

Economic Valuation of Respiratory and Cardiovascular Hospitalizations



Principal Investigators

Lauraine Chestnut, Stratus Consulting

Mark Thayer, San Diego State University

Stephen Van Den Eeden, Kaiser Permanente

Final Project Presentation

May 13, 2003

Project Overview



- Purpose: Determine monetary value of reducing hospitalizations
- Context
 - Hospitalizations associated with air pollution in California
 - Benefits of pollution control quantified with monetary value estimates

Background



- Benefits of reducing hospitalizations have been based on limited cost-of-illness (COI) estimates
 - Direct medical costs of hospitalization
 - Value of lost productivity during hospitalization

Currently Used Estimate



- US EPA, 1999 dollars
- Respiratory
 - All ages: \$11,000
 - 65 and over: \$16,000
- Cardiovascular
 - 65 and over: \$18,000
- Does not include recovery period, and only some COI included

Objectives for this Project



- Improve COI estimates of direct and indirect costs of hospitalizations
 - Kaiser Permanente records and primary data
 - Survey of patients
 - CA hospital data
- Provide WTP estimates to prevent future hospitalizations
 - Survey of patients

Improving COI Estimates



- Review the air pollution link to selected health endpoints
- Estimate direct medical costs
 - CA hospital data
 - Kaiser Permanente database
- Patient out-of-pocket costs
- Estimate indirect costs of illness
 - Value of lost productivity
 - Value of non-work time

WTP Estimates



- Monetary measure of what individual is willing to forego to prevent an illness or episode
- Monetary measure of the full impact on a person's well-being
- Appropriate in benefits assessments to evaluate amount of society's resources to invest in pollution control

WTP Estimates (cont.)



- WTP expected to reflect
 - Out-of-pockets costs of illness
 - Value of lost time
 - Value of pain and discomfort
- WTP will not be expected to include costs incurred by third parties

Previous WTP Studies



- Morbidity episodes valued:
 - Days with respiratory symptoms
 - Days with symptoms and activity restriction
 - Restriction in one study included hospitalization
- Valuation approaches used:
 - Direct WTP questions
 - Choice questions

Previous WTP Results



- Respiratory symptoms: \$15 to \$25 / day
- Asthma symptoms: \$42 / day
- Angina episode: \$66 / day
- Respiratory MRAD: \$50 / day

Johnson et al. (1998)

Canadian Study



- Only WTP study to date that specifically addresses hospitalization
- Used a choice question design
- Included a range of symptoms and activity restriction levels from none to in hospital
- Survey of general population (no specific history of hospitalization)

Johnson et al. (1998)

Canadian Study (cont.)

	At home (Canadian dollars)	In hospital (Canadian dollars)
1 day	\$285-\$365	\$430-\$535
5 days	\$565-\$760	\$705-\$910
10 days	\$720-\$980	\$855-\$1,115

Study Approach



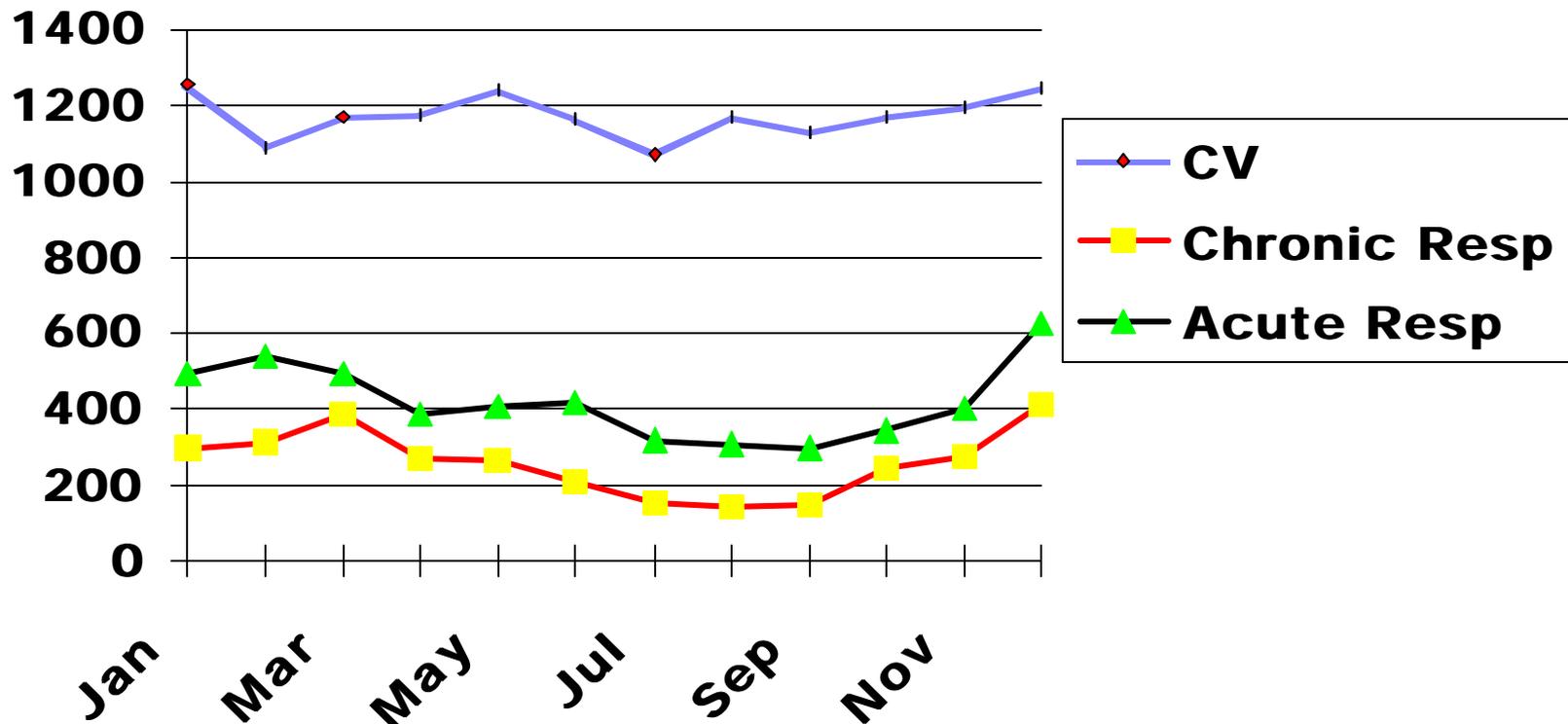
- Use available hospitalization data
- Use Kaiser hospitalization data
- Conduct survey of Kaiser patients who have hospitalization experience:
 - Detail on COI
 - WTP to prevent future hospitalization

Hospitalizations Associated with Pollution



- Respiratory illnesses
 - Chronic diseases, primarily asthma and COPD
 - Acute diseases, primarily pneumonia
- Cardiovascular illnesses
 - Ischemic heart disease, including heart attack
 - Heart failure
 - Other coronary heart disease

Frequencies of Diagnoses



Kaiser Permanente Records



- Diagnosis frequencies
- Hospitalization costs
- Associated costs such as follow-up office visits
- Patient characteristics
- Contact information for survey

COI Survey Component



- Out-of-pocket costs for patient
- Time lost from productivity activity
 - Patient's time
 - Activities restricted
- Post hospitalization impacts of the illness episode

WTP Approach



- Goal to develop new estimates useful for air quality benefits assessments
- Survey-based stated preference approach
- Survey population with hospitalization history-familiarity with the good

WTP Survey Component



- Stated preference (SP) approach relies on asking either direct or indirect valuation questions
- Accuracy of results depends on credibility and subject comprehension of the questions
- This is a new contribution to the literature — several SP design issues not previously addressed

Survey Development



- Conceptual development and draft
- Expert peer review
- Kaiser internal review board
- CPHS review at SDSU
- In-person interviews and testing
- Pre-test

Survey Outline



- Introduction and hospitalization event
- Out-of-pocket expenses
- Time and activity losses
- Effects of hospitalization
- Set up for WTP questions
- WTP questions and follow-up
- Socioeconomic

WTP Introduction



- Approaches to reduce illness events, treatment, environmental, preventative
- Importance of preventing/reducing future hospitalization
- Idea of having to pay for prevention
- Diagnosis same as previous event, number of days specified in question

WTP Choice Questions



- 6 choice questions
- Higher costs for fewer days in hospital
- No illness event in some choices
- Illness event and costs to prevent in the next year
- 10 versions of choice questions, with varying combinations of events and costs

Choice Question Example

Would you prefer Alternative A or Alternative B if faced with a future illness event? *(Check A or B)*

Days in hospital
Days of at-home recovery
Additional cost to you
Which do you prefer?
(Check A or B)

Alternative A
5 days
10 days
\$500
A <input type="checkbox"/>

Alternative B
10 days
10 days
\$0
B <input type="checkbox"/>

Open Ended WTP



- Alternative estimate, more information
- Easier after choice questions, although not independent
- 10 combinations of hospital and at-home recovery days
- Allows consistency checks

WTP Follow-Up Questions



- Agreement/disagreement with 6 statements
- Gauges attitudes and acceptance of WTP scenario
- Used to identify protest responses and scenario acceptance/rejection
- Allows consistency checks

Survey Implementation



- Sample selection
- Physician approval
- Version assignment and first mailing
- Reminder postcard
- Second mailing to non-respondents
- Data entry

Survey Sampling



- Stratified sample drawn equally from
 - Three diagnoses groups
 - Two age groups
- Over selects respiratory — consistent with air pollution epidemiology
- Over selects adults under age 65 — to ensure sufficient sample for analysis

Survey Response



- 1,129 mailed
- 441 returned
- 397 at least 75% complete
- Overall usable response rate 35%
 - 30% for under 65
 - 40% for 65 and over
- Primary complaint: Too long and difficult

Respondent Characteristics

Age in years	65 (18 to 94)
2001 household income	\$43,000
High school graduates	90%
Female	53%
Children at home	13%
Non Caucasian	20%

Average Length of Stay

Diagnosis	Survey respondents		California hospital survey	
	18-64	65 +	18-64	65 +
Acute respiratory	7.3	5.2	5.6	6.2
Chronic respiratory	4.7	4.9	4.1	5.1
Cardiovascular	4.6	6.9	4.2	4.8

Diagnoses for Respondents

Diagnosis	Survey respondents		Survey sample	
	18-64	65 +	18-64	65 +
Acute respiratory pneumonia	85%	92%	94%	94%
Chronic respiratory asthma	47%	14%	65%	22%
non-asthma COPD	53%	86%	35%	78%
Cardiovascular ischemic heart dis.	60%	49%	60%	51%
heart failure	6%	12%	12%	13%

Chronic Condition



- Have an ongoing illness that interferes with life's activities — 54%
- Recent hospitalization related to this ongoing illness — 78%
- Hospitalization related to ongoing illness:
 - Acute respiratory: 33%
 - Chronic respiratory: 54%
 - Cardiovascular: 45%

California Hospital Data



- Office of Statewide Health Planning and Development (OSHPD)
- All non-HMO hospital admissions 1998-1999
- Selected matching diagnosis categories for unplanned admissions

CA Hospital Charges

Diagnosis	Average length of stay		Average hospital charges per day	
	18-64	65 +	18-64	65 +
Acute respiratory	5.6	6.2	\$4,000	\$3,600
Chronic respiratory	4.1	5.1	\$3,600	\$3,500
Cardiovascular	4.2	4.8	\$6,800	\$5,600

Kaiser Average Costs

Diagnosis	Hospital costs per day	Follow-up care (6 months)
Acute respiratory	\$1,800	\$1,100
Chronic respiratory	\$1,600	\$1,000
Cardiovascular	\$3,200	\$1,100

Out-of-Pocket Expenses

Cost category	Acute respiratory		Chronic respiratory		Cardiovascular	
	18-65	65 +	18-65	65 +	18-65	65 +
In-hospital medical	\$62	\$177	\$111	\$119	\$101	\$92
At-home medical	\$173	\$85	\$93	\$399	\$53	\$240
Household services	\$238	\$227	\$83	\$225	\$16	\$85
Total	\$473	\$489	\$287	\$743	\$170	\$417

Time Lost



■ Household chores

- Normally 6.5 hours per day
- Unable to do for 31 days
- Average about 200 lost hours
- Valued at \$9 per hour

■ Active recreation

- Normally 2.1 hours per day, lost 36 days
- Valued at one-half wage rate

Value of Time Lost

Cost category	Acute respiratory		Chronic respiratory		Cardiovascular	
	18-65	65 +	18-65	65 +	18-65	65 +
Earnings	\$3,093	\$391	\$2,753	\$158	\$2,220	\$191
Chores	\$2,669	\$2,085	\$836	\$2,552	\$886	\$1,528
Recreation	\$599	\$600	\$299	\$925	\$505	\$702
Total	\$6,361	\$3,076	\$3,888	\$3,635	\$3,611	\$2,421

Total COI Estimates

Cost category	Acute respiratory		Chronic respiratory		Cardiovascular	
	18-65	65 +	18-65	65 +	18-65	65 +
Total costs	\$30,645	\$27,233	\$20,105	\$23,333	\$33,334	\$30,839
Length of stay	5.55	6.24	4.09	5.12	4.17	4.78
Cost/day	\$5,522	\$4,364	\$4,916	\$4,557	\$7,994	\$6,452

Effects of Hospitalization Illness Event

	Pain and discomfort	Anxiety and distress
In hospital	2.6	2.7
At-home recovery	1.5	1.7
5-point scale with 0 = none, 1 = mild, 2 = moderate, 3 = severe, and 4 = very severe.		

How Bothersome Impacts

Impact	Mean	N.A.
Out-of-pocket expenses	2.0	14%
Lost time from paid work or school	2.2	41%
Lost time from household chores	2.5	11%
Lost ability for active recreation	2.8	8%
Physical pain and discomfort	2.9	4%
Emotional distress and anxiety	3.3	4%
5-point scale with 1 = not at all, 2 = a little, 3 = moderately, 4 = very, and 5 = extremely.		

Importance of Prevention

	Not at all or a little	Moderately	Very or extremely	Mean
Prevent 10 day illness event	2%	5%	94%	4.5
Reduce the length of hospital stay	19%	19%	62%	3.7
Reduce the at- home recovery time	16%	18%	66%	3.8

Hardship of Payment

	\$50	\$500	\$3000
No hardship	64%	13%	4%
Small hardship	17%	13%	3%
Some hardship	8%	21%	5%
Moderate hardship	6%	22%	11%
Great hardship	5%	30%	77%

WTP Follow-Up

	Disagree	Neutral	Agree	Mean
Health insurance should pay	4%	10%	86%	3.4
I answered as if I would pay	13%	38%	49%	2.5
I am willing to spend	26%	18%	57%	2.4
I don't believe illness can be prevented	41%	22%	36%	1.9
I can't afford to pay anything	24%	11%	64%	2.8
Thinking of additional benefits	13%	36%	51%	2.5

Open Ended WTP Answers

Category	Retained for analysis	Dropped from analysis
Non-zero WTP	213	
No response		53
\$0 WTP	113	17
Highest WTP (\$1,000,000)		1

WTP Mean Values

	N	Mean
Total WTP	326	\$770
WTP:		
1 hospital day	67	\$590
2 hospital days	68	\$412
5 hospital days	128	\$965
10 hospital days	63	\$952
WTP per hospital day	326	\$259

Factors Affecting WTP



- Number of hospital days (nonlinear)
- Income (elasticity = 1.0)
- Ongoing illness related to hospitalization
- Education
- Insurance should pay
- Don't believe can be prevented

Factors Not Affecting WTP



- Age
- Diagnosis group
- At-home recovery days

Adjusted WTP Estimates

Hospital days	Mean WTP results	Mean WTP results adjusted for scenario rejection	
		Moderate	Maximum
1 day	\$457	\$1,308	\$1,886
2 days	\$535	\$1,386	\$1,964
5 days	\$948	\$1,800	\$2,378
10 days	\$1,034	\$1,885	\$2,463

Choice Question Results



- Significant factors similar to open-ended
 - Number of days in the hospital
 - Cost
 - Education
 - Scenario rejection
- Mean WTP per day about \$50
- 40% always chose lowest cost
- Scenario rejecters bring mean down

WTP Conclusions



- Value to prevent any event about \$500 to \$1,000, with more for additional days in hospital
- Substantial scenario rejection lowers estimates by about half
- Responses represent significant financial impact and income effect is strong

Values for 5-Day Event

- Individual incurred costs
 - Out-of-pocket expenses \$400
 - Value of time \$2,400
- Individual WTP to prevent
 - Mean adjusted \$2,200
- Costs shared by others
 - Medical costs \$18,000 to \$30,000
 - Lost earnings \$250 to \$2,700

Implications of Findings



- Medical expenses dominate value
 - CA costs appear substantially higher than national average
- Value of earnings and time lost during recovery is substantial
- WTP estimates suffer downward bias in this approach