Incorporating Equity Concerns into Benefit Cost Analysis

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The Context

- Distributional considerations are usually incorporated into BCA by presenting benefits for specific groups of concern
  - Health benefits are based on WTP to reduce risks to oneself
  - Decision maker is free to attach “welfare weights” to different groups
- Concerns for the health and safety of others—in the form of willingness to pay—are usually not incorporated into a BCA
  - My WTP to reduce health risks to Jon Levy or Henry Roman are not incorporated in a BCA
- Can/Should this be done?

Policy Questions

- Is it appropriate to include individuals' WTPs for changes in the distribution of risks in a population?
  - Yes, if altruistic values are allowed in a BCA
  - And, if people are paternalistically altruistic
- If so, what should people value—a change in the distribution of risks or a change in a risk equity measure?
  - Social welfare depends on risk levels rather than the distribution of risks *relative* to mean risk
  - Ask people to value changes in the distribution of risks
- Can people value changes in risk distributions?

Outline of Talk

- Arguments for including altruistic values in a BCA
- How should equity be represented?
  - Using an inequality index or a distribution of risks
- Preliminary attempts at measuring WTP for changes in risk distributions
- Questions that remain

Altruism and BCA

- Jones-Lee (1989): Altruistic values should be incorporated into a BCA if and only if people are paternalistically altruistic.

- Assume person 1 receives utility from his own wealth (w_1) and survival probability (π_1) and everyone else's:
- $SWF_1 = SWF_1(\pi_1, w_1, \pi_2, w_2, \pi_3, w_3, \ldots . \pi_n, w_n)$. (1)

- Problem: How strictly to regulate HAPs?
  - More stringent regulation will increase $\{\pi_i\}$ but will cost people money - alter $\{w_i\}$

What Benefit Measure to Use? Case of Pure Altruism

- Suppose each person is a "pure" altruist
  - He respects people's preferences, so SWF_1 is the sum of individuals' private utility functions
  - $SWF_1 = \sum u_i(\pi_i, w_i)$
- This means person 1 cares about the benefits of the program to each person but also the cost
- Each person's private WTP already captures this tradeoff
- The correct BCA criterion is to compare the sum of private WTPs for a change in survival probability with program cost

What Benefit Measure to Use? Paternalistic Altruism

- <u>Suppose each person is a "paternalistic" altruist</u>
  - He cares about people's safety but not about their wealth
  - $SWF_1 = v(w_1) + W(\pi_1, \pi_2, \pi_3, \ldots \pi_n)$ (2)
- The correct BCA criterion is to compare the sum of each individual's WTP for a change in $\{\pi_i\}$ with program cost
- So . . . We can measure WTP for a change in the distribution of risks and use it in a BCA if people are paternalistically altruistic

Measuring Distributional Preferences

- Borrowing from the income distribution literature, order people in the population from those with the lowest survival probability to those with the highest

- Each person's SWF can be written as:

- $SWF_1 = v(w_1) + \Sigma_p U(\pi_p)\omega(p)$ (3)

- Where p is the pth quantile of the distribution, $\pi_{p\ is}$ the average survival probability in the quantile and $\omega(p)$ is a welfare weight

Aside on the Income Inequality Literature

- Conditions for (3) to hold are (a) anonymity of individuals; (b) Pareto principle; (c) possibility that welfare depends only on the bottom end of the survival distribution (Blackorby and Donaldson 1980)
- A key result from the Income Inequality literature:
- Social welfare -- $\Sigma_p U(\pi_p)\omega(p)$ can be factored into the product of mean risk and an inequality index
- The form of the inequality index depends on the form of U( ) and ω(p)
  - The Atkinson Index results if $U(\pi_p) = (1-\varepsilon)^{-1}(\pi_p)^{1-\varepsilon}$
- Inequality indices DO NOT MEASURE WELFARE – they measure the distribution of income (or risk) relative to the mean.

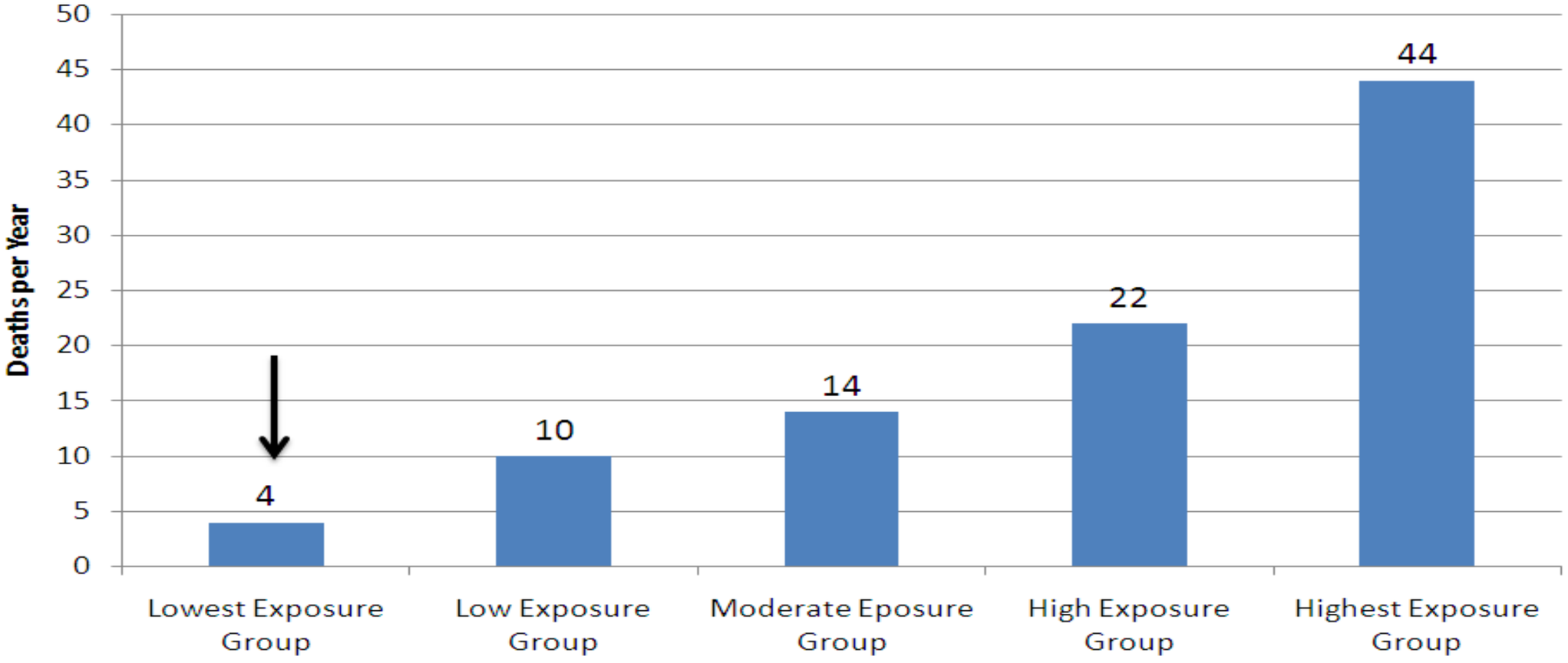
How Do We Value Changes in the Risk Distribution?

- Our goal here is to estimate WTP for a change in the risk distribution
- $WTP = \Sigma_p \, (\partial W/\partial \pi_p)/(\partial v_1/\partial w_1)$
- How to communicate baseline risks and changes in the risk distribution?
- In ongoing research we are:
  - Describing the population in quintiles
  - Using bars to describe annual cancer deaths in each quintile
  - Using bars to represent deaths after the policy
  - Focusing on risk reductions that make all quintiles better off
  - Varying how the policy affects the respondent

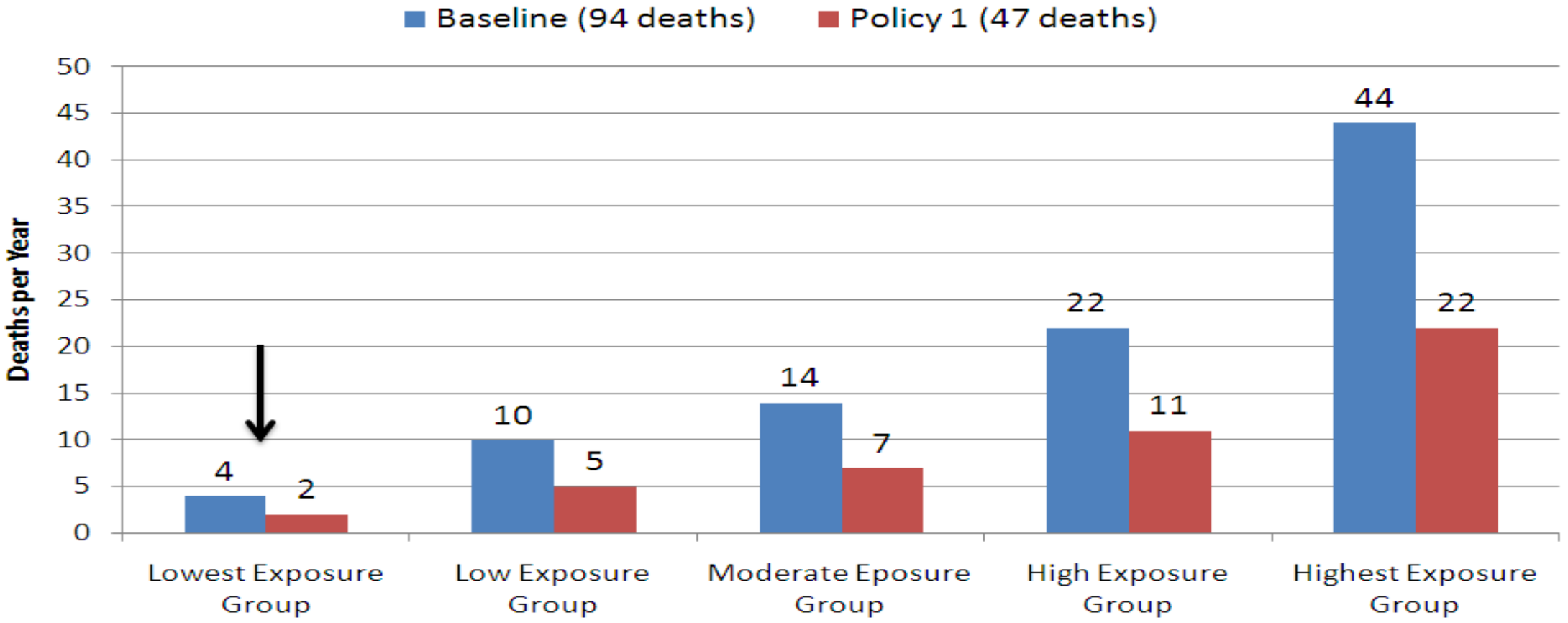
Baseline Benzene Cancer Deaths per Year in the United States: You are in the Lowest Group (represented by the arrow)

Divided into equal groups of 60 million people

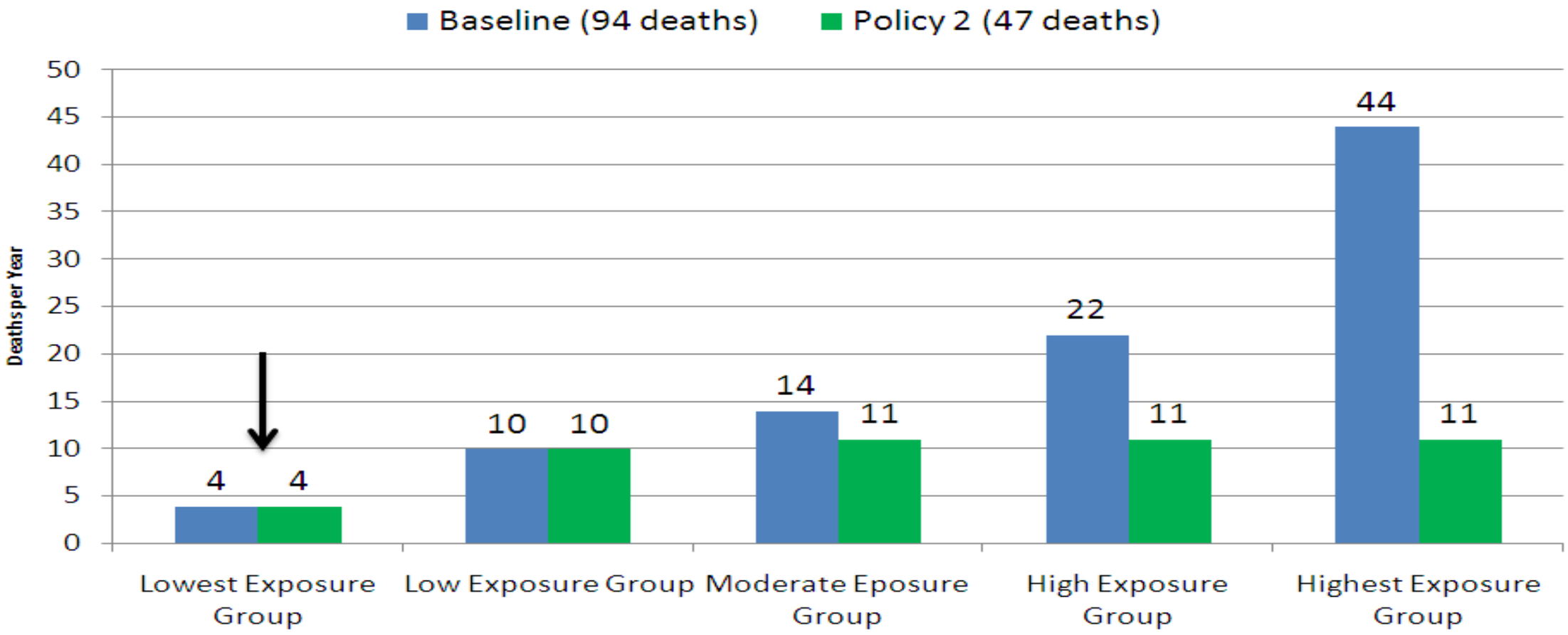
Baseline Benzene Cancer Deaths per Year, (You are in the Lowest Group (shown with the arrow))



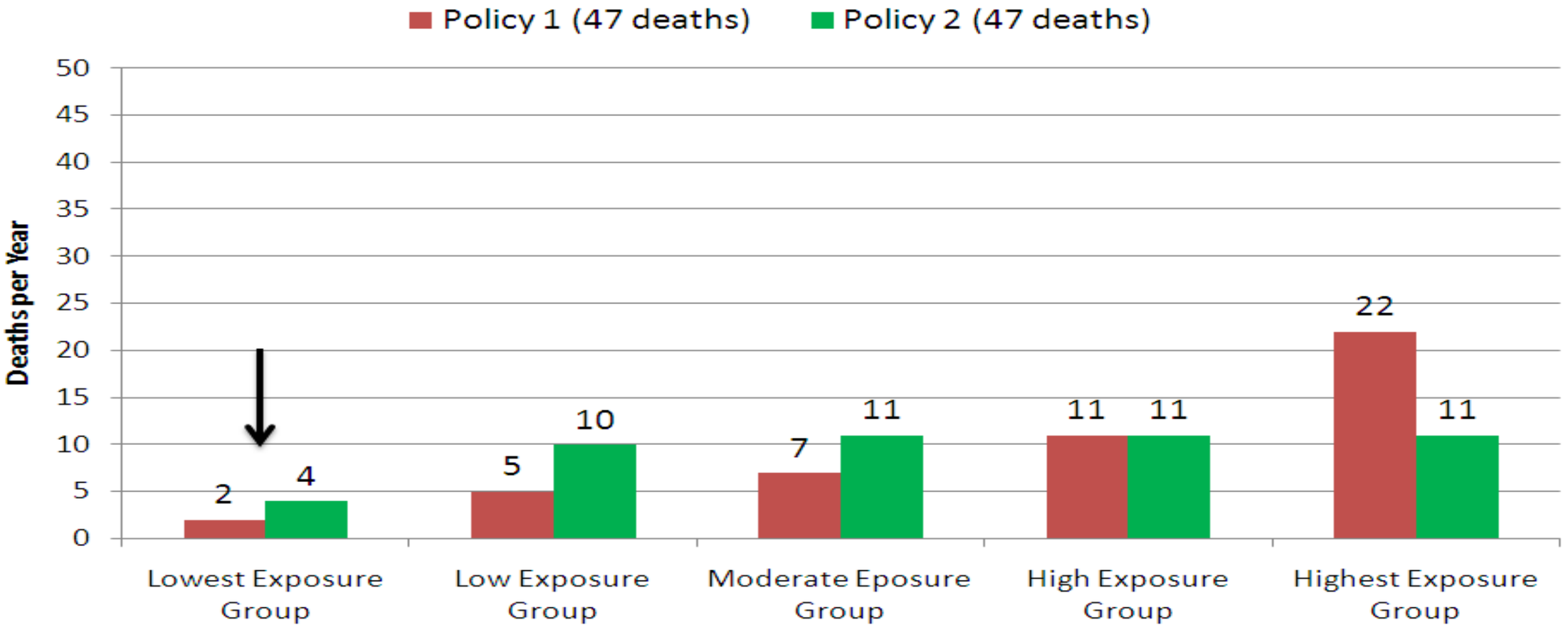
Policy 1 Comparison to the Baseline: You are in the Lowest Group (shown with the arrow)



Policy 2 Comparison to the Baseline: You are in the Lowest Group (shown with the arrow)



Policy 1 Comparison to Policy 2:You are in the Lowest Group (shown with the arrow)



Issues in Valuing Changes in Risk Distributions

- How would WTP for a change in the risk distribution be used in a policy context?
  - When respondent is affected by the policy, WTP for a change in the risk distribution includes impact on respondent (don't add individual VSL)
  - Would sum WTP for a change in the risk distribution across all individuals, both those affected by the policy and those who are not
- Are people paternalistically altruistic?
- Have altruistic values been allowed in regulatory impact analyses?
  - BCAs of the Clean Water Act use WTP for improvements in a public good (improving water quality in a lake or stream)
  - This could include altruistic values (others benefit from improved water quality)