Rapporteur's Notes for

Valuing Risk Reductions Using Different Valuation Methods

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As we have seen throughout this conference, economists have developed several measurement techniques for valuing risk and nonmarket goods. Our breakout session discussed the general advantages and disadvantages of six techniques and their appropriateness for estimating the monetary benefits of policies or actions that reduce the risks of unsafe food. Benefit estimates from these techniques can be used as input in cost-benefit analyses for policies that reduce food safety risks.

In particular, we discussed six measurement techniques: cost-of-illness, contingent valuation, experimental auction markets, hedonic pricing, cost-effectiveness analysis, and health-health analysis techniques. The first four techniques provide estimates that are measured in dollar values, three of which (contingent valuation, experimental auction markets, and hedonic pricing) provide willingness-to-pay (WTP) estimates. Policymakers may feel more comfortable using benefit estimates in dollars instead of estimates of the number of lives lost or saved computed from techniques such as health-health analysis, but this is not always the case.

Cost-of-Illness Analysis

There was little enthusiasm in our group for the cost-of-illness (COI) method. The COI method tallies the dollars spent on medical expenses and the dollars of employment compensation that are forgone as a result of illnesses, accidents, or premature deaths (Kuchler and Golan, 1999). For example, the annual costs of a specific health risk such as *Salmonella* in food can be estimated by adding together all of the estimated annual medical costs and productivity losses and other illness-specific costs, such as special education and residential-care costs, for all patients stricken with foodborne salmonellosis in a given year. Examples of COI studies for food safety include Buzby *et al.* (1996) for bacterial foodborne illness and Frenzen *et al.* (1999) for foodborne salmonellosis.

One advantage of the COI method is that it measures the economic impacts of a particular illness, and this accounting is useful to policymakers interested in the economic flows of public health regulations. COI is also meaningful to the health industry as it is interested in data associated with particular illnesses (*e.g.*, the number of days of hospitalization for an average salmonellosis patient). One disadvantage is that the COI analysis may not reveal the severity of illness. The analysis may also be complicated by our modern system of payment for health care where prices for medical care vary depending on how they are paid. Co-payments by ill individuals tend to be lower than total costs billed to insurance companies. This suggests that insurance co-payments are a far cry from the WTP notion and so the rationale that COI is a lower bound disappears (see appendix in Kuchler and Golan, 1999).

Contingent Valuation

The second technique that we discussed was contingent valuation (CV). CV surveys or interviews elicit consumers' WTP for a particular nonmarket good "contingent" on a given hypothetical scenario. There have been over 1,600 publications on contingent valuation and CV surveys have been increasingly used to measure consumers' WTP for food safety risk reductions. For example, CV surveys have elicited consumers' WTP for reduced risk from toxins in shellfish (Lin and Milon, 1995), nitrates in drinking water (Crutchfield *et al*., 1997), *Salmonella* in chicken and eggs (Henson, 1996), and pesticide residues in food (Buzby *et al.,* 1995 and 1998).

One advantage of the CV method is that it is grounded in the theory of welfare economics (people will pay more if they get greater utility or welfare). Another strength is that a hypothetical scenario can be built for any market of interest.

On the other hand, V.K. Smith discussed how CV studies may fail to be successful in eliciting true WTP in dealing with conditional probabilities, a concept that many consumers find difficult to understand. This concept is very relevant to valuing the benefits of a food safety risk reduction. For example, in describing a risk reduction for human illness from *Salmonella* in eggs, the CV survey must make it clear to respondents that there is both the probability of having an egg contaminated with *Salmonella* serotype *Enteritidis* (SE) and the probability of getting sick given that the egg was contaminated with SE.

Because of the hypothetical nature of the CV technique and because no money is exchanged, there are various biases that may be associated with CV estimates (see Mitchell and Carson, 1989). The hypothetical scenario in the CV surveys may not come across as relevant or realistic. And, because health and safety are normal goods, predicted changes in WTP values can be explained by changes in income, ceteris paribus.

Another weakness is that it may be difficult to ascertain the validity and implications of the results. Despite the detailed guidance for implementation of the CV technique provided by the 1990 National Oceanic and Atmospheric Association (NOAA) Blue Ribbon Panel, there is no standard which should be used to judge whether results are believable. We can however be more confident with the results if the prescribed sequence of events such as focus groups, pretesting, and so forth is followed. Of the techniques that we discussed, CV has the most detailed guidance for implementation because of this NOAA panel and because of the relatively extensive use of this technique. In general, researchers want and will use guidelines for applying a valuation technique if the guidelines are from a reputable source or consensus.

Conjoint Analysis

At this point, we went off on a brief tangent and discussed conjoint analysis which is another hypothetical market tool. Essentially, in the CV technique, the attributes are embedded whereas in conjoint analysis, the attributes are distilled. Our group generally felt that this technique should be explored further. Two advantages are that there is more design control with this

technique and that it is cheaper in the sense that the researcher can ask more questions for a given budget. One downside is that the resulting observations are dependent.

Experimental Market Techniques

The third technique that we discussed was the experimental market technique (or "experimental auction technique"), where individual choices made in constructed market situations reveal preferences for a good that usually cannot be directly purchased in the market. Food safety is a non-market good primarily because of high information costs and/or information asymmetry. Contingent valuation of food safety overcomes the information problem by providing objective assessments of health risk. Valuation of food safety in experimental markets attempts to go one step further – eliminating the informational deficiency and placing the good in something akin to a market situation where money actually changes hands. Examples of experimental market studies for food safety issues include studies on reductions in pesticide risk (Roosen *et al.,* 1997), bovine growth hormone in milk (Fox, 1995), and a series of studies on irradiated pork by Shogren, Fox, and others.

Valuation in the lab offers some advantages in valuing food safety risk reductions. First, although the choice situation is artificially created, the choices are real not hypothetical and force respondents to consider their budget constraints. Second, revelation of truthful values is encouraged through the requirement that the winner of the auction eats one of the "risky" food products being valued and through the use of an incentive-compatible auction mechanism. In one common auction mechanism, the Vickrey second-price auction, the person with the highest bid buys the good at the second highest price. This is incentive compatible because the bidders' best strategy is to bid their true WTP value. Third, Shogren states in his conference paper that because of the laboratory nature of this technique, researchers can replicate or repeat the experiments to isolate, control for, and understand the ramifications of a wide range of different auction or market settings. Fourth, Kuchler and Golan (1999) point out that as with the CV technique, the experimental auction technique incorporates the recognition that individual preferences are unique and that individual demands for risk reduction vary. Despite the advantages of this technique, according to Shogren, the results from experimental markets do not always fare better than results from contingent valuation studies, and there is clearly a great deal more to learn.

Hedonic Price Techniques

The fourth technique that we discussed was hedonic pricing. This technique estimates the value of each attribute of a good or service, including health-influencing attributes. The dominant application calculates compensating wage differentials or a "risk premium" revealed in labor markets through the higher wages employers must offer to induce workers to take riskier jobs. Some hedonic studies have focused on nutrition and other food-related issues such as fat content in milk, fiber in cereal, and organic versus non-organic. [1] Shogren mentioned one study that he

[1] Other studies have covered goods and issues such as seat belts, property values, smoke detectors, and highway speed.

did on the marbling, coloring, and size of pork chops.

In his conference paper, Shogren pointed out that some of the disadvantages of hedonic wage-risk studies include the presumption that workers know all the risks in the job and that they can change jobs costlessly. Another common criticism is that these studies focus on those who have a job and underrepresent other segments of our population such as seniors and children. One challenge is to fully understand the market and its consumers, with only price and quantity data.

Cost-Effectiveness Analysis

The fifth technique that we discussed was cost-effectiveness analysis, which is essentially a comparison of costs with the number of physical benefits. The ratio of dollar costs to physical benefits is the cost per physical benefit, and the program with the lowest cost per benefit is the most cost-effective (Kuchler and Golan, 2000). One advantage of this technique is that it uses real cost and outcome data. There are numerous Centers for Disease Control and Prevention (CDC) studies and studies by other health professionals that use this technique. However, to date, it has not been applied to food safety issues.

The cost-effectiveness method is becoming closer to the traditional cost-benefit analysis because of the trend toward monetization of quality-adjusted life-years (QALY) as we have seen in Josephine Mauskopf's presentation. Also, note that it is a short step from choosing a number for a QALY to having to choose a value of a statistical life for a study. On the downside, unless we measure the benefits in QALY's, the questions that can be answered with this method are fairly limited, and unless we monetize health benefits, the net benefits cannot be determined. Instead, only projects with identical outcomes can be ranked by their cost per physical benefit. This limitation may be fine if the research stays within one narrowly defined health outcome.

Health-Health Analysis

The sixth technique that we discussed was health-health analysis. In essence, health-health analysis evaluates policies by comparing a count of deaths prevented with a count of deaths induced by transferring income from individuals to the government in order to finance health and safety programs. One advantage of this technique is that it uses real markets and real tradeoffs. The premise is that if people pay for a policy that reduces a particular health or safety risk, their disposable income goes down, in effect reducing the amount that they can spend to protect themselves in other ways. This means that there could be an increase or decrease in their overall level of safety. One food safety example is the study by Kuchler *et al.* (1999) on oysters.

In cases where agencies are really averse to assigning dollars to a life, this is an alternate route that still maintains the spirit of cost-benefit analysis in that a net benefits figure can be calculated. It also provides some insight into income-risk tradeoffs. However, this approach acknowledges the general equilibrium nature of tradeoffs but then focuses on partial equilibrium tradeoffs.

Where Do We Go From Here?

The selection of a valuation technique for a particular research project depends largely on the goals of the project. And even when a particular valuation technique is selected, researchers will tailor the approach as necessary for the project. As previously mentioned, the 1989 NOAA panel provided guidelines and recommendations for contingent valuation. However, some of the other techniques are more broadly defined than contingent valuation and do not have similar guidelines.

The consensus of the breakout group was that we would like to see a panel discuss issues and come up with guidelines or recommendations about the different methodologies and about how to interpret the results. These guidelines could also cover the scope, role, and implementation of benefit-cost analysis. Perhaps a second panel could look at specific issues related to food safety and other similar health outcomes. We would like to see guidance for food safety but in a way that makes sense such as by identifying a class of risks. However, as a precursor to any panel, there needs to be a great effort made in organizing what is known about the methodologies to provide background for the panel to make their guidelines or recommendations. Also, the panel would benefit from a list of issues that need to be addressed.

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