



The Cost of Air Pollution: A Meta-Analysis of Air Quality Valuations

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Outline

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Introduction and Background

- Air Quality
 - Poor air quality has significant health, environmental, and economic impacts
 - Air quality is a public good (“non-market good”) and difficult to value
- Significance to public policy
 - How air quality is valued in society is a significant concern to policy makers as they make decisions about the appropriate means that should be allocated to air quality improvement

Introduction and Background

- Meta-Analysis (“study of studies”)
 - The purpose of a meta-analysis is to measure relationships between reported environmental valuation estimates for goods and non-market goods
- Types of air quality valuation studies included in this meta-analysis:
 - Revealed preference
 - e.g., Hedonics: How much do people reveal their air quality preferences; may pay more to live in an area with better air quality
 - Stated preference
 - e.g., Contingent Valuation: Surveys that ask individuals/households “How much would you be willing-to-pay for a 50% reduction in air pollution?”

Introduction and Background

- Several Air Quality Meta-Analysis Studies have been conducted since 1995
 - Vassanadrumrongdee et al. (2004). “Meta-analysis of contingent valuation studies on air pollution-related risks.”
 - Focus is on contingent valuation method (CVM) studies and the health effects of air pollution
 - Delucchi et al. (2002). The Health and Visibility Cost of Air Pollution: A Comparison of Estimation Methods.
 - Focus in on health and visibility costs using hedonics and CVM studies
 - Smith, V.K. & Huang, J. (1995). “Can Markets Value Air Quality? A Meta-Analysis of Hedonic Property Value Models.”
 - Focus in on Hedonic Valuation studies

Purpose and Research Question

- Research Question:
 - How much are people willing-to-pay for air quality improvements?
- Purpose/Objectives:
 - To provide a statistical summary of air quality valuations conducted around the world
 - To examine stated and revealed preference studies that measured air quality against health costs and property values
 - To provide insights into the costs to society of air pollution and how much people are willing-to-pay for air quality improvements

Data

- 104 studies found using Georgia Tech library databases (including UGA and GSU), Environmental Valuation Research Inventory (EVRI), Research Papers in Economics (RePEC), and Google scholar
 - 19 were dropped due to missing information
 - 34 were not in print or had a cost associated
 - 1 was dropped due to language barrier (not available in English)
 - 4 were meta-analyses
 - 46 articles were examined
- The sample size is defined as the number of willingness-to-pay observations (n=309)

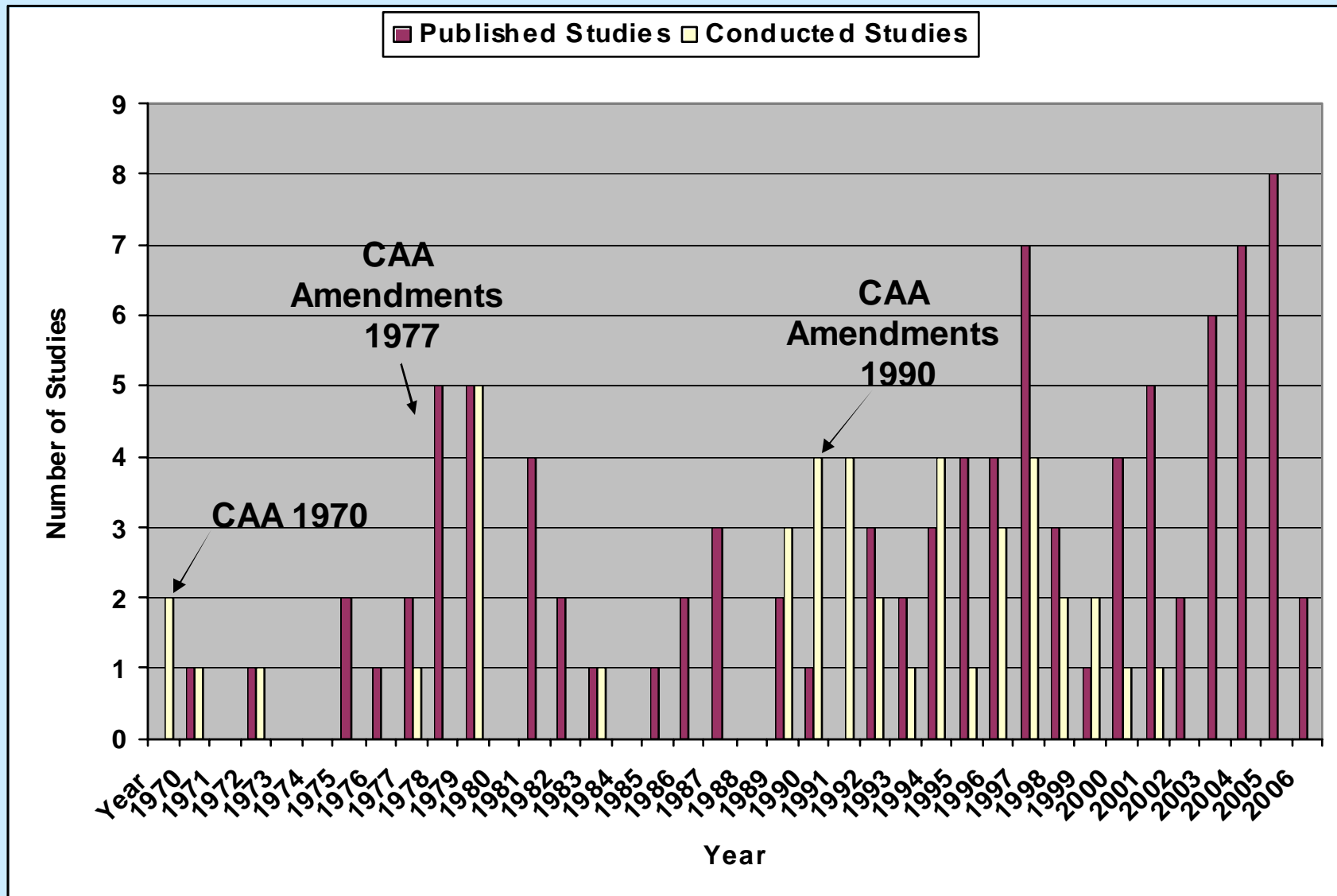
Data

Variable	Definition
Air Quality	Mean air quality level (e.g., PM10, Ozone, TSP)
Change in air quality,	% change in air quality measure (e.g., 50% reduction in ozone)
Population	Population of study area
Income	Sample income per household
Country	Study site
Year	Year published
Year Conducted	Year the survey was conducted/data gathered
Peer-reviewed	Was the article peer-reviewed?
type of valuation,	Hedonics, CVM, 2-stage hedonic, compensating differential, benefit transfer
Funder	Who funded the study (G=gov't, N=nonprofit, A=school, W=World Bank, O=other)
Good	The good the author(s) are valuing (e.g., improving air quality by 50%)
Sample Size,	Size of the author(s) study sample
elasticity	Income elasticity
Model	Type of model used (e.g., R=regression, L=logit, P=probit)
demographic groups	# of demographic variables in study
survey	Type of survey (e.g. phone, mail, door-to-door)
third world	Was the study conducted in a third world country?

Data

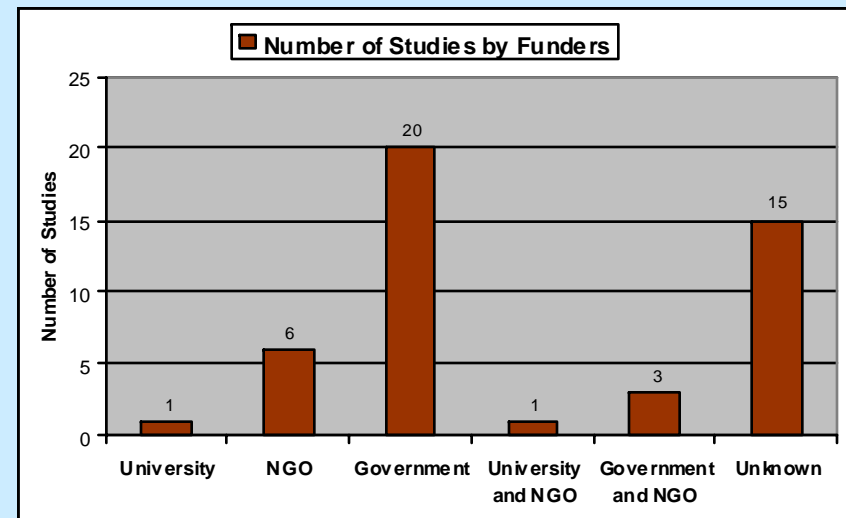
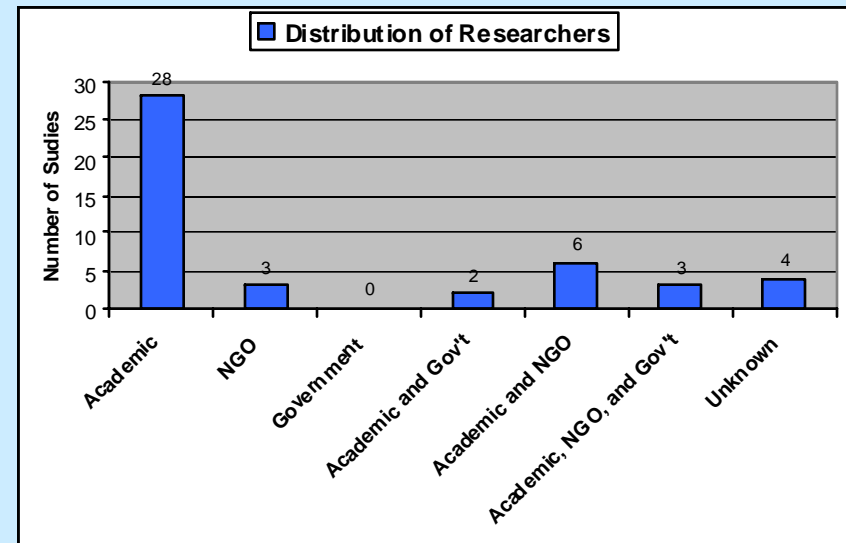
- Number of studies (46)
 - Revealed preference studies
 - 30 articles
 - Stated preference studies
 - 14 articles
 - Combined stated and revealed preference studies
 - 2 articles
- Number of observations (n=309)
 - Revealed preference observations
 - 190 observations
 - Stated preference observations
 - 119 observations

Analysis

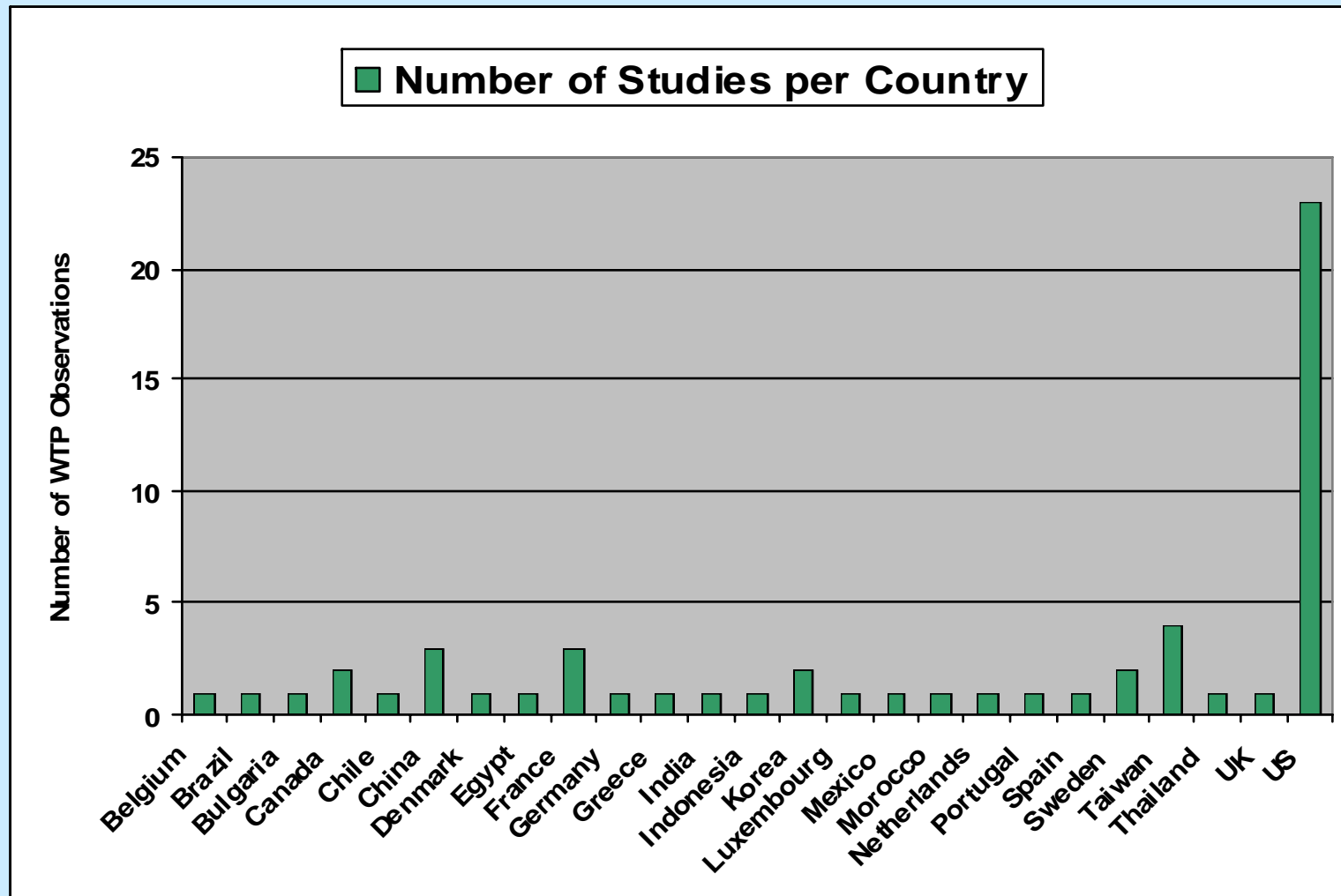


Researchers and Funders

- Distribution of Researchers
 - 28 studies conducted by academic researcher(s)
 - 3 studies conducted by NGO researcher(s)
 - No studies conducted by government researcher(s)
 - 11 combined researcher studies
 - 4 studies did not indicate researcher affiliation
- Funders of Studies
 - Government funded 20
 - NGOs funded 6
 - University 1
 - Combined 4
 - Unknown 15

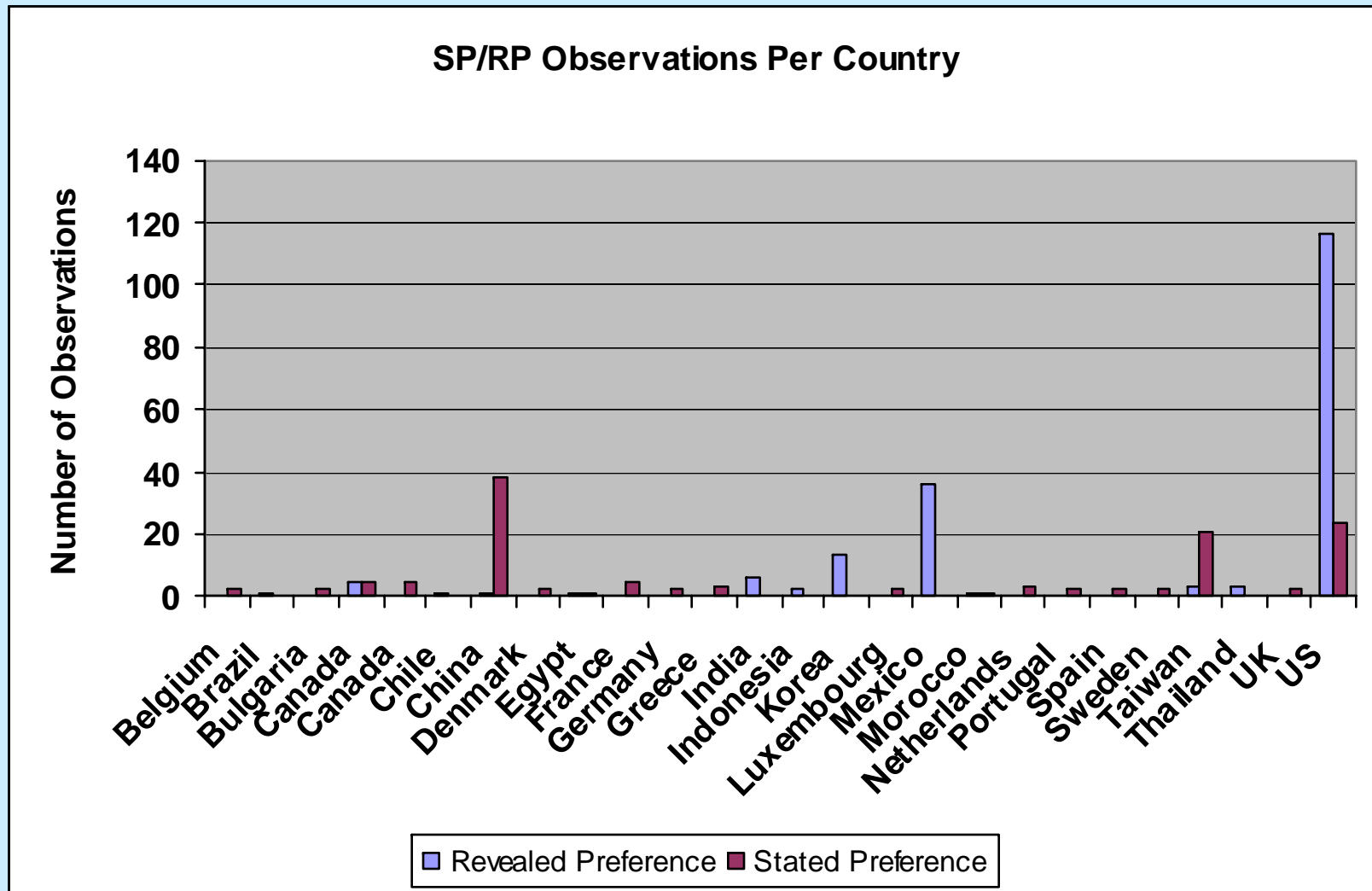


Studies by Country

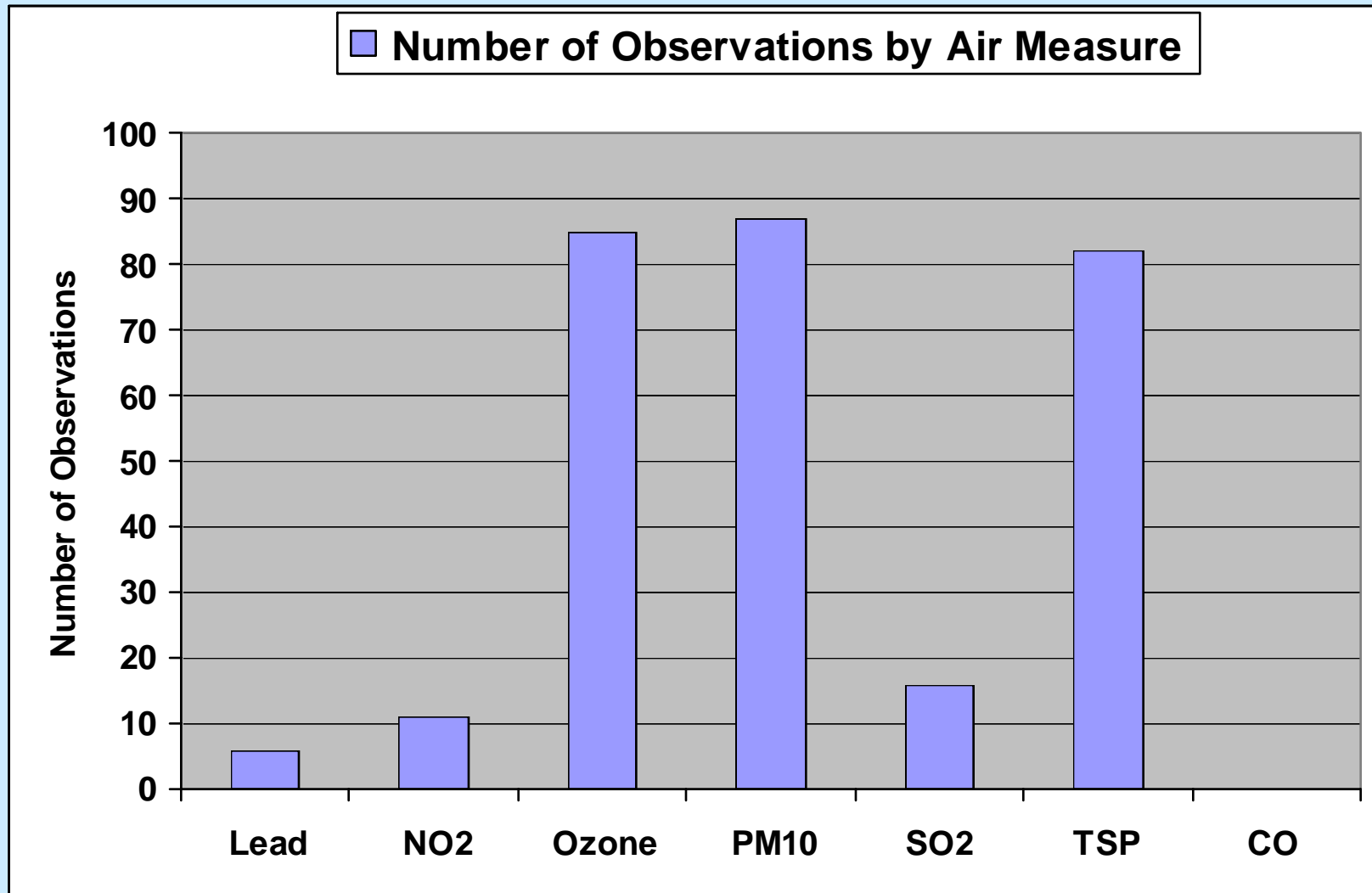


25 countries represented, including
10 developing countries

Stated and Revealed Preference Studies Varied by Country



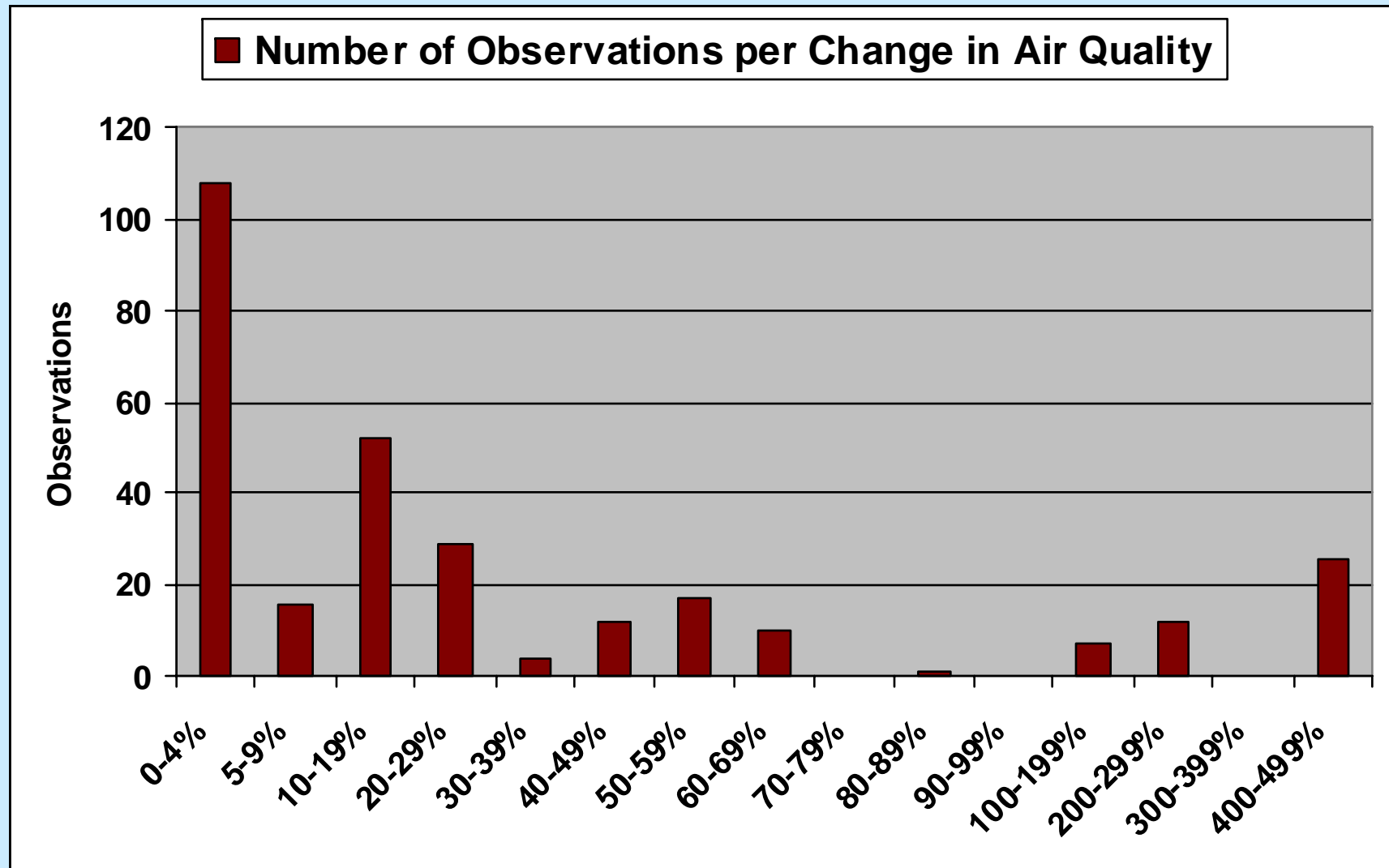
Types of Air Measures



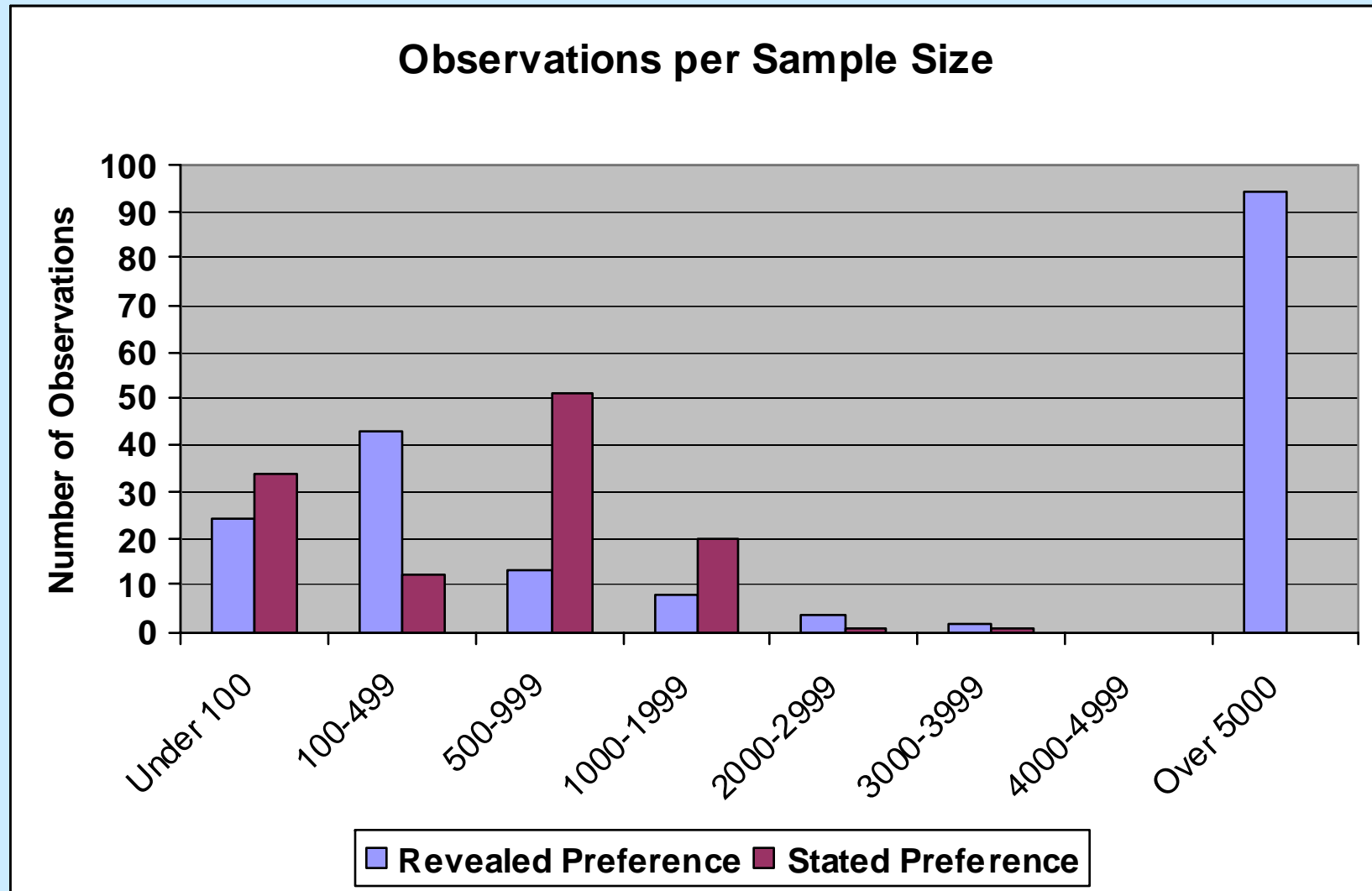
Additional Air Measures

- There were some additional observations for non-criteria air pollutants
 - Visibility
 - Black fallout days
 - Cooling degree days
 - Heating degree days
 - Days with unhealthy air
 - Odor
 - Noise

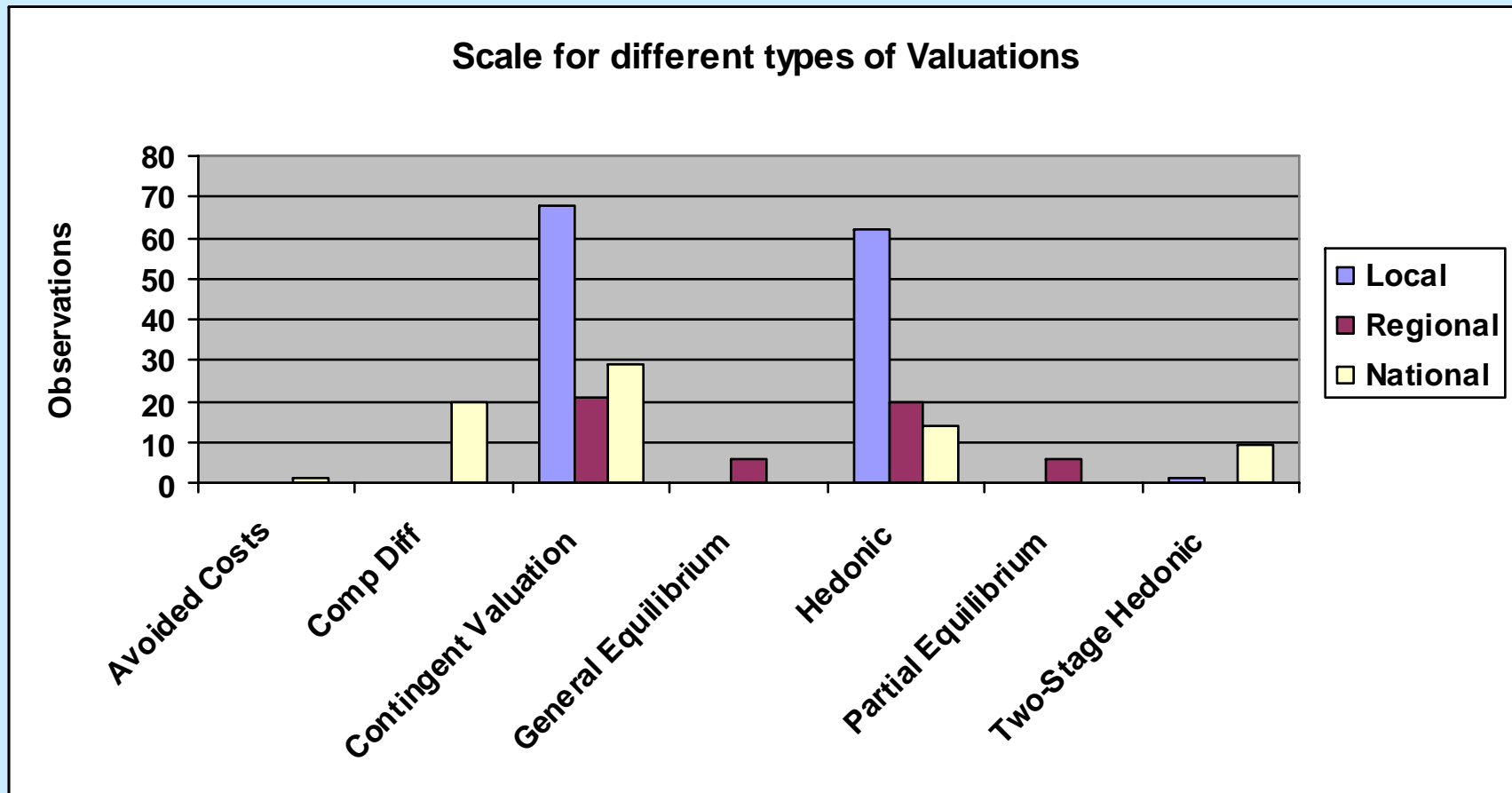
Change in Air Quality



Sample Size of Studies Reviewed

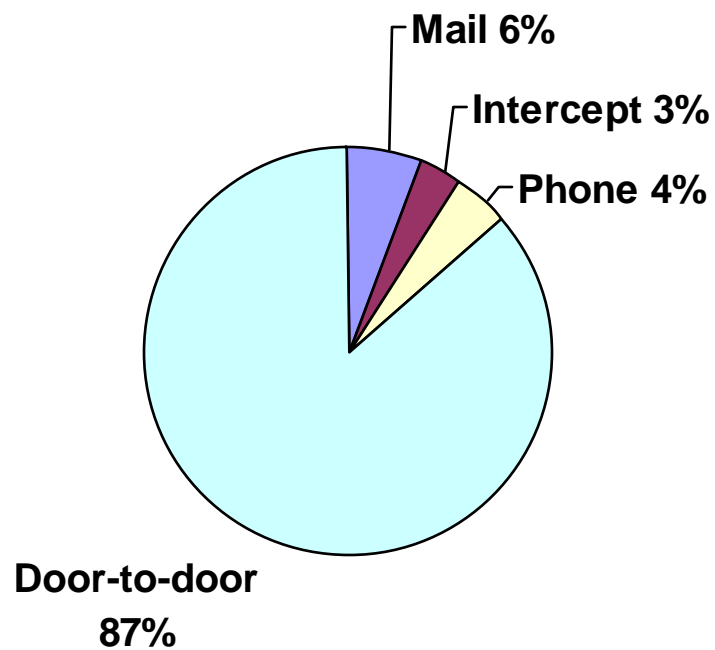


Local, Regional, or National?



Survey Modes

Survey Mode for CVM Observations

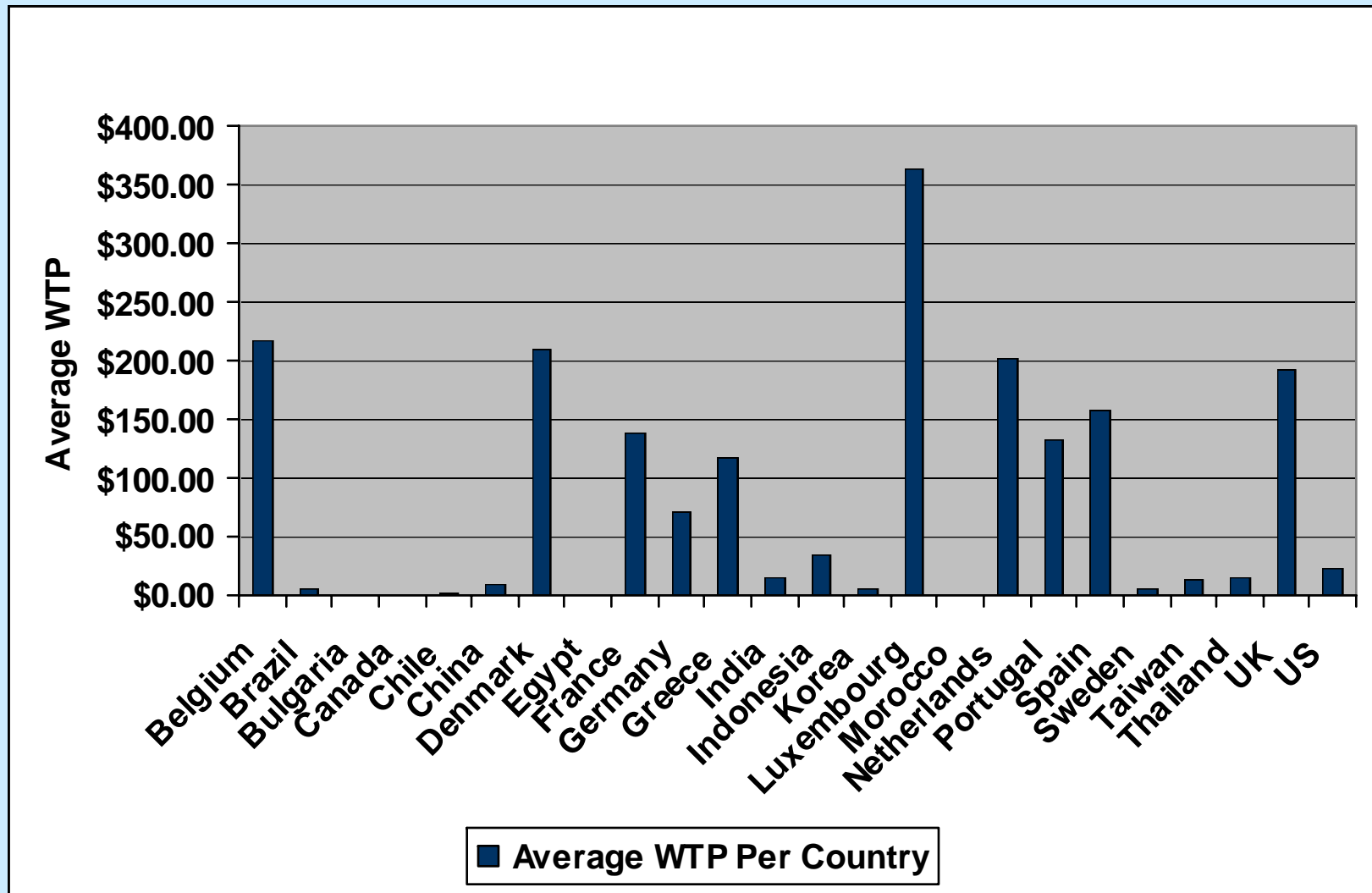


Mail Intercept Phone Door-to-door

Final WTP measures were converted to annual estimates per household (2.5) based on a 1% change in air quality

	Revealed Preference	Stated Preference	Total WTP
Mean	\$20.99	\$48.89	\$37.98
Median	\$4.73	\$10.13	\$7.67
Max	\$141.31	\$364	\$364.31
Min	\$.06	\$.00	\$.00
SD	\$30.12	\$79.50	\$65.32

Average WTP Across Countries



Conclusion

- Stated preference studies have a higher WTP than revealed preference studies
- The total mean WTP based on evaluations around the world ranges from \$0-\$364
- This wide range of results demonstrates the difficulty in valuing air quality
- These varying results make it hard for public policy makers to determine the true value society places on air quality
- Transferring benefit estimates to other locations can yield confidence intervals based on the location's unique attributes

Questions???