

## MEMORANDUM

To: Holly Stallworth, DFO  
Science Advisory Board Staff Office

From: Nathalie B. Simon, Associate Director  
National Center for Environmental Economics

Date: December 16, 2010

Subject: Charge Questions for SAB-EEAC January 2011 meeting

The purpose of this memorandum is to transmit charge questions for consideration by the Science Advisory Board's Environmental Economics Advisory Committee (SAB-EEAC) during our upcoming consultation scheduled on January 20 and 21, 2011.

EPA and other agencies use a variety of tools, including benefit-cost analysis, to help inform regulatory and other public policy decisions that affect human health. When considering new regulations to reduce people's exposure to pollutants, EPA first estimates how much the various options would reduce mortality risks. EPA then calculates the benefits associated with those options by using published estimates of how much people are willing to pay for small reductions in their annual risks of dying. This estimate is commonly known as the "Value of Statistical Life" (VSL), but it is important to understand that this quantity does not measure the value of an individual life. Rather, the VSL is the total willingness to pay for small risk reductions summed over a large number of people. This estimate, together with other benefits of the regulation, are then compared to the costs.

EPA is now in the process of updating its guidance for conducting benefit-cost analysis, and has identified a number of important issues that should be considered. These are detailed in a white paper on "Valuing Mortality Risk Reductions in Environmental Policy," which will be submitted to the EPA's independent Science Advisory Board shortly for review and advice. The charge questions follow from a white paper submitted to the SAB-EEAC for review entitled "Mortality Risk Valuation for Environmental Policy." The paper addresses the following key issues:

- Terminology: Replacing the term "Value of Statistical Life," which has often been misunderstood as a measure of the value of individual lives, with the term "Value of Mortality Risk Reductions" (VMR). This change in terminology should help to avoid some of the confusion surrounding the interpretation of the

VSL. It would not affect the results of the analysis itself, but rather how the benefits of reduced risks are reported and described.

- Cancer Differential: Taking into account potential differences in how much people would pay for reductions in their chances of dying from cancer relative to other causes when estimating the benefits of policies that reduce exposure to cancer-causing pollutants.
- Altruistic Effects: Taking into account that the amount of money people would pay for “public” risk reductions that affect everyone (like reductions in water pollution) may differ from what they would be willing to pay for “private” risk reductions that only affect the individual (say, choosing to install a water filter in your home). Many of the published estimates of willingness to pay are for private risk reductions, but since EPA regulations generally result in “public” risk reductions, accounting for these differences when estimating benefits could be important.

As indicated in the accompanying materials, advice on these issues will not only be important ultimately to the revision of our *Guidelines for Preparing Economic Analyses*, it will be of immediate relevance to the Agency in its pursuit of improved guidance on mortality risk valuation in particular. We look forward to the SAB-EEAC’s review.

Please contact me if you have any questions about the attached charge.

Attachment

Cc: Al McGartland

## Valuing Mortality Risk Reductions for Environmental Policy

1. Current EPA guidelines and standard practice use “Value of Statistical Life” (VSL) as the metric for valuing mortality risks. Section 3.1 of the white paper discusses the VSL terminology commonly used in mortality risk valuation exercises in greater detail. The white paper suggests that the Agency move away from using the traditional VSL terminology in favor of a new term of art for estimates of the marginal rate of substitution between health risks and income (see section 3.1). Specifically, the white paper suggests that the Agency refer to these estimates as the “value of mortality risk,” and report the associated units using standard metric prefixes to indicate the size of the risk change, e.g., \$/mr/person/yr (dollars per milli[10<sup>-3</sup>]-risk per person per year), or \$/μr/person/yr (dollars per micro[10<sup>-6</sup>]-risk per person per year), etc. Does the Committee agree that the Agency should pursue such a change? Does the Committee believe that making these changes would ease or exacerbate the misunderstandings documented by Cameron (2010)? Would some other terminology or approach be preferable? Please explain.

Experts generally agree that *value function transfers* can outperform *point value transfers* in cases where the characteristics of the risks and/or the exposed populations differ between the source studies and the policy context in measurable ways. That is, the more commodity- and individual-specific attributes that can be included in the benefit transfer exercise, the better the estimate of willingness to pay. Charge questions 2 and 3 inquire about whether applications of benefits transfer methods to value mortality risk reductions from environmental pollutants can be improved by controlling for more of the attributes that distinguish the source studies from the policy scenario.

2. The white paper concludes that research since the 2000 EPA Guidelines suggests that people are willing to pay more for mortality risk reductions that involve cancer than for risk reductions from accidental injury (see section 3.3). Our preliminary review suggests that a “cancer differential” of up to 50% over immediate accidental or “generic” risk valuation estimates may be reasonable. Conceptually, would the weight of evidence (both theoretical and empirical) suggest there is a cancer differential? If so, does the Committee believe that our estimate of the differential is appropriate? If not, how does the Committee recommend the Agency incorporate cancer differentials in benefits analysis involving reduced cancer risks?
3. Environmental policies generally provide public risk reductions. However, research, particularly stated preference research, provides willingness to pay estimates for both public risk reductions as well as private risk reductions. And, some research indicates that individuals’ willingness to pay for public risk reductions may be different than that for private risk reductions. One factor that may contribute to these differences is altruism, which, all else equal, should make values for public risk reductions larger than those for private risk reductions.

- a. Should EPA rely on studies that estimate willingness to pay for both public and private risk reductions? If so, is it sufficient to control for this key characteristic in the modeling framework? Or, should EPA limit the analysis to studies according to the type of risk reduction in the study? If using only one type of study is recommended, should EPA use studies that estimate public or private risk reductions? If we are to limit the studies used to one type, is there a role for the excluded group?
  - b. Studies that estimate willingness to pay for public risk reductions may allow EPA to better capture altruistic preferences in benefit-cost analysis. Did the white paper adequately capture the theory on how to incorporate altruism into the value of mortality risk reduction? How should altruistic preferences be treated in benefit-cost analysis? Should the Agency incorporate altruism into the value of mortality risk reductions, even if we are unable to distinguish the specific form of altruism involved (i.e., paternalistic or non-paternalistic)? More generally, what alternatives should the Agency pursue in the short-term to appropriately account for altruistic preferences when evaluating public programs, if any?
4. The two primary literatures used to assess willingness to pay for mortality risk reductions are stated preference studies and hedonic wage studies. The white paper assembles two databases summarizing studies in both literatures, capturing much of the information outlined in number 3 of the SAB-EEAC's recommendations dated October 2007 (see section 4).<sup>1</sup> These studies, or a subset thereof, would form the basis of revised guidance in the near term as well as possible future meta-analyses.
- a. The selection criteria employed in creating the two data sets are carefully outlined in the paper (see sections 4.1.2 and 4.2.4). Please consider these criteria in answering the following questions:
    - i. Should additional criteria be added to screen studies for inclusion in the datasets? If so, please specify those criteria. Should any criteria be eliminated or modified?
    - ii. Section 4.2.2 of the white paper discusses problems of measurement error associated with some common sources of occupational risk information among other concerns with the hedonic wage approach. Should EPA limit its selection of hedonic wage studies by the source of occupational risk information? For instance, studies relying on data from the Society of Actuaries (SOA) have been omitted from the described data set. Should the SOA studies be excluded? Should other sources be excluded as well?
  - b. Should any of the studies included in the datasets be eliminated? If so, please specify those studies and the reasons for eliminating them.

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<sup>1</sup> The recommendations included specific features of hedonic wage and stated preference studies that should be identified in the studies.

- c. Is the committee aware of relevant empirical studies in the stated preference and hedonic wage literatures that are not adequately captured in this review? If so, please provide citations.
5. Income elasticities are discussed briefly in section 5 of the white paper. In keeping with Agency practice, we created the two databases by adjusting all estimates for income growth over time using an income elasticity value of 0.5 based on prior Agency reviews of the literature and results Viscusi and Aldy, 2003. In addition, we adjusted all estimates for inflation as well as for purchasing power parity where necessary, as recommended by the EEAC's October 2007 report. Does the Committee agree with this approach to accounting for income growth over time? Does the Committee believe the Agency should adjust its value of income elasticity for use in policy analysis in light of recent findings in the literature? If so, what value or range of values does the Committee believe should be used?
6. The white paper describes a simplified approach for updating the Agency's recommended mortality risk value estimate(s) (see section 5.1.1). This approach involves fitting a parametric distribution to the set of estimates from selected studies. This is similar to the approach used for EPA's current default VSL estimate.
  - a. Should EPA pursue this approach for updating its mortality risk valuation guidance in the near term (until a more detailed analysis can be conducted)?
  - b. If so, should the databases on which values are based be created using only one estimate drawn from each study or multiple estimates from each study?
  - c. If only one estimate per study should be used, what criteria should the Agency apply in selecting the appropriate estimate? How would these criteria vary from one segment of the literature to the other? The paper describes the methods used to select independent estimates from each study. Does the Committee agree with the methods used?
  - d. How important is it that estimates be drawn from non-overlapping subsamples? If multiple estimates per study are recommended in the construction of the meta-datasets, should the estimates be selected to avoid overlapping sub-samples?
  - e. Does the Committee still favor analyzing the stated preference and hedonic wage estimates separately? If so, how should the separate results of these analyses be used in evaluating new policies? If not, how should they be combined in a single analysis?
  - f. Would the Committee support the development and application of separate means or ranges generated from the two segments of the literature? Given separate means and/or ranges from each segment, should the results be weighted and combined to produce a single point estimate or range? If so, how? Are other presentations of the results preferable? More generally, how should uncertainty in the estimated value(s) of mortality risk reductions be handled in benefits analyses?

7. We are interested in developing a standardized protocol for updating the Agency's recommended mortality risk value estimates on a regular basis—for example, every 5 years or so—to incorporate new estimates from relevant economic valuation studies as they appear in the literature. Such a protocol might be based on the approach outlined in Section 5.1.1 or something similar. This approach, combined with a set of rigorous criteria for determining which new studies and value estimates are suitable for inclusion in the pool for meta-analysis, would allow the Agency to update its guidance in a more timely and transparent manner. (After a working protocol was put in place, it then could be modified over time to match changes in the Agency's general mortality risk valuation approach and meta-analysis methods, as necessary. See charge question 8.) Does the committee believe that developing such a protocol is feasible and desirable? Please explain.
  
8. In addition to the short-term issues that underlie charge questions 1-7, we are interested in supporting and conducting additional research to further develop EPA's health risk valuation methods over the longer-term. In particular, we would like to begin the transition from the point value transfer approach to a benefit function transfer approach. With this longer-term research and guidance development objective in mind, please answer the following questions:
  - a. Should EPA continue to use its current approach—that is, a point value or range of values, possibly with an adjustment for cancer risks—or is there now a sufficient body of empirical research to support the development of a more detailed form of functional benefit transfer?
  - b. If a functional transfer approach is feasible given the existing body of empirical results, should this be based on a meta-analysis or a calibrated structural preference function or perhaps some hybrid of these?
  - c. If the body of empirical literature is sufficient to estimate or calibrate some form of structural preference function, what are the key variables that should be included in such a function? That is, based on a priori theoretical considerations and previous empirical findings, which attributes of the affected individuals and the policy scenario should be included? What specifications are feasible given data availability?
  - d. Have the econometric issues we identified (unobserved heterogeneity, heteroskedasticity, and small sample size) been adequately addressed by the recent meta-analyses reviewed in Sections 4.1.1 and 4.2.3? Would the classical approaches that we suggest for overcoming these data limitations improve upon previous work? If a new meta-analysis is conducted, what statistical approach(es) would be preferred?
  - e. What role, if any, does the Committee believe that the life-cycle consumption and mortality risk framework could play in evaluating health risk reductions? In particular, does the Committee believe that this framework could be used as a foundation for some form of structural benefit transfer function?