Willingness to Pay for Small Reductions in Morbidity and Mortality Risks: Canada and the United States

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ENVIRONMENTAL AND RESOURCE ECONOMICS

Additional Information

Other papers: Cameron/DeShazo, other coauthors as noted:

A Generalized Empirical Model of Demand for Health Risk Reductions

Two Types of Age Effects in the Demand for Reductions in Mortality Risks with Differing Latencies

The Effect of Health Status on Willingness to Pay for Morbidity and Mortality Risk Reductions

The Effect of Children on Adult Demands for Health-Risk Reductions (E. Johnson)

Willingness to Pay for Health Risk Reductions: Differences by Type of Illness (E. Johnson)

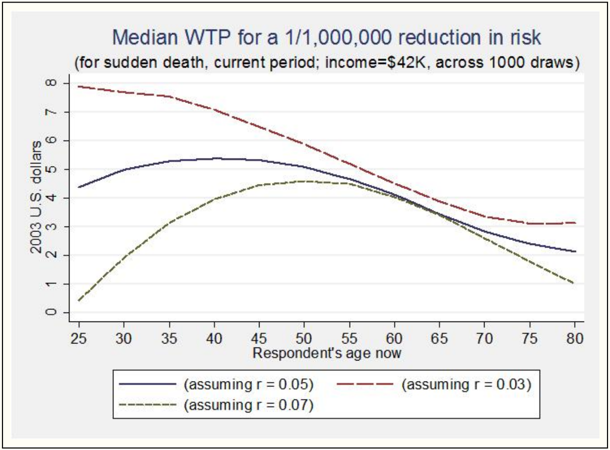
Scenario Adjustment in Stated Preference Research (E. Johnson)

Subjective Choice Difficulty in Stated Preference Surveys (E. Duquette)

Differential Attention to Attributes in Utility-theoretic Choice Models

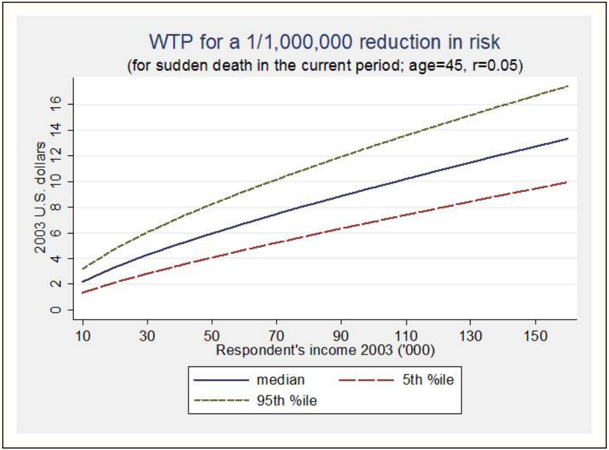
Discount Rate Sensitivity

US sample only: WTP for 1/1,000,000 reduction in risk of sudden death now, as a function of respondent age now, for three different discount rate assumptions



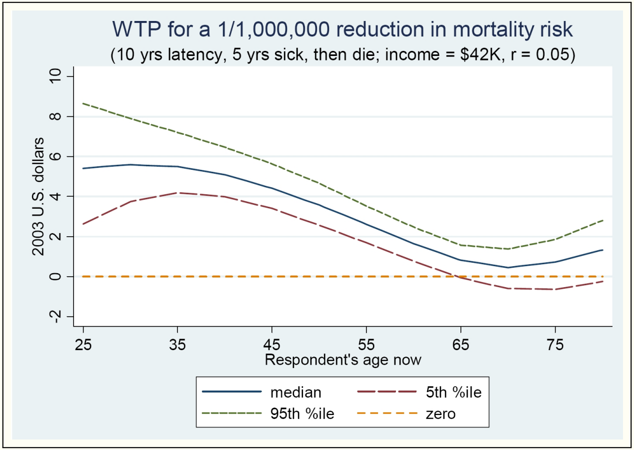
Income Sensitivity

US sample only: WTP for 1/1,000,000 reduction in risk of sudden death now, as a function of respondent income in $'000, for a 45-year-old



Income Sensitivity

Illness profile with latency and morbidity (US sample only)



Estimated Model

NOTE: All parameters are from ONE model

discounted expected utility difference=

$$\beta \times \text{(square root term in net income)}$$
$$+\alpha_1 \log\left(pdvi_i^A+1\right)+\alpha_2 \log\left(pdvr_i^A+1\right)+\alpha_3 \log\left(pdvl_i^A+1\right)$$
$$+\alpha_4 \log\left(pdvl_i^A+1\right)^2+\alpha_5 \log\left(pdvi_i^A+1\right)\times\log\left(pdvl_i^A+1\right)$$

Baselines and Interactions	US(base)	× 1(Canada)
$\beta \times$(square root term in net income)	.01422 (6.15)***	-
… × 1(female)	.01069 (4.33)***	-
… × 1(very low risk of this illness)	-	.01462 (2.11)**
… × 1(very high risk of this illness)	-.008117 (2.75)***	-
… × 1(not confident in health care) m1	-	.01824 (2.57)**
… × 1(highly confident in health care) p1	.004504 (1.86)*	-

continued…

Estimated Model

Discounted sick-years:

Baselines and Interactions	US(base)	× 1(Canada)
$\alpha_1 \times \log(pdvi_i^A + 1)$ (sick-years)	-56.8 (3.78)***	-57.47 (2.89)***
…× 1(female)	32.77 (3.11)***	-
…×1(low risk of this illness)	37.48 (2.61)***	-
…×1(mod. Low risk of this illness)	24.66 (1.85)*	-
…×1(mod. High risk of this illness)	-14.48 (1.12)	-
…×1(high risk of this illness)	-32.62 (2.02)**	-
…×1(mod. high opp. Impr exercise)	-33.02 (3.08)***	-
…×1(very. high opp. Impr exercise)	-42.04 (3.93)***	-
…×1(very low opp. Impr smoking)	-	44.21 (2.72)***
…×1(mod. low opp. Impr smoking)	-	191.6 (2.50)**

continued…

Estimated Model

Discounted post-illness recovered/remission years:

Baselines and Interactions		US(base)	× 1(Canada)
$\alpha_2 \times \log(pdvr_i^A + 1)$	(recovered/remission years)	-	-
… × 1(female)		-67.88 (4.82)***	40.74 (1.71)*

continued…

Estimated Model

Discounted lost life-years:

Baselines and Interactions	US(base)	× 1(Canada)
$\alpha_3 \times \log(pdvl_i^A + 1)$ (lost life-years)	-436.3 (2.83)***	-
…×age	27.2 (4.42)***	-24.88 (9.21)***
…× age-squared	-.2743 (4.68)***	.3671 (8.17)***
…× 1(female)	22.66 (2.05)**	38.04 (2.00)**
…× 1(college degree or more)	-32.56 (2.94)***	39.28 (2.15)**
…× 1(non-married)	35.97 (3.25)***	-34.06 (1.79)*
…× 1(have gone outside Cdn health plan for services)	-	-33.61 (1.73)*
…× 1(low risk of this illness)	66.32 (4.95)***	-
…×1(mod. Low risk of this illness)	32.44 (2.69)***	-
…×1(mod. High risk of this illness)	-43.73 (3.63)***	-
…×1(high risk of this illness)	-69.12 (4.73)***	-
…× 1(not confident in health care) m1	25.24 (2.13)**	-
…× 1(highly confident in health care) p1	-17.34 (1.46)	46.91 (2.24)**
…×1(very low opp. Impr. Doctor visits)	-17.27 (1.83)*	-

Estimated Model

Higher-order terms in discounted lost life-years:

Baselines and Interactions		US(base)	× 1(Canada)
$\alpha_4 \times \left[\log(pdvl_i^A + 1)\right]^2$	(lost life-years)^2	145.7 (1.89)*	-
...×age		-10.75 (3.46)***	9.353 (7.52)***
...×age-squared		.1111 (3.70)***	-.1412 (6.46)***
$\alpha_5 \times \log(pdvi_i^A + 1) \times \log(pdvl_i^A + 1)$	(sick-years) x (lost life-years)	-30.41 (2.97)***	93.73 (5.80)***
Observations		32079	
Log L		-15756.297	

NOTE: model also includes controls for two kinds of scenario adjustment by respondents, as well as a response bias correction

Estimated Model

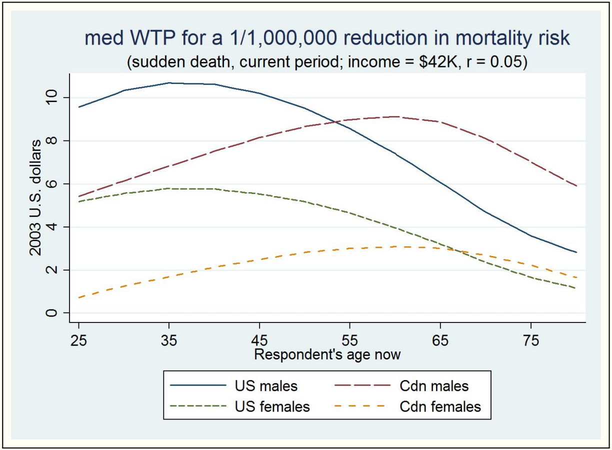
Additional nuisance parameters in same model: "valid" value for each variable is zero, if respondent

- did NOT say they would never benefit from the program in question
- expected to begin to benefit around the time the survey said they would
- stated a subjective life expectance that matches the one given in each scenario
- had a fitted survey response propensity equal to the population average (525,000 initial panel contacts)

…continued	***1(benefits never)**	**overest. latency**	**overest. lifespan**	**Excess. resp propensity**
$\beta \times$ (square root term in net income)	-	.0007978 (6.50)***	-	-
$\alpha_1 \times \log(pdvi_i^A + 1)$ (sick-years)	206.8 (4.66)***	8.417 (8.97)***	-1.926 (3.77)***	3.942 (2.43)**
$\alpha_3 \times \log(pdvl_i^A + 1)$ (lost life-years)	639.1 (4.16)***	11.87 (14.33)***	-.741 (1.58)	-
$\ldots \times$ age	-7.028 (2.76)***	-	-	-
$\alpha_5 \times \log(pdvi_i^A + 1) \times \log(pdvl_i^A + 1)$ (interaction)	-	-4.945 (4.44)***	-	-
$\ldots \times$ age	-14.72 (4.18)***	-	-	-
$\ldots \times$ age-squared	.2216 (3.97)***	-	-	-

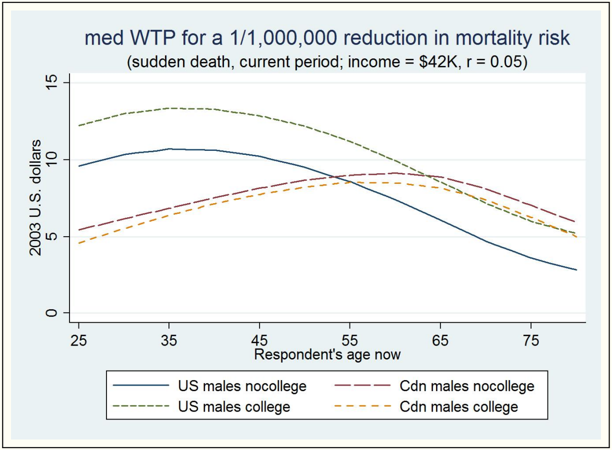
Results:

Medians in one figure: by gender and by country



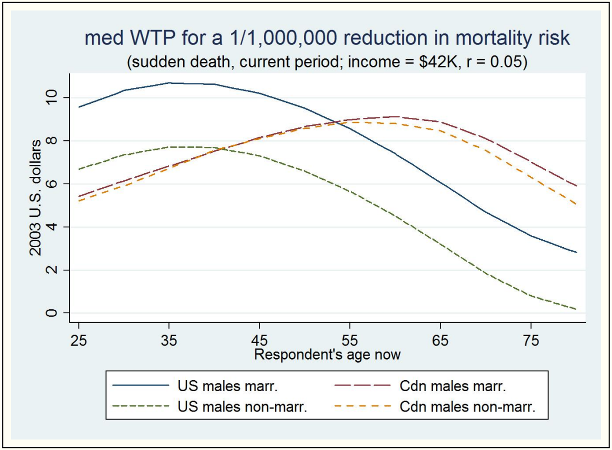
Results:

Medians in one figure: by college/no-college and by country



Results:

Medians in one figure: by married/nonmarried; country



General Take-Away Points

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- No other models for valuing health risk reductions seamlessly integrate morbidity and post-illness recovered/remission states as well as lost life-years
- We have focused our comparisons on the special case of "sudden death in current period" (like VSLs), but WTP for any arbitrary illness profile can be simulated
- We control for a wide variety of within- and across-country factors that account for systematic differences in WTP, but there remain significant residual differences in WTP by age and jurisdiction

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- Raymond F. Mikesell Foundation (University of Oregon)

This paper has not yet been reviewed by any of these agencies.

Roadmap

Examine heterogeneity in Willingness to Pay to avoid adverse health states:

- Explain WTP differences between people from Canada and U.S.
- Examine heterogeneity in WTP (benefits transfers, public perception, normative considerations)
- Motivation and Methodology, Survey Design (valuing an "illness profile" instead of just "sudden death now"), Individual Heterogeneity by Age, Results and Comparison to Existing Literature, Summary and Conclusions

Introduction

Environmental policies can affect human health, e.g.:

Clean Air regulations

- Reductions in air pollution can reduce the risk of respiratory diseases, heart disease, and cancers

Clean Water regulations

- Reductions in water pollution can reduce pathogen-induced gastro-intestinal diseases, colon and bladder cancer

Measuring WTP

Conventional measure: Value of a Statistical Life (VSL)
– MRS between mortality risk and money

Methods for measuring VSL:

- Revealed preference methods
- Stated preference methods

VSL for policy is typically a one-size-fits-all measure, but

- Environmental policies are not one-size-fits-all
  - Affect different types of risks (latency vs. sudden death)
  - Affect different populations (children, elderly vs. working age)

Motivating Questions

- To monetize environmental health benefits for policy or regulatory analyses in Canada, is it safe just to do a "benefits transfer" using estimates for the U.S. or other jurisdictions?

  Or, are demands for health risk reductions different in Canada?

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- Is it sufficient to have a single one-size-fits-all VSL? Can we transfer this point estimate of average willingness to pay from the U.S. to Canada? Or, should we transfer a function that gives the VSL for different kinds of risks when they affect different kinds of people?

  Or, are even the functions different?

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- What about health effects *other than* premature mortality (death)? What about morbidity (sick-time)?

The Survey Data

United States Sample:

US survey (alone) has been analyzed previously in Cameron and DeShazo (2006)

- Fielded using the standing consumer panel maintained by Knowledge Networks, Inc.
- Random-digit-dialed panel recruitment, internet and WebTV delivery
- About 1800 subjects, 79% response rate to invitations
- Sample selection corrections available and employed (versus 525,000 recruitment attempts)

The Survey Data

Canada Sample:

Canadian survey has not been systematically analyzed until this paper

- Fielded using Ipsos Reid internet consumer panel
- About 1100 subjects; unfortunately English-speaking only (budget too small for two languages)
- Various recruitment methods, not necessarily random, but invitees selected to match relevant population distribution on several important observables
- No sample selection corrections available

The Survey - five parts

1. Perceptions and health habits
    - Subjective health risks
    - Room to improve habits?

Subjective health risks

Think about your health, your family history, and hazards to which you are exposed. Which illnesses or injuries do you feel most <u>at risk</u> of experiencing over your lifetime?

Select one answer from each row in the grid

	Low risk 1	2	3	4	High risk 5
Respiratory disease - (asthma, emphysema, bronchitis)	●	●	●	●	●
Diabetes	●	●	●	●	●
Alzheimer's disease	●	●	●	●	●
Heart Disease -(heart attack, angina)	●	●	●	●	●
Cancer - (colon, breast, prostate, etc.)	●	●	●	●	●
Stroke - (stroke, blood clot, aneurysm)	●	●	●	●	●
Major car accident	●	●	●	●	●

Room to improve health habits

Is there room for <u>you</u> to reduce your health risks by improving your lifestyle or habits in these ways?

Select one answer from each row in the grid

	No room to improve 1	2	3	4	Much room to improve 5
drink less alcohol	●	●	●	●	●
quit smoking	●	●	●	●	●
eat a healthier diet	●	●	●	●	●
see a doctor more regularly	●	●	●	●	●
exercise more	●	●	●	●	●
lose weight	●	●	●	●	●
use a seat belt more	●	●	●	●	●

The Survey

2. Illness profile tutorial
    - An illness profile is a sequence of future health states (latency, sick-years, post-illness years and lost life-years)

Idea of an Illness Profile - examples

Conventional VSL profile:

sudden death now

Time: Now: Death t_D Nominal Life Expectancy t_E

Illness Profile	Lost Life Years
Health Status	

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Illness Profile	Lost Life Years	
Health Status		

+ latency, morbidity

Time:	Now	Disease Onset t_0	Death t_D	Nominal Life Expectancy t_E
Illness Profile	Latency Period	Sick Years	Lost Life Years	
Health Status	healthy	sick		

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Conventional VSL profile:

sudden death now

Time:	Death t_D Now:	Nominal Life Expectancy t_E
Illness Profile	Lost Life Years	
Health Status		

+ latency, morbidity

Time:	Now	Disease Onset t_0	Death t_D	Nominal Life Expectancy t_E
Illness Profile	Latency Period	Sick Years	Lost Life Years	
Health Status	healthy	sick		

+ recovery/ remission

Time:	Now	Disease Onset t_0	Recovery t_R	Death t_D	Nominal Life Expectancy t_E
Illness Profile	Latency Period	Sick Years	Recovered Years	Lost Life Years	
Health Status	healthy	sick	recovered		

The Survey

3. Risk tutorial
    - Display risk in a 25x40 grid format
    - Risk comprehension question

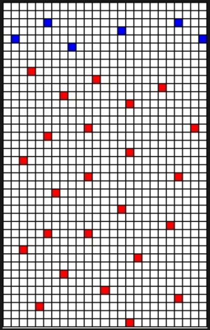
Risk Grid Example

Programs may be very effective at reducing your risk, but you should remember that your risks of dying may be very small.

For example, consider a new program that reduces your risk of dying by 20% - from 30 in 1,000 to 24 in 1,000 - over 34 years. This may sound like a large percentage reduction, but your initial chance of dying was only 30 in 1,000 over the next 34 years. To illustrate this below, the blue squares (■) represent the size of this risk reduction. The red squares (■) represent your remaining chance of dying even with the new program.

20% percent reduction

from 30 in 1,000 to 24 in 1,000



The Survey

4. Conjoint choice sets
   - 3 alternatives per choice set
     (Program A, Program B, Neither Program)
     - Each program consists of an annual non-invasive test that will reduce probability of illness profile (characterized by illness label, onset, duration, symptoms, treatment, outcome)
   - 5 independent choice sets per respondent
   - Extensive randomized design

One Randomized Choice Set

Choose the program that reduces the illness that you most want to avoid. But think carefully about whether the costs are too high for you. If both programs are too expensive, then choose Neither Program.

If you choose "neither program", remember that you could die early from a number of causes, including the ones described below.

	Program A for Heart Disease	**Program B for Colon Cancer**
Symptoms / Treatment	Get sick when 71 years old 2 weeks of hospitalization No surgery Moderate pain for remaining life	Get sick when 68 years old 1 month of hospitalization Major surgery Severe pain for 18 months Moderate pain for 2 years
Recovery / Life expectancy	Chronic condition Die at 79 instead of 88	Recover at 71 Die of something else at 73 instead of 88
Risk Reduction	5% From 40 in 1,000 to 38 in 1,000	50% From 4 in 1,000 to 2 in 1,000
Costs to you	$15 per month [= $180 per year]	$4 per month [= $48 per year]
Your choice	○ **Reduce my chance of heart disease**	○ **Reduce my chance of colon cancer**
	○ **Neither Program**	

The Survey

5. Debriefing questions
    - Questions about each choice (Never benefit from a program? Subjective latency? Reasons for choosing neither program, etc.)
    - Questions about choice exercises overall; Confidence in health care; Subjective life expectancy, etc.

VSLs and Age

Concerns about age effects

Many researchers have explored the relationship between respondent's age and willingness to pay to reduce health risks.

Policy minefield: "senior death discount" fiasco at U.S. EPA

- Accumulating *positive* evidence that VSL differs by age.
- Controversy stems from the *normative* question of whether public expenditures or the stringency of regulation should be age-blind.

VSLs and Age

Role of Age?

Age may serve as a crude proxy for many other factors that contribute to differences in WTP for health-risk reductions.
As people age, they may experience changes in:

- Their subjective risks of different illnesses
- Their health-related behaviours
- Their concerns about the availability and quality of health care

We will control for some of these differing perceptions and health experiences, in addition to age

Subjective Health Risks, Health Habits, Confidence by Age

Selected age patterns in the raw data

Separately for each age (25 to 80), we calculate:

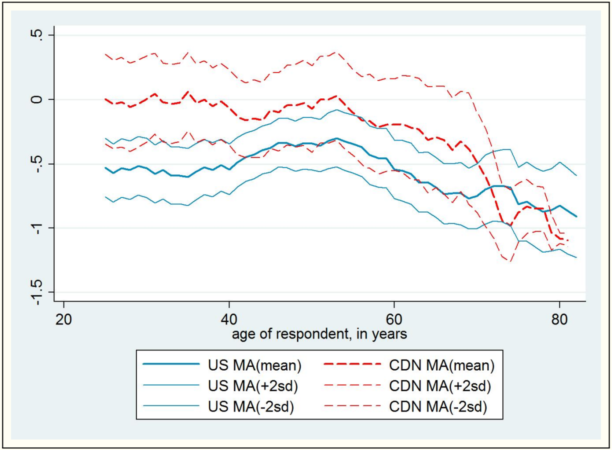
- the mean subjective risk rating (ranging from -2 to +2), and
- the standard deviations of these means

Plots to follow show:

- MA(mean) = moving average of mean subjective risk rating
- MA(+2sd) = moving average of mean plus two stdev
- MA(-2sd) = moving average of mean minus two stdev

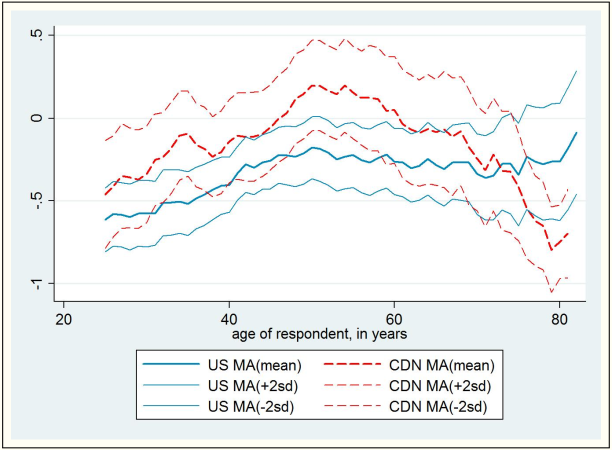
Subjective Health Risks, by Age

Respiratory disease



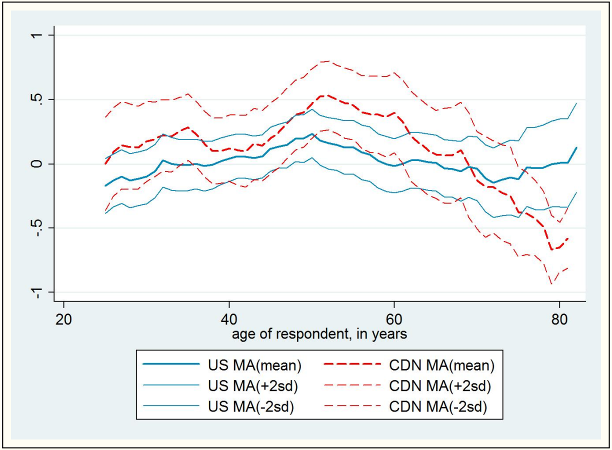
Subjective Health Risks, by Age

Stroke



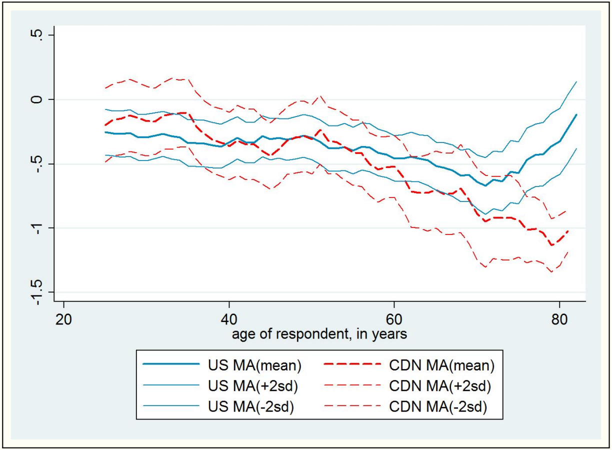
Subjective Health Risks, by Age

Heart attack or heart disease



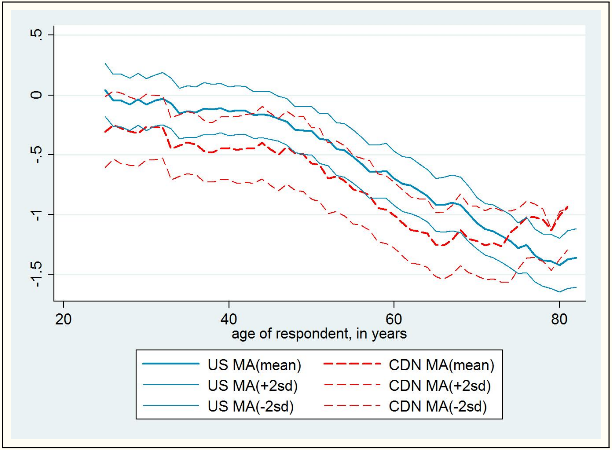
Subjective Health Risks, by Age

Serious traffic accidents



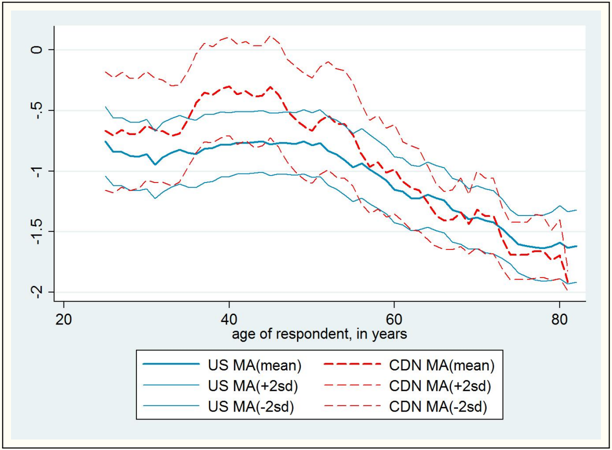
Room to Improve Health Habits, by Age

See a doctor more regularly



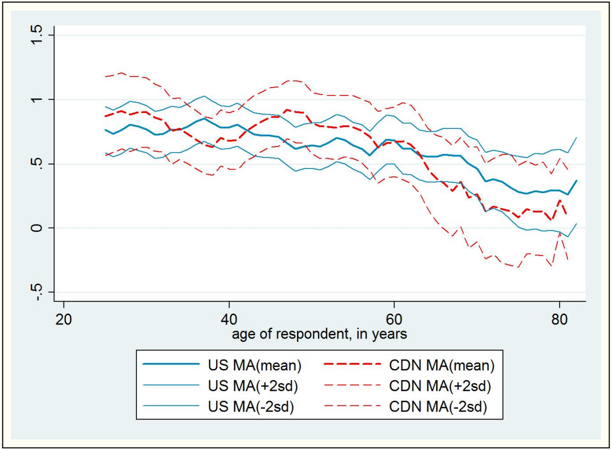
Room to Improve Health Habits, by Age

Cut back on smoking



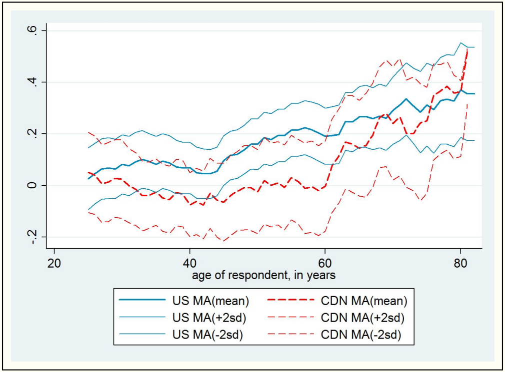
Room to Improve Health Habits, by Age

Exercise more



Confidence in Health Care, by Age

"Imagine you experience one of the major illnesses described in this survey. How confident are you that your diagnosis and treatment by your current health care provider would be both timely and of high quality?"



Sketch of the Econometric Implementation

- Builds on basic model in Cameron and DeShazo (2008)
- Random Utility Model: 3 alternatives (A, B, Neither)
- Assumes choices maximize present discounted expected utility
- Utility defined over
  - net income
  - a complete time profile of avoided adverse health states:
    - sick-years,
    - post-illness (recovered/remission) years,
    - lost life-years.

For each choice set, the respondent is randomly given some baseline risk of a randomized illness profile, and a health risk reduction

Variables to Capture Illness Profile

Figure 1: A nonfatal illness (with recovery) that reduces life expectancy

$\mathbf{1}(pre_{it})$	*Pre-illness_year*$_{it}$	1111111111	00000000000	00000000000000000	0000000
$\mathbf{1}(ill_{it})$	*Illness_year*$_{it}$	0000000000	11111111111	00000000000000000	0000000
$\mathbf{1}(rcv_{it})$	*Recover_year*$_{it}$	0000000000	00000000000	11111111111111111	0000000
$\mathbf{1}(lyl_{it})$	*Life-year_lost*$_{it}$	0000000000	00000000000	00000000000000000	1111111
	Health status →				
	Time from now	0	onset t_0	recovery t_r	death t_d nominal life expectancy, t_e

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$\mathbf{1}(lyl_{it})$	*Life-year_lost$_{it}$*	0000000000	00000000000	00000000000000000	1111111
	Health status →				

Time from now	0	onset t_0	recovery t_r	death t_d	nominal life expectancy, t_e

$\alpha_1 \log\left(pdvi_i^A + 1\right)$ $\quad$ $\alpha_2 \log\left(pdvr_i^A + 1\right)$ $\quad$ $\alpha_3 \log\left(pdvl_i^A + 1\right)$

$$pdvi_i^A = \sum \delta^t 1\left(ill_{it}^A\right)$$

$$pdvr_i^A = \sum \delta^t 1\left(rcv_{it}^A\right)$$

$$pdvl_i^A = \sum \delta^t 1\left(lyl_{it}^A\right)$$

Basic Specification: 6-parameter model

Homogeneous; shifted translog form

$$PDV\left(E\left[\Delta V_i^A\right]\right) = \beta\left[square\ root\ term\ in\ (net\ income)_i^A\right]$$

$$+\alpha_1\left\{\Delta\Pi_i^{AS}\log\left(pdvi_i^A+1\right)\right\}$$ ...sick-years term (base)

$$+\alpha_2\left\{\Delta\Pi_i^{AS}\log\left(pdvr_i^A+1\right)\right\}$$ ...recovered-years term (base)

$$+\alpha_3\left\{\Delta\Pi_i^{AS}\log\left(pdvl_i^A+1\right)\right\}$$ ...lost life-years term (base)

$$+\alpha_4\left\{\Delta\Pi_i^{AS}\left[\log\left(pdvl_i^A+1\right)\right]^2\right\}$$ ...[lost life-years]^2

$$+\alpha_5\left\{\Delta\Pi_i^{AS}\left[\log\left(pdvi_i^A+1\right)\right]\left[\log\left(pdvl_i^A+1\right)\right]\right\}$$ ...[sick-years] · [lost life-years]

$$+\varepsilon_i^A$$

where

$\alpha_3 = \alpha_{30} + \alpha_{31}age_{i0} + \alpha_{32}age_{i0}^2$

$\alpha_4 = \alpha_{40} + \alpha_{41}age_{i0} + \alpha_{42}age_{i0}^2$

pdv = present discounted value of health state years

Generalized Estimating Equation

Introduce more heterogeneity (by US/Canada, male/female, etc.)

$$PDV\left(E\left[\Delta V_i^A\right]\right) = \beta' X_{0i}^A \left[square\ root\ term\ in\ (net\ income)_i^A\right]$$

$$+\left[\alpha_1' X_{1i}^A\right]\left\{\Delta\Pi_i^{AS}\log\left(pdvi_i^A+1\right)\right\}$$ ...sick-years term

$$+\left[\alpha_2' X_{2i}^A\right]\left\{\Delta\Pi_i^{AS}\log\left(pdvr_i^A+1\right)\right\}$$ ...recovered-years term

$$+\left[\alpha_3' X_{3i}^A\right]\left\{\Delta\Pi_i^{AS}\log\left(pdvl_i^A+1\right)\right\}$$ ...lost life-years term

$$+\left[\alpha_4' X_{4i}^A\right]\left\{\Delta\Pi_i^{AS}\left[\log\left(pdvl_i^A+1\right)\right]^2\right\}$$ ...[lost life-years]^2 term

$$+\left[\alpha_5' X_{5i}^A\right]\left\{\Delta\Pi_i^{AS}\left[\log\left(pdvi_i^A+1\right)\right]\left[\log\left(pdvl_i^A+1\right)\right]\right\}$$ ...[sick-years] · [lost life-years] term

$$+\varepsilon_i^A$$

where

$$\beta' X_{0i}^A = \beta_0 + \text{shifters}$$
$$\alpha_1' X_{1i}^A = \alpha_{10} + \text{shifters}$$
$$\alpha_2' X_{2i}^A = \alpha_{20} + \text{shifters}$$
$$\alpha_3' X_{3i}^A = \alpha_{30} + \alpha_{31} age_{i0} + \alpha_{32} age_{i0}^2 + \text{other shifters}$$
$$\alpha_4' X_{4i}^A = \alpha_{40} + \alpha_{41} age_{i0} + \alpha_{42} age_{i0}^2 + \text{other shifters}$$
$$\alpha_5' X_{5i}^A = \alpha_{50} + \text{shifters}$$

Estimated Model - Summary of Core Variables

Active variables for simulations	US(base) coef	t-stat	× 1(Canada) coef	t-stat
$\beta \times$(square root term in net income)	.01422	(6.15)***	-	
…× 1(female)	.01069	(4.33)***	-	
$\alpha_1 \times \log(pdvi_i^A + 1)$ (sick years)	-56.8	(3.78)***	-57.47	(2.89)***
…× 1(female)	32.77	(3.11)***	-	
$\alpha_2 \times \log(pdvr_i^A + 1)$ (recov./remission)	-		-	
…× 1(female)	-67.88	(4.82)***	40.74	(1.71)*
$\alpha_3 \times \log(pdvl_i^A + 1)$ (lost life-years)	-436.3	(2.83)***	-	
…× 1(female)	22.66	(2.05)**	38.04	(2.00)**
…× age	27.2	(4.42)***	-24.88	(9.21)***
…× age-squared	-.2743	(4.68)***	.3671	(8.17)***
…× 1(college degree or more)	-32.56	(2.94)***	39.28	(2.15)**
…× 1(non-married)	35.97	(3.25)***	-34.06	(1.79)*
…× 1(have gone outside Cdn plan)	-		-33.61	(1.73)*
$\alpha_4 \times \left[\log(pdvl_i^A + 1)\right]^2$ (lost life-years)^2	145.7	(1.89)*	-	
× age	-10.75	(3.46)***	9.353	(7.52)***
× age-squared	.1111	(3.70)***	-.1412	(6.46)***
$\alpha_5 \times \log(pdvi_i^A + 1) \times \log(pdvl_i^A + 1)$ (sick-years) x (lost life-years)	-30.41	(2.97)***	93.73	(5.80)***

Simulations: guide to next slides...

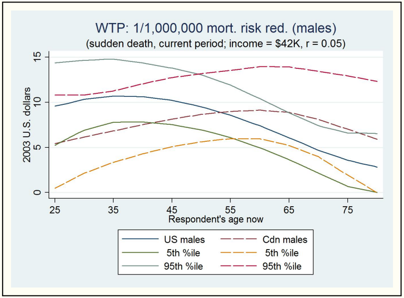
$$\text{WTP} = \frac{\text{marginal utility of health state(s)}}{\text{marginal utility of net income}}$$

- Although capable of valuing avoided illness across a complete time profile of adverse health states, we focus on just "sudden death now" for WTP simulations
- Results shown are for an individual earning US$42,000; median levels of subjective risks, health habits, and confidence in care
- Based on 1,000 random draws from joint distribution of the MLE parameters, for each age
- Figures show *age patterns* in WTP for a 1/1,000,000 risk reduction
    - For each country: we plot median, 5th and 95th percentiles WTP for each age

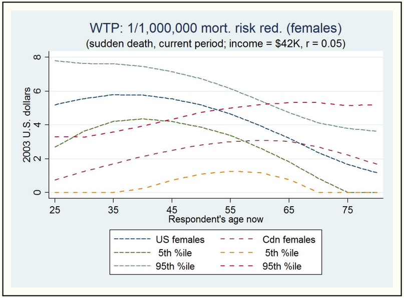
Results: Gender and Country

Differences by Canada (red/yellow) and U.S. (blue/green)

Males



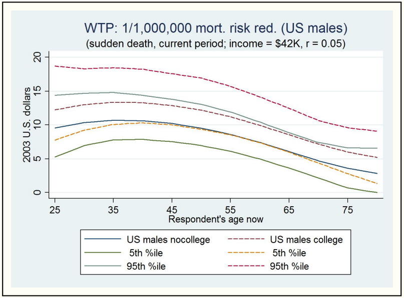
Females



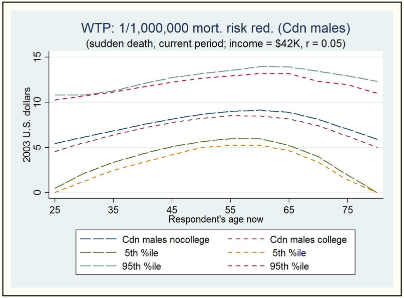
Results: Country and Education

College (red/yellow) vs No College (blue/green)

U.S.



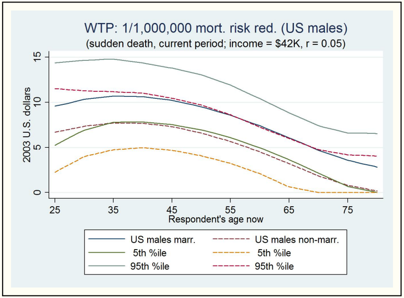
Canada



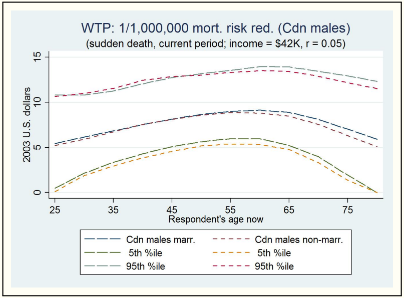
Results: Country and Marital Status

Nonmarried (red/yellow) vs Married (blue/green)

U.S.

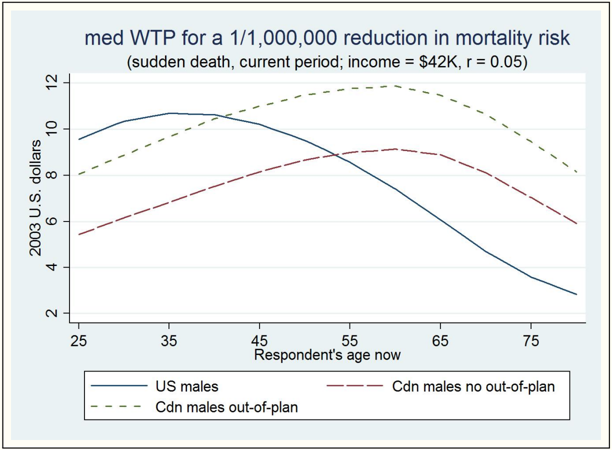


Canada



Results:

Medians in one figure: by in- and out-of-plan experience



Previous Literature

Two key studies:

- Krupnick, Alberini, Cropper, Simon, O'Brien, Goeree & Heintzelman (*JRU*, 2002) (for sample from Hamilton, Ontario)
- Alberini, Cropper, Krupnick & Simon (*JEEM*, 2004) (Hamilton, Ontario, and general population of U.S.)

Other research:

- Adamowicz, Dupont, & Krupnick (2005) *Report to Health Canada and EPA*
- Zhang, Adamowicz, Krupnick, & Dupont (2007) Resources for the Future Discussion Paper 07-39
- Zhang (2008), working paper, *UA Dept of Rural Economy*, University of Alberta

Stratus Review (Laurie Chestnut)

"Economic Valuation of Mortality Risk Reduction: Review and Recommendations for Policy Analysis" (March 2008)

Canadian WTP Studies (results in 2007 C$)

- **Wage-risk studies:** 5 studies from 1989 to 1999
  Mean VSL = $7.8 million (M)
  Range: $6.2 to $9.9 M, similar to US results
- **Stated preference studies:** 3 studies in 2004
  Mean VSL = $5.0 M
  Range: $3.4 to $6.3 M

Comparable results for same instruments in US and Canadian studies

Stratus Review (Laurie Chestnut)

Summary of meta-analyses, US and international (recommended models)

- Mrozek and Taylor (2002): 33 US wage-risk studies
  - Mean VSL = \$3.7 M adjusting for industry wage differences
- Viscusi and Aldy (2003): 44 US wage-risk studies
  - Mean VSL = \$10.8 M
- Kochi, Hubbell, and Kramer (2006): 45 wage-risk and stated preference studies, multiple countries
  - Mean VSL = \$12.7 M from US wage studies
  - Mean VSL = \$7.5 M from all US stated preference studies
  - Mean VSL = \$7.7 M from all studies, all countries

Stratus Review (Laurie Chestnut)

Existing Evidence on How WTP Varies with Age

- Stated preference results show either
  - no effect, or
  - 20 to 35% decline in WTP after age 65 – 74
- Wage-risk results show
  - WTP increasing at first, then
  - decreasing after age 45 – 50
- No support for
  - WTP proportional to life expectancy
  - (basis for the construct known as VSLY)

Our New Findings

Examples: Heterogeneity by Age

"VSL" (sudden death in the current period) for person with household income of US $42,000, married, no college degree (plus sample median subjective risk ratings, health habits, confidence in medical care):

- Age at peak VSL: Canada - 60 years; U.S. - 40 years
- Peak male VSL: Canada - $9 M; U.S. - $11 M
- Peak female VSL: Canada - $3 M; U.S. - $6 M

Our New Findings

Further Statistically Significant Heterogeneity based on sociodemographics; history of going outside provincial health plan

- College degree
  - raises peak WTP in US by about $3 M
  - *negligible effect* in Canada
- Unmarried status
  - lowers peak WTP in US by about $3 M
  - *negligible effect* in Canada
- Canadians who have (have not) gone outside their provincial health plan have higher (lower) max WTP than US

Our New Findings

NO one-size-fits-all VSL

- It would be just dumb luck if a one-size-fits-all VSL is the right estimate of WTP for any particular environmental health risk affecting any given population
- Many environmental health risks are different from "sudden death in the current period"; WTP will differ too
- WTP depends on:
  - "Who?": age, income, gender, marital status, education
  - "What?": the illness profile for which risk is reduced
- WTP for avoided lost life-years differs with age both within and between Canada and the U.S.

Conclusions

- Remaining differences in demand for health risk reductions between the U.S. and Canada might be traced to different institutions for provision of healthcare?
- Acknowledge the political challenges of differentiated VSLs (public confuses VSL with "worth of a human being")
- Positive/normative considerations need to be kept separate
- Need for differentiated WTP estimates is greatest when a policy targets an atypical risk that affects an atypical population
- **Recommendation:** Always question whether the prevailing one-size-fits-all VSL may be too different from a WTP estimate tailored to the health risk and the population in question

End of Presentation

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