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"A Set of Morbidity and Mortality Values For
Environmental Assessment"

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DISCLAIMER

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Table 1

Estimated Effects of 1 Microgram Per Cubic Meter Increases
in Selected Pollutants on the Mortality Rate

(Deaths/100,000)

Pollutant:	Study					
	Lave and Seskin ^a	Lave and Seskin ^b	Chappin and Lave ^c	Cracker et. al.	Mendel- sohm and Orcutt ^d	Schwing and McDonald
so2		2.64		-.313	1.02	2.01
Sulfates (SO4)	5.418	-1.02	13.092		16.0	18.0
TSP	.613	-.022	-.322	.107	-.051	
NO2		.17	.082	-.082	-1.09	
Nitrates (NO3)		.035			-.059	2.3
CO(mili- gram/per cubic meter)					7.04	
O3					.58	

a

From Lave and Seskin (1977), Regression 7.1-3

b

From Lave and Seskin (1977), Regression 7.8-10

c

From Chappie and Lave (1982), Regressions 6-9

d

Based on implied effects of 1 microgram per cubic meter change using estimates in Table III and pollutant means in Table A1 in Mendelsohm and Orcutt (1979), 1970 age characteristics of the population for creation of adult population at ion mortality rate effects.

e

Schwing and McDonald present estimated elasticities of pollutant effects on mortality rates. The estimates in Table 1 are based on elasticities for the pollutant at its primary standard level or, in the case of nitrates, at the average level presented in Mendelsohm and Orcutt (1979). Results are based on the constrained least squares elasticity estimates for total mortality rates given in Schwing and McDonald (1976).

Table 2

Comparison of Crocker, et. al. and Chappie and Lave
 Estimation Results
 (deaths/100,000)

Explanatory Variable	Crocker, et. al.	Chappie and Lave
Percent of population non-white	5.63 (4.56)	3.61 (3.47)
Median age of population	6.59 (11.54)	
Percent of households with greater than 15 persons/room	31.77 (2.35)	
Number of days with temperature below 0 ⁰	1.44 (2.91)	
Packages of cigarettes/year/ capita	2.2 (2.81)	
Per capita expenditures on smoking items		2.512 (1.92)
Per capita expenditures on alcohol In (population)		1.255 (2.45) -42.59 (1.98)
Median family income In (population/sq.mile)		.036 (2.78) 41.98 (1.90)
Grams/day/capita of protein	70.1 (3.55)	8.42 (0.21)
Gram/day/capita of carbo- hydrates	-2.92 (1.36)	.146 (0.20)
Grams/day/capita of saturated fatty acids	14.6 (1.45)	-2.222 (0.12)
Physicians/10,000 population	-.53 (4.35)	-.64 (3.79)

Table 3

Estimated Effects of 1 Microgram Per Cubic Meter Increases
in Selected Pollutants on Morbidity Rates

Pollutant	Study				
	Crocker, et. al (1979)		Cropper (1981) (c)	Ostro (1983) (d)	Portney Mul lany (1985) (e)
	acute (a)	chronic (b)	acute	acute	acute
SO ₂			0.075		
Sulfates				0	0
TSP	0.1 to 0.15	6.64		.0375	
NO ₂		4.15			
O ₃ (Ozone)	to				
(ppm)					

Notes

- a From estimated demand for freedom from acute illness function.
- b From estimated chronic illness dose response function
- c Regression only includes SO₂ as a "pollution index", other pollutants omitted because highly collinear. Estimate is for 10% change from mean.
- d Based on coefficient of partial effect of air pollution used in Appendix II, "National Estimates. . .".
- e Dependent variable is Restricted Activity days due to respiratory illness; range estimated from Table 6.

7-SYMP TOM HEALTH OUESTIONAIRE: ONE DAY

R. RANKING OF SYMPTOMS

In this next set of questions, I'm going to describe several symptoms of discomfort that are common to many people. The symptoms will not necessarily describe what you experience. I would like you to put yourself in the position of having these symptoms, however.

I want you to suppose that your health in the next 12 months is going to be like it was in the past 12 months, except that you will experience an additional day of a given symptom.

First we're going to talk about which of the symptoms you consider to be worst, and which you would be bothered by the least.

Everyone has experienced coughing. Please look at this card, which describes a particular coughing experience.

[Hand respondent Coughing Days card]

The card describes the one additional day on which coughing occurs. You will cough about twice an hour in spells that last 10 to 20 seconds. You will feel the cough in your chest, but it is not severe enough to make you red in the face.

I am going to pause briefly to let you think about how much you would mind the one additional day of coughing.

[Interviewer pause for 15 seconds]

Now suppose that, instead of having the one additional day of coughing, you will have one additional day of sinus problems in the next 12 months. In other respects, your health will be exactly as it has been in the last 12 months.

A day of sinus problem is described on this card.

[Interviewer hand respondent Days of Sinus Problem card]

7-SYMP TOM HEALTH OUESTIONAIRE: ONE DAY

You Will have congestion and pain in your sinuses and forehead all day. You will be bothered by a feeling of stuffiness in your head, accompanied by sinus drainage in your throat. You will need to blow your nose every few minutes. You will have to breathe through your mouth most of the tine.

Please think over how much you would be bothered by the one additional day of sinus problems, and compare it to the day of coughing. Think about which symptom you nind the least and which the mast.

When you have decided, please tell me which bothers you more.

[Check one]

_____ One Coughing day

_____ One Day of sinus problem

Place that card under the other card.

[Wait for respondent to arrange cards]

Another problem that bothers people is throat congestion. Here is a card describing a day of throat congestion.

[Hand respondent card on Day of Throat Congestion]

On this day, you will have congestion in your throat and upper respiratory tract. You will make repeated efforts to clear your throat. The throat clearing is annoying to you and those around you. Your throat will be scratchy. Your voice will be hoarse, and you will have some difficulty speaking.

Suppose that instead of either the coughing or the sinus problems, you will have one additional day of throat congestion, as described on the card.

Please rank the 3 symptoms. The question is which day bothers you the least, which the next least, and which bothers you the most.

Take your time.

Place the three cards In the order you have decided on.

7-SYMPTOM HEALTH QUESTIONNAIRE: ONE DAY

[Interviewer check to see Card8 are in proper order. If respondent has difficulty in ranking the days, read the following three indented paragraphs. If respondent has difficulty in ranking later on in the questionnaire, return and read these paragraphs. Otherwise, do not read the indented paragraphs to the respondent]

If there are symptoms that bother you the same, cards for those days should be next to each other in the deck. It does not matter which comes before the other.

For example, if you don't care whether you have coughing or sinus problems, either of the two cards may be on top.

[Interviewer be sure that the cards for any group within which there is indifference are in their proper place in the deck, showing how this group ranks relative to the other days.]

Symptoms that you mind less than coughing and sinus problems should be on the top, symptoms that mind more should be on the bottom.

[Resume text if indented paragraphs were not read]

Let's go on to eye irritation. Here is a card describing a day with this type of problem.

[Hand respondent card on Days of Itching and Smarting of Eyes]

Watering and smarting of your eyes on this day forces you to interrupt what you are doing every 15 minutes or so. You rub your eyes and close them. Stinging of your eyes brings tears three times during the day--bad enough to cause you to use a handkerchief or Kleenex around your eyes.

We want to proceed as before. Please think about how much you mind one additional day of this symptom and how you rank it with the others.

[Wait until respondent has finished arranging cards]

Next we consider a day on which you have headaches. Here is the card that describes the headache experience.

7-SYMP TOM HEALTH QUESTIONAIRE: ONE DAY

[Hand rerpondent Headache Day card]

Two rather painful, splitting headaches will strike aoe
tine during the day. Each period of headache will LAST 2 hours.

Please proceed a8 before. Think about how much you mind
the additional day of headaches. After you have decided, put the
card in its proper place in the deck.

[Wait until respondent is through3

We have a couple of more symptoms to consider. The next one
is drowsiness. Here is a card describing a day when you are
bothered by heavy drowsiness.

[Hand rerpondent Heavy Drowsiness card1

You will have 1 xtreae difficulty staying awake during 6
of the hours when you are normally awake. Sometimes your eyelids
will flutter. You will doze off for an inrtant now and then.
The drowsiness will interfere with your social activities and
other leisure. You will find the drowsiness dangerour if it
comes over you while you are driving or working with tools,
appliance8 or other nachinery.

After thinking about one additional day when you have
drowsiness, add the card to the deck to reflect where it comes in
your ranking.

[Wait for respondent to finish, and then proceed]

The last symptom is nausea- Here is a card about it.

[Hand rerpondent Nausea card3

Throughout the day, you will have a lingering urge, to vomit,
but you will not be able to do 80. Stomach distress will be
strong. There will be no actual pain.

As before, think about how you rank one additional day of
nausea, and place it in the deck.

Thank you. I'm going to record your answers for use later.
Let's keep the deck Sitting there. We'll use it in a minute.

[Interviewer record rankings on Tally Sheet.3

7-SYMP TOM HEALTH QUESTIONAIRE: ONE DAY

CV. CONTINGENT VALUATION

In this next set of questions, I'm going to ask you how much it would be worth to you to avoid the symptoms we've been talking about.

The answers in this part are for yourself alone and not for any other member of your household.

Before we start, please look at this card showing how a typical family spends its take-home income.

[Hand respondent Household Spending card]

When you pay to avoid symptoms, the money will have to come out of one of the categories shown. We'll leave the card here so that you can think about where the money comes from that you would spend to avoid the symptoms. Keep in mind, however, that your situation is probably different from this one.

Let's think about ways we normally deal with health problems. One way is to go to the doctor, another way is to buy medicine at the drugstore. Oftentimes we don't do anything at all--we just suffer through the problem until it goes away. It might be that the price of a bottle of medicine or a visit to the doctor measures the value of a cure. But if we stop to think about it, the cure might be worth much more to us than that--if we really had to pay it. A cure might be valuable to us even when we just suffer with the problem until it goes away. In such cases we might ask ourselves "How much would I be willing to pay to get rid of this problem right now, even if I don't want to take medicine or visit the doctor?"

With these thoughts in mind, please try to give the largest dollar value a cure would be worth to you when answering the next few questions.

Now look at the card at the top of the deck--[symptom]-- which is the symptom you mind least.

7-SYMP TOM HEALTH CIUESTIONAIRE: ONE DAY

cv-1. If your health symptoms in the next 12 months wore the same as in the last 12 months, except that you would also be faced with one additional day of [symptom], would it be worth \$100 to you to completely get rid of these days of symptoms? [Circle one]

Y e s N o

cv-2. [If answer to CV-1 is Yes. ark if getting rid of the day would be be worth \$200, \$400--doubling each time until a No response is obtained. Then subtract half the difference between the two previous answers. Continue adding or subtracting half thr difference between the last two answers until respondent no longer wants to change.3

[If answer to CV-1 is No, ark SSO, \$25--decreasing by half until a Yea response is obtained. Then add half the difference between the two previous answers, continuing with the half difference procedure until respondent no longer wants to change.] [Record final bid at top of tally sheets.]

Next look at the card at the bottom of the deck which is the symptom you mind the most.

[Interviewer: For the following two questions, you will need a calculated bid for CV-3. The calculated bid for CV-3 is the bid to get rid of the least bothersome day given in the answer to CV-2, multiplied by two.]

CV-3. If your health symptoms were the same in the next 12 months as in the last 12 months, except that you would also be faced with one day of the symptom you mind the most, would you be willing to pay [calculated bid for CV-53 to completely gmt rid of the symptoms on that day? [Circle one]

Y e s N o

cv-4. [If the answer to CV- is Yes, ask if respondent would be willing to pay double the calculated bid for CV-3. Proceed by further doubling until a No answer is obtained. Then subtract half the difference between thr first No amount and the last Yes amount. Continue increasing or decreasing by half the difference a until a final bid is obtained.1

7-SYMP TOM HEALTH QUESTIONAIRE: ONE DAY

[If the answer to CV-3 is No, ask if respondent would be willing to pay half the calculated bid for cv-3. Proceed by halving until a Yes answer is obtained. Then add half the difference between the first Yes amount and the last No amount. Continue increasing or decreasing by half the difference until a final bid is obtained.]

[Record Final bid at bottom at tally sheet.]

I have here a tally sheet for you to keep track of your answers. [Interviewer hand respondent Tally Sheet]

Here is a pencil. [Interviewer hand respondent pencil]
The first column of the Tally Sheet is called "Symptom Day Ranked from Least to Most Bothersome". In this column, I have written the symptoms in the correct order from the dock of cards you have arranged.

The second column of the Tally Sheet is your Bid to avoid additional symptom day. The dollar amounts you have given are for the first and last lines in this column.

At this point, think about how much you would be willing to pay to avoid one additional day of the other five symptoms that you placed between the least and most bothersome.

Take as much time as you need to decide on the amounts you would be willing to pay to avoid each symptom day. As you decide on the amounts, record them.

People often find that they want to change the bid originally given for the least and most bothersome days. They often take several tries at each entry in the column.

Feel free to change any of the amounts as much as you want. In this part, people find themselves using the eraser a lot.

7-SYMP TOM HEALTH QUESTIONAIRE: ONE DAY

Tally Sheet

RANKING OF SYMPTOMS
FROM LEAST TO MOST
BOTHERSOME

BID FOR ONE DAY OF
RELIEF IN THE NEXT
12 MONTHS

1) -----

\$----- per year

2) -----

\$-----per, year

3) -----

\$-----per year

4) -----

\$-----per year

5) -----

\$-----per year

6) -----

\$-----per year

7) -----

\$-----per year

Table 4

Willingness to Pay and Private Cost
of Illness Comparisons of Means

Symptom	Sample size (a)	Mean Daily Willingness to pay (b)	Mean Daily Private Costs of Illness (c)	t-valued (d)
Coughing Spells	27	\$105.34	\$11.29	2.12*
Stuff Up Sinuses	43	30.84	6.79	2.22*
Throat Congestion	24	43.93	14.27	1.59*
Itching Eyes	16	172.23	14.56	1.24
Heavy Drowsiness	6	173.89	3.33	2.07*
Nausea	18	91.24	2.36	20.3*

a

Only those experiencing the symptom are included

b

Willingness to pay to avoid one extra day of the symptom.

c

Calculated as expenditures on doctor visits and medicine net of insurance reimbursements plus lost earnings, expressed on a daily basis.

d

Test of the null hypothesis that willingness to pay is less than or equal to private costs of illness. *Indicates hypothesis rejected at 0.05 level of significance in a one-tailed test.

VALUE OF LIFE FIND HEALTH OVER THE LIFE CYCLE

- Components of morbidity value include
 - medical outlays
 - foregone earnings
 - loss of non-work activity
 - physical suffering
 - mental suffering

- Willingness to pay (WTP) is less, the longer the latency period (Rosen model)

- Value of an extra year of life increases with age (Rosen model)

- One period elasticity of satisfaction with respect to consumption is a key determinant of the value of health and life (Rosen model)

MODELLING OF CHOICES WITH UNCERTAIN PREFERENCES

- Premise: People are not irrational (as in Tversky, Kahneman et. al.) but rather try to make choices when information is costly and imperfect.
- Preference reversals and intransitivities reflect high costs of information, not irrationality (Kahn model).
- Imperfect information increases variance of value estimation but does not cause bias (Kahn model).
- Example of theorem: More effort is given to answering WTP questions if they are realistically related to people's prior beliefs about values (Kahn model).
- Hypothesis: In regressions, variance of behavioral response will be predictably related to uncertainty of outcome and cost of information.
- Hypothesis: Environmental information acquisition is done collectively. Knowledge about dangers or side effects of new compounds accumulates more slowly than knowledge about benefits from their use. As a result, individual responses on average may be biased, that is, people take less than optimum defensive measures, affecting bias of benefit estimates.

CV. CONTINGENT VALUATION--ANGINA

In this next set of questions, I'm going to ask you how much it would be worth to you to reduce or avoid angina pectoris--a painful condition that can occur with different frequencies and different levels of severity. The description I will read to you almost certainly won't describe your own circumstances. I would like you to put yourself in the position of having these symptoms, however, and tell me what it would be worth to you to remove them.

Angina is a painful condition of the chest that afflicts about 500,000 people in the United States. It can occur in people of any age, although most sufferers are 50 years of age or older. Symptoms can be of varying degrees of severity. Even the severest instances however, hardly ever result in death.

Mild Angina:One Day

First let's consider mild angina. Here is a card describing it. [Hand respondent card on Mild Angina.]

An attack lasts anywhere from 10 minutes to 3 hours. You experience stiffness in the shoulders, backache and numbness in the hands and feet. Often, these symptoms are accompanied by difficulty breathing with any exertion and dull persistent chest pain like a band is tightening around your chest.

Suppose that in an average month, you can expect 1 of these symptom days.

CV-1 Would it be worth \$53 a month to completely avoid the day of symptoms?

Yes _____

No _____

[If Yes, ask \$100, \$200, etc. until Reject. Then work back to highest previous Accept (but no further).

If No, ask \$20, \$10, etc. until Accept. Then work back if necessary. Record final answer on Tally Sheet, Value 1.1

Mild Angina:10 days

Next suppose you have the angina condition 10 days a month on the average. Would it be worth [Double Value 1] per month to completely avoid one of those days each month?

Yes _____ No _____

[Iterate as in Value 1 instructions. Record on Tally Sheet, Value 2.1

Again let's suppose you have the angina condition 10 days a month, just as described on the card you have. This time I'd like you to tell me how much you'd be willing to pay to completely eliminate all ten symptom days each month.

[Record on Tally Sheet, Value 3.1

Suppose you had the opportunity to eliminate half of these 10 symptom days. How much would it be worth to you to be free of the five symptom days each month?

[Record on Tally Sheet, Value 4.1

Severe Angina:One Day

Now let's look at a more severe angina problem. Here is a card about it. [Hand respondent card on Severe Angina.] Severe angina has all the symptoms we have just discussed, but some of them are considerably worse. There is a feeling of suffocation. Chest pain is now almost unbearable. The experience can be terrifying because one feels as though one were dying. After having some experience with these attacks, however, and with assurances from the doctor, one learns that they do not pose a risk of death. The symptoms last 10 minutes to 3 hours and occur one day a month.

Suppose you had the severe angina condition one day a month, would it be worth [Double Value 14] a month to completely avoid the day of symptoms?

Yes _____ No _____

[Iterate as in Value 1 instructions. Record on Tally Sheet, Value 5.1]

Next suppose you have the severe angina condition 10 days a month. Would it be worth [Double Value 5] a month to completely avoid one of those days each month?

Yes _____ No _____

[Iterate as in Value 1 instructions. Record on Tally Sheet, Value 6.1]

Again let's suppose you have the severe angina condition 10 days a month, as described on the card. This time, tell me how much it would be worth to you to completely eliminate all ten days of severe angina each month.

[Record on Tally Sheet, Value 7.]

One last question. Once again you experience the severe angina symptoms ten days a month. Suppose you could eliminate half the symptom days each month. How much would you be willing to pay to be free of 5 of the 10 symptom days each month?

[Record on Tally Sheet, Value 8.]

Now I'd like to show you a summary of your answers. [Hand Tally Sheet to respondent.]

[If any of the Severe Angina values are smaller than the corresponding Mild Angina values, point it out on the Tally Sheet and say]

Value for Severe Angina is smaller than Value _____ for Mild Angina, even though the situations are the same in other respects. Would you like to make a change that takes this into account?

[If there are no inconsistencies, say]

Tell me if they look o.k. to you, or if any answers need to be changed.

[Record any changes. Take back Tally Sheet and Symptom cards.1]

Angina Tally Sheet

Frequency

Value

MILD ANGINA:

You have one day of mild anguina each month

Value of eliminating one day a month 1. \$ _____/month

You have 10 days of mild anguina each month

Value of eliminating one day a month 2. \$ _____/month

Value of eliminating 10 days a month 3. \$ _____/month

Value of eliminating 5 days a month 4. \$ _____/month

SEVERE ANGINA:

You have one day of severe anguina each month

Value of eliminating one day a month 5. \$ _____/month

You have 10 days of severe anguina each month

Value of eliminating one day a month 6. \$ _____/month

Value of eliminating 10 days a month 7. \$ _____/month

Value of eliminating 5 days a month 8. \$ _____/month

LIFE HEALTH SCENARIOS

Age	Cancer	Emphysema
50	Good Health	Good health
55		Symptoms (which probably began earlier) become apparent: Loss of energy (e.g., {climbing stairs tires you out; shortness of breath, difficulty in breathing. Breathing difficulties result in increasing work absences.
60	Relative good health but noticeably reduced from that at 50.	Symptoms become increasingly severe. Health deteriorates to the extent that early retirement is necessary.
65	Health reductions continue both with no serious illnesses. You continue able to do a full day's work, but you retire at age 65.	Lung deterioration reaches point where you intermittently must use a portable bottled oxygen supply to reduce breathing difficulties while walking.
70	Cancer symptoms become apparent, and chemotherapy is initiated. Side effects include nausea. You feel the need to vomit several days each week. There are periods of improved well being, but on other occasions you feel rotten for days at a time.	You become bedridden and require continuous bottled oxygen to reduce breathing difficulties.
74	Chemotherapy and side effects continue, but otherwise you lead a normal life.	Death due to heart failure.
76	Cancer spreads throughout your body and death occurs.	
78		

LIFE HEALTH SCENARIOS (Continued)

Age	Cancer
50	Good health
55	
60	Relative good health but noticeably reduced from that at age 50.
65	Health reductions continue but with no serious illnesses. You continue able to do a full day's work, but retire at age 65.
70	Still no serious illnesses
74	
76	
78	Sudden and painless death occurs due to heart failure.

Table 5

Estimates of Marginal Price of Air Pollution
(Suspended Part iculates)

St ud y	Location	Year	Estimated Marginal (1980 Dollars/mm3)
Diamond (1980)	Chicago	1969-71	\$422
Li and Brown 1980	Boston	1971	1-8 ^a
Smith (1978)	Chicago	1971	91-108
Smith and	Houston	1970	4-21
Clhsfeldt (1979)	Houston	1970	14-68
Wieand (1973)	Census	1960	6-9 ^a

^a Not statistically different from zero.

Table 6

Estimates of Elasticities of Demand for Clean Air

Study	Location	Date Year	price Elasticity	Income Elasticity
Bender, et al. (1980)	Chicago	1972	- .516	.609
Harrison and Rubinfeld (1978)	Boston	1970	- .850	.957
Nelson (1970)	D.C.	1970	-1.250	1.000
Ohsfeldt (1983)	Houston	74-79	-1.111	.081
	Chicago	74-79	- .113	.139
	Philadelphia	74-79	- .382	.123

Table 7

Marginal Value of Safety

(Source: Gegax, et. al. 1984)

Technique	Mean Value
Wage Hedonic	82.148 mill. (normal distribution)
Contingent Valuation	\$2.136 mill. (distribution skewed right)

Table a

Framework for health Values

healthn Effects Valued

Value reflects

Acute or Short-term Morbidity

--light symptoms

--physical and mental discomfort

--marginal change in time spent ill

--work time lost

--&her time lost

--medical expenditures

--costs of averting behavior or preventive measures

Aggravation of Previously Existing Chronic Morbidity

--chronic lung conditions

--a larger degree of all of the above

--chronic heart conditions

--individuals' health

status is already low

--marginal and non-marginal changes in time spent ill

Increased Incidence of Non-fatal Chronic Morbidity

--chronic lung conditions

--all of the above

--chronic heart conditions

--lifestyle and work

changes due to the existence of chronic illness

--cancer

Mortality

--unforeseen instant death

--mortality risks

--chronic lung conditions

--morbidity preceding

mortality valued as above

--chronic heart conditions

--cancer

--psychic costs of imminent death

Table 9

Values of Acute Morbidity

approach, study, and health effect	Value (\$/day)	Value dis- comfort	Component work lost	time lost	Included medi- cal	preven- tion
Cost of Illness						
Hodson & Kupstein (1984), Paringer & Berk (1377)			x		x	
--respiratory illness	35					
<u>Contingent Valuation</u>						
Tolley, et al(1985)						
--cough	44	x	x	x	x	
--sinus	51	x	x	x	x	
--throat	36	x	x	x	x	
--eyes	100	x	x	x	x	
--drowsiness	36	x	x	x	x	
--headaches	112	x	x	x	x	
--nausea	78	x	x	x	x	
--cough, throat and sinus	113	x	x	x	x	
--drowsiness, headaches and nausea	202	x	x	x	x	
Loehman, et al (1979)						
--shortness of breath/ chest pains:						
mi ld	8		x	x	x	
severe	18		x	x	x	

Table 9

Values of Acute Morbidity (continued)

Approach study, and health effect	Value (\$/day)	Value dis- comfort	Component work lost	Component time lost	Included med i- cal	preven- tion
--coughing/sneezing:						
mild	4	X	X	X-	X	
severe	11	X	X	X	X	
--head congestion, eye, ear, throat irritation:						
mild	6	X	X	X	X	
severe	13	X	X	X	X	
Health Product Inc						
Cropper (1381)						
--acute illness	176		X			X
Gerking, et al (1984)						
--acute illness	40	X	X	X	X	X

Table 10

Values of Chronic Morbidity

Approach, study, and health effect	Value (\$/day)	Value dis- comfort	Component work lost	time lost	Included medi- cal preven- tion
<u>CHRONIC LUNG CONDITIONS</u>					
Cost of Illness					
Freeman, et al (1976)					
--average case of: emphysema	3194		X		X
Scitovsky & McCall(1976)					
--average case of pneumonia (non-hospital care)	253				X
<u>Contingent Valuation</u>					
Tolley, et al (1985)					
predicted value of 1 day of relief for person usually sick. (experienced 36 days of symptom) for :					
--cough	107	X	X	X	X
--sinus	82	X	X	X	X
--throat	163	X	X	X	X
--eyes	334	X	X	X	X
--cough, throat and sinus	297	X	X	X	X
30 days of: (given normal health)					
--cough	462	X	X	X	X
--sinus	643	X	X	X	X
--throat	463	X	X	X	X

Table 10

Values of Chronic Morbidity (continued)

Approach, study, and health effect	Value (\$/day)	Value dis- comfort	work lost	time lost	Included med i - cal - w -	preven- tion ---w---
--eyes	se3	X	X	X	X	
--cough, throat and sinus	829	X	X	X	X	
Rowe and Chestnut (1984)						
--average of 36 bad asthma days	401	X	X	X	X	
Loehman, et al (1979)						
one week of:						
--shortness of breath/ chest pains:						
mi ld	22	X	X	X	X	
severe	57	X	X	X	X	
--cough ing/sneez inq :						
mi ld	13	X	X	X	X	
severe	32	X	X	X	X	
--head congest ion, eye, ear, t hroat irritation:						
mi ld	15	X	X	X	X	
severe	33	X	X	X	X	
90 days of:						
--shortness-of breath/ chest pains:						
mi ld	56	X	X	X	X	
severe	156	X	X	X	X	

Table 10

Values of Chronic Morbidity (continued)

approach, study, and health effect	Value (s/day)	Value dis- comfort	work lost	time lost	Included medi- cal	preven- tion
--coughing/sneezing:						
mi ld	37	X	X	X	X	
severe	81	X	X	X	X	
--head congest ion, eye, ear, throat irritation:						
mi ld	40	X	X	X	X	
severe	99	X	X	X	X	

CHRONIC HEART -CONDITIONS

Cost of Illness

Acton(1975)

--average case of
coronary heart
disease

2703

X

Hartunian, et al (19??)

--average case of
angina

604

X

X

Sctivosky & McCall(1976)

--myocardial
infarct ion

11,254

X

X

Contingent Valuation

Tolley, et al (1985)

angina, various
endowments :

--1 mild day

86-146

X

X

X

--1 severe day

160-650

X

X

X

Table 10

Values of Chronic Morbidity (continued)

Approach, study, and health effect	Value (\$/day)	Value dis- comf art	work lost	Components time lost	Included medi- cal	preven- tion
--5 mild days	151	X	X	X	X	
--5 severe days	242	X	X	X	X	
--10 mild days	252-756	X	X	X	X	
--10 severe days	330-1210	X	X	X	X	
--20 mild days	1090	X	X	X	X	
--20 severe days	1327	X	X	X	X	

CANCER

Cost of Illness

Hodson & Kopstein
(1984), Paringer
& Park (1977)

--average case of
cancer

9742

X

X

Hartunian, et al (19??)

--average first year
of lung cancer

29,924

X

X

Table 11
 Values of Different Kinds of Mortality
 Comparing Causes of Mortality
 (Source: Jones-Lee (1985))

Cause of Death	Prefer to have Reduced (%)	Mean WTP For reduction in (British pounds)*
-----	-----	-----
Motor Accidents	11	7.35 million
Heart Disease	13	13.23 million
Cancer	76	23.12 million

*Value is a single payment to reduce the number of deaths from these causes by 100 next year. Value is not a value of statistical life.

Table 11
(Continued)

Seriousness of Different Types of Injury

(source: Jones-Lee (1985))

Type	Not as bad as death (%)	As bad as death'	Worse than death
Lose an eye	92.1	5.0	2.8
Badly scarred for life, and in a hospital for a year	87.5	7.7	4.7
Confined to a wheelchair for the rest of your life	48.6	27.7	23.8
Permanently bedridden	36.7	33.4	30.0

Table 12

Interim Values for Morbidity and Mortality Effects of Air Pollution

Category	Value Estimate		
	Low	Medium	High
Acute or short-term morbidity			
average day (restricted activity day) :			
--sinus	\$20	\$35	\$60
--throat	10	25	40
--respiratory symptoms	15	30	50
--eye irritation	20	40	100
--headache	30	50	110
--1 ikely combination	35	60	100
severe day (work loss day) :			
--likely combination	80	125	175
mild day (discomfort):			
--likely combination	10	2s	50
Aggravation of previously existing chronic morbidity (per day)			
lung conditions:			
--emphysema	50	100	300
--asthma/bronchitis	35	60	100
heart conditions:			
--angina, possibly with other heart disease	75	150	400
--likely combination of lung and heart	45	80	190

Interim Values for Morbidity and Mortality Effects of Air Pollution

Table 12

Category	Value Estimate		
	Low	Medium	High
Increased Incidence of Non-fatal Chronic Morbidity (per case per year)			
lung conditions:			
--emphysema	\$3,200	\$7,000	\$10,000
--asthma/bronchitis	200	900	1,200
--lung cancer	30,000	60,000	100,000
heart conditions:			
--angina uncomplicated	500	800	2,000
--other heart disease	2,500	4,000	10,000
--likely combination of lung and heart	1,700	3,800	5,900
Mortality (per statistical <u>life</u>)			
--unforseen instant death	.5 mill.	2 mill.	5 mill.
--emphysema	.64 m	3.5 m	9 m
--asthma/ broch it is	.53 m	2.5 m	5.5 m
--lung cancer	.58 m	4 m	10 m
--heart d i sease	.54 m	3 m	7 m
--weighted average of al 1 causes	.58 m	3.8 m	9.4 m