

Appendix C-13

Health And Economic Values for Mortality And Morbidity Cases Associated with Air Pollution In Brazil

Ronaldo Serôa da Motta

Ramon Arigoni Ortiz

Sandro de Freitas Ferreira

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AIMS

- If divergence on WTP values are to be accounted among countries, the same concern should be applied for valuation among regions within a country with significant variations on factors and parameters affecting WTP, as it is the case in most developing economies.
- This study is an attempt to present back-of-the-envelope estimates of morbidity and mortality health benefits associated with air pollution in the Metropolitan Area of São Paulo in Brazil.

This is NOT:

Exercise on methodological validity.

Risk function estimation.

SCOPE

Our exercise will use short-cut procedures based on these three distinct approaches, as follows:

- 1 - Estimating measures of output foregone caused by premature death and health expenditures.
- 2 - Applying benefit transfer functions for European countries values (ExternE, 1998).
- 3 - Adjusting an existing estimate of WTP (Oliveira, 1997) based on hedonic property price function.

Table 1 - PRESENT VALUE OF FUTURE OUTPUT (PVFO) OF PREMATURE DEATH IN MASP (1997 US\$)

age bracket in years	mortality rate (%)	economically active share	unemployment rate (%)	monthly avg income	PVFO $r = 3\%$	PVFO $r = 10\%$
15-17	0,72	28,70	10,88	217,68	254.777,08	45.195,16
18-24	1,11	65,21	9,23	420,98	255.353,99	60.637,59
25-29	1,11	74,77	5,44	673,39	248.352,34	79.208,47
30-39	2,73	75,33	3,60	870,27	213.299,45	87.066,73
40-49	5,21	72,41	2,13	1.045,46	151.187,34	81.661,27
50-59	7,38	52,21	1,64	971,14	74.100,64	51.871,67
60-64	9,64	29,69	1,25	867,30	24.656,93	19.857,08
65-	12,91	11,25	0,91	860,27	10.959,40	9.325,26

Source: Demographic data from IBGE and income data from IPEA (1998)

Table 2 - TOTAL HEALTH EXPENDITURES (HE) ASSOCIATED WITH AIR POLLUTION IN MASP (1997 US\$)

RESPIRATORY MORBIDITY				
age brackets in years	hospital expenditures	work days lost	monthly avg income	HE
0-14	8.100.408,22	0	0,00	16.200.816,43
15-59	5.989.939,15	141.708	772,10	19.274.036,56
60-	3.736.039,68	79.739	864,23	12.066.302,64
HEART FAILURE MORBIDITY				
age brackets in years	hospital expenditures	work days lost	monthly avg income	HE
0-14	-	0	0,00	-
15-59	10.275.887,10	54.069	772,10	23.334.858,49
60-	12.298.218,09	58.592	864,23	27.972.250,45

Sources: Hospital expenditures and work days lost from DATASUS and income data from IPEA (1998)

Table 3 - ADJUSTMENT PARAMETERS FOR BENEFIT TRANSFER FUNCTIONS TO BRAZIL (1995 US\$)

Parameters	Brazil	Europe
Per capita GDP at Purchase Power Parity (PPC)	5.500,00	17.900,00
Life expectancy (E)	67,1	77,3
Health expenditures (G)	7,4	8,6

Functions	e = 0,54	e = 1
Function 1 (*)	0,528756	0,307263
Function 2 (**)	0,395069	0,229577

Source: Authors' estimates with data from WR (1998) and Markandya (1998)

(*) $(PPC_{br}/PPC_{eu})^e$

(**) $(PPC_{br}/PPC_{eu})^e \cdot (E_{br}/E_{eu}) \cdot (G_{br}/G_{eu})$

Table 4 - ESTIMATES OF TRANSFERRED VALUES OF HEALTH BENEFITS TO BRAZIL (1997 US\$)

	statistical value of life	WTP for hospital admission respiratory morbidity	WTP for hospital admission heart failure morbidity
Europe	4.141.652,32	3.677,52	6.017,76
Brazil	function 1 e = 0,54	2.189.923,05	1.944,51
	e = 1	1.272.574,74	1.129,96
	function 2 e = 0,54	1.636.239,48	1.452,88
	e = 1	950.826,57	844,27
			2.377,43
			1.381,54

Source: Authors' estimates with European values from ExternE (1998) and Markandy (1998)

Table 5: SUMMARY OF THE ESTIMATES OF HEALTH BENEFIT VALUES ASSOCIATED WITH AIR POLLUTION IN MASP (1997 US\$)

Valuation of Statistical Life		
Transfer Pricing		
function 1 - e=0,54	2.189.923,05	
function 1 - e=1,00	1.272.574,74	
function 2 - e=0,54	1.636.239,48	
function 2 - e=1,00	950.826,57	
Hedonic Pricing		
minimum	166.000,00	
maximum	487.406,67	
Output Foregone Pricing		
r= 3 %	197.664,07	
r= 10 %	73.079,05	
Willingness to Pay for Morbidity Risk Reduction		
	RESPIRATORY	HEART FAILURE
Transfer Pricing		
function 1 - e=0,54	1.944,51	3.181,93
function 1 - e=1,00	1.129,96	1.849,03
function 2 - e=0,54	1.452,88	2.377,43
function 2 - e=1,00	844,27	1.381,54
Hospital Expenditures	1.985,79	7.336,85

Conclusions

- Mortality results are the highest from benefit transfer valuation whereas output foregone estimates are the lowest ones: variation may reach the factor of 30.
- Apart from methodological differences, results showed that data constraints are dominant in each of the methodological approach when one is willing to estimate site-specific values
- If health benefit measures are important ancillary benefits to justify and promote combat actions to climate change, the choice of one these specific short-cut approaches will affect the economic assessment of these actions.
- WTP surveys must be promoted and improved in developing countries to offer reliable health benefit value: another opportunity of north-south research cooperation in the field of climate change issues.