



Flu Shots, Mammograms, and the Value of a Statistical Life

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Research Questions

- What is the VSL (value of a statistical life)?
 - Based on risk of death from influenza
 - Using costs associated with treatment
 - Subjective and Objective risk of death with and without flu shots
- How do subjective expectations of risks differ from epidemiological predictions?
- What factors influence participation in preventive care programs?

Preview of Results

- Survey data on influenza and flu shots
 - Actual and expected costs
 - Subjective and objective probability
- Risks are greatly overestimated
- Find wide variation in willingness to pay for risk reduction using individual specific calculations
- No significant willingness to pay using a discrete choice model

Why Preventive Care?

- Policy implications
 - Control growth of health care costs
 - Evaluate effectiveness of existing programs
- Individual decisions and perceptions about future risk
 - Relationship to underlying epidemiological risk
- Relationship between SES & health in part due to investments
- Age cutoffs for government programs create a natural experiment

The Value of a Statistical Life

- What is it?
 - Useful way to make decisions we have to make
 - How much you'd pay to avoid risk
 - Price/change in risk
- Kidney dialysis → \$50,000 for one year of life
- EPA \$6 million
- Caltrans \$3 million

How the Value of a Statistical Life Is Measured

- Hedonic pricing models
 - Wage differentials
 - Housing
 - Auto safety
- Price/change in risk

What We Can Do Differently

- Two sources of information about the reduction in risk
 - Individuals assessment
 - Epidemiological predictions
 - Individual risk not population risk
- For all individuals
 - Risk information
 - Expected/actual costs
 - Take up for all individuals

Free Flu Shots in the Netherlands

- Influenza & flu shots
 - Free every year
 - Paid for by the government
 - Invitation from Doctor
 - Everyone over age 65
 - Some other high risk individuals
 - Also some employer's provide
 - Reduces risk by 80%

Our Data: CentERPanel

- April 13th-April 15th, 2007
- Participate in weekly surveys
- Representative of Dutch Population
- Experience with subjective probability
 - Future income and labor supply, pension policy changes, price changes, and life expectancy
- Possibility
 - Follow up
 - Randomization

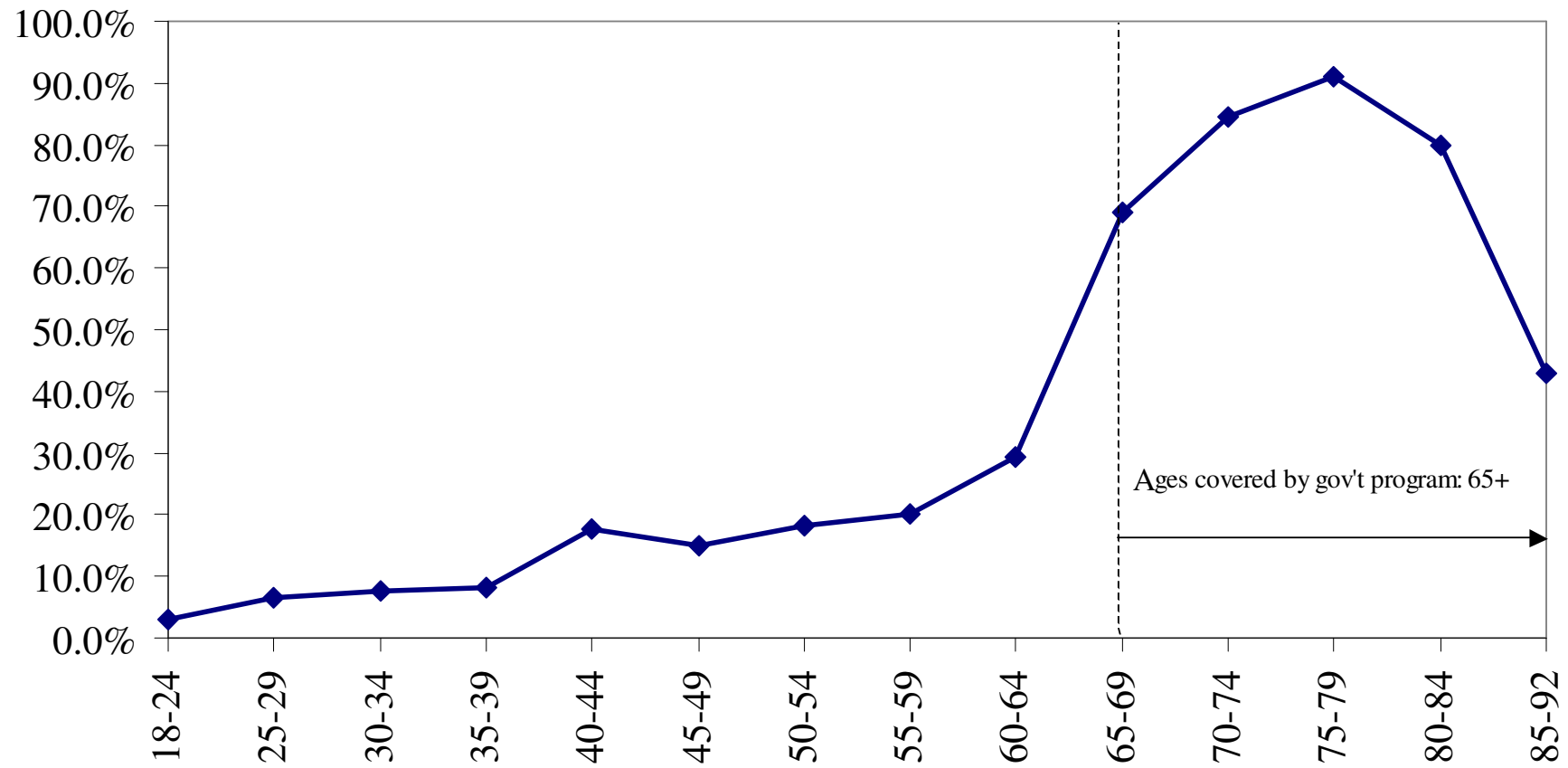
Our Survey Instrument

- Use of flu shots
- Invitation for flu shot
- Cost and time to use (expected and actual)
- Perception of importance of use (individual and dr)
- Some reasons why people wouldn't get a flu shot
- Friends die
- Subjective probability that you get influenza
- Subjective probability that you die from influenza
- Subjective probability that you are better in 1 week

Our Survey Instrument: Additional Information

- Underlying risk factors
- Use of health care
- Plus many other background characteristics else from CentERPanel
 - Socioeconomic variables
 - Financial decisions
 - Health status & insurance coverage

Take Up By Age: Flu Shot



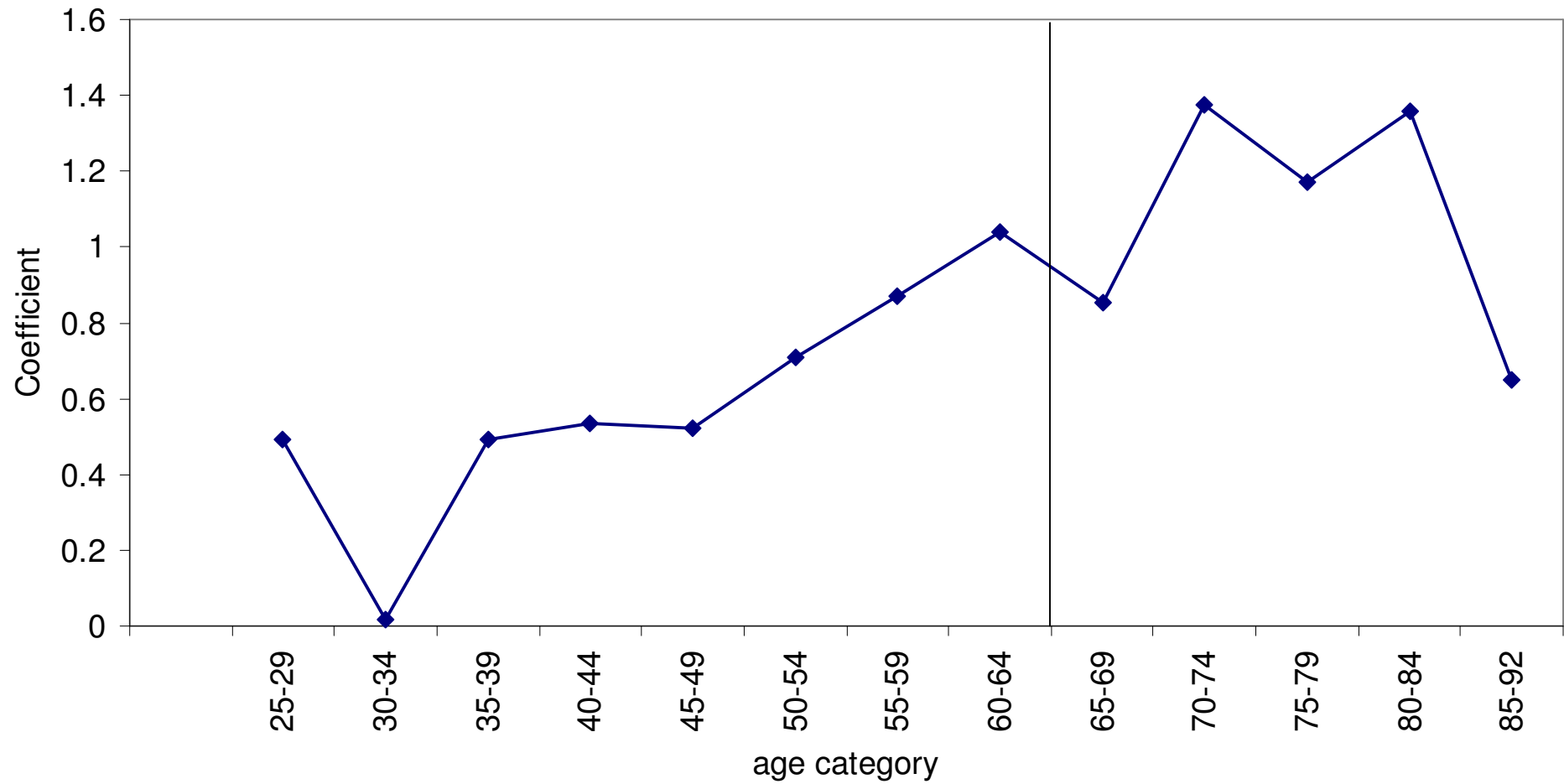
Awareness of Flu Shots

- Questions about why people do or do not have flu shots
 - I don't know anything about flu shots
 - I never thought about flu shots
 - Strongly Agree (1) to Strongly Disagree (5)
- Use sum of two variables

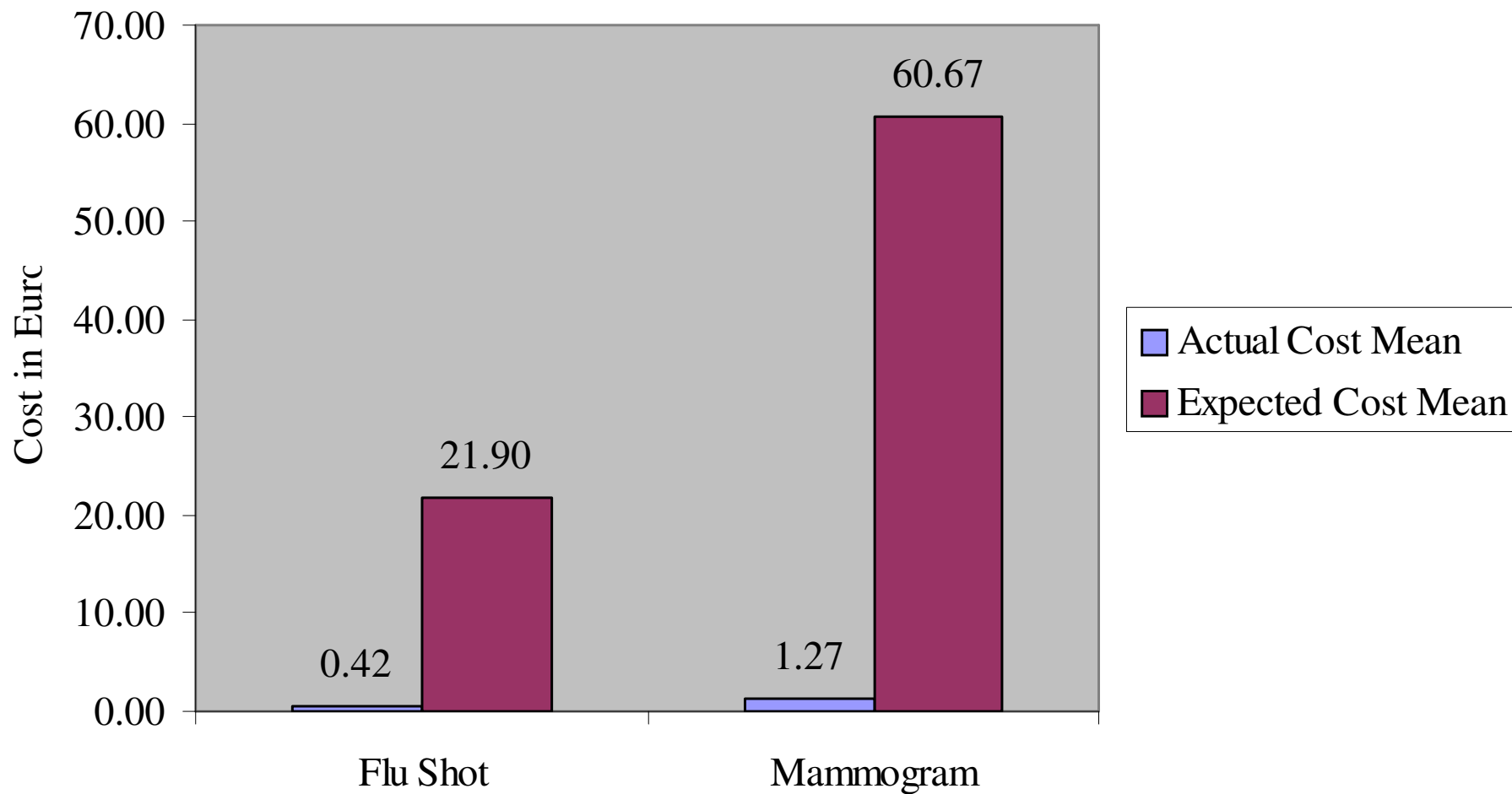
Determinant of Awareness

Variable	Coefficient	Std. Error	P-value
Male	-0.342	0.087	0
Higher education	0.354	0.089	0
Received and invitation	1.797	0.108	0
Spouse received invitation	0.119	0.119	0.317
Friend died	0.363	0.291	0.212
No doctor	0.564	0.815	0.488
Heart Disease	0.322	0.147	0.029
Diabetes	0.068	0.154	0.658
High Blood Pressure	-0.027	0.102	0.79
Number of Doctor visits	0.043	0.015	0.003
Number of specialists visits	0.003	0.011	0.775
Hostpital Stays	-0.015	0.010	0.16
Net household income	0.000	0.000	0.816
Constant	5.534	0.231	0

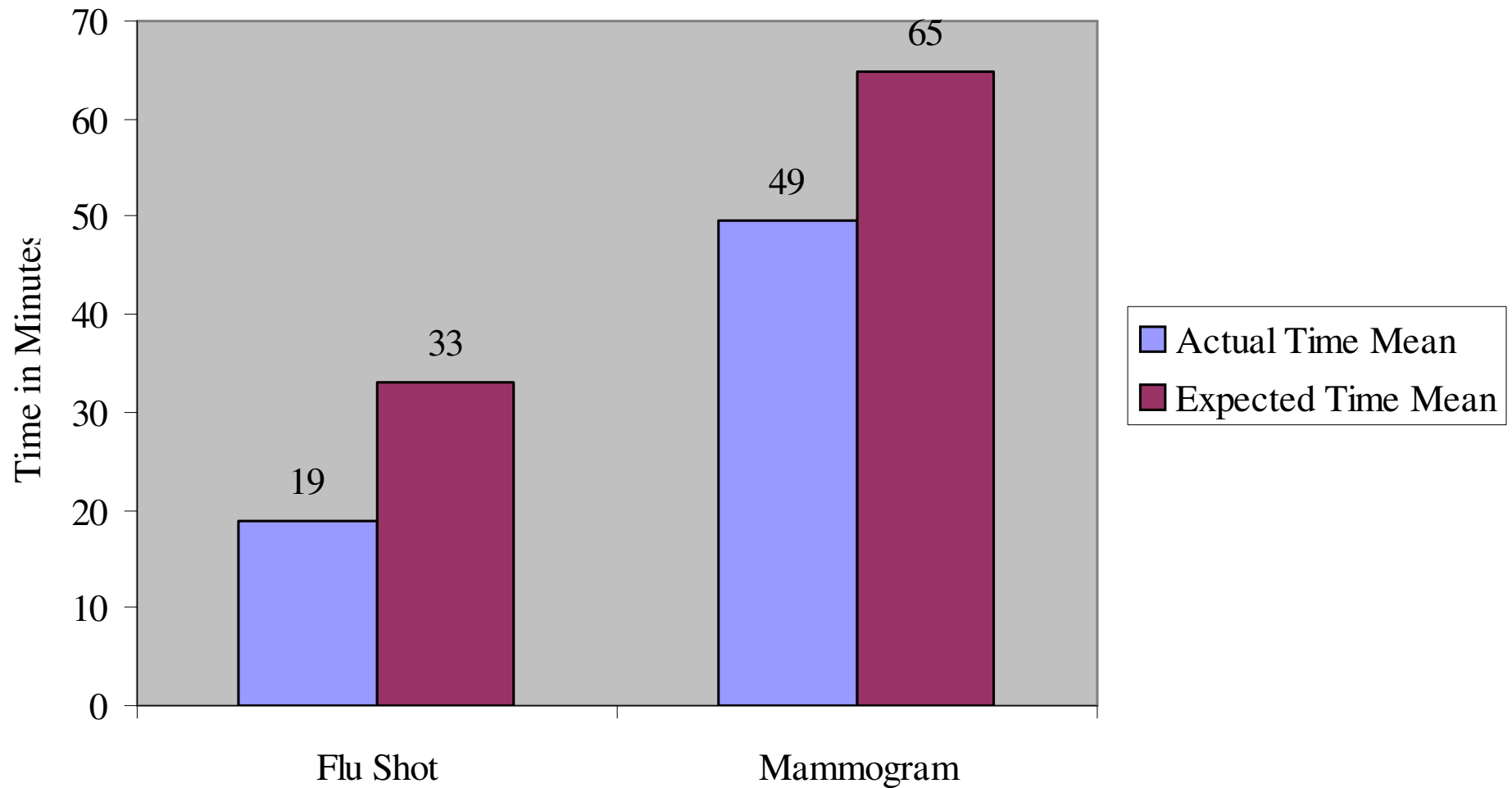
Coefficient on Age Group Relative to Age 18-24



Expected Costs of Prevention



Expected Time for Prevention



Subjective Probabilities

- Risk of contracting and mortality
- 5 diseases
 - With and without intervention
- Randomization
 - Wording
 - Order
- 2 time frames
- Answer on scale 0 to 100
 - Allow numbers after the decimal point

Sample Questions: Subjective Probability

- In your opinion, what are the chances that you will get the flu in the winter?
 - Assume that you get a flu shot in the autumn.
 - Assume that you do not get a flu shot in the autumn.
- Imagine you get the flu. In your opinion, what are the chances that you will X?
 - X is survive or die
 - Assume that you get a flu shot in the autumn.
 - Assume that you do not get a flu shot in the autumn.

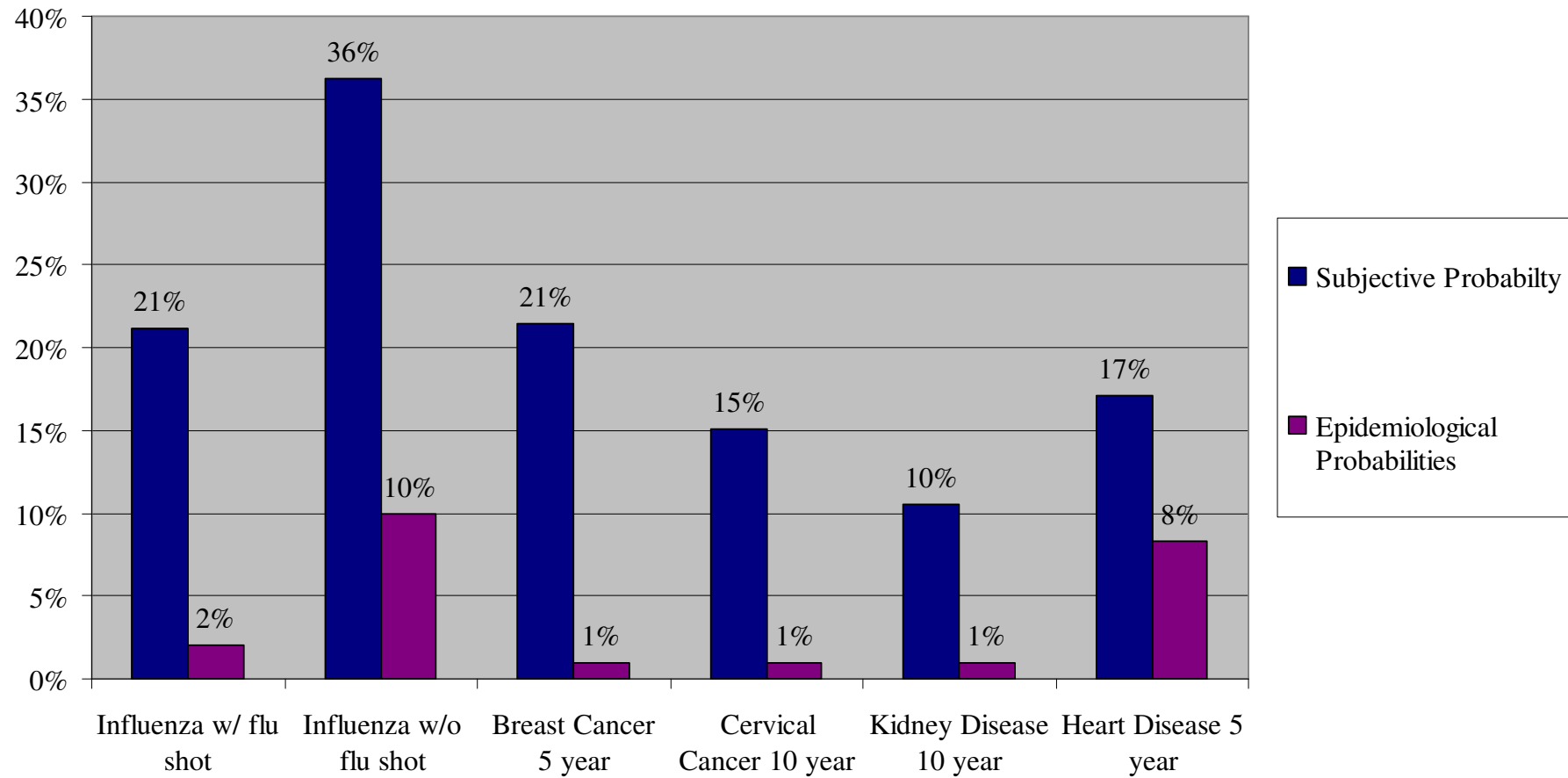
Epidemiological Literature

- Calculate individualized risks
- Use risk factors found in epidemiological literature to calculate risk of disease and death
- Effectiveness from Epid literature
 - Ideally allow for effectiveness of prevention to vary with risk factors

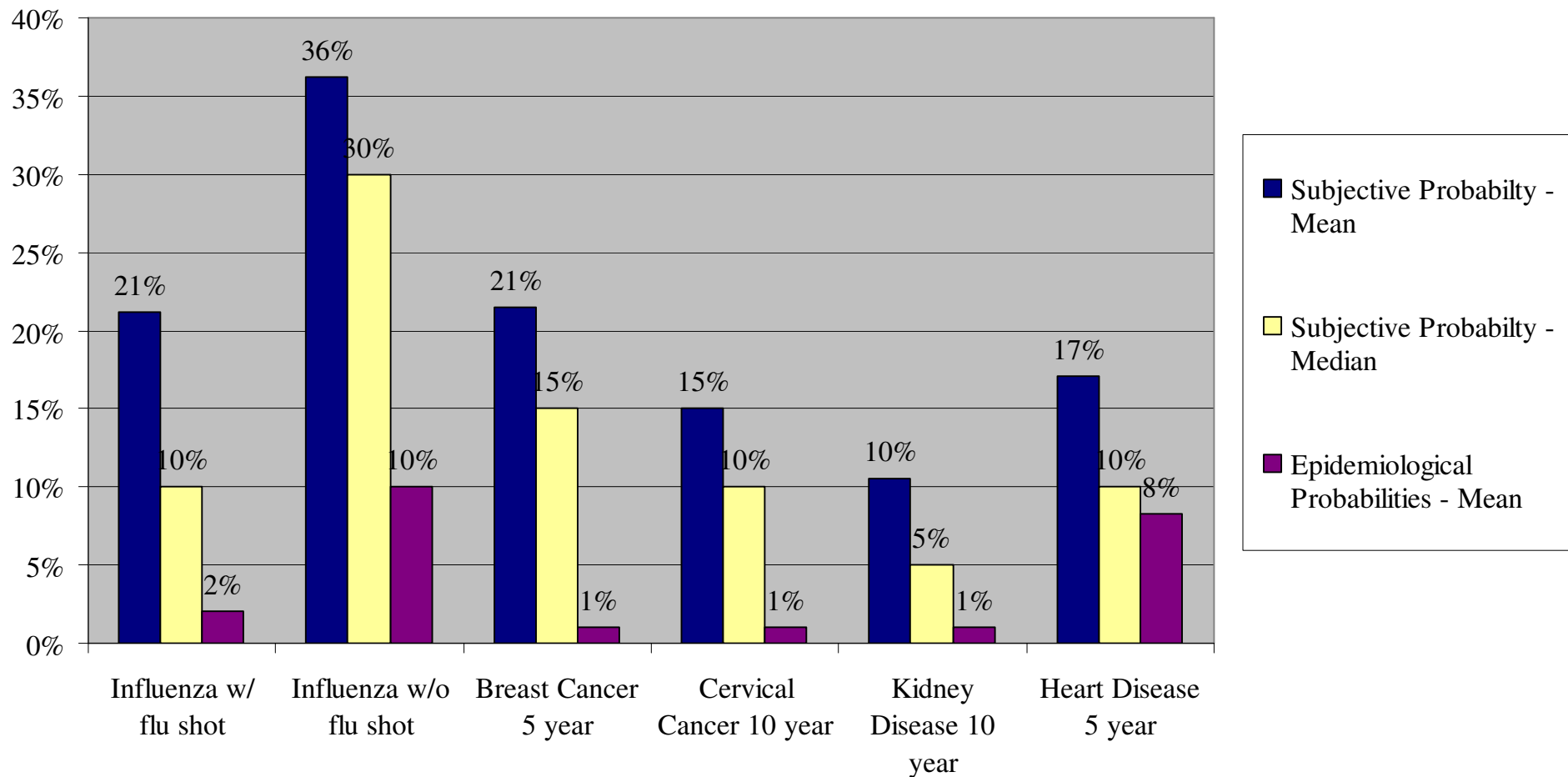
Epidemiological Literature on Influenza and Vaccination

- 3 measures of influenza mortality rates
 - Confirmed influenza (low)
 - Circulatory or respiratory complications (mid)
 - Age 5 to 49: 0.5 / 100,000
 - 50 to 64: 7.5 / 100,000
 - 65 plus: 98.3 /100,000
 - All cause potentially related (hi)
- Flu shots reduces risk by 80%
- Use information on vaccination rates by age to calculate probability of death with and without flu shot

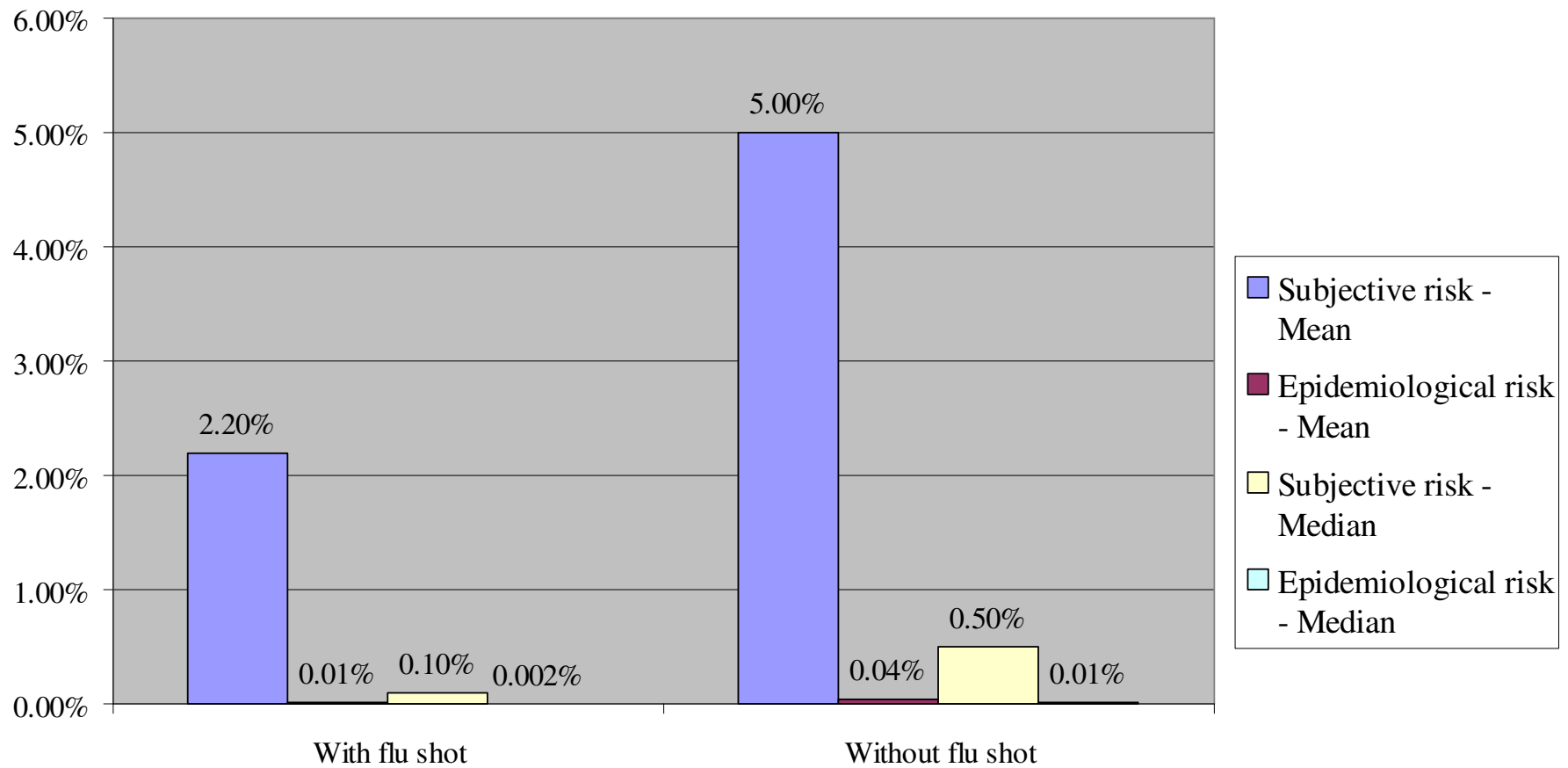
Mean Probability of Contracting Diseases



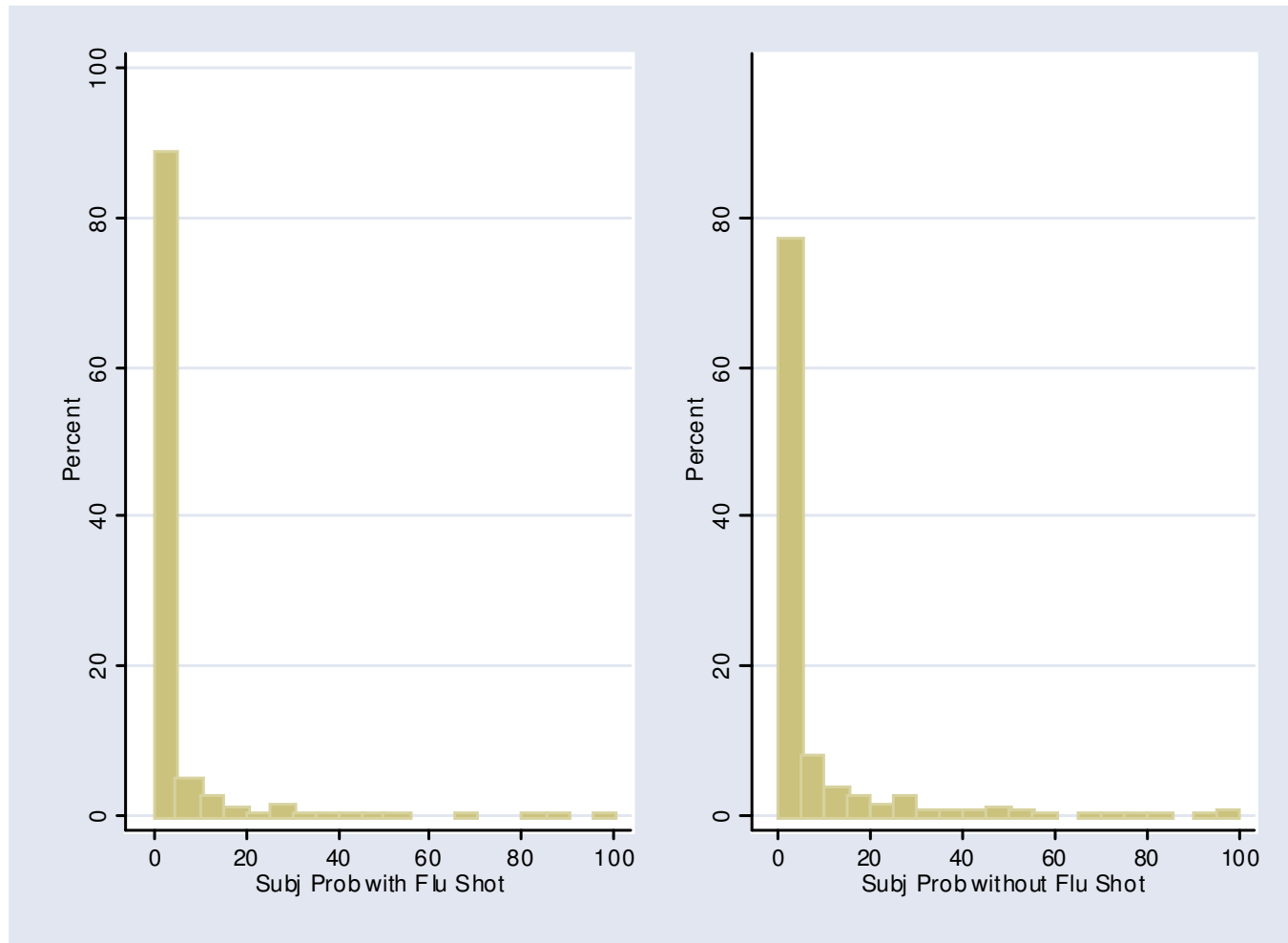
Subjective Probability of Contracting Diseases



Risk of Death From Influenza



Subjective Probability of Death From Influenza



Calculation of VSL

- Use ratio of cost to risk reduction
- Costs defined by
 - Monetary costs including shot and travel
 - Time costs based on hourly income

VSLs Implied by Flu Shot Choices

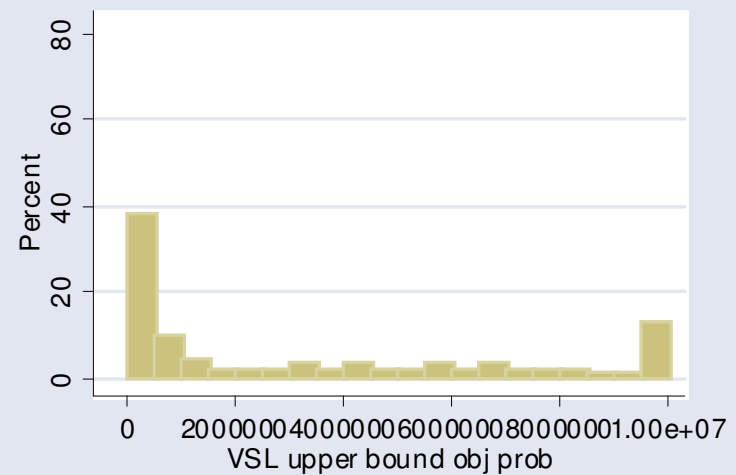
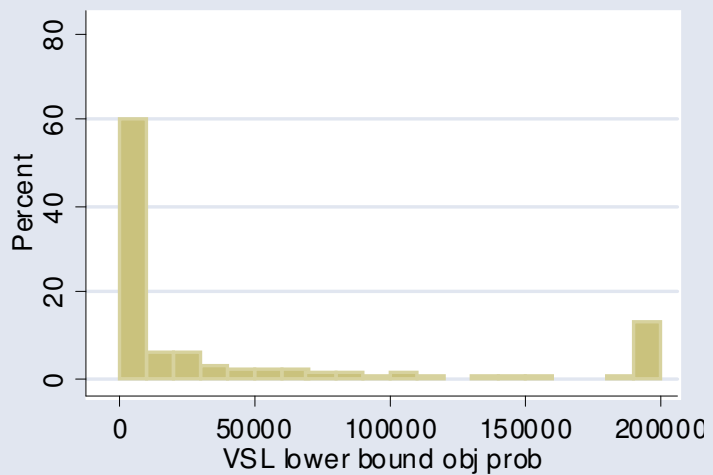
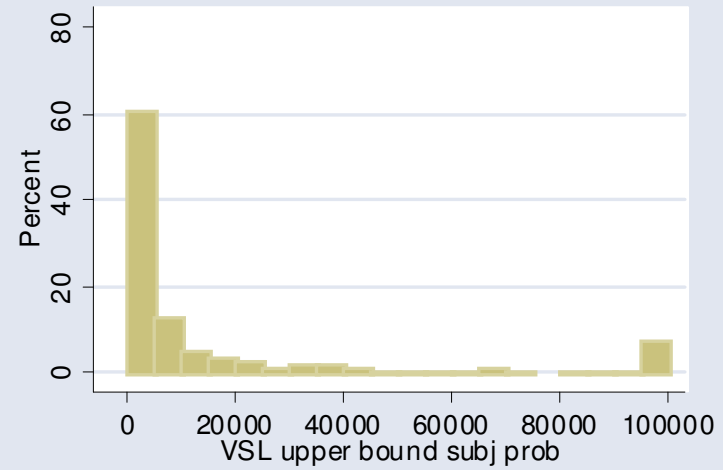
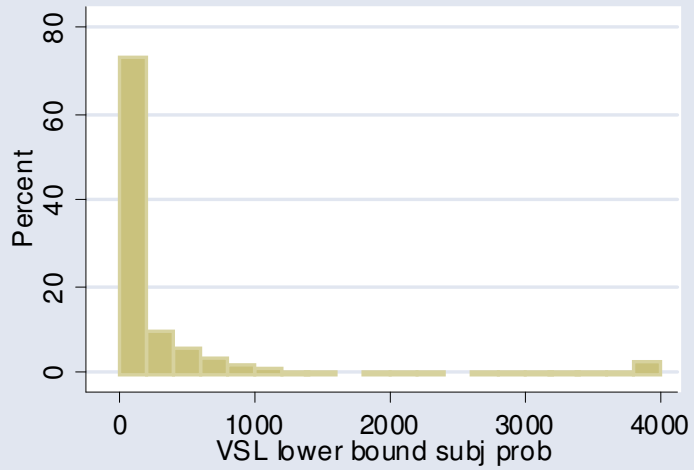
Table 6A: Upper Bound on VSL for Individuals Who Did Not Have a Flu Shot

Subj/Epid probability	Mean	Stan. Dev	Min	Median	Max	N
Subj	€ 80,545	624,325	€ 0	€ 2,990	€ 8,651,248	484
Epid- cons	€ 10,073,934	12,400,000	€ 0	€ 4,359,943	€ 89,815,176	484
Epid- mod	€ 3,854,081	5,047,870	€ 0	€ 1,139,691	€ 35,926,072	484
Epid- hi	€ 1,320,625	1,662,469	€ 0	€ 512,058	€ 11,975,358	484

Table 6B: Lower Bound on VSL for Individuals Who Had a Flu Shot

Subj/Epid probability	Mean	Stan. Dev	Min	Median	Max	N
Subj	€ 770	5,735	€ 0	€ 53	€ 93,750	339
Epid- cons	€ 272,485	1,047,623	€ 0	€ 15,293	€ 10,897,031	339
Epid- mod	€ 95,051	416,919	€ 0	€ 3,336	€ 4,358,813	339
Epid- hi	€ 34,923	139,162	€ 0	€ 2,429	€ 1,452,938	339

Distribution of VSLs



Estimation Based on Discrete Choice Model

- Discrete choice model
- Ratio of coefficients represents willingness to pay for risk reduction
 - Coefficient on change in probability/coefficient on cost
- Total cost given by sum of monetary and time costs

Probit Results With Flu Shot Participation As Dependent Variable

	Coef.	Std. Err.	P>z
Change in prob. of getting flu (wo-w)	0.610	0.175	0
Change in prob. of dying of flu (w-wo)	-0.337	0.416	0.418
Total Cost	-0.059	0.006	0
Age	0.028	0.004	0
Male	0.038	0.110	0.733
Higher Education	0.003	0.110	0.98
Received invitation	2.273	0.134	0
Spouse received invitation	0.256	0.133	0.054
Constant	-3.053	0.232	0
R-squared	0.6833		
Number of observations	1897		
VSL	5.746	7.111	0.419
Willingness to Pay to Avoid Flu	10.410	3.115	0.001

Conclusions

- Estimated costs are higher than actual costs
- Invitations play a large role in participation
- Vast differences between objective and subjective risks
- Large range on upper and lower bound of VSL
 - High variation in values
- Discrete choice model gives insignificant willingness to pay to avoid influenza death

Current Limitations and Next Steps

- Further review of epidemiology literature
 - Influenza: multiple risk factors
 - Continuous rather than categorical variables
 - Cervical cancer, kidney disease and heart disease
- Long run risks & competing risk

Current Limitations and Next Steps

- Discrete choice – willingness to pay model
 - Incorporate intertemporal nature of problem
- Improve the measurement of subjective probabilities
 - Very small probabilities
 - Conditional (versus joint and marginal) probabilities
 - Potential confusion over question
 - Joint probability of death from several diseases
 - Survival curves

International Extensions

- Different perception of preventive care
- Different attitudes towards risk
- More options for men