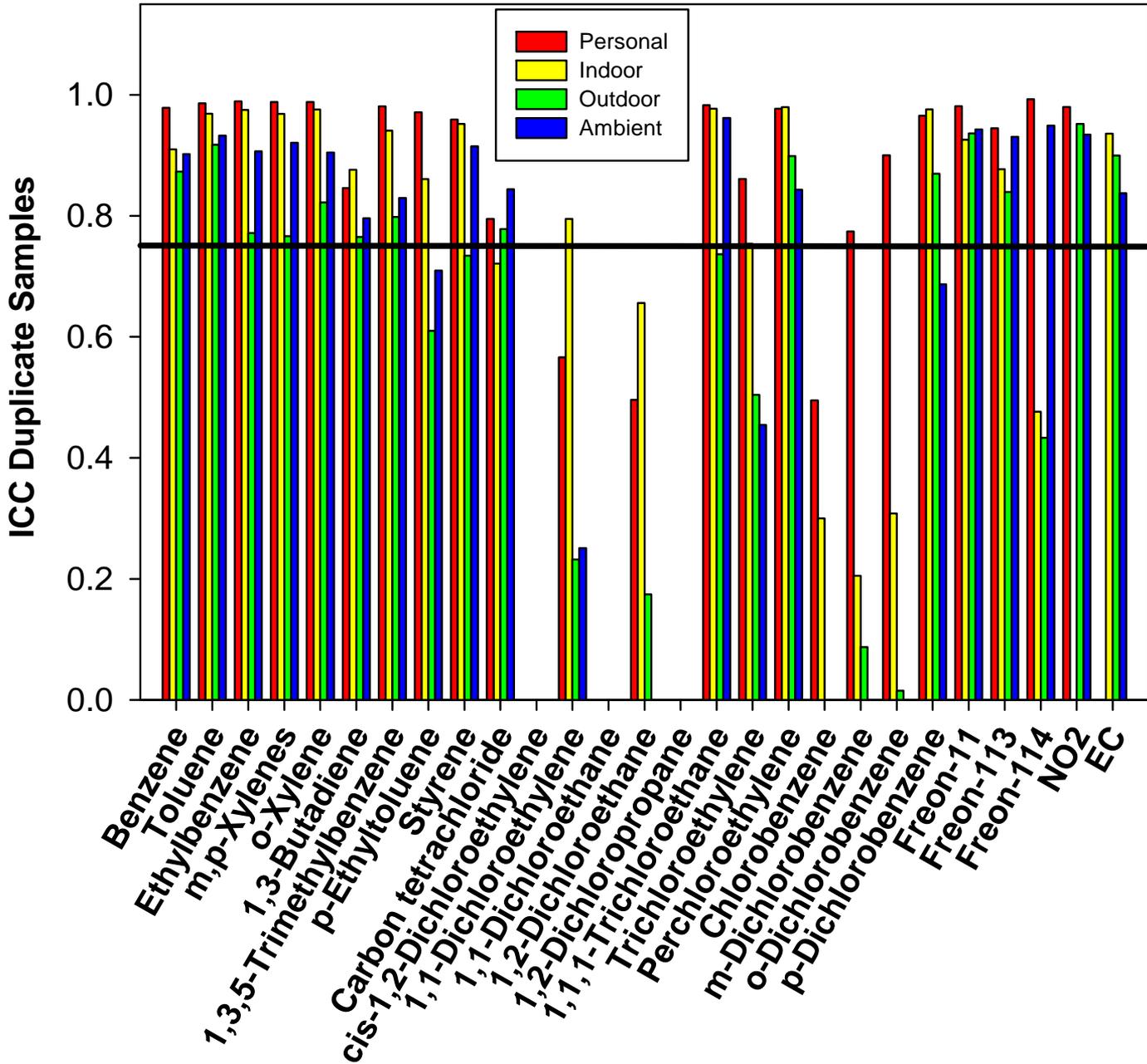
Freon

Trichlorofluoromethane (11)

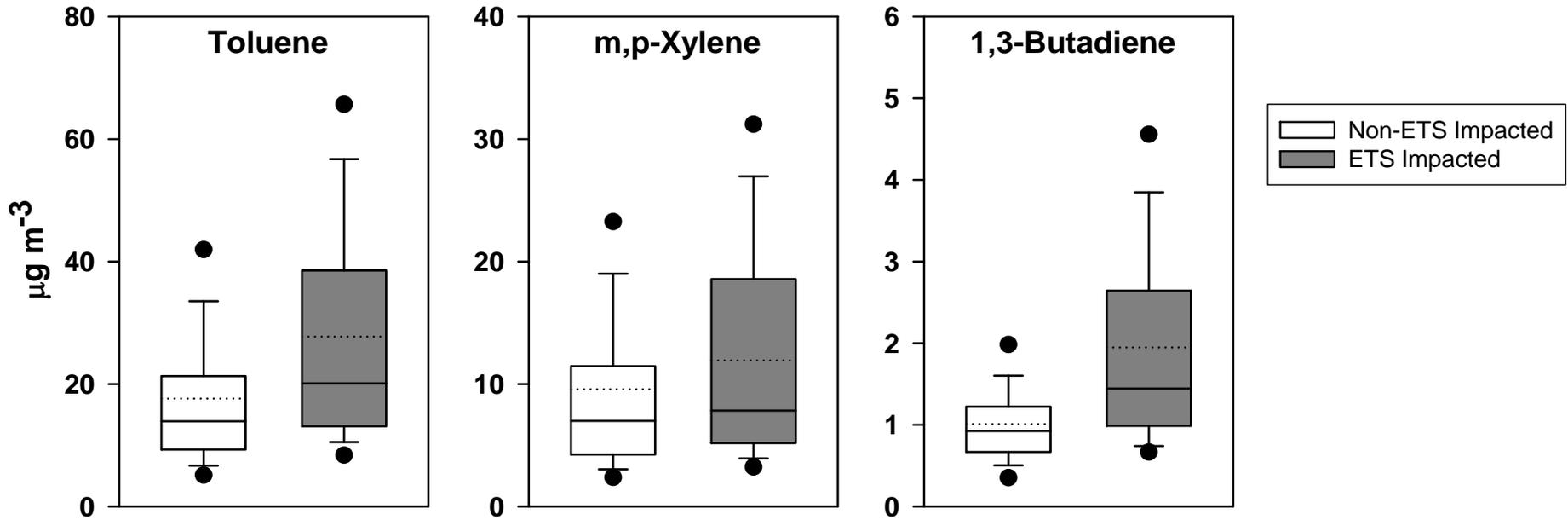
1,1,2-Trichloro-1,2,2-trifluoroethane (113)

1,2-Dichloro-1,1,2,2-tetrafluoroethane (114)





Impact of Environmental Tobacco Smoke



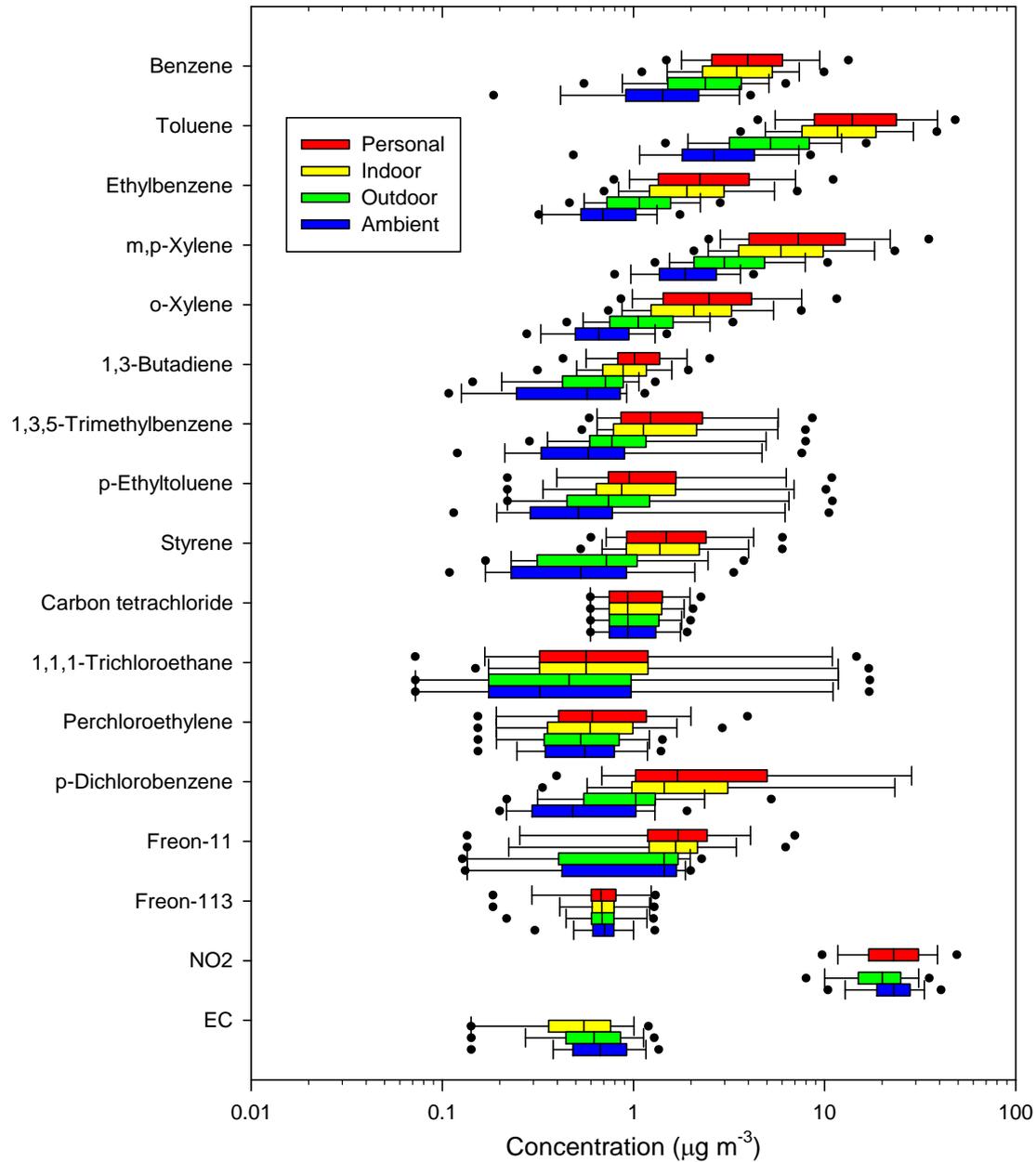
- Indoor levels of VOCs associated with tobacco smoke
- ETS was measured using an optical technique on filter samples
- Samples were considered impacted by ETS when ETS levels exceeded $1.5 \mu\text{g m}^{-3}$
- 34% of personal and 21% of indoor samples contained ETS $> 1.5 \mu\text{g m}^{-3}$

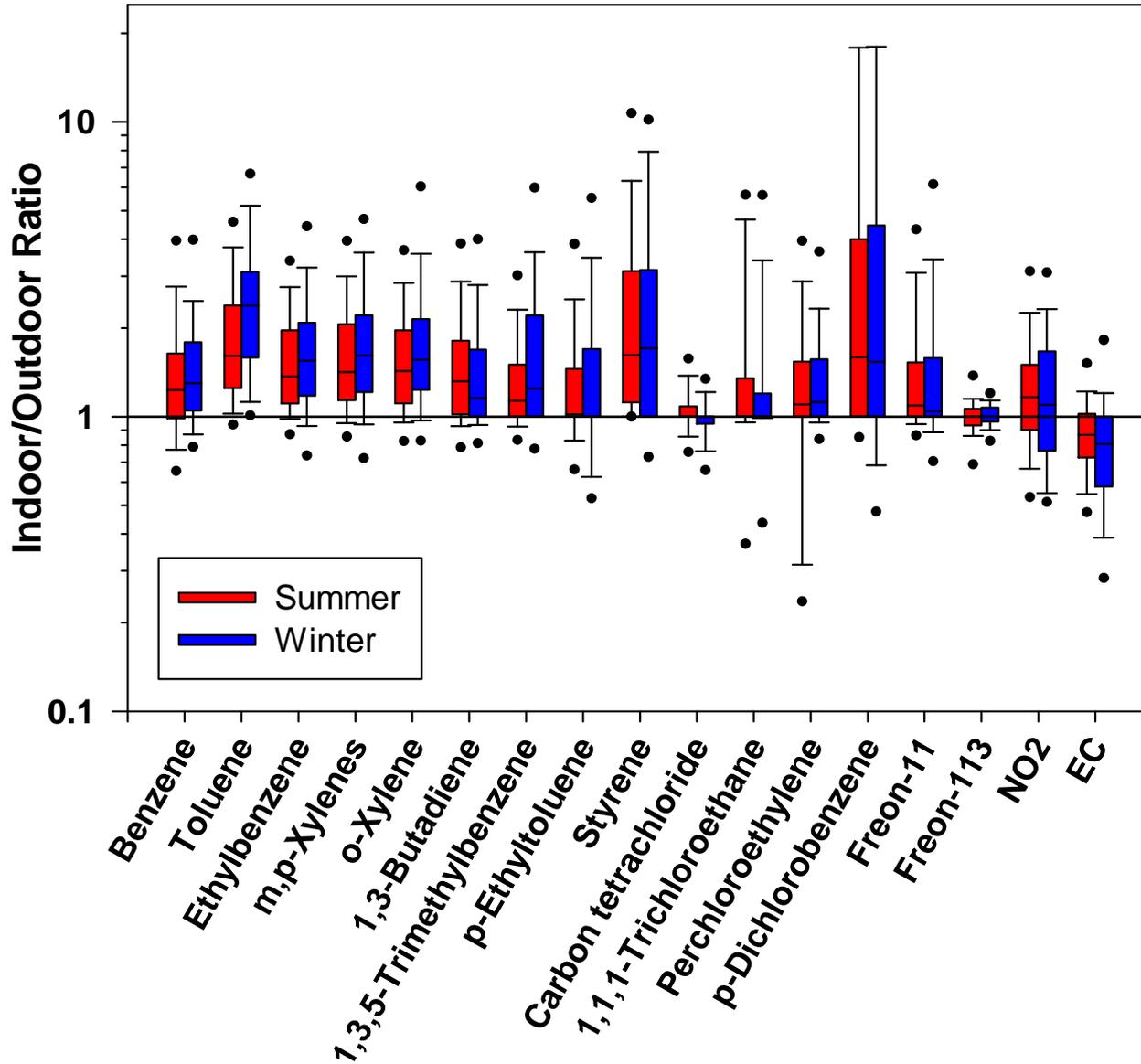
Effect of Residential Characteristics

Pollutant	Location	Attached Garage	Painting (7 d prior)	Carpet (6 mo. Prior)	Construction (6 mo. Prior)	Linoleum (6 mo. Prior)	Gas Stove
Benzene	Indoor	46	44	6		17	
	Personal	115	45				
Toluene	Indoor	48	51	37	14	66	
	Personal		38	36			
Ethylbenzene	Indoor	38	56	90	32	52	
	Personal		15	58	54		
m,p-Xylenes	Indoor	52	58	95	33	50	
	Personal	46	28	76	26		
Perchloroethylene	Indoor						
	Personal						
NO₂	Personal						34
EC	Indoor						

Effect of Personal Activities

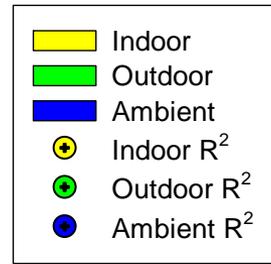
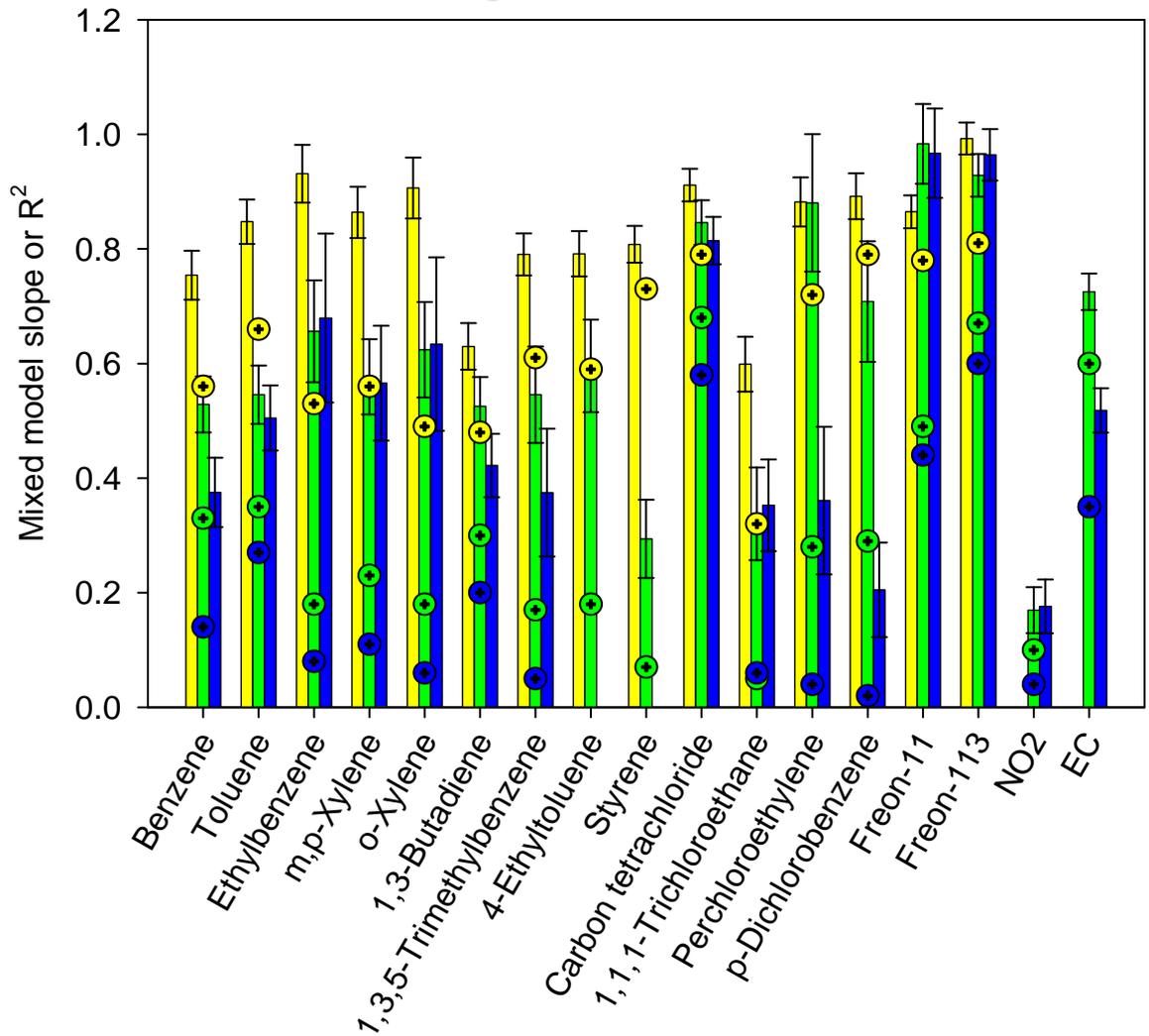
Pollutant	Location	Gas space heater	Solvent usage	Candles or incense	Dryclean (7 d. prior)
Benzene	Indoor			-27	
	Personal			-36	
Toluene	Indoor		38	-30	
	Personal			-38	
Ethylbenzene	Indoor		64	-30	
	Personal		118	-32	
m,p-Xylenes	Indoor		65		
	Personal		10		
Perchloroethylene	Indoor				376
	Personal				645
NO₂	Personal	114			
EC	Indoor			121	





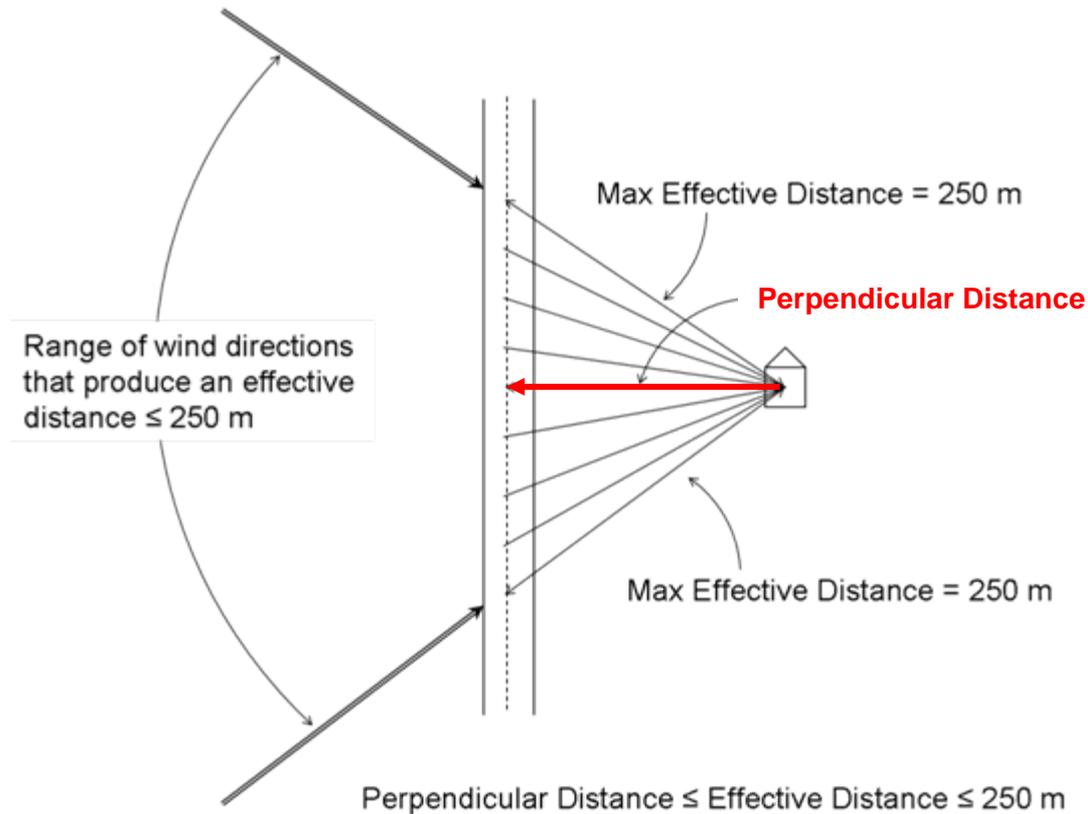
Personal Exposure Relationships

Log Transformed Data

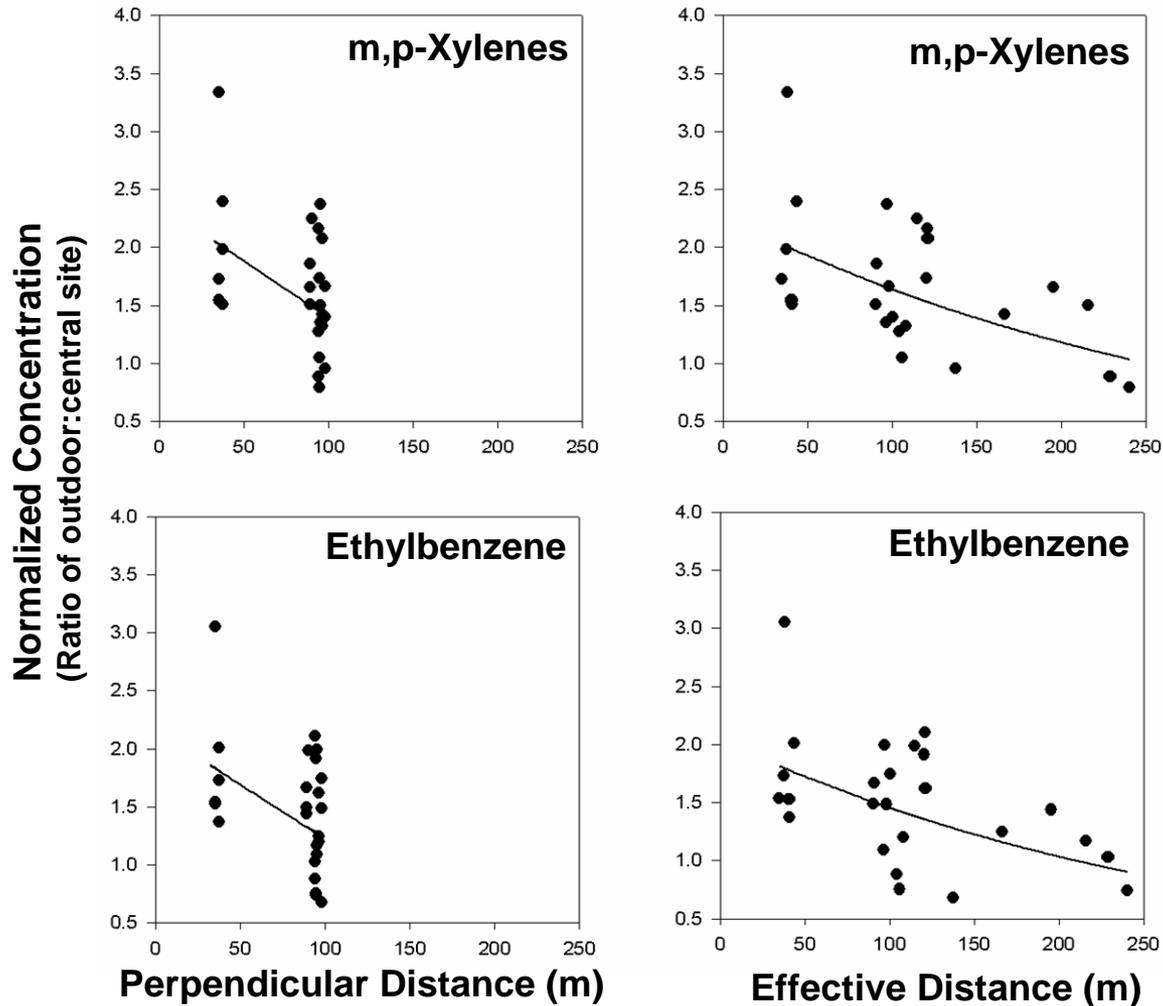


- Mixed models – account for repeated measures
- Exposures related to indoor, outdoor and sometimes ambient
- Slopes (agreement): I > O > A

Effective Distance from Roadway



Effective Distance from Roadway



Conclusions

- Carbopack-X passive tubes – robust and reliable method to measure VOCs
- ETS found in 21% of indoor air and 34% of personal exposure samples
- Residential characteristics and personal activities affect indoor and personal exposures
- Significant spatial and temporal variability in MSATs
 - Impact of sources (EMA) and locations (I, O, A)
- Personal exposures to MSATs
 - Indoor > Outdoor > Ambient

Disclaimer

Although this work was reviewed by EPA and approved for publication, it may not necessarily reflect official Agency policy.

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