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Fear Assessment: Cost-Benefit Analysis and the Pricing of Fear and Anxiety

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FEAR ASSESSMENT: COST-BENEFIT ANALYSIS AND THE PRICING OF FEAR AND ANXIETY

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INTRODUCTION

Death, illness, and injury are welfare-setbacks. So, too, is the fear of death, illness, and injury.[1] Yet at the level of regulatory practice, a striking asymmetry between the physical and psychological constituents of welfare has emerged. Cost-benefit analysis by the EPA, NHTSA, FDA, OSHA, and other environmental, health, and safety agencies typically includes a quantitative "risk assessment," where measures to reduce physical harm are under consideration.[2] The deaths, illnesses, and injuries avoided by the various interventions that the agency might undertake are enumerated and then, often, priced in dollar terms.[3] But these agencies almost never engage in *fear assessment* (to coin a term). They almost never enumerate and price the distressing mental states, such as fear, anxiety, worry, panic, or dread, that are causally connected to environmental, occupational, and consumer hazards and would (or at least might) be reduced by more stringent regulation.[4] In this Article, I argue against the

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1. *See* Matthew D. Adler, *Risk, Death and Harm: The Normative Foundations of Risk Regulation*, 87 MINN. L. REV. 1293, 1321–40, 1375–85 (2003).

2. *See* Office of Management and Budget, *Economic Analysis of Federal Regulations Under Executive Order 12866* § III.A.4 (January 11, 1996), *at* http://www.whitehouse.gov/omb/inforeg/riaguide.html (requiring that cost-benefit analyses of major rules include risk assessments); Robert W. Hahn et al., *Assessing Regulatory Impact Analyses: The Failure of Agencies to Comply with Executive Order 12,866*, 23 HARV. J.L. & PUB. POL'Y 859, 868 (2000) (examining forty-eight major nontransfer rules issued between 1996 and 1999 and finding that "[o]f those rules that listed benefits, approximately 70 percent described benefits in quantitative terms, either as a range or a best estimate").

3. *See* Hahn et al., *supra* note 2, at 870 ("[I]n 83 percent of the rules for which agencies identified safety benefits, the agency presented a monetized estimate of those benefits. In contrast, agencies monetized benefits for only 54 percent of the rules that identified health benefits.").

4. *See infra* text accompanying notes 16–21.

asymmetry—fear assessment should be a component of cost-benefit analysis ("CBA"), at least for an important subset of agency decisions—and I discuss at some length how best to measure fear and related kinds of psychological distress on a monetary scale.

A contrasting pair of recent administrative rulemakings will serve to illustrate the current and conceivable role of fear assessment in CBA. In the arsenic rulemaking, the EPA compared various levels of arsenic contamination in drinking water to the baseline level of fifty micrograms per liter, the legally acceptable level at the time.[5] Sophisticated risk assessment techniques were used to predict the number of bladder and lung cancer cases, both fatal and nonfatal, that would be avoided by reducing the arsenic level to twenty, ten, five, or three micrograms per liter.[6] Each fatal cancer avoided was valued at $6.1 million, and each nonfatal cancer at $607,000.[7] But the public's "peace of mind" from drinking less contaminated water was not quantified, let alone monetized[8]—even though the anxiety-reduction benefits here encompassed not merely the intrinsic benefit of being less anxious, but the reduction of costly aversive behaviors triggered by high perceived arsenic, such as drinking bottled water;[9] even though the public tends to be particularly fearful of toxic chemicals, and arsenic (unlike many other compounds) is popularly known to be a toxin;[10] and even though a fear assessment might have better justified the ultimate decision that the EPA did reach, since the monetized benefits of reduced cancer mortality and morbidity were smaller than regulatory costs at every arsenic level lower than the fifty micrograms per liter baseline.[11]

5. *See* National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring, 66 Fed. Reg. 6976 (Jan. 22, 2001) (codified at 40 C.F.R. pts. 9, 141, 142).

6. *Id.* at 7008–09.

7. *Id.* at 7012.

8. *See id.* at 7012, 7021.

9. *See* ABT ASSOCIATES, ARSENIC IN DRINKING WATER RULE ECONOMIC ANALYSIS, EPA 815-R-00-026, at 5-35 (Dec. 2000), *available at* http://www.epa.gov/safewater/ars/econ_analysis.pdf.

10. *See* Cass R. Sunstein, *The Arithmetic of Arsenic*, 90 GEO. L.J. 2255, 2261–63 (2002).

11. *See* National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring, 66 Fed. Reg. at 7016. *Cf.* JASON K. BURNETT & ROBERT W. HAHN, EPA'S ARSENIC RULE: THE BENEFITS OF THE STANDARD DO NOT JUSTIFY THE COSTS (2001), *available at* http://aei.brookings.org/admin/pdffiles/reg_analysis_01_02.pdf. Burnett and Hahn find that the costs of the arsenic rule outweigh the benefits even when a "high estimate" of nonquantifiable benefits, equaling four times the mortality-reduction benefit, is included in the analysis. *Id.* at 5–11. However, Burnett and Hahn use a relatively low monetary value for mortality-reduction ($1.1 million instead of the $6.1 million

The FDA's medical gloves rulemaking stands in sharp contrast to the EPA's arsenic decision.[12] The FDA used CBA to determine whether to reduce the acceptable defect rate of gloves, used by doctors and nurses to examine patients, from the current baseline of 4 percent to a lower level of 2.5 percent.[13] These defect rates serve as lot-specific regulatory triggers: if the proportion of defects in a sample of gloves from a particular lot exceeds the acceptable level, no gloves in the lot may be sold for medical use. The FDA calculated not merely the reduction in the rate of blood-borne illnesses associated with a lower defect level, but also the reduction in blood screening tests ordered by medical personnel who experience defective gloves. Specifically, the FDA determined that 0.6 cases of HIV, 0.6 cases of hepatitis, and roughly 100,000 blood screening tests would be avoided annually by lowering the defect rate to 2.5 percent.[14] The benefits of lower HIV and hepatitis mortality and morbidity were then monetized, but so too were the benefits of fewer screening tests—including both the avoided direct costs of testing and the anxiety-reduction benefit. The monetary value assigned to anxiety-reduction was thirteen dollars per test—the cost of the anxiety state experienced by a medical worker sufficiently worried by a defective glove to order a blood screen, an anxiety state that begins when the worker perceives the defect and that ends (in most cases!) when she learns the test results.

The FDA arrived at the thirteen dollar figure by measuring anxiety on a "QALY" scale, and then converting from QALYs to dollars. QALYs, or quality-adjusted life years, are a widely used welfare scale in health economics. The scale ranges from zero (for death) to one (for a perfect health state). The FDA reasoned:

> [Persons] who experience high levels of uncertainty due to the possibility of contracting serious, threatening diseases experience heightened levels of stress and anxiety until the results of the

assumed by the EPA), because they employ a relatively high discount rate (7 percent) to adjust the mortality-reduction benefit for latency. *Id.* at 6.

12. *See* Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. 15,404 (proposed Mar. 31, 2003) (to be codified at 21 C.F.R. pt. 800).

13. More specifically, the FDA's proposed rule lowers the acceptable defect rate for patient examination gloves to 2.5 percent, lowers the acceptable defect rate for surgeons' gloves to 1.5 percent, and makes certain other changes with respect to the regulation of glove quality. *See* Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria , 68 Fed. Reg. at 15,405.

14. *See* Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. at 15,408–13 (cost-benefit analysis of proposed rule).

> testing screens are negative. According to one measurement scale of well-being, reduced mental lucidity, depression, crying, lack of concentration, or other signs of adverse psychological sequence may detract as much as 8 percent from overall feelings of well-being. . . . Scaling of the relative stress caused by events shows that concerns of personal health, by themselves, are likely, on average, to contribute approximately one-sixth of the total weighting required to trigger a major stressful episode. Thus, FDA approximates that increased stress and anxiety concerning possible exposure to pathogens may reduce overall sense of well-being and result in a [QALY] loss of approximately 1.3 percent.
>
> . . . FDA has calculated an assumed [monetary value] of $373,000 for a statistical QALY [i.e., each year of life at a QALY value of 1]. This figure implies that the probability of each day of quality adjusted life has a social value of $1,022 ($373,000/365). If blood test results are usually obtained within 24 hours, the resultant loss of societal well-being for each test subject is valued at approximately $13 ($1,022 times 0.013).[15]

This is a remarkable piece of public deliberation. We might worry about the agency's QALYs-to-dollars methodology for pricing anxiety—an issue I will discuss below. But in any event the FDA deserves much applause for its analytic originality.[16] Quantitative fear assessment, as exemplified by the gloves rulemaking, is extremely rare in American practice. I examined all rulemakings in the AEI-Brookings Joint Center database of major rules.[17] The database comprises virtually all the "economically significant" rules issued by federal executive agencies during the period 1996–1999, other than transfer rules (those that simply redistribute wealth or income).[18] "Economically significant" rules are those for which agencies are required, by Presidential order, to prepare a formal cost-benefit analysis that is reviewed by the Office of Management and Budget.[19] There are forty-eight rulemakings in the database. In numerous cases agencies quantified and monetized death, illness, and physical injury, but in only a single instance—the FDA's mammography rulemak-

15. Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. at 15,413.

16. *Cf.* Eric Thunberg & Leonard Shabman, *Determinants of Landowner's Willingness to Pay for Flood Hazard Reduction*, 27 WATER RESOURCES BULL. 657, 657–58 (1991) (discussing attempt by the Army Corps of Engineers to monetize the psychological trauma caused by flooding).

17. *See* Hahn et al., *supra* note 2 (examining rulemakings in this database so as to assess agency compliance with the Presidential cost-benefit order).

18. *See id.* at 861–63 (describing criteria for including rulemakings in database); *id.* at 881–85 (listing rulemakings).

19. Exec. Order No. 12,866, 3 C.F.R. 638 (1994), *reprinted in* 5 U.S.C. § 601 (2000).

ing[20]—did an agency quantify or monetize fear, anxiety, or any other welfare-reducing mental states.[21]

Why is fear assessment so unusual? Part of the answer, surely, is normative: fear *is* difficult to predict and value, and thus agencies are often justified in resisting the measurement of fear. To put the point in cost-benefit terms: fear assessment has high deliberation costs, costs that are often not worth incurring, for example, if the population whose fears would be abated or inflamed by the agency decision is relatively small, or if the agency decision is not likely to have a causal influence on anxiety because the hazard being regulated is not "dreaded" or socially salient.[22] But this normative answer is incomplete since, as the FDA's gloves rulemaking illustrates, there will be instances in which (*ex ante*) fear assessment is justified: prediction and valuation can be anticipated to be relatively tractable; mortality- and morbidity-reduction benefits are not large enough, alone, to determine the agency's choice; the agency has reason, preanalytically, to think that the options under consideration will have substantial psychological effects, as compared to baseline; and so on. Nor can the answer be that fear, by contrast with death, illness, or injury, is too intangible to be cognizable by risk regulators—consider the wide range of intangible benefits that are now standardly recognized within environmental economics, such as the enjoyment experienced by visitors to parks or other protected areas, the recreational benefits of

20. *See* Quality Mammography Standards, 62 Fed. Reg. 55,852, 55,962–63 (Oct. 28, 1997) (final rule).

21. The forty-eight agency decisions in the AEI database were final rules or, in a few cases, interim final rules. I examined the published *Federal Register* statements accompanying these decisions, and did not examine earlier agency statements published when the rules were proposed, or the regulatory impact analyses that agencies prepared for OMB review or other agency cost-benefit analyses connected to the decisions, except insofar as these were excerpted in the *Federal Register*. It is possible that agencies in some of these rulemakings priced fear in the regulatory impact analyses but not the *Federal Register* statements. I saw no indication that agencies did indeed engage in nonpublic fear-pricing, but have not attempted to rule out the possibility. Still, the paucity of cases where agencies publicly quantify and monetize fear, by contrast with the frequent public pricing of death, is striking. By my count, agencies explicitly quantified and monetized death, illness, or injury in thirteen of the forty-eight *Federal Register* statements accompanying the final rulemakings, and quantified but did not monetize death, illness, or injury in seven instances.

It might be argued that agency failure to quantify and monetize fear rests upon the view that the monetized valuations of life (VOSLs) agencies employ already incorporate fear costs. *See infra* Part II (discussing the possibility of the "bundled" valuation of fear and risk through "tailored" VOSLs). But I found no indication that agencies are consciously using VOSLs in this way.

22. *See infra* text accompanying notes 83–89.

hunting and fishing,[23] the improved visibility that accompanies better air quality,[24] smell- or noise-avoidance,[25] the "scenic" benefit of viewing a nice landscape,[26] and the sheer satisfaction of knowing that a site, ecosystem, or species exists[27]—nor that fear and anxiety are too trivial, since real ongoing anxiety about a hazard can be a serious welfare setback indeed.[28]

Is it too fanciful to think that the explanation is, in part, historical—specifically, that a now-obscure Supreme Court decision from the early 1980s partly explains the near-universal agency reluctance to price fear? Most scholars of risk regulation are familiar with the Supreme Court's *Industrial Union Department v. American Petroleum Institute*[29] decision, from 1980, which spurred the growth of risk assessment by demanding that OSHA quantify the riskiness of a workplace toxin before regulating it. A few years later, in *Metropolitan Edison v. People Against Nuclear Energy*,[30] the Court rejected a claim by a group of Harrisburg residents, living near the Three Mile Island nuclear plant, that the Nuclear Regulatory Commission was required to file an environmental impact statement addressing the psychological effects of restarting the plant. The Court held that psychological distress was not, without more, an environmental impact triggering the statutory requirement (under the National Environmental Policy Act ("NEPA")) for an impact statement. It evinced concern about the deliberation costs in quantifying fear, and skepticism about the ability of agencies to distinguish between genuine fear, on the one hand, and mere political preferences, on the other.

> If contentions of psychological health damage caused by risk were cognizable under NEPA, agencies would . . . be obliged to expend

23. *See* A. MYRICK FREEMAN III, THE MEASUREMENT OF ENVIRONMENTAL AND RESOURCE VALUES 417–52 (2d ed. 2003) (discussing valuation of recreational benefits associated with natural resource systems, including fishing, hunting, boating, hiking, and camping).

24. *See, e.g.*, Raymond Kopp et al., *Cost-Benefit Analysis and Regulatory Reform*, 3 HUM. & ECOL. RISK ASSESSMENT 787, 806–07(1997).

25. *See, e.g.*, Eran I. Feitelson et al., *The Impact of Airport Noise on Willingness to Pay for Residences*, 1 TRANSP. RES. (PART D) 1 (1996).

26. *See, e.g.*, B. R. Bamber & Gaby Khoury, *Contingent Valuation of Landscape*, 135 PROC. INSTITUTION OF CIVIL ENGINEERS—TRANSP. 185 (1999).

27. *See* FREEMAN, *supra* note 23, at 137–59 (discussing nonuse values).

28. *See* Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025, 2030–41 (1999).

29. 448 U.S. 607 (1980) (plurality opinion); *see also* John D. Graham, *The Risk Not Reduced*, 3 N.Y.U. ENVTL. L.J. 382, 386 (1995) (describing *Industrial Union* as "[t]he turning point for quantitative risk assessment").

30. 460 U.S. 766, 779 (1983).

> considerable resources developing psychiatric expertise that is not otherwise relevant to their congressionally assigned functions. . . . [Further,] [a]nyone who fears or dislikes a project may find himself suffering from "anxiety, tension[,] fear [and] a sense of helplessness."[31]

Metropolitan Edison is, in effect, the negative counterpart to *Industrial Union*. Had *Industrial Union* been decided differently, risk assessment would be less central to decisionmaking at OSHA and, arguably, other federal agencies too. The whole discipline of risk assessment might not have developed nearly so rapidly. And, had *Metropolitan Edison* been decided differently, fear assessment would be more than a gleam in this scholar's eye. Agencies would have been required to characterize fear for NEPA purposes; that would have pushed them to quantify fear, and the step from quantification to monetization is not so large, given the "contingent valuation" techniques[32] now widely used to monetize the environmental intangibles mentioned above.

Historical speculation stops here. The thrust of this Article is normative. *Metropolitan Edison* may be rightly decided as a matter of NEPA, but legal requirements that agencies engage in cost-benefit analysis (statutory requirements or the generic Presidential order) are a different matter. Part I of the Article argues that fear assessment should be part of the practice of CBA by environmental, health, and safety agencies, at least in a nontrivial set of cases.[33] The remainder of

31. *Id.* at 776–77.

32. *See infra* Part III.

33. I and others have suggested that agencies should include fear-reduction benefits in cost-benefit analysis. *See* Adler, *supra* note 1, at 1395–1401; Eric A. Posner, *Fear and the Regulatory Model of Counterterrorism*, 25 HARV. J.L. & PUB. POL'Y 681, 687–88 (2002); Cass R. Sunstein, *Cognition and Cost-Benefit Analysis*, *in* COST-BENEFIT ANALYSIS: LEGAL, ECONOMIC, AND PHILOSOPHICAL PERSPECTIVES 223, 258 (Matthew D. Adler & Eric A. Posner eds., 2001). Indeed, Thomas Schelling suggested as much almost forty years ago in his seminal work on monetizing death. T. C. Schelling, *The Life You Save May Be Your Own*, *in* PROBLEMS IN PUBLIC EXPENDITURE ANALYSIS 127, 145–46 (Samuel B. Chase, Jr. ed., 1968). The current article builds on these suggestions, and on a very small theoretical and empirical literature in economics that addresses how a money measure of fear should be constructed and seeks to estimate fear's monetary (dis)value. *See* Mordechai Shechter, *Incorporating Anxiety Induced by Environmental Episodes in Life Valuation*, *in* 2 APPLIED BEHAVIOURAL ECONOMICS 529 (Shlomo Maital ed., 1988); M. Shechter & M. Zeidner, *Anxiety: Towards a Decision Theoretic Perspective*, 43 BRIT. J. MATH. & STAT. PSYCH. 15 (1990); sources cited *infra* notes 140, 150–51.

This Article's focus is CBA. On the related problem of quantifying fear, anxiety, and other mental states for purposes of environmental impact assessment or "social impact assessment," see Hillary S. Egna, *Psychological Distress as a Factor in Environmental Impact Assessment: Some Methods and Ideas for Quantifying this Intangible Intangible*, 15 ENVTL. IMPACT ASSESSMENT REV. 115 (1995); Kurt Finsterbusch, *Psychological Impact Theory and Social*

the Article explores the subtleties of pricing fear. Part II argues, with some qualifications, for *unbundled valuation*. In other words, the cost of fear and anxiety plausibly should be measured separately from the cost of those physical events (death, injury, illness) that are the objects of fear and anxiety states. Two sorts of methodologies are generally used by cost-benefit analysts to ascribe costs and benefits: revealed-preference studies and contingent-valuation studies. In Part III, I suggest that the latter technique is best suited to measuring the unbundled cost of fear and anxiety. The contingent-valuation technique is an interview technique: the respondent is asked whether he or she would be willing to pay a certain sum of money for a benefit, or willing to accept a certain sum in return for a welfare-setback.

Part IV discusses some foundational issues relevant to the design of contingent-valuation studies for valuing fear. Who participates in the study (fearful people, or rather calm people who can remember or imagine being fearful)? What is being valued: feared events, or the fear state itself? How should we untangle the intrinsic hedonic cost of fear from its instrumental effects (for example, the way anxiety can ruin relationships, hinder consumption, slow the growth of wealth, or interfere with careers)? Part IV also considers the indirect, QALY-to-dollars technique for monetary valuation that health economists increasingly employ, and that the FDA used to price fear in the gloves rulemaking. This technique is appropriate, I suggest, but only if the QALY scale is truly a *welfare* scale. Money, within CBA, functions as the universal metric for well-being. QALYs can function this way too, but too often researchers conceptualize the QALY scale as a measure of "health" rather than of well-being.

It is common for theorists of risk regulation to argue that agencies should be responsive to the "dread" of the citizenry. Lay and expert judgments of risk differ; this difference arises because lay judgments of the riskiness of a hazard track not merely the aggregate fatalities that are expected to result from the hazard, but the hazard's familiarity, controllability, and, crucially, how "dreaded" it is; and a democratic practice of risk regulation should hinge, in turn, on popular perceptions of riskiness.[34] This is a familiar line of analysis; my

Impacts, 1 IMPACT ASSESSMENT BULL. 71 (1982); John Lounsbury et al., *Psychosocial Assessment*, *in* SOCIAL IMPACT ASSESSMENT METHODS 215 (Kurt Finsterbusch et al. eds., 1983).

34. *See* Cass R. Sunstein, *The Laws of Fear*, 115 HARV. L. REV. 1119, 1144–60 (2002) (describing and criticizing Paul Slovic's populist approach to risk regulation); K. S. SHRADER-FRECHETTE, RISK AND RATIONALITY: PHILOSOPHICAL FOUNDATIONS FOR POPULIST REFORMS 89–99 (1991).

argument is very different. The account presented here is technocratic, not democratic. Risk regulation should track social welfare, not popular risk perceptions. CBA is a technocratic tool for maximizing social welfare. Yet technocratic risk regulation need not focus narrowly on mortality and morbidity. It should focus (prima facie) on all constituents of welfare, including fear and anxiety.

In effect, my view lies between the democrats' and the naive technocrats'. Popularly perceived risk should not determine risk regulation; the anxiety and dread that flow from popular risk perceptions is simply one welfare impact among the multitude of costs and benefits flowing from hazards; but neither should risk regulation reduce to counting deaths or injuries, to a crude minimization of physical impacts or a simplistic balancing in which death- and injury-reduction are the sole regulatory benefits that are seen to counterbalance compliance costs.

I. DEFENDING FEAR ASSESSMENT

What is fear? Philosophers nowadays tend to analyze fear as a package of belief, desire, physical arousal, and unpleasant affect.[35] P is afraid if he (1) believes that he may be harmed and wants not to be harmed (paradigmatically if he believes that some physical change to his body, which he strongly disprefers, may occur); (2) experiences physical arousal such as rapid heartbeat, perspiration, or upset stomach, as a result of the belief that harm may occur; and (3) also experiences an ineffable feeling or sensation of distress. Anxiety is, intuitively, different from fear. The difference may be that anxiety is targeted at a harm that the subject believes he lacks any ability to flee; or that the object of anxiety is more "indefinite" than the object of fear, in the sense that the anxious subject lacks a clear picture of the possible harm or a clear understanding of its likelihood.[36] Fear and anxiety, in turn, are different from phobia. Fear and anxiety

35. *See* Wayne A. Davis, *The Varieties of Fear*, 51 PHIL. STUD. 287 (1987). Philosophical accounts similar to Davis's are cited in Adler, *supra* note 1, at 1377 n.229. The psychological literature on fear and anxiety is large and heterogeneous. Its various subliteratures focus on one or another component of full-blown fear (the cognitive, behavioral, affective, or somatic component), or on some combination of these. For summaries, see DAVID H. BARLOW, ANXIETY AND ITS DISORDERS: THE NATURE AND TREATMENT OF ANXIETY AND PANIC (1988); Arne Ohman, *Fear and Anxiety as Emotional Phenomena: Clinical Phenomenology, Evolutionary Perspectives, and Information-Processing Mechanisms*, *in* HANDBOOK OF EMOTIONS 511 (Michael Lewis & Jeannette M. Haviland-Jones eds., 2000).

36. *See* Ohman, *supra* note 35, at 512; IAIN WILKINSON, ANXIETY IN A RISK SOCIETY 18–21 (2001).

entail a full-fledged *belief* that harm might occur; by contrast, phobia is a state of distress and arousal triggered by the mere thought of possible harm.[37] I desire not to fall from the high building, but know that, given the high guard-rail in front of me, I will not. Still, I am phobically aroused and upset.

In this Article, I argue that environmental, health, and safety agencies should engage in fear assessment: they should quantify and monetize the fear states that would result from regulatory choices. The analysis carries over to anxiety; to phobia states (for example, phobias concerning a nuclear plant that nearby residents believe to be quite safe, but can't help thinking about in a fearful way); and to all other structurally similar mental states, such as dread, worry, apprehension, panic, or terror, wherein the subject's cognition (thought or belief) about the possibility of his being harmed is married with a desire not to be harmed, with physical arousal, and with a sense of distress. The terms "fear" and "anxiety" are used below to refer to fear in the strict sense, to anxiety in the strict sense, and to phobia, dread, apprehension, worry, terror, panic, and other such cognitive/conative/physiological/affective hybrids.[38]

What about other welfare-reducing mental states, such as sadness, depression, misery, demoralization, anomie, boredom, and many others? For that matter, what about welfare-enhancing mental states, like cheerfulness, happiness, serenity, excitement, and pleasure?[39] Shouldn't agencies generally engage in a broad practice of

37. This distinction between fear and phobia builds on a salient distinction within the philosophical literature on fear—the distinction between belief and mere thought—and may not track the way psychologists differentiate the two states. *See* John Deigh, *Cognitivism in the Theory of Emotions*, 104 ETHICS 824, 835–42 (1994); John Morreall, *Fear Without Belief*, 90 J. PHIL. 359 (1993); Kendall L. Walton, *Fearing Fictions*, 75 J. PHIL. 5, 6–10 (1978). The belief/thought distinction has welfare relevance; but since both phobia and fear *are* harmful compared to a calm baseline, and closely related if not identical mental states, I do not emphasize the fear/phobia distinction in my analysis below. *See* Adler, *supra* note 1, at 1383–84.

38. I focus on fear rather than "stress," which is not a type of mental state but rather a fuzzier category used to refer to the range of welfare effects, physiological as well as psychic, and sometimes if not often positively rather than negatively valenced, that "stressful"—demanding—events can have on persons. Anxiety is one psychic aspect of stress. On stress, see generally FIONA JONES & JIM BRIGHT, STRESS: MYTH, THEORY AND RESEARCH (2001); MEASURING STRESS: A GUIDE FOR HEALTH AND SOCIAL SCIENTISTS (Sheldon Cohen et al. eds., 1995).

39. *See* Arthur A. Stone, *Measurement of Affective Response*, *in* MEASURING STRESS: A GUIDE FOR HEALTH AND SOCIAL SCIENTISTS, *supra* note 38, at 148, 151–53 (categorizing a wide range of specific affective states as combinations of two dimensions, "positive affectivity" and "negative affectivity").

hedonic assessment, including but not limited to fear assessment?[40] This seems incorrect. As discussed at greater length below, the proper scope of fear assessment (and, by extension, of hedonic assessment) is limited by deliberation costs. And fear is sufficiently different from other harmful (to say nothing of beneficial) mental states, both in its causal linkage to agency choice and in its welfare impact, that in some choice situations agencies will be justified in engaging in fear assessment but not a broader hedonic assessment. The causal difference has to do with the cognitive component of fear states. Fear states partly consist in thoughts or beliefs about risky things, including the serious hazards regulated by environmental, health, and safety agencies. Regulatory mitigation of these hazards will tend to have a more direct causal effect on fear and anxiety—or at least a different kind of causal effect—than on welfare-reducing states, such as sadness or listlessness, that are not essentially cognitive.[41]

Further, given the welfare difference between fear and other mental states, in other situations agencies will be justified in conducting fear assessment as a *component* of hedonic assessment, *i.e.*, in using fear/anxiety, rather than some more generic grouping, as one particular type of hedonic impact—with its own particular unit cost—that agency choices might have. Finally, the cognitive component of fear makes the pricing of fear states especially tricky. In short, fear assessment should plausibly be a separable component of hedonic assessment, and I therefore analyze it separately in this Article.

So much for the nature of fear. Why incorporate fear costs within CBA?

Overall welfare is a morally important, if not conclusive, consideration bearing on governmental choice.[42] CBA is in many cases the optimal decision-procedure for a governmental official concerned to

40. *See* BRUNO S. FREY & ALOIS STUTZER, HAPPINESS AND ECONOMICS: HOW THE ECONOMY AND INSTITUTIONS AFFECT WELL-BEING 175–77 (2002).

41. Toxins could also cause fear and related mental states through a physiological rather than cognitive mechanism, by producing physiological changes that in turn produce negative affects and other components of fear. *See* Moshe Zeidner & Mordechai Shechter, *Psychological Responses to Air Pollution: Some Personality and Demographic Correlates*, 8 J. ENVTL. PSYCHOL. 191, 205 (1988). *But see* Evelyn Bromet et al., *Psychosocial Correlates of Occupational Lead Exposure*, *in* 6 ADVANCES IN ENVIRONMENTAL PSYCHOLOGY 19, 28 (Allen H. Lebovits et al. eds., 1986). Fear thus produced, like fear produced through risk perceptions or other cognitions, is costly and thus (at least prima facie) should be included in fear assessment. Conceivably, if prediction costs differ substantially for the two kinds of fear, CBA might justifiably incorporate one but not the other.

42. *See* Matthew D. Adler, *Beyond Efficiency and Procedure: A Welfarist Theory of Regulation*, 28 FLA. ST. U. L. REV. 241, 302–13 (2000); Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 209–16 (1999).

determine which of the choices open to her maximizes overall well-being.[43] "Costs" and "benefits," for CBA purposes, are improvements and setbacks with respect to welfare. So if fear/anxiety is a kind of welfare setback, there is a prima facie case for including fear/anxiety costs within the CBA analysis. And, clearly, fear/anxiety *is* a welfare setback. The law has long recognized this in areas other than administrative practice: for example, in the ancient tort of assault; in the more modern emotional-distress torts (epitomized by intentional fear-infliction, although unlike assault not limited to fear-infliction); and in the compensability of fear as a component of pain and suffering damages.[44] Although the nature of well-being remains contested—the long scholarly debate about hedonic versus preferentialist versus objectivist accounts of welfare continues unabated—fear is a welfare-setback on all of these accounts.[45] Fear, like pain, essentially involves an unpleasant feeling. So only the masochist could prefer to be anxious; normal types typically prefer the opposite. And the best objectivist accounts, such as Martha Nussbaum's,[46] recognize emotional and psychological well-being as one dimension of human welfare; they also recognize other dimensions (such as friendship, professional accomplishment, or aesthetic experience) that fear or anxiety would tend to interfere with.

I have recently come to the view that the relevant account of human well-being, for CBA purposes, is an objectivist account—not a preferentialist or hedonic account. CBA, again, implements overall welfare. But overall welfare depends on the balance of objective goods and bads. Except in the special case where one governmental choice is Pareto-superior—a case rarely if ever encountered by regulatory agencies—individual preferences provide no basis for determining which choice maximizes aggregate welfare.[47] And hedonic views of welfare are just too narrow. Hedonism, for example, would not recognize the forced inactivity of a person crippled by fear as a grave intrinsic welfare loss additional to the hedonic cost of her fear. Still, it is worth emphasizing that my prima facie case for

43. *See* Adler & Posner, *supra* note 42, at 225–43; Matthew D. Adler & Eric A. Posner, *Implementing Cost-Benefit Analysis When Preferences are Distorted*, *in* COST-BENEFIT ANALYSIS, *supra* note 33, at 269, 272–80.

44. *See* Adler, *supra* note 1, at 1380.

45. For a summary of these accounts and the philosophical debate about them, see *id.* at 1303–10.

46. *See* MARTHA C. NUSSBAUM, WOMEN AND HUMAN DEVELOPMENT: THE CAPABILITIES APPROACH 34–110 (2000).

47. *See* Adler, *supra* note 42, at 289–96.

governmental fear assessment holds good across all the standard welfare theories, not just objectivism.

This case holds good, I think, whether or not the fear takes the form of classic fear or anxiety as opposed to phobia, and—in the case of classic fear or anxiety—whether or not the belief component of the fear is rational or irrational. Jim is irrationally certain that his chance of dying on a bumpy airplane ride is one in one hundred, and is quite distressed during the six hour ride. June rationally believes that the chance of dying from a immunological disease, with which she has just been diagnosed, is one in one hundred, and like Jim is quite distressed for the six hours until she learns that the diagnosis was erroneous. Both Jim and June suffer welfare losses, I suggest, on the objectivist as well as hedonic and preferentialist views of welfare. Arguably, June's loss is greater, since her distress is epistemically warranted while Jim's is not.[48] Were fear assessment wonderfully refined, that difference might be attended to by regulators. But a flat refusal to see irrational fear as a welfare setback and thus a kind of cost that, prima facie, should be incorporated in CBA, would be mistaken.

If fear is a welfare setback, why shouldn't agencies price it? What would overcome the prima facie case just presented for including fear costs in CBA? One worry concerns *quantification*: that the fear states resulting from governmental choices cannot be characterized in numerical terms, and thus cannot be valued monetarily and incorporated in the overall calculus of costs and benefits. I agree that fear must be quantified before it can be priced, but deny that quantification (as such) is a problem. At a minimum, individuals can be placed in the complementary categories of fearful or unafraid, anxious or not, and quantities such as fear-hours or anxiety-days (the aggregate time during which individuals are in the negative psychological state) can be measured. This is what the FDA did in the gloves rulemaking.[49] In fact, much more finely calibrated scales for measuring fear and anxiety are standardly used by psychiatrists and experimental psychologists, such as the Spielberger State-Trait Anxiety Inventory, the Hamilton Anxiety Rating scale, the Beck Anxiety Inventory, and the Covi Anxiety Scale.[50] These scales, administered by observers or

48. *See* Adler, *supra* note 1, at 1382–84.

49. *See* Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. 15,404, 15,413 (Mar. 31, 2003).

50. *See* PRACTITIONER'S GUIDE TO EMPIRICALLY BASED MEASURES OF ANXIETY (Martin M. Antony et al. eds., 2001); Eric D. Peselow, *Outcome Measurement in Anxiety Disorders*, *in* OUTCOME MEASUREMENT IN PSYCHIATRY: A CRITICAL REVIEW 191 (Waguih William

by subjects themselves, assign numbers to fear states, depending on some function of the observed or self-reported mix of somatic, affective, and cognitive states experienced by the fearful subject plus his behaviors.[51] And the scales, or at least some of them, are seen by scholars in the field to be reasonably "reliable" (in the sense of producing replicable results) and "valid" (in the sense of tracking the states they purport to measure).[52]

An external skeptic might object that fear/anxiety scales, perhaps psychometric scales in general, cannot be valid, regardless of what the psychologists and psychiatrists might believe. Ascribing numbers to fear states is a meaningless exercise. But the objection is misconceived. Numbers measuring the subject's arousal are validated by the physiological states constitutive of arousal: the heart rate, the amount of perspiration, the breathing speed. Numbers measuring the subject's desires (how intensely does he disprefer the physical impact that he fears) and beliefs (to what degree does he believe that the impact will occur) are validated, respectively, by his utilities and by his subjective probabilities. For more than half a century, since the seminal work of von Neumann, Morgenstern, and Savage, economists have accepted that preference and belief can be measured on cardinal scales.[53] Skepticism is perhaps most plausible with respect to the scaling of the affective component of fear.[54] What does it mean to say that Sally's degree of distress rates 8 on a 0–10 scale? I will bracket the question of whether it is meaningful to speak of affective intensity apart from welfare. At a minimum, subjects can be asked (in principle) to rate affective states on a cardinal scale, with the top number representing maximum well-being, and the bottom number minimum well-being, using the standard gamble technique deriving (once more) from von Neumann and Morgenstern and now popular within the QALY literature.[55] Health economists accept that the intensity of a headache,

IsHak et al. eds., 2002); M. Katherine Shear et al., *Anxiety Disorders Measures, in* HANDBOOK OF PSYCHIATRIC MEASURES 549 (Task Force for the Handbook of Psychiatric Measures ed., 2000).

51. Among other things, the subject's performance on tests of attention, memory and task completion may well be a useful measure of her anxiety. *See* Ben Searle et al., *Cognition, Stress and Anxiety, in* STRESS: MYTH, THEORY AND RESEARCH, *supra* note 38, at 89, 95–106.

52. *See* sources cited *supra* note 50 (discussing reliability and validity of anxiety scales).

53. *See* Matthew D. Adler, *The Puzzle of "Ex Ante Efficiency": Does Rational Approvability Have Moral Weight?*, 151 U. PA. L. REV. 1255, 1257 n.2 (2003) (citing sources).

54. *See* Stone, *supra* note 39 (discussing measurement of affect).

55. *See infra* text accompanying notes 175–79.

an angina attack, or bronchitis is cardinally measurable;[56] so, too, is the intensity of fear and anxiety.

The quantification objection to fear assessment is belied by a body of empirical work where standard anxiety scales, or similar instruments, are used to quantify anxiety and related psychological states associated with various hazards.[57] For example, Zeidner and Shechter used the Spielberger State-Trait Anxiety Inventory and another self-report anxiety scale to measure the correlation of anxiety with perceived and actual air pollution among residents of the Haifa Bay Area, an industrial region of Israel.[58] Gibbs used the Spielberger scale to study anxiety in the populations near landfills found to contain hazardous toxics.[59] Dohrenwend and his co-authors used the Demoralization Scale to quantify psychological distress resulting from the Three Mile Island accident.[60] The Demoralization Scale, like the Spielberger measure, is a self-report measure that asks about affects, cognitions, and perceived somatic states; it seeks to track all forms of distress, including but not limited to anxiety. Bachrach and Zautra used surveys incorporating the Demoralization Scale to determine the degree of distress among residents of Rainbow Valley, Arizona, site of a proposed hazardous waste site.[61] Markowitz and Gutterman used the scale to measure distress in Staten Island, New York and Linden-Perth Amboy, New Jersey, shortly after accidental releases of toxic chemicals near those communities.[62] Lebovits and his co-authors in-

56. *See generally* VALUING HEALTH FOR POLICY: AN ECONOMIC APPROACH (George Tolley et al. eds., 1994).

57. A related body of work quantifies the traumatic effect of disasters. *See, e.g.*, Bonnie L. Green et al., *Levels of Functional Impairment Following a Civilian Disaster: The Beverly Hills Supper Club Fire*, 51 J. CONSULTING & CLINICAL PSYCH. 573 (1983); Ronald W. Perry, *Environmental Hazards and Psychopathology: Linking Natural Disasters with Mental Health*, 7 ENVTL. MGMT. 543 (1983).

58. *See* Zeidner & Shechter, *supra* note 41; *see also id.* at 191–92 (discussing other studies of the linkage between air pollution and anxiety or other negative mental states).

59. Margaret S. Gibbs, *Psychological Impacts of Toxic Exposure in Third World Countries: An Extrapolation*, 8 IMPACT ASSESSMENT BULL. 7, 9 (1990).

60. Bruce P. Dohrenwend, *Psychological Implications of Nuclear Accidents: The Case of Three Mile Island*, 59 BULL. N.Y. ACAD. MED. 1060 (1983); Bruce P. Dohrenwend et al., *Stress in the Community: A Report to the President's Commission on the Accident at Three Mile Island*, 365 ANNALS N.Y. ACAD. SCI. 159 (1981).

61. Kenneth M. Bachrach & Alex J. Zautra, *Assessing the Impact of Hazardous Waste Facilities: Psychology, Politics, and Environmental Impact Statements*, *in* 6 ADVANCES IN ENVIRONMENTAL PSYCHOLOGY; EXPOSURE TO HAZARDOUS SUBSTANCES: PSYCHOLOGICAL PARAMETERS 71 (Allen H. Lebovits et al. eds., 1986) [hereinafter ADVANCES IN ENVIRONMENTAL PSYCHOLOGY].

62. Jeffrey S. Markowitz & Elane M. Gutterman, *Predictors of Psychological Distress in the Community Following Two Toxic Chemical Incidents*, *in* 6 ADVANCES IN ENVIRONMENTAL PSYCHOLOGY, *supra* note 61, at 89.

terviewed asbestos workers and controls to determine the correlation between perceived health risk and psychopathology; psychopathology was quantified with the Current and Past Psychopathology Scales, an observer-rated scale that includes a subscale for depression and anxiety.[63] Davidson and her co-authors compared stress among persons living near Three Mile Island to controls by using three different measures: a self-report measure of psychological stress, the Symptom Checklist-90, which covers anxiety, fear, depression, and related states; a behavioral measure of persistence and concentration, on the theory that stress impairs both (subjects were asked to solve a puzzle and complete a proofreading task); and a urine sample for elevated levels of epinephrine and norepinephrine.[64]

So much for quantification. A different objection concerns *uncertainty*. A hazard will cause some distribution of fear states in the population, and these states can (in principle) be measured on a numerical scale like the Spielberger State-Trait Anxiety Inventory. But regulators will never be in a position to know what the true distribution is—or so the objection goes. Yet uncertainty is a pervasive feature of regulatory choice. Risk assessors, for example, are always uncertain about the number of deaths that would result from hazards.[65] Consider a carcinogenic toxin in a waste dump. There are a wide range of possible exposure scenarios, by which the toxin is spread to larger or smaller groups of persons in larger or smaller

63. Allen H. Lebovits et al., *The Case of Asbestos-Exposed Workers: A Psychological Evaluation*, *in* 6 ADVANCES IN ENVIRONMENTAL PSYCHOLOGY, *supra* note 61, at 3.

64. Laura M. Davidson et al., *Toxic Exposure and Chronic Stress at Three Mile Island*, *in* 6 ADVANCES IN ENVIRONMENTAL PSYCHOLOGY, *supra* note 61, at 35. Andrew Baum, a co-author on this study, published several other similar quantitative studies of the psychological effects of Three Mile Island. *See* Andrew Baum et al., *Emotional, Behavioral, and Physiological Effects of Chronic Stress at Three Mile Island*, 51 J. CONSULTING & CLINICAL PSYCH. 565 (1983); Andrew Baum et al., *Stress at Three Mile Island: Applying Social Psychology to Psychological Impact Analysis*, in 3 APPLIED SOCIAL PSYCHOLOGY ANNUAL 217 (1982). Further scholarship in this vein includes the Dohrenwend studies mentioned *supra*, note 60; JOHN SORENSEN ET AL., IMPACTS OF HAZARDOUS TECHNOLOGY: THE PSYCHO-SOCIAL EFFECTS OF RESTARTING TMI-1 (1987); the studies summarized in U.S. NUCLEAR REGULATORY COMMISSION, WORKSHOP ON PSYCHOLOGICAL STRESS ASSOCIATED WITH THE PROPOSED RESTART OF THREE MILE ISLAND, UNIT 1, 18–31 (1982); and studies cited in Markowitz & Gutterman, *supra* note 62.

65. On the topic of uncertainty in risk assessment, see, e.g., ALISON C. CULLEN & H. CHRISTOPHER FREY, PROBABILISTIC TECHNIQUES IN EXPOSURE ASSESSMENT: A HANDBOOK FOR DEALING WITH VARIABILITY AND UNCERTAINTY IN MODELS AND INPUTS (1999); M. Granger Morgan, *Uncertainty Analysis in Risk Assessment*, 4 HUMAN & ECOL. RISK ASSESSMENT 25 (1998); Elisabeth Paté-Cornell, *Risk and Uncertainty Analysis in Government Safety Decisions*, 22 RISK ANALYSIS 633 (2002); Pamela R. D. Williams & Dennis J. Paustenbach, *Risk Characterization*, *in* HUMAN AND ECOLOGICAL RISK ASSESSMENT: THEORY AND PRACTICE 293, 336–45 (Dennis J. Paustenbach ed., 2002).

quantities, depending both on the physics of the "fate and transport" of the carcinogen away from the dump and the demographics of the surrounding population. It is also highly uncertain, for a given population exposed to a given amount of the carcinogen, what the aggregate number of resulting deaths will be; the mechanisms of cancer remain unclear, and even taking as given one or another causal model of cancer, the degree of toxicity of a particular substance (in effect, a model parameter) will not be known with certainty. None of this is a conceptual obstacle to CBA (bracketing deliberation costs, a point to which I will return in a moment). For example, probabilities can be assigned to each exposure scenario, and to each possible number of aggregate premature deaths within each scenario, and can be combined using probability theory to predict a mean number of deaths—then used as an input for CBA.

Parallel techniques can be imagined for handling uncertainty within fear assessment. Assume that the basic unit that agencies properly employ for quantifying fear is the *fear-day*: a day during which the individual is substantially more fearful or anxious than population norms.[66] This is just the kind of unit now regularly employed by agencies and health economists for cost-benefit analysis of acute physical morbidities such as headaches, angina, congestion, coughing, sneezing, nausea, or eye irritation. Monetary prices are assigned to headache-days, angina-days, congestion-days, etc.[67] For a given person (characterized by the fear assessor, in more or less detail, to include some if not all[68] of the characteristics that might influence fearfulness, such as her personality makeup, her awareness of the hazard being evaluated for regulation, her physical proximity to the hazard, its social salience, etc.) and a given day and a given regulatory choice (either the baseline choice of inaction or some other regulatory choice), the assessor can ascribe a probability that the

66. Agencies could perhaps use the fear-day unit to capture the instrumental as well as intrinsic costs of fear, by ignoring the dependency of instrumental costs on subjects' nonhedonic as well as hedonic characteristics, and assuming a simple, linear correlation between the number of fear-days each subject experiences and fear's instrumental costs for him or her. However, fear-days would more naturally be used to capture merely the intrinsic cost of fear. On the intrinsic/instrumental distinction, see *infra* Part IV.A.

67. *See* F. Reed Johnson et al., *Valuing Morbidity: An Integration of the Willingness-to-Pay and Health-Status Index Literatures*, 16 J. HEALTH ECON. 641, 644–45, 650–51 (1997); George Tolley et al., *State-of-the-Art Health Values*, *in* VALUING HEALTH FOR POLICY: AN ECONOMIC APPROACH, *supra* note 56, at 323, 329–36.

68. Deliberation costs would warrant agencies in undertaking a limited rather than more complete description of the traits of the various persons whose anxiety levels could be affected by agency choices. On deliberation costs, see *infra* text accompanying notes 83–89.

person will be fearful on that day. From these probability ascriptions, the agency can determine, for each regulatory choice and each person, the mean number of fear-days that the person might experience. Summing across the population, the assessor can determine the mean incremental number of total fear-days that might occur as a result of each regulatory option, relative to baseline.

Standard monetary values for the value of avoiding a fear-day—analogous to the standardized values for avoiding premature death that agencies are beginning to employ,[69] and the standardized monetary values for avoiding morbidity that are also now emerging[70]—can be calculated, using the contingent-valuation techniques I will discuss below. These monetary values can be combined with the estimates of total incremental fear-days to produce a total monetized fear cost or benefit for each regulatory option, relative to baseline. For example, if the standard value for avoiding a fear-day is $50, and the mean number of total fear-days that might occur if some regulatory option were chosen is 100,000 less than the mean baseline number of total fear-days, the total value of fear-saving is $5 million ($50 multiplied by 100,000).

The format for fear assessment just described is robust with respect to uncertainty, and seems quite plausible because it parallels techniques currently employed by agencies for quantifying and pricing mortality and morbidity. Different formats can also be imagined: for example, measuring fear in units more finely or coarsely calibrated than fear-days; allowing the cost of a fear-day to vary with the subject's wealth, age, and other characteristics, rather than using a standard value; or directly pricing the lotteries over fear states produced for each individual by each regulatory option rather than using those lotteries to derive a mean number of fear-days and then pricing those days. These, too, are robust with respect to uncertainty.

I have thus far rebutted the quantification and uncertainty objections to fear assessment. Skeptics might also worry about *causality*. The quantifiability of fear is necessary but insufficient for fear assessment: the analyst needs to predict the fear states that will be caused by hazards and abated by regulatory intervention. But what, really, is the objection here? Causal models linking hazards and fear states can surely be developed. These can be rough, informal, "folk"

69. *See, e.g.*, Donald Kenkel, *Using Estimates of the Value of a Statistical Life in Evaluating Consumer Policy Regulations*, 26 J. CONSUMER POLICY 1 (2003) (surveying agency practice).

70. *See* sources cited *supra* note 67.

models. The FDA in the gloves rulemaking relied, in effect, on a folk model of fear-causality: it assumed, without formal modeling, that an event sufficiently elevating an individual's perceived probability of infection by blood-borne pathogens to prompt her to undergo testing would cause a fear state in her, lasting until the time that infection was ruled out. More formal models are also possible, no less here than for other social and psychological phenomena. For example, in their study of the psychological effects of the Three Mile Island accident, John Sorensen and his co-authors employed a multi-factorial model that correlated an individual's fear with his or her distance from the plant, socio-economic status, family size, trust in plant management, and other factors.[71]

To be sure, given the contested state of social and psychological science, experts have not converged (and cannot be expected to converge any time soon) on a single, consensus model linking hazards and fear states. Some of the literature on risk perception suggests that perceived differences in the riskiness of hazards (and, by extension, differences in resulting fear states) are produced by a rich, lay normative framework that focuses on generic features of hazards, such as controllability, familiarity, and inequity of the resulting distribution of fatalities.[72] By contrast, other work emphasizes the role of various biases or mistakes in producing popular perceptions. On this view, citizens evaluate hazards (and, by extension, would tend to fear hazards) by engaging in an intuitive, but often quite inaccurate, cost-benefit analysis.[73] Yet a different strand in the scholarship sees fear-causation as a dynamic, social process, involving the "availability" heuristic and informational or reputational "cascades" manipulated by political entrepreneurs.[74]

71. *See* SORENSEN ET AL., *supra* note 64, at 95–121.

72. *See generally* PAUL SLOVIC, THE PERCEPTION OF RISK (2000).

73. *See generally* HOWARD MARGOLIS, DEALING WITH RISK: WHY THE PUBLIC AND THE EXPERTS DISAGREE ON ENVIRONMENTAL ISSUES (1996).

74. *See* Timur Kuran & Cass R. Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683 (1999). Yet further models exist. For example, Mary Douglas and Aaron Wildavsky's "cultural" theory asserts that different modes of risk perception—for example, a tendency to fear economic collapse, or instead environmental damage—are associated with different social groups. *See* MARY DOUGLAS & AARON WILDAVSKY, RISK AND CULTURE: AN ESSAY ON THE SELECTION OF TECHNICAL AND ENVIRONMENTAL DANGERS (1982). For an overview of current causal models of risk perception, see SOCIAL THEORIES OF RISK (Sheldon Krimsky & Dominic Golding eds., 1992); Nick F. Pidgeon & Jane Beattie, *The Psychology of Risk and Uncertainty*, *in* HANDBOOK OF ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT 289 (Peter Calow ed., 1998).

But the plurality of possible causal models of the hazard-fear linkage simply represents one kind of uncertainty. Here, too, the analogy to risk assessment is reasonably straightforward. Continuing scientific uncertainty about cancer mechanisms has produced a plurality of formal models of carcinogenicity: specifically, a plurality of types of "dose-response" curves that correlate an individual's incremental cancer risk with her degree of exposure to a carcinogen. The possible dose-response models include the log-probit, logit, Weibull, one-hit, multihit, and multistage models, to name only the most common.[75] This plurality has not stopped risk assessment, since various decision-theoretic techniques for handling model uncertainty (like other kinds of uncertainty) exist and can be incorporated within CBA. A highly sophisticated technique is so-called Delphi analysis, where experts in the field—in the case of fear assessment, sociologists and psychologists who research hazard perception—are systematically polled to determine the range of plausible causal models and then the subjective probabilities that each expert ascribes to each model, with the probabilities averaged or otherwise integrated to produce a probability distribution across the models.[76] A cruder technique is to adopt the model that (the decisionmaker believes) is best supported by the evidence. This was Sorensen's approach in his study of Three Mile Island's psychological impacts, and has been the EPA's approach to risk assessment. The EPA's current guidelines presumptively require that risk assessors employ the so-called "linearized multistage" model in drawing dose-response curves.[77]

A different problem regarding causality in fear assessment concerns *causal inertness*. The worry here is not that models of fear-causation can't be constructed, or are uncertain, but rather that the best model will predict fear states in the populace to be insensitive to regulatory choice. Consider the Alar scare. After fear entrepreneurs

75. *See* VINCENT T. COVELLO & MILEY W. MERKHOFER, RISK ASSESSMENT METHODS: APPROACHES FOR ASSESSING HEALTH AND ENVIRONMENTAL RISKS 166 (1993).

76. *See generally* ROGER M. COOKE, EXPERTS IN UNCERTAINTY: OPINION AND SUBJECTIVE PROBABILITY IN SCIENCE (1991). Studies that have employed Delphi analysis to estimate carcinogen potency in the teeth of uncertainty about the shape of dose-response curves and other kinds of causal uncertainty include John S. Evans et al., *A Distributional Approach to Characterizing Low-Dose Cancer Risk*, 14 RISK ANALYSIS 25 (1994); John S. Evans et al., *Use of Probabilistic Expert Judgment in Uncertainty Analysis of Carcinogenic Potency*, 20 REGULATORY TOXCIOLOGY & PHARMACOLOGY 15 (1994); William E. Fayerweather et al., *Quantifying Uncertainty in a Risk Assessment Using Human Data*, 19 RISK ANALYSIS 1077 (1999).

77. *See Guidelines for Carcinogen Risk Assessment*, 51 Fed. Reg. 33,992, 33,997–98 (Sept. 24, 1986).

publicized the alleged cancer dangers of the apple pesticide Alar, many consumers became fearful of apples.[78] Consumers experienced fear states that were targeted at apples: fear states bundling together the consumer's desire not to get cancer, with the belief that an apple or apple-containing product might result in cancer, plus attendant distress and arousal. Still, a regulator faced with the choice of banning Alar or leaving Alar on the market[79] might believe that the total number of fear-days would be unaffected by the choice. To be sure, if Alar were withdrawn, consumers would experience fewer fear states targeted at Alar. But this reduction would be roughly balanced (the regulator might believe) by additional fear states targeted at other products. The regulator might have two general grounds for believing risk regulation (in some area) to be causally inert with respect to overall fear. The first is the psychological thought that many people are dispositionally anxious; they tend to find something or other to be anxious about, and their overall level of anxiety remains pretty much the same, with different objects rationalizing an ongoing anxiety state.[80] The second is the social thought that, given the constraints of individual attention and intersubjective communication, only a few hazards (such as Alar) can be socially salient at any one time, and conversely that informational cascades manipulated by fear entrepreneurs,[81] or other such mechanisms, will always cause the available slots for socially salient hazards to be filled. If Alar is banned, it will be genetically modified foods, or fatty foods, or some other "hazard of the month" that will become the target of widespread fears.

The causal-inertness objection to fear assessment is a serious one. Some empirical studies of the fear/anxiety effects of hazards *have* concluded that the hazards examined had little effect on the aggregate amount of fear—although this is hardly a universal finding.[82] In any event, it is important to see that the causal-inertness objection to

78. *See* Kuran & Sunstein, *supra* note 74, at 698–701 (describing the Alar scare).

79. As it turned out, Alar was withdrawn from the U.S. market by its manufacturer. *See id.* at 699.

80. *See, e.g.*, EUGENE E. LEVITT, THE PSYCHOLOGY OF ANXIETY 16 (2d ed. 1980) (distinguishing between "state anxiety (momentary and situational) and trait anxiety (a personality characteristic reflecting a high predisposition or proneness to experience state anxiety)").

81. *See* Kuran & Sunstein, *supra* note 74, at 685–88.

82. *See* Lebovits et al., *supra* note 63; *see also* Dohrenwend, *Stress in the Community*, *supra* note 60, at 174 (finding that Three Mile Island accident produced substantial demoralization in the community, which dissipated within two months of the accident). *But see* Gibbs, *supra* note 59, at 10 (finding that toxic exposures had longer-term psychological effects); Davidson et al., *supra* note 64, at 44 (finding that Three Mile Island accident had longer-term psychological effects).

fear assessment is essentially connected to the problem of deliberation costs. Assume that the deliberation costs of fear assessment are zero. It is costless for analysts to produce probability distributions across possible causal models of fear-production and, within each model, probability distributions across model parameters and inputs. The upshot is (say) a mean incremental number of fear-days that would occur if a given regulatory option were chosen, as compared with the baseline option of inaction. If the hazard being evaluated is causally inert with respect to fear, then this mean number should be roughly zero. But that estimate can emerge as the *upshot* of the fear assessment. The fact that, prior to undertaking a full-blown fear assessment, the analyst expects that the assessment will demonstrate overall fear to be unchanged by regulatory intervention, is no reason not to undertake the assessment—*if* the analyst also expects that the costs of performing the full-blown assessment are zero.

But of course expected deliberation costs, for any variant of policy analysis, are not zero. Thus the *deliberation-cost* objection to fear assessment: the most potent of all the objections, I tend to think. This objection subsumes various plausible claims about how the differences between physical and psychological harms justify their differential treatment within CBA. One such claim, as already mentioned, is that risk regulation is causally inert with respect to psychological but not physical harms. Another is that psychological harms, by contrast with physical harms, are relatively minor welfare setbacks. The aggregate benefits of mitigating the fears produced by workplace toxins are (perhaps) much less than the aggregate benefits of preventing the deaths these toxins cause. This fact or, more precisely, the decision-maker's preanalytic belief[83] that the fact is true, constitutes a reason to truncate CBA—to focus on physical but not psychological harms—only if the expected costs of CBA itself are nonzero. A third is that, although regulators are uncertain both about the causal dependency of mortality on regulatory choice, and about the causal dependency of fear on regulatory choice, the latter uncertainty is deeper. There are more possible causal models to consider in the latter case, say—and thus greater deliberation costs involved in assigning probabilities to the possible outcomes of regulation.

83. I say "preanalytic" because the threshold balancing of the expected benefits of undertaking full-blown CBA with respect to some category of welfare impact, as against the expected deliberation costs of doing so, must be done in a rough and intuitive way to avoid incurring the very deliberation costs whose justifiability is being evaluated.

Deliberation costs mean that agencies should be selective in performing fear assessment, not that they should refrain entirely. Deliberation costs are a general problem for CBA[84] (although it could well be true that the ratio of deliberation costs to the benefits of full-blown deliberation are larger for fear assessment and other novel variants of CBA than for traditional policy analysis). Agencies currently employ formal CBA to evaluate only a small fraction of the choices for which CBA is statutorily permissible. The Presidential cost-benefit order demands that agencies produce a full written cost-benefit analysis, for OMB review, only in the case of agency rules (not other decisions) and only where the rules are "economically significant," that is, have annual costs exceeding $100 million.[85] This substantial limitation in the scope of the Presidential order is grounded in (or at least plausibly justified by) the deliberation costs of full-blown CBA, even *sans* fear assessment.

Deliberation costs—specifically, the kind of deliberation costs that present an objection to fear assessment or other novel types of CBA—derive from our bounded rationality.[86] The problem is not that CBA requires full information; I have emphasized that it does not. The problem, rather, is that the very task of characterizing possible outcomes, and assigning probabilities to them, is costly. Were our conceptual and mathematical abilities unbounded, the task would be costless. Bounded rationality, too, means that the meta-CBA I have entered into here—specifying the conditions under which agencies should perform various kinds of CBA—cannot be both fully rigorous and cost-effective. With that as an excuse for a lack of rigor, let me offer the following factors which plausibly should bear on an agency's decision to undertake fear assessment. (Whether these factors, or decision rules grounded on them, should be formalized in agency or OMB guidelines is an issue I will not pursue.) (1) *The balance of nonpsychological costs and benefits.* If the physical benefits of hazard mitigation, namely mortality- and morbidity-reduction, already justify agency intervention, fear assessment is unnecessary. In effect, fear assessment should be performed (if at all) as a sequel to traditional CBA. For example, the EPA does not need to evaluate the fear-avoidance benefits of cleaning up a waste dump if it has already

84. *See* Adler & Posner, *supra* note 42, at 217–18.

85. Exec. Order No. 12,866 §§ 3(f), 6(a)(3), 3 C.F.R. 638, 641 (1994), *reprinted in* 5 U.S.C. § 601 (2000).

86. *See generally* HERBERT A. SIMON, MODELS OF BOUNDED RATIONALITY (3 vols. 1982–1997).

determined that the monetized value of the lives saved by the clean-up exceeds clean-up costs. (2) *Population size.* Is the population expected to be aware of the hazard, large or small? *Ceteris paribus*, a larger population means more fear. (3) *Population fearfulness.* Does the affected population fall in some general category that tends not to be fearful: workers that self-select into high-risk occupations, for example, as opposed to consumers or members of the general population exposed to pollution?[87] It would be reasonable for the EPA or the Consumer Product Safety Commission to pursue fear assessment more aggressively than the Mine Safety Administration or OSHA. Alternatively, is the affected population so dispositionally fearful (sufferers from a generalized anxiety condition, say) that the elimination of particular fear-targets, such as regulated hazards, is unlikely to change the total amount of fear? (4) *Dreaded hazards.* Does the hazard fall in a general category that is especially dreaded? The well-known empirical work undertaken by Paul Slovic and collaborators, quantifying the extent to which the population perceives various hazards to be risky,[88] turns out to be potentially quite valuable for agencies—although surely not in the way that Slovic intended. Hazards with high generic perceived risks, such as pesticides, nuclear power, food additives, or industrial carcinogens, are more likely to be the object of fear states (*ceteris paribus*) than hazards with lower generic perceived risks, such as home power tools, bicycles, or sunbathing. Agencies might use Slovic's diagrams, or similar work, to decide when to undertake fear assessment. While it is silly for CBA analysts to give less weight to the deaths caused by power tools than by industrial carcinogens, it is not silly for analysts to recognize that power tools cause less psychological distress than carcinogens, and thus to attempt to quantify those fear states when carcinogens, not tools, are being regulated. (5) *Hazard salience.* Is the particular hazard socially salient? Measures of public attention (for example, the amount of media coverage) might be used as a partial trigger for fear assessment. Alar is, generically, no more dreaded than any other pesticide. This particular pesticide became the especial object of widespread fears because of social dynamics. The very fact of public attention to Alar might warrant the EPA in performing fear assessment only in the Alar proceeding, rather than in pesticide decisions more generally.

87. *Cf.* W. KIP VISCUSI, FATAL TRADEOFFS: PUBLIC AND PRIVATE RESPONSIBILITIES FOR RISK 42–47 (1992) (discussing heterogeneity in individual valuation of mortality risk).

88. *See* SLOVIC, *supra* note 72.

(6) *Causal inertness.* Does the scholarly literature suggest that the hazard being evaluated is causally inert with respect to fear? This overlaps with the population-fearfulness factor, but is partly distinct, since there might be categories of hazards (particular consumer products or product-constituents, say) that are causally inert with respect to aggregate fear even in the general population.

Assume that the factors just described weigh in favor of fear assessment. Some regulatory option would eliminate or mitigate a hazard that is "dreaded" á la Slovic and salient to a sufficiently large population, neither particularly fearful nor particularly fearless; the regulator does not believe (preanalytically) that the hazard is causally inert with respect to fear; and the morbidity- and mortality-reduction benefits of the option are not alone enough to outweigh the costs, relative to baseline. In such a case—where the expected benefits of fear assessment are larger than expected deliberation costs—are there cogent objections to the practice? One objection is that communication and education rather than hazard regulation may be the optimal governmental technique, in many contexts, for reducing fear.[89] Although the elimination or mitigation of a feared hazard might be cost-benefit justified given fear-reduction benefits, relative to the regulatory baseline of governmental inaction, perhaps the option of providing truthful and reassuring information to the public is in turn cost-benefit justified relative to the elimination/mitigation option, given avoided compliance costs. But this objection is not really an objection to fear assessment; rather, it shows that, where fear is at issue, regulators should use CBA (including fear assessment) to evaluate a wider array of policy alternatives than is traditional, including informational and educational as well as prescriptive options.

A different objection is that fear assessment is self-defeating in the long run. If agencies incorporate fear-reduction benefits in CBA, fear entrepreneurs will have an added incentive to make citizens fearful of the hazards that the entrepreneurs want eliminated.[90] This

89. *See* Posner, *supra* note 33, at 689–95 (describing range of regulatory instruments for reducing fear about terrorism); Sunstein, *supra* note 33, at 259 ("The appropriate [initial] response to social fear not based on evidence, and to related ripple effects, is education and reassurance rather than increased regulation.").

90. *See* Howard F. Chang, *Risk Regulation, Public Concerns, and the Hormones Dispute: Nothing to Fear but Fear Itself?* (unpublished paper, on file with author) (suggesting that WTO's risk assessment requirement is justifiable, notwithstanding social costs of popular fears unsupported by a risk assessment, in virtue of fear-creation incentive that special interests would have absent the WTP requirement).

objection would be quite serious, I think, if agency decisions were insulated from legislative control, or if legislative decisions were themselves driven by CBA. Imagine a technocratic world in which both Congress and agencies conscientiously resist popular pressure and use CBA to reach their choices; in such a world, shifting from traditional CBA to a CBA that incorporates fear assessment could well end up, perversely, causing a greater amount of fear. For now, however, fear entrepreneurs have a large incentive to incite fear, regardless of the details of agency CBA, since agency decisions can always be reversed by legislators who are (predictably) sensitive to popular fears. Consider that fear-mongering is already a familiar part of the politics of environmental, health, and safety regulation even though agencies, with a very few exceptions, do not currently quantify and monetize fear.[91]

Finally, consider the objection to fear assessment expressed by the Supreme Court in the Three Mile Island case, *Metropolitan Edison v. People Against Nuclear Energy*.[92] The Court was concerned not only about the deliberation costs of quantifying fear, but also that "[i]t would be extraordinarily difficult for agencies to differentiate between 'genuine' claims of psychological health damage and claims that are grounded solely in disagreement with a democratically adopted policy."[93] If the Court's objection is that psychometric instruments cannot distinguish between genuine fear of some hazard, and mere opposition to the hazard, even where respondents are truthful, this is clearly untrue. Attitudinal as opposed to anxiety scales focus on quite different somatic, behavioral, affective, and cognitive features of respondents. For example, William Freudenberg tested the Court's claim in *Metropolitan Edison* by surveying persons residing near a nuclear facility under construction in Washington State. The survey employed a scale of pro-nuclear attitudes (based on questions such as "Do you favor or oppose the construction of this nuclear plant?") and a psychological distress scale (based on questions such as "Do your hands tremble enough to bother you?"). Freudenberg found that opposition to the plant was uncorrelated with distress.[94]

91. *See generally* BARRY GLASSNER, THE CULTURE OF FEAR: WHY AMERICANS ARE AFRAID OF THE WRONG THINGS (1999); FRANK FUREDI, CULTURE OF FEAR: RISK-TAKING AND THE MORALITY OF LOW EXPECTATION (rev. ed. 2002).

92. 460 U.S. 766 (1983).

93. *Id.* at 778.

94. William R. Freudenburg & Timothy R. Jones, *Attitudes and Stress in the Presence of Technological Risk: A Test of the Supreme Court Hypothesis*, 69 SOC. FORCES 1143 (1991).

If the Court's objection, instead, is that respondents who strongly oppose or support regulation of some hazard will not be truthful in answering questions about their anxiety, the Freudenberg study suggests that that claim too is overblown. In any event, self-report fear surveys focused on the very hazard being evaluated for regulation (where the respondents' incentive to lie about anxiety would be strongest) are hardly the only tool for estimating the fear states that would be caused by the hazard.[95] A different claim is that, where a person's desire for the regulation of some hazard leads her to be genuinely afraid of that hazard (and not merely to make untrue assertions about her anxiety), *that* fear should be discounted for CBA purposes. But why? The genuine fear of those who support regulation is no less a welfare-setback than the fear of those who (for ideological reasons) oppose it, or those who are indifferent.

II. BUNDLED OR UNBUNDLED VALUATION: SHOULD RISK AND FEAR BE PRICED TOGETHER OR SEPARATELY?

In Part I, I presupposed that fear assessment and risk assessment would be separate analytic undertakings. For a given hazard, an agency engaged in CBA would predict and then monetize the premature deaths caused by the hazard. And it would, quite separately, predict and then monetize the fear/anxiety states caused by the hazard. The discussion in Part I addressed possible concerns about the feasibility and cost-effectiveness (given deliberation costs) of the predictive component of fear assessment. But the proponent of incorporating fear costs within CBA might object that this whole discussion was unnecessary. Fear and risk assessment can be bundled together, it might be proposed. Deaths can be sorted into different categories, which (*inter alia*) are differentially feared. Contingent-valuation or revealed-preference methods can be used to determine individual willingness-to-pay to avoid a risk of death of each type. This willingness-to-pay number should, in principle, incorporate individual willingness-to-pay to avoid the fear states associated with the anticipation of each type of death. Based upon the average willingness-to-pay to avoid a small risk of the different types of death, we can calculate a "value of statistical life" ("VOSL") for each type. For example, if individuals are (on average) willing to pay $1,200 to avoid

95. For example, as already noted, fear and anxiety scales include observer- as well as subject-administered scales. *See* sources cited *supra* note 50.

a 1 in 10,000 risk of incurring fatal cancer, but only $800 to avoid a 1 in 10,000 risk of dying from a noncancerous disease, and $600 to avoid a 1 in 10,000 risk of dying in a car crash, the VOSL for cancer would be $12 million; for death from a noncancerous disease, $8 million; and for a fatal car crash, $6 million. These "tailored" VOSLs (tailored to different types of fatalities, including differentially feared fatalities) could then be employed by CBA analysts to price fatalities, obviating the need for a separate "fear assessment."

Why think that "tailored" VOSLs might incorporate a fear cost? To see the idea here in a concrete way, imagine a population of 10,000 exposed to two separate hazards, the first some old bridge that no one fears, the second a toxic dump that everyone fears. Each hazard will cause exactly one fatality in the population. Members of the population are polled about their willingness-to-pay to remove each hazard. If the individual is rational in the expected utility sense, then she conceptualizes each hazard as a lottery over possible outcomes,[96] and determines willingness-to-pay by comparing this "Hazard Lottery" with the "No-Hazard Lottery" that results if the hazard is removed. In the case of the bridge, the Hazard Lottery differs from the No-Hazard Lottery by imposing a greater risk of premature death on the individual subject: outcomes in which the individual lives a full lifespan are relatively less likely (by 1 in 10,000), and outcomes in which she dies from disease or by accident are relatively more likely. In the case of the toxic dump, the Hazard Lottery differs from the No-Hazard Lottery in *two* ways: by imposing an incremental 1-in-10,000 risk of premature death on the subject *and* by involving a very high probability of fear states targeted at the dump, states that occur with zero probability in the No-Hazard Lottery and that (let us assume) are not replaced in the No-Hazard Lottery by fear states with other targets. Thus the members of the population exposed to the dump and bridge would, quite rationally, be willing to pay more to remedy the first: exposure to the dump means an incremental risk of death plus the certainty of incremental fear, while exposure to the bridge means only an incremental risk of death.

The idea of "tailored" VOSLs is not novel. In particular, the idea of using "tailored" VOSLs to capture the special fear/anxiety associated with certain kinds of deaths is not novel. Ricky Revesz, in a major article on the valuation of life in environmental law, argues that

96. *See* Adler, *supra* note 53, at 1257.

the EPA should employ a separate VOSL for cancer deaths, one that has been adjusted upwards from the VOSL revealed by wage-risk studies (in effect, VOSL for industrial accidents) to reflect the fact that cancer is especially "dreaded."[97] An important distinction, here—one that Revesz does not draw sufficiently clearly—is the distinction between *fearing cancer* and *fear as a component of cancer morbidity*.[98] Someone exposed to a 1-in-10,000 risk of incurring fatal cancer is, in effect, handed a lottery ticket involving two kinds of fear states. First, there is fear of cancer, that is, the distress and arousal triggered by the substantial (perceived) risk that she might contract cancer—a fear state she incurs, let us imagine, with probability 1. Second, there is the fear of death that accompanies the pain, suffering, and other disease components of cancer: a fear state she incurs with probability 1 in 10,000. I am agnostic about whether agencies should employ cancer-specific VOSLs to capture the fear that is part and parcel of cancer itself. My main concern in this Article is with the widespread fear and anxiety states caused by the mere risk of death, illness, and injury, not with the less common (although surely not less intense) fear and anxiety states that are experienced as one symptom of disease or injury. This first kind of fear—fear apart from actual disease or injury—should not be valued through "tailored" VOSLs. For this kind of fear, we *do* need a fear-assessment practice separate from risk assessment, or so I shall now argue.

A. *Welfare Equivalents and WTP/WTA: The Foundations of CBA*

Should fear be valued separately from the risk of death, or should the two be ascribed a single, "bundled" cost? To answer this question (and related ones that will arise down the line) we need to

97. *See* Richard L. Revesz, *Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L. REV. 941, 972–73, 981–84 (1999). Revesz's suggestion was considered and rejected by the EPA's Science Advisory Board, for lack of sufficient evidence about the size of the fear premium. *See* EPA Science Advisory Board, *An SAB Report on EPA's White Paper* Valuing the Benefits of Fatal Cancer Risk Reduction 5–6 (July 27, 2000), *at* http://www.epa.gov/sab/pdf/eeacf013.pdf.

98. Revesz begins his discussion of "dread" by noting that cancer mortalities, unlike industrial accidents, "often occur following a long and agonizing ordeal." Revesz, *supra* note 97, at 972. This statement suggests that, by the "dread" component of cancer, Revesz means the fear that accompanies cancer itself. Yet Revesz goes on to say that an estimate of the value of a cancer death calculated by adding a morbidity premium to the value of an instantaneous death is "conservative" because "it does not account for the dread aspects of carcinogenic deaths." *Id.* at 973. "Dread," here, seems to mean the anticipatory fear of cancer that (rationally or irrationally) inflates willingness-to-pay to avoid a risk of cancer beyond the amount implied by its mortality *and* morbidity characteristics.

discuss a very basic valuational problem within CBA: the difference between willingness-to-pay/accept and the novel valuational construct that I have elsewhere proposed and will rely upon in my analysis of fear assessment, namely the "welfare equivalent."

Consider a governmental official faced with a choice between various options. CBA aspires to measure the welfare effect of each option on a dollar scale—one that will reflect, at least roughly, the goodness of the option in light of overall welfare. How to do that? The measurement approach proposed in the economics literature is this: for each option, for each individual in the population, we can calculate her willingness-to-pay or -accept ("WTP/WTA") for that option, in dollars, relative to some baseline. Then the overall monetary number assigned to each option is the sum of the WTP/WTA amounts for that option, aggregated across the population.[99]

WTP/WTA is, crucially, understood in terms of the subject's *preferences*. In the idealized case, where uncertainty has been removed and the subject knows for sure which outcomes the regulatory options will lead to, the definition of WTP/WTA is straightforward. Imagine that the baseline of regulatory inaction leads to outcome W, and that a regulatory intervention leads to outcome W*. Then person P's WTP/WTA for the intervention is the amount of money, subtracted from or added to his wealth in W*, such that—with his wealth position in W* thus changed—he is indifferent between W and W*. He neither prefers W to amended W*, nor amended W* to W.[100] In the more realistic case where the subject is uncertain about the upshots of regulatory choice, so that each option is (in effect) a lottery over outcomes, the definition of WTP/WTA is more complicated but still essentially invokes preferences. Consider the set of all possible outcomes $\{W_i\}$. The baseline option is a lottery L that assigns one particular array of probabilities, summing to one, to these possible outcomes. The other regulatory choice L* is a lottery that assigns a different array of probabilities, also summing to one, to these possible outcomes. Traditionally, economists define the subject's WTP/WTA for L* as follows: the amount of money such that, subtracted from or added to his wealth position in each of the outcomes in L*, he is indifferent between the L* lottery (thus amended) and L.[101] WTP/WTA

99. *See* Adler & Posner, *supra* note 42, at 177–87.

100. *See* ROBIN BOADWAY & NEIL BRUCE, WELFARE ECONOMICS 31–60, 195–234 (1984).

101. This amount is known as P's "option price" for the lottery L*. Although P's WTP/WTA under uncertainty might be specified in other ways, I believe that the "option price" is the correct approach on my view of CBA as a decision-procedure implementing overall well-being,

under uncertainty is the wealth change such that, were it to occur in each and every possible outcome of a lottery being compared to a baseline lottery, the subject would neither prefer the lottery to the baseline lottery nor vice versa.

The sum of WTP/WTA, thus specified, functions as the analytic foundation for CBA within the contemporary economics literature. Applied economists recognize that agencies do not have boundless deliberational resources, and often propose CBA techniques that are simply approximations to the aggregate WTP/WTA construct[102]—for example, ignoring risk aversion, or pricing welfare impacts with an average WTP/WTA rather than one that is fully sensitive to the heterogeneity of individual preferences. But the sum-of-WTP/WTA is the concept that underlies these approximating techniques.

My own view of CBA is quite different. As I have argued elsewhere, the proper foundation for CBA is not WTP/WTA, but rather the construct of a welfare equivalent ("WE").[103] CBA implements the normative criterion of overall well-being. But well-being and preferences do not necessarily match. The relevant account of welfare, where interpersonal comparisons come into play, is objectivist, not preferentialist.[104] Given two outcomes, the baseline outcome W and another outcome W*, P's (objective) welfare equivalent is this: the amount of money added to or subtracted from P's holdings in W* such that W* (thus amended) is objectively as good for P's welfare as W. Here is one example: if P is a sadist and W* is an outcome differentiated from W by the fact that P inflicts pain on someone else, then P might have a large WTP for W*, but his welfare equivalent is zero. Engaging in torture might satisfy P's preferences, but is not objectively better for his welfare. "Objective" welfare goods are those features of human lives that prompt convergence of idealized (not actual) preferences.[105] No one, under ideal conditions, would prefer sadism. Thus sadism is not objectively better for the sadist.

WEs, like the traditional notion of WTP/WTA, can be extended to the case of governmental choice under uncertainty. The "lottery"

and given the correct specification of overall-welfare maximization under uncertainty. This is not a topic I can pursue here. On CBA under uncertainty, see, e.g., FREEMAN, *supra* note 23, at 209–57; Richard C. Ready, *Environmental Valuation Under Uncertainty*, *in* HANDBOOK OF ENVIRONMENTAL ECONOMICS 568 (Daniel W. Bromley ed., 1995).

102. *See, e.g.*, BOADWAY & BRUCE, *supra* note 100, at 211–20.

103. *See* Adler & Posner, *supra* note 42, at 220–22; Adler & Posner, *supra* note 43, at 272–80.

104. *See* Adler, *supra* note 42, at 289–302.

105. *See id.* at 298–99.

notion remains useful. Where the choosing official and affected individuals are uncertain about the upshots of different governmental choices, each option can be understood as a lottery across outcomes.[106] The baseline option maps onto lottery L, say; a different option onto lottery L*. Then P's welfare equivalent, as between the lotteries, is the amount of money added to or subtracted from each of the outcomes in L*, such that L* (thus amended) is objectively just as good for P as L. Convergent idealized observers would neither prefer L to L*, nor vice versa.

The foundational construct for CBA, I suggest, is the sum of WEs, not the sum of WTP/WTA. For it is the sum of WEs (as weighted, perhaps, to compensate for the variable marginal utility of money), not the sum of WTP/WTA, that maps onto overall objective well-being. What does this mean, concretely, for agency practice? CBA analysts should, at least in some cases, override a subject's expressed or revealed WTP/WTA where the analyst believes that the WTP/WTA is "distorted"—where it substantially deviates from (what the analyst believes to be) the subject's welfare equivalent. To be sure, individuals are in many cases the best judges of their own welfare. Further, given the incremental deliberation costs of determining an individual's WE rather than his WTP/WTA, the apparent gap between the two welfare measures should be reasonably clear and substantial before the CBA analyst departs from the traditional WTP/WTA measure. Still, there will be ample scope within optimal administrative practice for such departures—for an agency to "second guess" an individual's judgment about the impact of an agency choice on his or her welfare, and specifically about the size of the monetary payment needed to counterbalance that impact.

Indeed, as Eric Posner and I have demonstrated in prior work, agencies undertaking CBA regularly correct for preference distortions and depart from the traditional WTP/WTA measure.[107] This can happen in three basic ways. Consider once more an agency choice between a baseline option, understood as a lottery L over possible outcomes, and another choice, understood as a different lottery L* over outcomes. The subject's WTP/WTA for L* might be distorted,

106. I am skeptical that the probabilities in this lottery are frequentist probabilities, and tend to think that they are subjective probabilities measuring the official's beliefs. But this is not an issue I can pursue here. *See* Adler, *supra* note 53, at 1276–79; Adler, *supra* note 1, at 1316–21; Matthew D. Adler, *Legal Transitions: Some Welfarist Remarks*, 13 J. CONTEMP. LEGAL ISSUES 5, 15–16 (2003).

107. Adler & Posner, *supra* note 43, at 280–89.

relative to his or her true welfare equivalent, by virtue of (1) distorted preferences with respect to the outcomes in the lotteries; (2) a distorted view of the lottery probabilities; or (3) a distorted mechanism for combining outcome-values and probabilities to arrive at an overall valuation of the lotteries. Agencies, in practice, correct for all three types of distortions to WTP/WTA. For example, agencies decline to count the satisfaction of sadistic preferences, racist, sexist, or homophobic preferences, preferences for drug use or other activities that are widely seen to be valueless, or (in most cases) disinterested preferences, as "benefits" for CBA purposes.[108] These are all preferences for features of outcomes that, as a matter of objective welfare goods, make no difference to the subject's welfare.

Agencies also routinely correct for WTP/WTA amounts that are distorted by the subject's mistakes (by the agency's lights) about outcome probabilities.[109] A standard technique for doing so is to recharacterize the agency's choices in a way that circumvents the probability mistakes, and then to survey affected persons about their willingness-to-pay/accept for the recharacterized choices. For example, in a CBA regarding visibility over the Grand Canyon, the EPA showed respondents photographs of the site with different degrees of visibility, rather than merely telling them about concentrations of pollutants (obviating respondents' mistakes about the correlation between a given concentration and a given visibility).[110] In a CBA regarding labeling of meat and poultry products, the USDA relied on contingent-valuation studies focused on the health benefits that (USDA predicted) would result from label changes, rather than contingent-valuation interviews about the literal changes in label wording being contemplated by the agency, since respondents might misunderstand the complicated linkages between label information, behavior, and health.[111]

108. *See id.* at 285–86, 281–82.

109. Much empirical work has documented that probability mistakes—specifically, probability ascriptions that fail to conform to the probability calculus—are widespread. *See generally* REID HASTIE & ROBYN M. DAWES, RATIONAL CHOICE IN AN UNCERTAIN WORLD: THE PSYCHOLOGY OF JUDGMENT AND DECISION MAKING (2001). Popular probability ascriptions that do conform to the calculus, but fail to match the decisionmaking official's probability ascriptions (whether these are taken as beliefs about the real, underlying frequentist probabilities that ought to drive the official's choices, or rather as the first-person subjective probabilities that ought to drive his choices, see *supra* note 106), also potentially count as "mistakes" that might warrant the official in correcting WTP/WTA amounts.

110. *See* Adler & Posner, *supra* note 43, at 283.

111. *Id.*

More generally, the whole practice of risk assessment as an input to CBA is an elaborate effort to correct the mistaken probabilities that individuals who are exposed to hazards often ascribe to the possibility of death. Consider the arsenic rulemaking, where the EPA evaluated the benefit of reducing arsenic in drinking water from a baseline of fifty micrograms per liter, to twenty, ten, five, or three micrograms, by performing a risk assessment—predicting the deaths avoided by each regulatory option—and then monetizing those avoided deaths, rather than by directly polling individuals for WTP/WTA for reduced amounts of arsenic.[112] That sort of direct polling would have obviated the need for an arsenic risk assessment, but—given the wide divergence between lay and expert assessment of the changes in fatality probabilities created by a given reduction in toxins such as arsenic—would have produced distorted valuations of the regulatory options being considered by the EPA.

What about the third and final way in which WTP/WTAs can be distorted relative to welfare equivalents: by virtue of a distorted mechanism for combining outcome-values and probabilities to arrive at valuations of uncertain choices? To understand this distortion, we need a view about how outcome-values and probabilities are properly integrated. The answer should not be surprising, given the consequentialist roots of CBA and the criterion of overall welfare: outcome-values and probabilities are properly combined in accordance with *expected utility theory*.[113] Given an agency baseline and some other choice, mapping onto lotteries L and L*, subject P's welfare equivalent for L* is the amount of money, added to or subtracted from P's wealth in every outcome in L*, such that idealized observers, valuing the lotteries in conformity with the axioms of expected utility theory, would neither prefer the amended L* to L, nor vice versa. There is considerable evidence, for example in the famous empirical work of Allais, and more recently of Tversky and Kahnemann,[114] that laypersons deviate from the expected utility axioms. Agencies should

112. *See* Alan Randall & Warren Kriesel, *Evaluating National Policy Proposals by Contingent Valuation*, *in* ECONOMIC VALUATION OF NATURAL RESOURCES: ISSUES, THEORY, AND APPLICATIONS 153, 160 (Rebecca L. Johnson & Gary V. Johnson eds., 1990) (discussing the design of a contingent-valuation survey to elicit citizen valuations of national environmental policies, and positing that "citizens value programs in terms of delivered levels of services rather than, for example, concentrations of particular chemicals").

113. *See* Adler, *supra* note 53, at 1257 n.2 (citing sources explicating and defending an expected-utility account of rationality).

114. This empirical work is surveyed in HASTIE & DAWES, *supra* note 109.

correct for this source of distortion to WTP/WTA, as well as for the others already discussed.

B. *Against Bundled Valuation*

I have argued that the foundational construct for CBA is not WTP/WTA, but rather the welfare-equivalent ("WE"). Agencies should, and do in practice, correct individual valuations that rest on a clear misunderstanding about the features of outcomes that are intrinsically beneficial or harmful for welfare; about the empirical linkages between agency choices and good or bad outcomes; or about the correct way to value lotteries. This objectivist (and idiosyncratic!) view of CBA has important implications for the pricing of fear. To begin, it shows why proposals to measure fear and risk costs in a single bundle—both Revesz' proposal to use tailored VOSLs and other bundled-valuation proposals—are generally problematic.

I will use the following stylized facts to illustrate my points. Some feared carcinogen currently exists in some medium (food, water, air, ground, etc.) at some baseline concentration. One million persons (consumers, workers, citizens, etc.) are exposed to the toxin. An agency is considering three regulatory options: inaction; the "moderate" option of issuing directives or taking other steps to reduce the toxin to a lower level; and the "strict" option of issuing directives or taking other steps to eliminate the toxin entirely. The moderate option prevents ten cancer deaths, relative to baseline. The strict option prevents ten more, for a total of twenty, relative to baseline. The monetized *benefit* of the moderate option is the sum of welfare equivalents (WEs) for the move from baseline to a lower level of the toxin, across the population. Similarly, the monetized benefit of the strict option is the sum of WEs for the move from baseline to a zero level of the toxin. For simplicity, assume that individuals are homogenous in their tastes, wealth levels, etc. so that for each individual in the population the three regulatory options map onto the same lotteries: a baseline lottery L; a lottery L*, corresponding to the moderate option, which differs from baseline in that the actual risk[115] of cancer

115. The "actual" change in an individual's cancer risk produced by a regulatory option might mean the change in the frequentist probability of the individual's getting cancer, or it might instead mean the change in the subjective probability number that the agency official making the choice ascribes to the possibility of the individual's getting cancer. This is a thorny issue, which I have bracketed, see *supra* note 106. In the stylized case discussed in the text, I am assuming that the actual change in risk equals the number of avoided deaths divided by the size of the population exposed to the toxin: 10 divided by 1 million for the moderate option, 20

is reduced by 1 in 100,000 and the individual will (or may) suffer fewer days during which he fears cancer; and a lottery L**, corresponding to the strict option, which differs from baseline in that the actual risk of cancer is reduced by 2 in 100,000 and the individual will (or may) suffer fewer days in which he fears cancer.

What are the possible techniques for estimating the sum of WEs that might obviate the need for a separate fear assessment? Because of the simplifying assumption that individuals are homogenous, and face the same lotteries L, L*, and L**, estimating the sum of WEs in this case reduces to estimating the unique WE amounts for L* and L** relative to baseline L, and multiplying that amount by the population size.

First, contingent-valuation surveys focused on the literal legal language of the regulatory options being considered by the agency, or the changes in toxin level resulting from those options, might be undertaken.[116] Assume that the moderate and strict options are formulated as technology-based requirements. Then individuals might be asked for their willingness-to-pay for those technological prescriptions, or for a lower or zero concentration of the toxin. *If* individuals were excellent judges of the causal links between technology or chemical concentrations and cancer deaths, so that their subjective estimates of the deaths avoided by the regulatory options closely tracked the actual numbers, and if other conditions held true, then WTP numbers expressed in the sort of contingent-valuation survey just described would be good evidence of individuals' welfare equivalents for the regulatory interventions, and would subsume both the risk-reduction and fear-reduction benefits of those interventions. Not only would fear assessment be unnecessary, but so too would risk assessment. The problem, of course, is that perceived risk and actual

divided by 1 million for the strict option. If frequentist fatality probabilities are calculated in a commonsensical way—such that the probability of P's dying from a toxin equals the frequency with which all persons exposed to the toxin die as a result—and if the agency official develops subjective probabilities that track the frequentist probabilities thus calculated, then the number of avoided deaths divided by the population size will equal the "actual" change in risk on either understanding of "actual" risk. To be sure, frequentist probabilities could be calculated in a different way, and the agency official's subjective probabilities need not track the frequentist probabilities. But all the points I make in the analysis below, criticizing various "bundled" valuation techniques, would hold true even where the change in "actual" cancer risk for some individual resulting from some regulatory option does not equal the avoided deaths divided by the exposed population.

116. For a discussion of the contingent-valuation technique, see *infra* Part III.

risk[117] can differ, and often do. By "perceived risk" I mean the risk of death as perceived by those exposed to the hazard. In the case at hand, risk assessment leads the agency to predict that the moderate option avoids ten deaths in an exposed population of one million and the strict option ten more, and thus to ascribe an actual risk-reduction of 1 in 100,000 to L* and an actual risk-reduction of 2 in 100,000 to L**. But individuals exposed to the carcinogenic toxin might well believe that the moderate and strict options involve much greater risk reductions: 1 in 1,000 and 5 in 1,000, for the sake of argument. Thus individual WTP amounts voiced in contingent-valuation studies focused on the literal legal language being considered by the agency, or on the chemical concentration amounts that would result were that language to be adopted, might diverge wildly from the individuals' true WEs for the agency's choices and from the agency's estimates of the individuals' true WEs. In our stylized case, the WE for the moderate option is the welfare equivalent for a 1 in 100,000 risk-reduction, plus some additional amount for fear-reduction. If the moderate option is perceived by affected individuals as involving instead a 1 in 1,000 risk-reduction, then stated WTP for that option (described literally or in chemical terms) would presumably be orders of magnitude larger than the WE. Ditto for the strict option.

"Tailored" VOSLs, as proposed by Revesz, constitute a second way that agencies might produce a bundled estimate of regulatory benefits, including fear-reduction benefits, without engaging in fear assessment. VOSLs are widely used in contemporary CBA practice to value life saving.[118] Each death avoided is multiplied by a sum in the vicinity of $6 million. The underlying theory is that, where small risks are involved, WTP to avoid a risk is approximately a linear function of the risk avoided. If WTP to avoid a 1-in-1 million risk is $6, a

117. An individual's perceived risk of some hazard is her own subjective probability of that hazard. That can differ from the actual risk, whether defined as the frequentist probability or instead as the agency official's subjective probability. *See supra* note 106. For evidence of the divergence between actual and perceived risk in the area of environmental, health, and safety regulation, see, e.g., Ted Gayer et al., *Private Values of Risk Tradeoffs at Superfund Sites: Housing Market Evidence on Learning about Risk*, 82 REV. ECON. & STAT. 439 (2000) (finding that individuals' perceived probability of cancer from Superfund sites, and therewith their WTP/WTA to avoid these sites, is changed by EPA's release of information from its remedial investigation of the sites); Mary Riddel et al., *Environmental Risk and Uncertainty: Insights from Yucca Mountain*, 43 J. REGIONAL SCI. 435 (2003) (finding that the perceived risk of an accident during the transportation of high-level radioactive waste, among residents of Southern Nevada, is generally much higher than the Department of Energy's risk estimate). *See generally* HASTIE & DAWES, *supra* note 109 (discussing lay probability mistakes).

118. The literature on VOSLs is large. *See* Adler, *supra* note 1, at 1398 n.297 (citing sources).

1-in-100,000 risk is $60, and a 1-in-10,000 risk is $600, then the sum of WTP for a measure that avoids, and is seen to avoid, a single death is $6 million regardless of the size of the population at risk—assuming it is large. CBA, as I have conceptualized it, involves welfare equivalents rather than WTP, but the theory of VOSLs plausibly carries over to welfare equivalents. Indeed the approximate linearity of welfare equivalents as a function of risk-reduction (for small risks) is an upshot of expected utility theory—the normative account of choice that, I have suggested, helps define the concept of a welfare equivalent. Imagine that individuals, after thorough deliberation and with a good understanding of probability theory, on average state that they are willing to pay an incremental six dollars for each incremental 1-in-1 million reduction in fatality risk. Then the sum of WEs associated with the risk-reduction component of regulatory options—in our stylized case, the options of reducing the toxin or eliminating it entirely—can reasonably be estimated by predicting the deaths avoided by those options and multiplying that number by $6 million.

Although straight VOSLs are a plausible way to capture the risk-reduction benefits of regulatory choices, "tailored" VOSLs are *not* a plausible way to capture the combined risk- and fear-reduction benefits of regulatory choices. Consider our stylized case. Revesz's proposal is that there exists a "tailored" VOSL for cancer death—a number Y greater than $6 million—such that 10Y will reliably track the sum of WEs for the moderate option and 20Y will reliably track the sum of WEs for the strict option. But this proposal rests on two premises, both deeply problematic.[119] The first premise is that fear is a linear function of perceived risk; the second, that perceived risk and actual risk are the same. Much recent work in psychology undermines the first premise. As Loewenstein and co-authors explain, in a review article summarizing this work:

> Changes in probability within some broad midrange of values have little effect on anticipatory emotions perhaps because . . . emotions arise in large part as a reaction to mental images of a decision's outcomes. Because such images are discrete and are not much affected by probabilities, the emotions that arise from them are

119. As usual, Schelling was prescient:

> A special difficulty of evaluating the anxiety and the [feared] event together is that they probably do not occur in fixed proportions. . . . To be specific, there are good reasons for considering the worth of risk-reduction to be proportionate to the absolute reduction of risk, for considering a reduction from 10 percent to 9 percent about equivalent to a reduction from 5 percent to 4 percent. There is no reason for the anxiety to follow any such rational rule.

Schelling, *supra* note 33, at 151.

> likewise insensitive to variations in probability. One's mental image of what it would be like to win the state lottery, for example, is likely to be about the same, whether there is a 1 in 10,000,000 chance of winning or a 1 in 10,000 chance of winning. . . . This is not to say that fear responses are completely unaffected by probabilities, but they are largely unaffected by orders-of-magnitude differences at the extreme (e.g., between a 1 in 100,000,000 chance of winning the lottery and a 1 in 100,000 chance).[120]

In short, "feelings of fear or worry in the face of decisions under risk or uncertainty have an all-or-none characteristic; they may be sensitive to the possibility rather than the probability of negative consequences."[121] In particular, the intensity of an individual's distress about a toxin might be largely a function of the knowledge that she is exposed to the toxin, and not solely a function (let alone a linear function) of her perceived probability that the toxin will cause her death. The agency's strict option, which eliminates the toxin entirely, might well produce a fear-reduction benefit (fear-days avoided) many times the fear-reduction benefit produced by the moderate option—even though the death-reduction benefit (twenty deaths) is just twice the death-reduction benefit of the moderate option (ten deaths). If so, the sum-of-WEs for the strict option should be more than double the sum-of-WEs for the moderate option—perhaps quite substantially so. But whatever the particular number Y that might be used as the "tailored" VOSL for cancer hazards, the methodology will necessarily estimate the monetized benefit of the strict option (20Y) to be exactly double the monetized benefit of the moderate option (10Y). More generally, "tailored" VOSLs assume that the ratio of the fear-days avoided by different regulatory options exactly equals the ratio of the deaths avoided by those options—and that is a highly problematic assumption, given the psychology literature just cited.

Even if fear *is* a linear function of perceived risk, the "tailored" VOSL approach runs afoul of the possible divergence between actual and perceived risk.[122] To see this, imagine that in our stylized case the perceived risk-reduction generated by the moderate option is 1 in 1,000 (rather than 1 in 100,000), and the perceived risk-reduction generated by the strict option is 5 in 1,000 (rather than 2 in 100,000). On

120. George Loewenstein et al., *Risk as Feelings*, 127 PSYCHOL. BULL. 267, 276 (2001) (citations omitted).

121. *Id.*

122. *See* Markowitz & Gutterman, *supra* note 62, at 102 (finding perceived threat to physical health to be significant in predicting demoralization); Zeidner & Shechter, *supra* note 41, at 199–200 (finding that perceived air pollution better correlates with anxiety and anger about air pollution than actual air pollution).

On the (implausible!) assumption that experienced fear-days correlate linearly with perceived risk, the amounts that well-reasoning individuals express in interviews inquiring about willingness-to-pay to avoid small cancer risks should be approximately a linear function of those risks. For example, individuals might express a willingness to pay $12 to avoid a 1-in-1 million cancer risk, $120 to avoid a 1-in-100,000 cancer risk, and so on, generating a "tailored" VOSL for cancer of $12 million. But $120 would then be the individual welfare equivalent for the combined risk- and fear-reduction benefit of an option that (1) reduces the individual's actual risk of death by 1 in 100,000; and (2) reduces the individual's perceived risk of death by 1 in 100,000, and therewith his fear-days by some amount equaling a constant K multiplied by 1 in 100,0000. $120 would *not* be the individual welfare equivalent for the moderate option in our stylized case, namely an option that (1) reduces the individual's actual risk of death by 1 in 100,000 and (2) reduces the individual's perceived risk of death by *1 in 1,000*, and therewith his fear-days by an amount equaling constant K multiplied by that reduction in perceived risk. Rather, his welfare equivalent for the moderate option would be larger than $120—since the fear-days avoided by the moderate option are the constant K multiplied by 1 in 1,000 (the perceived risk-reduction) rather than 1 in 100,000 (the actual risk-reduction). Nor, finally, can it be assumed that the *ratio* between actual and perceived risk is approximately constant across regulatory choice situations, with this assumption somehow used to salvage the "tailored" VOSL method. Consider the stylized case. The strict option achieves a reduction in actual risk of 2 in 100,000, the moderate option a reduction in actual risk of 1 in 100,000. What is to prevent the perceived reductions in risk from having a ratio other than 2 to 1: for example, 5 to 1, as I have posited?

Yet a third "bundled" valuation idea, different from the notion of asking individuals directly about regulatory proposals, or using "tailored" VOSLS, is this: for each regulatory option, conduct a contingent-valuation interview where respondents are told about the fear-relevant features of the option, plus the actual risk-reduction achieved by the option, and WTP/WTA is elicited for the option thus described. In the stylized case, that would mean estimating WE for the moderate option by asking about willingness-to-pay for the reduced concentration of the toxin achieved by the moderate option, and informing respondents that the risk-reduction resulting from the lower concentration is 1 in 100,000. Similarly, WE for the strict option

would be estimated by asking about willingness-to-pay for eliminating the toxin, and informing respondents that the risk reduction resulting from elimination is 2 in 100,000. The idea here is that the risk-reduction component of stated willingness-to-pay should track the actual risk, not the perceived risk (thus the effort to inform respondents about the actual risk), and that the fear-reduction component should reflect whatever respondents are scared of, not necessarily the perceived risk (thus the description of the fear-relevant features of regulatory options and the separate interview for each option, with no constraint that the ratio of the fear-reduction benefits of different options should be equal to the ratio of their death-reduction benefits).

Although this "third" bundled approach is an improvement on the first two, it is still problematic. The largest problem is this: there is substantial evidence that fear and anxiety skew decisionmaking under uncertainty—specifically, that individuals in a fearful or anxious state are much less sensitive to probabilities than expected utility axioms would require them to be, even more so than ordinary decisionmakers in a calm state.[123] For example, Rottenstreich and Hsee compared the differential WTPs to avoid small (1 percent) and large (99 percent) probabilities of a feared outcome (an electric shock), to the differential WTPs to avoid the very same probabilities of an averse but pallid outcome (losing some money).[124] They found that a 99-fold change in probability produced only a 1.5 fold change in WTP for the feared outcome, and an 18-fold change in WTP for the pallid outcome. Specifically, subjects were willing to pay seven dollars to avoid a 1 percent chance of being shocked, and ten dollars to avoid a 99 percent chance of being shocked! Similarly, Sunstein found that differential WTP to avoid a 1-in-1 million versus 1-in-100,000 risk of death described in a gruesome manner (so as to make the subjects anxious) was substantially smaller than differential WTP to avoid the same risk of death described less graphically.[125] These experiments demonstrate what Sunstein calls "probability neglect": choices by emotional decisionmakers are driven by their emotions, not the probabilities. For CBA purposes, this means the following: WTP/WTA amounts for lotteries expressed by anxious or fearful individuals are

123. *See generally* Loewenstein et al., *supra* note 120; Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61 (2002).

124. Yuval Rottenstreich & Christopher K. Hsee, *Money, Kisses, and Electric Shocks: On the Affective Psychology of Risk*, 12 PSYCH. SCI. 185 (2001).

125. *See* Sunstein, *supra* note 123, at 77–78.

likely to deviate dramatically from their true welfare equivalents, given the dramatic departures from expected utility maximization caused by fear and anxiety.

The problem of "probability neglect" connects to a very deep point about the proper role of fear in cost-benefit analysis. Fear is a welfare-reducing feature of outcomes, one that should count as a cost along with other, negative features such as death, pain, or bodily harm. If a regulatory choice reduces the fear that certain individuals would otherwise experience, then (*ceteris paribus*) the welfare equivalents of those individuals for that choice is positive. But to say that fear is a bad feature of outcomes is *not* to say that estimates of welfare equivalents for regulatory choices, and for the lotteries over outcomes produced by regulatory choices, should be derived from the expressed or revealed preferences of fearful *evaluators*. Rather, the relevant expressed or revealed preferences are those of individuals likeliest to be sensitive to the balance of objective welfare goods—individuals likeliest to generate WTP/WTA amounts that are close to the true welfare equivalents. Where risk-reduction is involved, this means (*inter alia*) that the individuals should be processing the risks in accordance with expected utility theory, at least roughly. And the literature on "probability neglect" suggests that fearful individuals do not do that.

"Probability neglect" thus undermines the third "bundled" valuation technique I am now considering, and more generally suggests that CBA estimates of the value of risk-reduction should be based on the expressed or revealed preferences of calm, not fearful individuals. Mentioning the fear-relevant features of regulatory choices to interview respondents (in our stylized case, the fact that the baseline and moderate options involve some exposure to a dreaded toxin, and that the strict option reduces exposure to zero) might well have the effect of scaring those respondents, and thus skewing their willingness-to-pay for the risk-reduction component of various options.

Probability neglect is not the only difficulty, here. Let me briefly mention some additional limitations of this third technique: (1) *"Stigma" and distorted outcome-preferences.* Some diseases, such as cancer, may be stigmatized, in the sense that individuals dispref have having the disease to having a nonstigmatized disease identical in its

mortality and morbidity characteristics.[126] An individual with this intrinsic preference against the stigmatized disease would express a higher willingness-to-pay to avoid a given risk of the disease, as against the same risk of a nonstigmatized disease that is equally fatal, painful, distressing, and disruptive of work and social interaction, even if the individual conforms to expected utility theory, and even bracketing the reduction of anticipatory fear. This is a distortion, since the objective welfare impact of a disease for some diseased person reduces to its physical, psychic, emotional, occupational, and affiliational impacts on her; the fact that the disease falls in some especially stigmatized category does not make it more harmful, except insofar as individuals with stigmatized diseases are, say, more isolated, or upset. The third "bundled" technique cannot avoid the "stigma" distortion: where a regulatory intervention reduces the risk of a stigmatized disease, telling interview respondents the name of the disease ("cancer," in our stylized case) would trigger the distortion, while failing to tell them would underestimate the fear-reduction benefit (since stigmatized diseases, plausibly, produce more anticipatory fear than non-stigmatized diseases). (2) *Fear and perceived risk.* Fear is not just a function of perceived risk, but perceived risk may not be completely irrelevant.[127] Assume it is not. If so, and if perceived and actual risk diverge, a contingent-valuation format where respondents are asked for their WTP for the actual risk-reduction secured by regulatory intervention with respect to some hazard, which is described to them in light of its fear-relevant characteristics (other than the perceived risk), produces a skewed estimate of the welfare equivalent for intervention. In our stylized case, the WE for the moderate option would be estimated by asking respondents to value a 1-in-100,000 reduction in risk resulting from a lower toxin level; and the WE for the strict option would be estimated by asking respondents to value a 2-in-100,000 reduction in risk resulting from the elimination of the toxin. But individuals in the population

126. Berman and Wandersman, in their review of the empirical scholarship on cancer fear, find that "[c]ancer is feared in the general population more than other serious medical conditions" and suggest (as I read the review) that this difference is partly but not wholly grounded in the objective differences between cancer and these other conditions. Steven H. Berman & Abraham Wandersman, *Fear of Cancer and Knowledge of Cancer: A Review and Proposed Relevance to Hazardous Waste Sites*, 31 SOC. SCI. MED. 81, 87 (1990).

127. *See* Loewenstein et al., *supra* note 120, at 276, 277 (declining to assert that "fear responses are completely unaffected by probabilities" and suggesting that "[t]he probability weighting function is flatter . . . for vivid outcomes that evoke emotions than for pallid outcomes").

generally perceive the moderate option to involve a much larger reduction in risk (1 in 1,000), and ditto for the strict option (5 in 1,000). Thus, responses to the interview questions just described would underestimate the WEs of the options. *Ceteris paribus*, a given reduction in the chemical concentration of some toxin, when perceived as involving a 1-in-1,000 risk-reduction, will (or at least may) produce a larger number of avoided fear-days then the same reduction in chemical concentration perceived to involve a 1-in-100,000 reduction in fatality risk. (3) *Predicting fear.* There is much evidence to suggest that individuals are not always accurate in predicting their future emotional states, including fear and anxiety states.[128] This is a further source of deviation between an individual's stated willingness-to-pay to remove some feared hazard, and her welfare equivalent for removal. Imagine a favorable case for the "bundled" valuation of fear and risk. Individuals are not afflicted by "probability neglect"; the actual and perceived risk-reductions of removing some hazard are the same; the deaths that would result from the hazard are not "stigmatized." An exposed individual is asked to value regulatory intervention. Deciding in conformity with expected utility theory, she conceptualizes the intervention as a lottery J* differing from baseline lottery J in that her probability of premature death is lower, and N fewer fear-days occur. If in fact the reduction in fear-days is M not N, then her valuation will deviate from her true welfare equivalent for J*.

To sum up: "Probability neglect," the deviation between actual and perceived risk, and the absence of any simple connection between perceived risk (let alone actual risk) and fear, as well as other problems, undermine the three "bundled valuation" techniques I have considered. The simplest solution is to monetize fear and risk separately. Consider the stylized case, and the problem of valuing the moderate option. That option maps onto a lottery L* which, as a matter of objective welfare goods, differs from L in two ways: by changing the subject's risk of a disease with certain morbidity and fatality characteristics and by changing his fear states. Imagine, then, a lottery L+ that involves the very same change in the subject's actual mortality and morbidity risk as L* (in this example, 1 in 100,000) but no change in his fear states, and a lottery L++ that involves the very

128. *See* George Loewenstein & David Schkade, *Wouldn't It Be Nice? Predicting Future Feelings*, *in* WELL-BEING: THE FOUNDATIONS OF HEDONIC PSYCHOLOGY 85 (Daniel Kahneman et al. eds., 1999).

same change in the subject's perceived risk and concomitant fear states as L*, but no change in his actual mortality and morbidity risk. My suggestion is that we estimate the welfare equivalent for L* by summing the welfare equivalents for L+ and L++.

Less formally: we use market or contingent-valuation data to estimate welfare equivalents for the actual, 1-in-100,000 reduction in the risk of a disease with the morbidity and mortality characteristics of cancer (but with the welfare-irrelevant "stigma" of cancer eliminated, as far as possible, from the valuation). Welfare equivalents for risk-reductions should be roughly a linear function of the reduced risk, where small risks are involved, and so the cumulative risk-reduction benefit can be estimated as the number of deaths avoided (ten in this case) multiplied by a VOSL number. Separately, we predict the change in fear states that the subject will experience as result of the lower toxin level, via his lower *perceived* risk of cancer and other determinants of fear, and use contingent-valuation techniques (as elaborated below) to determine his welfare equivalent for that reduction in fear taken alone. The latter step is just what I have called "fear assessment." The output of this fear assessment—a monetary valuation of the change in the subject's fear states flowing from the mitigation of the hazard—can be added to the monetized value of the change in his risk of disease and death flowing from the mitigation of that hazard to approximate his all-in monetary valuation of the mitigation.

To be sure, there is an additivity assumption here that is not warranted under all conditions. The monetary equivalent for the welfare impact of fear plus risk is not necessarily equal to, or even well approximated by, the monetary equivalent for the welfare impact of fear plus the monetary equivalent for the welfare impact of risk. Providing a rigorous analysis of the additivity issue is beyond the scope of this Article. Intuitively, one might say this: where the anticipatory fear of a fatal disease or injury, and the fatal disease or injury itself, make roughly independent contributions to a subject's welfare, and where the fear of the disease does not substantially change the welfare productivity ("marginal utility") of money, the additive technique just described will provide a good approximation to the subject's true welfare equivalent.[129] These conditions are quite plausible, at least where

129. It seems intuitively clear that, where fear and longevity do not make independent contributions to the subject's welfare, additivity can break down. Here is an extreme example. P can live a long life or a shorter life. His lives can be more or less anxious. Once a certain high level of anxiety is reached, longer life is no better than shorter life. In the baseline lottery L, P for certain will live a long life and a calm life. In the comparison lottery L*, P is at some risk r of

the fear states produced by some hazard do not result in widespread changes to a subject's activities and relationships (which *would* tend to produce a substantial change in the marginal utility of money).

Where the additivity conditions *do* break down, the best alternative to the "unbundled" valuation of fear and risk is, I suggest, a fourth kind of "bundled" technique: one where the agency predicts both the actual risk-reduction and the fear-days avoided by some regulatory intervention, and uses a contingent-valuation interview to determine willingness-to-pay for a lottery differing from baseline by those combined changes. In our stylized case, assume that the agency makes the following predictions about the moderate and strict op-

living a shorter life, and all his possible lives are extremely anxious, so much so that the longer possible lives in L* are no better than the shorter possible lives. Consider, now, L+, a lottery which has the same risk characteristics as L* but not the fear characteristics. In L+, P has a probability r of living a shorter calm life, and a probability 1-r of living a longer calm life. And consider L++, a lottery that has the same fear characteristics as L* but not the risk characteristics: in L++, P for certain lives a long, extremely anxious life. In this case (assuming money has the same utility in all the worlds), it is clear that P's welfare equivalent for L* is not the sum of his welfare equivalents for L+ and L++. Rather, his welfare equivalent for L* just equals his welfare equivalent for L++. Once we have injected sufficient anxiety into P's lives to make the longer lives no better than the shorter ones (L++), adding a risk of shorter life (L*) makes no difference to the expected utility of the lottery over lives.

Similarly, it seems intuitively clear that, where fear changes the marginal utility of money, additivity can break down. Assume P is now forty. In L, he lives to seventy for sure. In L*, he has a risk r of dying at the age of sixty, 1-r of dying at age seventy, and he experiences terrible anxiety in the immediate future, which abates once he's forty-one. This anxiety radically deflates the utility of money for P. In L+, P has a risk r of dying at age sixty, and no anxiety. In L++, he experiences terrible anxiety in the immediate future and no incremental risk. Here, it seems, P's welfare equivalent for L* (in the "willingness to ask" sense, *i.e.*, the amount we'd have to pay P in L* in the immediate future to make him just as well off as in L) exceeds the sum of his welfare equivalents for L+ and L++, again in the willingness-to-ask sense—at least if there's no possibility of investing the money. To compensate P for L*, we need to compensate him both for the welfare loss of the terrible anxiety, and for the expected welfare loss associated with the incremental risk of premature death. But the latter compensation would have to be effected at the money/welfare tradeoff rate of L*, where P is terribly anxious and therefore a given welfare increment requires more dollars than in L+.

As for the flip case, where fear and longevity do make independent contributions, and fear does not substantially affect the welfare productivity of money: Imagine (as is standardly assumed in the QALY literature) that an individual's lifetime welfare can be represented as a sum of well-being in each year, *i.e.*, there is intertemporal independence. Thus a case in which the hazard creates an incremental risk of fatal injury or disease in later years (*e.g.*, a cancer that will result, if at all, years down the line), and a fear that's experienced in earlier years, is one in which fear and risk make independent contributions to welfare. Assume, now, that the fear is not so intense as to change the welfare productivity of money. Then additivity would seem to obtain. Concretely, in lottery L, P lives to seventy for sure. In L* he has a risk r of dying at age sixty, and he experiences moderate anxiety for a year about that prospect; this anxiety is a hedonic loss, but it doesn't change the welfare/money tradeoff. In L+, P has a risk r of dying at sixty but no anxiety; in L++ he has moderate anxiety but no risk. Then (1) the difference between L* and L, in utility terms, does equal the sum of the utility difference between L+ and L and the utility difference between L++ and L; and (2) the amount of money it takes, in L+, L++, and L* to compensate for a given utility difference is the same.

tions: the moderate option will avoid ten deaths and one million fear-days (one for each individual in the population), while the strict option will avoid twenty deaths and twenty-five million fear-days (twenty-five for each individual). Then L* is a lottery differing from baseline by a reduced fatality risk of 1 in 100,000 and one fewer fear-day, while L** is a lottery differing from baseline by a reduced fatality risk of 2 in 100,000 and twenty-five fewer fear-days. Contingent-valuation interviews would then be conducted inquiring about willingness-to-pay for the two lotteries thus described. Note that this technique *does* require agencies to quantify fear, and in that sense to engage in fear assessment, but it values fear- and risk-reductions together, not separately.

The difficulties with this fourth and final "bundled" technique are various. First, it would impose greater cognitive demands on interview subjects than asking them separately about willingness-to-pay to avoid risk and willingness-to-pay to avoid fear. Second, it would inhibit standardization, thereby increasing deliberation costs and making CBA more vulnerable to inexpert or politicized agencies.[130] "Unbundled" fear assessment would allow agencies to develop a standard cost per fear-day, paralleling the standard cost per death beginning to emerge in current regulatory practice;[131] quantifying fear- and death-reduction might be difficult, but monetizing this reduction would be straightforward. By contrast, the "bundled" technique now being considered would presumably require agencies to conduct separate contingent-valuation interviews for each of its options, unless a standardized valuation function for combinations of fear- and risk-reduction could somehow be developed. Third, and perhaps most importantly, the technique is inconsistent with the VOSL method now widely used by agencies to value risk-reductions. Risks would instead be valued directly, in combination with fear, rather than indirectly by multiplying deaths by a money price. The final "bundled" technique would therefore constitute a fairly radical change in current CBA practices. Perhaps, on balance, this change is warranted. Again, the additivity conditions undergirding "unbundled" fear assessment may break down and, where they do, radical change might be a good thing.

130. On the importance of agency expertise and fidelity in choosing among variants of CBA, see Adler & Posner, *supra* note 42, at 217–18.

131. *See supra* note 69.

Or perhaps not. Comparing the fourth and final "bundled" technique to "unbundled" fear assessment is a truly difficult enterprise, beyond the scope of this Article. What I have established, I hope, is that the best way to incorporate fear costs within CBA, consistent with current, VOSL-based practices for monetizing risk-reduction, is "unbundled" fear assessment. The only variant of "bundling" consistent with VOSLs is Revesz's proposal to use "tailored" VOSLs. And *that* kind of "bundling" is deeply problematic. It is hard to see how that approach, rather than "unbundled" fear assessment, could be the incremental change to current CBA practice that we would be justified in making. For the remainder of the Article, I will focus on "unbundled" fear assessment and consider how agencies, within that context, should develop a price for fear states.

III. PRICING FEAR STATES: REVEALED PREFERENCE OR CONTINGENT VALUATION?

Assume I am correct that agencies should engage in "unbundled" fear assessment, at least under certain conditions. Agencies should predict, and separately value, the change in fear states resulting from the mitigation or elimination of feared hazards. How, then, should these fear states be monetized? To begin, should fear assessment draw its values from revealed-preference or rather contingent-valuation studies?

Revealed-preference and contingent-valuation studies are the two standard sources of WTP/WTA values employed by CBA.[132] Revealed-preference studies use behavior to infer a valuation. Most straightforwardly, the price of a marketed good evidences the WTP of the marginal consumer. Various revealed-preference methods also exist for valuing goods that are not the direct subject of market transactions. For example, WTPs for environmental amenities can be inferred from "travel cost" data (park users are willing to incur greater direct travel costs and foregone wages to visit parks they prefer more),[133] or from the variation of housing prices near amenities.[134] WTP/WTA for the risk of death can be inferred from the wage differential between more and less dangerous occupations.[135] As for "contingent valuation" studies, these are based on interviews or mail

132. *See* FREEMAN, *supra* note 23, at 95–136, 161–87.
133. *See id.* at 419–33.
134. *See id.* at 353–97.
135. *See id.* at 297–321; VISCUSI, *supra* note 87 , at 34–75.

surveys, where respondents are asked to express their preferences as between goods, or lotteries of goods, and money.[136] Most simply, average WTP for a good might be elicited by asking respondents "What is the maximum you are willing to pay?" for the good, and averaging the responses. A variety of other, more sophisticated survey techniques have been developed over the forty-some years since the inception of contingent-valuation work. A widely followed approach today is to employ so-called "single-bounded, dichotomous-choice" questions. Each respondent is asked "Would you be willing to pay $X?" for the good, where the queried amount is varied among respondents; econometric techniques are then applied to the survey answers to infer an average WTP.[137]

Although the correct CBA construct is the welfare equivalent, not WTP/WTA, revealed-preference and contingent-valuation studies would also be the main data source for welfare equivalents. In particular, as I have already suggested, welfare equivalents can often be derived from revealed-preference or contingent-valuation studies evidencing WTP/WTA with respect to a recharacterized set of agency choices.

I have no quarrel with revealed-preference methods in other contexts. But they are, I think, a problematic tool for valuing fear states, and thus a problematic tool for regulators engaging in "unbundled" fear assessment as I have described it.[138] Let us simplify matters by ignoring the possibility of uncertainty with respect to fear states themselves, and ask how we should determine P's welfare equivalent

136. For overviews of the contingent-valuation method and the literature about it, see generally IAN J. BATEMAN ET. AL., ECONOMIC VALUATION WITH STATED PREFERENCE TECHNIQUES: A MANUAL (2002); FREEMAN, *supra* note 23, at 161–87; ROBERT CAMERON MITCHELL & RICHARD T. CARSON, USING SURVEYS TO VALUE PUBLIC GOODS: THE CONTINGENT VALUATION METHOD (1989); VALUING ENVIRONMENTAL PREFERENCES: THEORY AND PRACTICE OF THE CONTINGENT VALUATION METHOD IN THE US, EU, AND DEVELOPING COUNTRIES (Ian J. Bateman & Kenneth G. Willis eds., 1999).

137. *See* BATEMAN ET AL., *supra* note 136, at 138–42 (discussing different methods for eliciting monetary values in contingent-valuation surveys). As the authors explain, the single-bounded dichotomous choice technique is itself now being refined to eliminate possible characteristic biases (perhaps a nay-saying bias) and to elicit more information from respondents. *See id.* at 141 (discussing one-and-a-half bound and double-bounded dichotomous choice formats).

138. Whether revealed-preference techniques would be useful for agencies employing the fourth "bundled" valuation methodology I described above, in Part II.B, is a different question. Even within the context of that methodology, contingent valuation would seem to be the more natural technique, since an individual's revealed WTP to avoid some feared hazard might well diverge from his or her WE for the bundle of fear- and risk-reduction by virtue of probability neglect. But the comparative merits of contingent-valuation and revealed-preference techniques for pricing packages of risk- and fear-reduction is not an issue I can address here.

for an outcome W* that differs from the baseline outcome W solely by virtue of the fact that P experiences fear in W*. Details involving the choice of fear scale can also be bracketed: assume that individuals are placed in the binary categories of fearful/not fearful for a given day, and our fear assessment predicts the total fear-days resulting from hazards. P, then, experiences a certain incremental number of fear-days in W* as compared to W. How to determine the money amount that, added to his resources in W* (or subtracted from his resources in W), truly compensates him for the difference?

The deep difficulty in using market transactions or other behavioral evidence to value fear-days is that of untangling the subject's WTP/WTA to avoid the risk of a feared outcome, from his WTP/WTA to avoid fear itself. Typically, market transactions tie both benefits together. If I am scared of dying in a car crash, and pay more to buy a car with airbags, then what I have purchased is both peace of mind (fewer fear-days) and a reduced risk of the outcome I fear (dying in a crash). The incremental price of cars with airbags does not, in any direct way, reveal the WTP of car drivers for fear-avoidance: rather, it directly reveals their WTP for the combination of fear-avoidance and risk-reduction. Similarly, if I am scared of being crushed on a factory floor, and demand higher wages to run that risk, then the wages are compensation both for the higher risk and for the additional anxious days I will experience as compared to a safer job. The wage differentials between safer and riskier jobs reveal WTP/WTAs for a package of goods, including but not limited to fear-reduction.

Regression analysis might be thought to offer one route around this difficulty. Observed WTP/WTA data for market transactions that reduce the risk of feared outcomes might be "regressed" on various independent variables, including both the degree of risk-reduction and the number of fear-days reduced.[139] The coefficient for the fear-day variable could be used to infer welfare equivalents for fear-reduction itself. Ian Savage employed roughly this methodology in a study where he correlated revealed-preference estimates of WTP to reduce the risk of different types of fatalities (specifically, fatalities caused by domestic fires, automobiles, air pollution, cigarettes,

139. *See* BATEMAN ET AL., *supra* note 136, at 182–91 (discussing the "bid function," which "explains the variation in WTP/WTA response based on the change in and the characteristics of the non-market good, prices of market goods, income and other socio-economic characteristics of the respondents").

airlines, and nuclear power) with individual dread of those fatalities, as measured by Slovic's psychometric surveys.[140] The problem here is the confounding effect of fear on choice under uncertainty: one of the problems that led us to separate risk assessment from fear assessment in the first place. Imagine that I can be seen paying $100 for a smoke alarm, $600 for an airbag, and $6,100 for a house further from the nuclear plant, and that in each case my risk of death would be reduced by 1 in 10,000. It further emerges that the smoke alarm buys me no relief from fear (since I do not fear house fires); the airbag buys me ten days relief (the total time I would spend in an anxiety state in a car without an airbag); and the house away from the nuclear plant buys me 100 days relief (the total incremental fear-days I would experience with the closer house). Can we infer that my welfare equivalent not to experience a single fear-day is $50–$60, calculated as (1) the incremental WTP for the air bag or house ($500 or $6000) compared to a good, the smoke alarm, that produces the very same risk-reduction but no fear-reduction, divided by (2) the total fear-reduction purchased with the air bag or house (ten or 100 days)?

This is a problematic inference, given the literature on probability neglect. An alternative and quite plausible explanation of the difference between my revealed valuations is that, because I am scared of car crashes and even more scared of nuclear plants, I irrationally overweight the risks associated with these. My very approach to choice changes by virtue of being afraid. More generally, a positive coefficient on the fear-days variable in a regression equation predicting revealed WTP could indicate a positive WTP to avoid the outcome of fear, or it could reflect increasingly panicky choosers.[141]

A different revealed-preference approach to disentangling the values of fear-reduction and risk-avoidance might focus on a special class of market transactions—those where the only good purchased is fear-reduction. For example, we might observe what anxious individuals pay for psychiatric services to alleviate their distress. This

140. *See* Ian Savage, *Psychological Features Affecting Valuation of Life*, 35 ECON. LETTERS 379 (1991).

141. Yet more sophisticated regression techniques *might* be able to distinguish between the impact on WTP for reduced risk of the chooser's present anxiety and the impact of the anticipated reduction in fear-days. Make our independent variables (*inter alia*) fatality risk reduction, fear-days reduced, and the present fearfulness of the actor whose WTP is being observed. This could do the trick—but there might well be a sample size problem, since welfare equivalents for anticipated fear-days would be revealed by choosers whose present fearfulness is zero, and the number of such fearless choosers identified in studies of the relevant market transactions (those involving feared outcomes) could well be small.

approach is intriguing, but still problematic. First, anxious individuals do not know, when they purchase anxiety-reduction services, what the actual degree of anxiety-reduction will be. What we observe, then, is their WTP/WTA for a lottery with respect to fear-reduction; this WTP/WTA amount is good evidence of their welfare equivalent for that lottery, or a good basis for deriving their welfare equivalent for a certain change in fear states, only on the assumption that the individuals behave in rough conformity with expected utility theory—a heroic assumption, surely, for the population suffering sufficiently serious anxiety to consult psychiatrists. Second, the fact that a substantial portion of those purchasing anxiety-reduction services are phobics may also skew their revealed WTP/WTA for fear-reduction away from the average welfare equivalent for the general population; as already explained, phobia is a nonstandard case of fear, since core fear involves belief, not merely thought. Finally, and most importantly, the appropriate emotional condition for a subject attempting to determine his welfare equivalent for fear-reduction is a *calm* state, not a fearful state. P's welfare equivalent for some outcome or lottery is the amount that he would accept or pay for the outcome or lottery, were he to be calm (not fearful or otherwise aroused) and well informed and to have deliberated thoroughly.[142]

Fortunately, revealed-preference techniques are not the only game in town. The contingent-valuation technique is now accepted by a substantial segment of the economics community.[143] Literally thousands of such studies have been undertaken by applied economists;[144] a large theoretical literature focused on improving the technique's validity and reliability has developed;[145] and WTP/WTA estimates derived from contingent-valuation studies are regularly employed by agencies, both in the course of CBA and in other contexts.[146] The bulk

142. *See infra* Part IV.B.

143. *See* Ian J. Bateman & Kenneth G. Willis, *Introduction and Overview*, *in* VALUING ENVIRONMENTAL PREFERENCES, *supra* note 136, at 1–5 (describing continuing controversy over contingent valuation, characterized by both substantial support for and opposition to the method in the economics community).

144. *See* Richard T. Carson et al., *A Bibliography of Contingent Valuation Studies and Papers* (Natural Resource Damage Assessment Inc., 1995) (unpublished paper).

145. *See, e.g.*, FREEMAN, *supra* note 23, at 161–87 (summarizing efforts to improve method); Richard C. Bishop et al., *Contingent Valuation*, *in* HANDBOOK OF ENVIRONMENTAL ECONOMICS, *supra* note 101, at 629, 629–54 (reviewing literature on validity of contingent valuation).

146. *See* Bateman & Willis, *supra* note 143, at 1–5; John B. Loomis, *Contingent Valuation Methodology and the US Institutional Framework*, *in* VALUING ENVIRONMENTAL PREFERENCES, *supra* note 136, at 613, 613–27.

of studies conducted to date focus on public environmental goods. But this is neither in principle nor in practice a methodology merely for valuing cleaner parks and richer ecosystems. Health economists have used interviews to elicit WTP/WTA for a range of disease states, *inter alia* "light morbidity" conditions such as angina; throat, sinus, or head congestion; headache; runny nose; cough and sneeze; eye irritation; nausea; and shortness of breath.[147] These are roughly analogous *qua* well-being to anxiety in that they can occur in acute (short term) as well as chronic form, and in degrees of intensity; the welfare impact of the less intense acute form is largely hedonic (a day with a moderate headache, like a day spent moderately anxious, is a welfare setback largely because it feels bad); and the chronic or intense forms, like chronic or intense anxiety, will also have nonhedonic impacts such as avoided activities. The contingent-valuation technique should be no less applicable to fear/anxiety than to "light" physical diseases such as headaches, nausea, and angina. Nor should it be less applicable to fear/anxiety than to psychiatric conditions, or the pain and awareness states that concern anesthesiologists. The contingent-valuation technique is beginning to make headway into the literature on mental health economics, where it has been used to value depression,[148] and the literature on anesthesia, which now includes published studies eliciting WTP/WTA to avoid intraoperative awareness.[149]

Surprisingly, given the range of diseases and experiences for which WTP/WTAs have been elicited through interviews, the contingent-valuation literature on fear or anxiety itself is almost

147. *See, e.g.*, Johnson, *supra* note 67; Tolley, *supra* note 67. On the use of contingent-valuation interviews to value health states, see generally VALUING HEALTH FOR POLICY, *supra* note 56; Alan Diener et al., *Health Care Contingent Valuation Studies: A Review and Classification of the Literature*, 7 HEALTH ECON. 313 (1998); Thomas Klose, *The Contingent Valuation Method in Health Care*, 47 HEALTH POLICY 97 (1999); Jan Abel Olsen & Richard D. Smith, Theory *Versus Practice: A Review of "Willingness-to-Pay" in Health and Health Care*, 10 HEALTH ECON. 39 (2001); Richard D. Smith, *Construction of the Contingent Valuation Market in Health Care: A Critical Assessment*, 12 HEALTH ECON. 609 (2003).

148. *See* Jürgen Unützer et al., *Willingness to Pay for Depression Treatment in Primary Care*, 54 PSYCHIATRIC SERVICES 340 (2003). On economic evaluation (including cost-benefit evaluation) of mental health more generally, see S. M. A. A. Evers et al., *Economic Evaluation of Mental Health Care Interventions: A Review*, 6 HEALTH ECON. 161 (1997); Andrew Healey & Daniel Chisholm, *Willingness to Pay as a Measure of the Benefits of Mental Health Care*, 2 J. MENTAL HEALTH POL'Y & ECON. 55 (1999); Bruce Singh et al., *The Role of Economic Evaluation in Mental Health Care*, 35 AUSTRALIAN & NEW ZEALAND J. PSYCHIATRY 104 (2001).

149. *See* Tong J. Gan et al., *How Much Are Patients Willing to Pay to Avoid Intraoperative Awareness?*, 15 J. CLINICAL ANESTHESIA 108 (2003); Kate Leslie et al., *Patients' Knowledge of and Attitudes Towards Awareness and Depth of Anaesthesia Monitoring*, 31 ANAESTHESIA & INTENSIVE CARE 63 (2003); *see also* Debora Matthews et al., *Putting Your Money Where Your Mouth Is: Willingness to Pay for Dental Gel*, 20 PHARMACOECONOMICS 245 (2002) (evaluating WTP for novel, noninjectable dental anaesthetic).

nonexistent. I have identified only a single study where respondents were asked directly for their monetary valuation of a fear or anxiety state: Zeidner and Shechter's study of Israeli university students, which inquired about WTP to reduce test anxiety.[150] Other contingent-valuation studies have measured the respondents' anxiety, and included that as one of the independent variables in an estimated "bid function," with WTP/WTA to reduce risk or purchase other goods as the dependent variable[151]—but for reasons that should now be evident, these sorts of contingent-valuation studies (like their revealed-preference counterparts) are a problematic basis for inferring the cost of fear.

The case against contingent valuation of fear, if there is one, will have to be generic, not specific. It is hard to see why the technique would be appropriate for environmental goods, but not health states; or serious diseases, but not light morbidity; or light morbidity and certain mental states (for example, headaches or intraoperative awareness) but not fear. The claim would have to be that contingent valuation, in general, is a flawed tool for measuring WTP/WTA (or, on my conceptualization of CBA, for measuring the objectivist correlate to WTP/WTA, namely welfare equivalents). And general claims of this sort certainly have been advanced;[152] indeed, the debate between the proponents of contingent valuation and its global critics has generated a mini-literature within economics.[153]

It is well beyond the scope of this Article to engage that debate in a thorough way. (I have already stated, and should stress, that my

150. *See* Moshe Zeidner & Mordechai Shechter, *Reduction of Test Anxiety: A First Attempt at Economic Evaluation*, 7 ANXIETY, STRESS, & COPING 1 (1994).

151. *See* David N. Fisman et al., *Willingness to Pay to Avoid Sharps-Related Injuries: A Study in Injured Health Care Workers*, 30 AM. J. INFECTION CONTROL 283 (2002); Stephanie J. Lee et al., *Patients' Willingness to Pay for Autologous Blood Donation*, 40 HEALTH POL'Y 1 (1997); Mandy Ryan, *Valuing Psychological Factors in the Provision of Assisted Reproductive Techniques Using the Economic Instrument of Willingness to Pay*, 19 J. ECON. PSYCHOL. 179 (1998); Ian Savage, *An Empirical Investigation into the Effect of Psychological Perceptions on the Willingness-to-Pay to Reduce Risk*, 6 J. RISK & UNCERTAINTY 75 (1993); Bruce H. Smith, *Anxiety as a Cost of Commuting to Work*, 29 J. URB. ECON. 260 (1991); Eric Thunberg & Leonard Shabman, *Determinants of Landowner's Willingness to Pay for Flood Hazard Reduction*, 27 WATER RESOURCES BULL. 657 (1991); Zeidner & Shechter, *supra* note 41.

152. *See, e.g.*, CONTINGENT VALUATION: A CRITICAL ASSESSMENT (Jerry A. Hausman ed., 1993).

153. *See, e.g.*, Peter A. Diamond & Jerry A Hausman, *Contingent Valuation: Is Some Number Better than No Number?*, 8 J. ECON. PERSP. 45 (1994) (presenting criticisms); Peter A. Diamond & Jerry A. Hausman, *On Contingent Valuation Measurement of Nonuse Values*, *in* CONTINGENT VALUATION, *supra* note 152, at 3–38 (presenting criticisms); Kevin J. Boyle & John C. Bergstrom, *Doubt, Doubts, and Doubters: The Genesis of a New Research Agenda?*, *in* VALUING ENVIRONMENTAL PREFERENCES, *supra* note 136, at 183 (surveying criticisms).

opposition to revealed-preference techniques is specific, not generic: the dual role of fear as a consequence of choice and a condition of the chooser undercuts the technique's usefulness in the particular domain of "unbundled" fear assessment.) Suffice it to say that all but one of the generic objections to contingent valuation seems misplaced, at least in the case of fear. One set of objections focuses on cognitive limitations or biases that can be overcome by changing the form of the interview. For example, answering the open-ended question "What is the maximum amount you are willing to pay/accept for ___?" is cognitively quite demanding; and reducing this cognitive load through a "bidding game," where respondents are presented with increasing monetary amounts, and asked about willingness to trade the good for these amounts until a maximum is reached, leads to WTP/WTA estimates that are biased by the initial bid (an instance of anchoring bias). But both these problems are avoided through the dichotomous choice format that is currently popular.[154]

A different objection is that answers to contingent-valuation surveys express moral judgments or political views, rather than the sorts of preferences relevant to CBA, namely self-interested ones. Critics voicing this objection often point to so-called "scope" problems: cases in which expressed WTP/WTA is invariant to the scope of the good being evaluated, such as Desvouges' well-known study where different groups of respondents expressed nearly identical mean WTPs to save 2,000, 20,000, and 200,000 migratory waterfowl.[155] The problem here has more to do with the good being valued than the valuation format—preferences for environmental goods revealed through contributions to the Sierra Club also are typically moral rather than self-interested preferences—and in any event is unlikely to carry over to the contingent valuation of fear or other experiential or health states, the heartland of self-interested preferences. Not surprisingly, a recent survey of health care contingent-valuation studies found little evidence of scope-invariance.[156]

154. *See* BATEMAN ET AL., *supra* note 136, at 138–42.

155. William H. Desvousges et al., *Measuring Natural Resource Damages with Contingent Valuation: Tests of Validity and Reliability*, *in* CONTINGENT VALUATION, *supra* note 152, at 91, 99–102.

156. *See* Klose, *supra* note 147, at 105–09. *Cf.* Alan Shiell & Lisa Gold, *Contingent Valuation in Health Care and the Persistence of Embedding Effects Without the Warm Glow*, 23 J. ECON. PSYCHOL. 251 (2002) (finding "embedding effects" in health care contingent-valuation study designed to exclude moral preferences).

What about the oft-heard claim that contingent valuation asks about hypothetical choices, while market and other revealed-preference data evidence actual choices? The respondent is being asked to compare a baseline lottery or outcome to a different lottery or outcome packaged with compensating changes to the respondent's wealth position, where these options are neither his to choose, nor even the government's to choose (since the actual options being considered by the government do not involve the hypothesized changes in respondent's wealth). It is hard to know what to make of this objection. Surely non-actual objects (choices, outcomes, things) can, in principle, be evaluated by humans. For example, the expected utility model of choice asks humans to value non-actual outcomes—the merely possible consequences of the agent's choices. Perhaps the thought is that contingent-valuation questions, *qua* hypothetical, are cognitively difficult. But this, once more, would seem to be more a question of the good evaluated than the elicitation method: consider the cognitive demands of deciding whether to buy a house, given its architecture and decor, possibly hidden defects, physical setting, immediate neighborhood, proximity to other goods and bads, and investment value. Thinking about willingness-to-pay to avoid anxiety, at least in the case of acute anxiety that has a relatively "local" effect on well-being, is no harder than thinking about willingness-to-pay for small consumption goods, and in the case of anxiety with more global effects would not seem to pose qualitatively greater cognitive demands than thinking about willingness-to-pay for a house, an education, or longevity.

Perhaps the complaint about the "hypothetical" cast of contingent-valuation questions goes to the respondents' seriousness. Respondents evaluate these hypothetical choices in a quick, off-hand way. This is a serious complaint, particularly for my purposes, since welfare equivalents presuppose thorough deliberation. The complaint is one part of a broader objection, namely that contingent-valuation surveys do not produce sincere and truthful answers. Stated preferences do not represent respondents' real preferences: either because they have not thought enough to formulate those preferences, or because they have but are lying for strategic reasons. On the last count: it is well known that self-interested actors will often have an incentive

to overstate or understate their WTP/WTA, depending on the interview format.[157]

The objection is surely worrying. Still, I do not think it is decisive against using contingent-valuation studies to value fear. First, respondents to these surveys, and to surveys more generally, seem often to be more honest than is rational in light of self-interest.[158] Second, and relatedly, interview format can help encourage honesty and deliberational work. (For example, paying respondents for their time can intensify guilt feelings that, intuitively, would help counteract shirking and lying.) Third, the fact that some respondents can be predicted to give untruthful responses to interview questions need not erase the epistemic value of the interviews. Randomly untruthful responses are one thing; but if I have theoretical grounds for believing in a correlation between stated and real preferences, *e.g.*, for believing that strategic untruths in a given context will overstate real welfare equivalents, then the contingent-valuation data will provide some evidence of real welfare equivalents. Finally, worries about sincerity and honesty provide no reason at all to use revealed-preference rather than contingent-valuation techniques insofar as the revealed-preference techniques incorporate self-report measures of fear. Understand that the revealed-preference technique will correlate the subjects' fear states with their WTP/WTA to mitigate those states or reduce the chance of the outcomes that the subjects fear. But characterizing the subjects' states may well involve *interviews*: interviews to determine how scared they are. For example, the "dread" variable upon which Ian Savage regressed revealed WTP to avoid deaths from domestic fires, automobiles, air pollution, cigarettes, airlines, and nuclear power was derived from Slovic's psychometric work, and that in turn was grounded on survey data where respondents were interviewed to determine how they viewed different hazards.[159] Why assume that respondents to Slovic's interviews are truthful, while respondents to contingent-valuation interviews are not?

To be sure, fear measures grounded in observer-reports rather than self-reports do exist. A psychiatrist or some other expert might be asked to scale the fearful individual's anxiety, as evidenced by her

157. *See, e.g.*, Robert Sugden, *Public Goods and Contingent Valuation*, *in* VALUING ENVIRONMENTAL PREFERENCES, *supra* note 136, at 131, 135–39.

158. *See id.* at 137–38.

159. *See* Savage, *supra* note 140, at 382; Paul Slovic et al., *Characterizing Perceived Risk*, *in* PERILOUS PROGRESS: MANAGING THE HAZARDS OF TECHNOLOGY 91 (Robert W. Kates et al. eds., 1985).

behavior or physiology; that observer-reported measure might then be correlated with the subject's purchasing activities to derive a revealed-preference measure of her WTP/WTA to avoid fear. But even this technique may presuppose more honesty and sincerity than axioms of individual rationality and self-interest would predict—by presupposing that the psychiatrist or other observer has truthfully communicated the fear state he observes, and has put some effort into the observation. In short, a substantial degree of trust (be it in subjects or observers) seems to be as much a precondition of revealed-preference techniques as of contingent-valuation techniques, and if so the problem of respondent honesty and sincerity is no grounds for abandoning the second set of techniques in favor of the first.

IV. USING CONTINGENT VALUATION TO VALUE FEAR STATES

I have argued that "contingent valuation" interviews should be used to attach a money price to fear states, at least where agencies engage in "unbundled" fear assessment. But what, precisely, is being valued? And whose valuations count? This Part engages these fundamental issues, then considers and endorses the thought that indirectly as well as directly derived money prices might be useful for CBA. By "directly derived," I mean a money price elicited through a classic contingent-valuation interview: one where the respondent is asked for her WTP/WTA. By "indirectly derived," I mean an interview format where the respondent is asked to measure fear on some other scale of well-being, such as a QALY scale, and these measurements are then converted to WTP/WTA through some standard conversion factor.[160]

160. Another question is whether fear is priced *ex post* or *ex ante*. Should the fear assessor (say) estimate the mean difference in fear-days as between different regulatory options, and then price this difference using an *ex post* valuation of a fear-day derived from contingent valuation? Or should she, instead, characterize the lottery over fear states that different members of the population face, and employ contingent valuation to price these lotteries? This Part assumes that the first approach, or something like it, is correct, given the extra deliberation costs of *ex ante* valuation, and discusses the design of contingent-valuation interviews to capture an *ex post* valuation of fear. But the claims in this Part generally carry over to *ex ante* valuation. Specifically, *ex ante* valuations could focus (narrowly) on the intrinsic costs of fear, or (more encompassingly) on instrumental as well as intrinsic costs; the evaluators should be calm, not fearful; and appropriate QALY measures could be translated into *ex ante* monetary valuations.

A. *What is a Fear State?*

"Unbundled" fear assessment asks CBA analysts to disaggregate two kinds of welfare costs that regulatory choices may have: the bad outcomes that prompt fear (deaths, injuries), and fear itself. Relatedly, contingent-valuation interviews should be the core technique for monetizing fear itself. These claims have an obvious implication for the *design* of the requisite contingent-valuation interviews. Those should be focused tightly on fear states, not on a looser amalgam of fear states and feared outcomes, as most interview work to date in this area has been. An illustrative example: Fisman et al. surveyed health care workers who reported a sharps-related injury while handling a contaminated medical device, asking "Suppose there was a reusable device that could have prevented your injury. Knowing what you know now, would you have paid $X out of pocket for such a device?"[161] The median time from injury to interview was three days, and although some of the interviewees had obtained definitive information about their risk of infection, some had not. Not surprisingly, the median reported WTP to avoid the injury was $850, substantially larger than WTP/WTA amounts elicited in contingent-valuation interviews for headache-days, angina-days, cold- and cough-days, and other light morbidities that (intuitively) should be roughly comparable in their welfare impact to fear.[162] Workers in the Fisman study who had not yet learned their infection status would be paying to avoid both the risk and the fear of infection, and presumably even some of those who had received a negative test prior to the contingent-valuation interview ascribed a nonzero probability to the infection outcome, for example, because of test inaccuracy.

Zeidner and Shechter, in their contingent-valuation study of exam anxiety among Israeli students, did focus narrowly on fear states.[163] This study illustrates a different point, one that to this point I have downplayed: namely, that fear states themselves are heterogeneous in their impact on human well-being. Students in two required introductory courses, one in economics and the other in education, were asked about willingness-to-pay to reduce their exam anxiety. The interviews occurred towards the end of the semester, prior to the

161. *See* Fisman et al., *supra* note 151, at 284.

162. *See infra* text accompanying note 193.

163. *See* Zeidner & Shechter, *supra* note 150. A different Zeidner and Shechter contingent-valuation study estimates willingness-to-pay to reduce air pollution as a function (*inter alia*) of anxiety. *See supra* note 41 and text accompanying note 151.

final exam in both classes. Economics students had on average a higher WTP. A partial explanation of the difference, Zeidner and Shechter suggest, is that anxiety had greater expected professional costs for the economics students than for the education students. Although a passing grade in both courses was required for further coursework in the respective majors, the pass rate in economics was much lower than that in education. Thus anxiety was less likely to prevent the education students, as compared to the economics students, from passing their tests and continuing in their majors. Fear states are both *intrinsically* bad (as a kind of negative experiential state) and *instrumentally* bad (insofar as fear causes or partly constitutes other welfare setbacks). The WTP values elicited in the Zeidner/Shechter study reflected the students' willingness-to-pay to avoid the combination of the intrinsic and instrumental costs of fear; because fear had greater instrumental costs, *qua* professional success, for the economics students, their WTP amounts were higher.

The distinction between the intrinsic and instrumental welfare effect of fear states is crucial. Any self-conscious and decently theorized practice of fear assessment must take account of that distinction. To see it in a more general way, consider Martha Nussbaum's list of objective welfare goods—the broadest and arguably the best list in the current philosophical literature: (1) life; (2) bodily health; (3) bodily integrity; (4) senses, imagination, and thought ("[b]eing able to use the senses, to imagine, think, and reason"); (5) emotions (*inter alia* "[n]ot having one's emotional development blighted by . . . fear and anxiety); (6) practical reason ("[b]eing able to form a conception of the good and to engage in critical reflection about the planning of one's life"); (7) affiliation ("[b]eing able to live with and toward others, . . . to engage in various forms of social interaction"); (8) other species; (9) play ("[b]eing able to laugh, to play, to enjoy recreational activities"); (10) control over one's environment. [164] P's fear is, without more, a setback with respect to Nussbaum's fifth dimension of welfare: the "emotions" dimension. But P's fear may also cause him to refrain from activities that would be beneficial with respect to other welfare dimensions. For example, if P is afraid of some object or activity he may substitute a different, more dangerous one, thus risking his life or health (dimensions one and two). P's fears may lead him to refrain from activities that advance his goals (dimension six), or from social interaction (dimension seven). If P's fears hinder his

164. *See* NUSSBAUM, *supra* note 46, at 78–80.

productivity, either because he is scared of particular workplaces or because a general anxiety state makes him less productive in any workplace, then fear might cause a drop in P's income, in turn causing setbacks with respect to all the dimensions for which money is useful (dimensions 1–10).

The causal impact of fear states on welfare goods is one kind of "instrumental" impact, but not the only kind. I am using "instrumental" to mean any nonintrinsic impact, where in turn an intrinsic impact is one that occurs solely in virtue of fear's experiential features. Fear can be an "instrumental" welfare setback either by causing other harms, or by displacing the experiential states that are one component of a larger good encompassing both experiential and nonexperiential features. Consider Nussbaum's ninth dimension, play or recreation. To recreate is to engage in certain activities, and to experience pleasure as a result. If P is scared of the toxin in his soil and "goes through the motions" of recreating in his backyard, but his fear state crowds out any enjoyment from these activities, then this fear has (noncausally) produced a cost with respect to dimension nine. An even more important example, arguably, involves Nussbaum's fourth, sixth and seventh dimensions. Theoretical reason, practical reason, and affiliation are (arguably) welfare goods that essentially include an enjoyment component. How good for P is a friendship in which he takes little pleasure (because he's in an anxiety state), or a practical or intellectual accomplishment that he cannot savor?

Incorporating the instrumental effect of fear within fear assessment is a complicated question, about which I lack firm views. One is tempted to think that a further unbundling might work here: for any given fear state, we can predict the (lottery over) other bad outcomes that the state might produce, and value the fear state as the sum of the intrinsic cost of fear, plus the (expected) cost of those other outcomes as priced using standard values.[165] For example, if P experiences 100 fear-days, and cuts back his recreational activities as a result, then the cost of fear is the experiential cost of the 100 days, plus the foregone benefit of the activities as measured by the market prices of those activities or by revealed-preference or contingent-valuation studies generally pricing the activities. The problem here is

165. In other words, "averting behavior" undertaken to avoid a perceived risk might be ascribed the same cost, regardless of whether the actor is fearful or fearless. On pricing "averting behavior," see, e.g., FREEMAN, *supra* note 23, at 337–38; George Tolley & Robert Fabian, *Future Directions for Health Value Research*, *in* VALUING HEALTH FOR POLICY, *supra* note 56, at 300, 315–16.

that fear may have the effect of deflating the welfare value of the recreational activities that P continues to engage in—an effect not captured by focusing merely on the foregone activities and valuing those activities at the price that the population in general, anxious and nonanxious alike, is willing to pay for them.[166] P goes to the park fifteen times instead of twenty, but the fifteen trips are not as enjoyable as fifteen trips in a nonfearful state; thus P's welfare equivalent for the instrumental effect on his recreation is greater than the foregone five trips multiplied by the amount he would have paid for those five trips in a nonfearful state (estimated by generic measures for the trips such as the market price of park entry or generic travel-cost studies.) More generally, insofar as experiential states have a constitutive role with respect to welfare dimensions such as affiliation, practical reason, or play that hybridize both experiences and other things, someone's welfare equivalent for a fear state cannot be accurately decomposed into the sum of WTP/WTA for the bad experience plus WTP/WTA for the change with respect to the nonexperiential features of these additional dimensions.[167]

Yet CBA routinely tolerates inaccuracies, given deliberation costs. Is estimating the cost of a fear state as the sum of the intrinsic cost of fear, plus the instrumental cost as priced using generic values, any different from (say) the multiple inaccuracies currently tolerated in the pricing of life? There, too, much heterogeneity is suppressed. If the intrinsic and instrumental aspects of fear are not unbundled, for CBA purposes, the prospect of standardizing (and thereby economizing on the costs of) fear assessment through a standard tariff of fear prices becomes dimmer. Perhaps agencies might distinguish between

166. There is a loose analogy, here, to the way in which physical disability can change the utility of money. *See* Alan Schwartz, *Proposals for Products Liability Reform: A Theoretical Synthesis*, 97 YALE L.J. 353, 364 (1988).

167. The point I'm making here can be rephrased in the language of multiattribute utility theory, more familiar to economists than talk of "intrinsic" and "instrumental." A person's objective well-being, my concern in this Article, cannot be accurately represented as her location on robustly *independent* dimensions such that (1) a fear state constitutes a change only with respect to one dimension, namely some kind of experiential dimension; (2) changes with respect to other dimensions have the same effect on the person's well-being, regardless of her location on the fear dimension, and vice versa. Rather, the best representation consists of an experiential dimension E plus other dimensions $D_1 \ldots D_n$, where some of the D_i are not even conceptually independent of E (it is impossible to concatenate all locations in E with all locations in these other dimensions) or if conceptually independent, interact with E in a complicated way to determine the subject's well-being. In either event, P's welfare equivalent for the change produced by fear with respect to $D_1 \ldots D_n$ must take account of his location on dimension E. WTP/WTA amounts for $D_1 \ldots D_n$ changes, elicited in generic contingent-valuation or revealed-preference studies where respondents or actors may well be located at a different point in the E dimension than P himself, are imperfect evidence of P's welfare equivalent for those changes.

two subpopulations within the group of persons whose fear states are influenced by agency choices: a subpopulation whose lives are "locally" affected by fear (the fear resulting from agency choice constitutes an intrinsic setback for them, plus perhaps induces behavioral changes, but does not alter the welfare-value of their activities in a pervasive way), and a subpopulation whose lives are "globally" affected. Standard values could be used to price fear-days and avoided activities within the "locally" affected group; these standard values for fear-days would be derived from contingent-valuation studies focusing solely on the intrinsic cost of fear. To price the impact of fear on the "globally" affected subpopulation, an agency could rely upon a more specialized and holistic contingent-valuation study: one eliciting WTP/WTA for the combination of fear-days plus the other welfare changes (professional, social, recreational, etc.) that persons within this subgroup would undergo.

The difficult issues sketched here are fodder for future research. I have not taken a position on the shape of optimal agency practice, but have simply described a basic problem that any agency engaged in fear assessment and designing or employing interviews to value fear states would need to confront. The point to recognize is that fear sometimes has wider effects than the purely experiential. Contingent-valuation studies of fear states might be localized, targeted just at the intrinsic harm, or holistic, targeted at bundles of intrinsic harms plus others. Fear assessment surely *will* rely upon localized studies—at a minimum, where the fear produced by agency choice is just a local harm, as was true of the very short-term anxiety states that the FDA priced in the gloves rulemaking. But holistic studies might also be a part of optimal CBA.

B. Whose Valuations Count?

The respondents in a contingent-valuation study of fear (be it a localized study focused on fear's intrinsic harms, or a holistic study encompassing both intrinsic and instrumental harms) might themselves be in a fear state, or they might be calm. Assuming that variations in respondents' fear characteristics produce variations in WTP/WTA—as might well occur[168]—which set of valuations is

168. *Cf.* G. Ardine de Wit et al., *Sensitivity and Perspective in the Valuation of Health Status: Whose Values Count?*, 9 HEALTH ECON. 109, 110 (2000) (surveying thirty-eight QALY studies in which different groups were asked for valuation of the same health state, and finding that

normative for CBA? This question parallels a general question mooted by health economists: should the respondents to QALY surveys be patients, or rather healthy individuals (such as doctors or members of the general population)? Many QALY studies of both kinds have been done; often diseased and healthy individuals provide different QALY values for the same disease state; and which QALY value should count for health policy analysis is controversial.[169]

My response to this problem of specifying respondents' anxiety condition in contingent-valuation interviews pricing fear, and more generally respondents' physical or psychological condition in any study eliciting money or QALY measures of well-being, is to recur to the objectivist account of welfare that—I have argued—undergirds interpersonal comparisons and therewith CBA and related kinds of policy analysis. Objective goods, I have claimed, are features of outcomes that idealized observers prefer. But what does "idealized" mean? In eliciting WTP/WTA for (say) a highly anxious state, as compared to a baseline (say, mildly anxious) state, the respondent might be: (1) absolutely calm; (2) mildly anxious; (3) highly anxious; or (4) panicked. Note that the respondent's anxiety state can, but need not, match either of the states being evaluated.[170] Both outcomes can be hypothetical, not occurrent. So it is our account of welfare goods, not the evaluative task at hand, that fixes the respondent's appropriate emotional condition. But what does *that* account stipulate?

The most sophisticated work developing an idealized preference account of welfare has been done by Peter Railton.[171] Railton defines a person's good as "what he would want himself to want, or to pursue, were he to contemplate his present situation from a standpoint fully and vividly informed about himself and his circumstances, and

"[t]wenty-seven of the 38 studies concluded that patient values are different or sometimes different from other groups' values").

169. *See id.*; *see also* Diener, *supra* note 147, at 320 (surveying contingent-valuation studies of health and finding variation in disease status of respondents).

170. *Cf.* de Wit et al., *supra* note 168, at 110 (summarizing study designs for comparing different groups' QALY valuations of health states, many of which ask respondents to value a hypothetical state rather than their actual state).

171. *See* Peter Railton, *Facts and Values*, 14 PHIL. TOPICS 5 (1986); Peter Railton, *Moral Realism*, 95 PHIL. REV. 163, 171–84 (1986); *see also* Connie S. Rosati, *Persons, Perspectives, and Full Information Accounts of the Good*, 105 ETHICS 296, 299 & n.7 (1995) (stating that "[Richard] Brandt and Railton provide the most developed discussion of what it is for a person to be fully informed" and treating Railton's position "as providing the standard formulation of Ideal Advisor views [of welfare], since it avoids problems to which other formulations are subject [including Brandt's] and thus can be regarded as the most fully developed such view").

entirely free of cognitive error or lapses of instrumental rationality."[172] This definition, and Railton's discussion, emphasizes information, cognition, and means-end rationality as components of the idealized observer's condition. Railton does not discuss the observer's emotional state, and so one must infer what his account would imply about that. Means-end rationality is certainly relevant here—at least if means-end rationality is understood to encompass the axioms of expected utility theory, as I believe it should. As we saw earlier, the literature on "probability neglect" suggests that fearful individuals are even worse than calm individuals at processing probabilities in accordance with expected utility theory. This seems to imply that Railton's idealized observer is calm, not fearful.

In response, it might be objected that probabilities are irrelevant to the particular valuational exercise being considered in this Part: the comparison of an outcome in which the respondent undergoes a particular anxiety experience for certain, to one in which he for certain does not undergo that experience. But in other contexts we *will* want to determine which lottery, rather than certain outcome, is better for a person—for example, in determining his welfare equivalent for a risk of death or bodily injury. It would be odd to vary the emotional characteristics of the idealized observer, such that he or she is stipulated to be calm in comparing lotteries but anxious in comparing certain outcomes.

Further, a contingent-valuation exercise putatively focused on a certain outcome will, inevitably, involve a suppressed lottery. Consider the question: "How much are you willing to pay to spend tomorrow in a calm state as opposed to a highly anxious state?" The alternatives being compared—the respondent's being calm tomorrow versus the respondent's being highly anxious tomorrow—are not maximally specified outcomes, complete "possible worlds." Rather, they are individual states of affairs that specify one attribute of a complete possible world. The respondent is asked to value alternatives that vary with respect to this attribute; the multiplicity of other attributes of possible worlds are not stipulated, and the respondent (if rational) will handle the valuational exercise by attaching probabilities to the remaining attributes, or at least some of them. In other words, the alternatives under comparison in this and every contingent-valuation interview *are*, in effect, lotteries: in this case, a lottery

172. Railton, *Facts and Values*, *supra* note 171, at 16.

in which respondent's being calm tomorrow has probability one, but his emotional state thereafter, his future wealth position, and many other things about him are uncertain, versus a lottery in which his being anxious tomorrow has probability one and all these other things are once more uncertain.[173]

What about the cognitive and informational elements of Railton's idealization: the stipulation that the observer be "fully and vividly informed about himself and his circumstances, and entirely free of cognitive error"? Fear does not preclude cognition. Indeed, core fear as I understand it entails cognition—a belief, which could well be true or warranted, that the subject has a nontrivial probability of being physically harmed. But one might ask whether the fearful or calm observer is better situated to grasp the array of ancillary true facts that may be relevant to valuing fear states. Believing a true fact is more than merely registering that fact; it means having that fact play a deliberational role. Some of the literature on anxiety suggests that fear involves an attention to the feared outcome, and perhaps a higher-order attention to the fear state itself, that (intuitively) would dampen the deliberational role of other facts.[174] For example, imagine that a somewhat holistic contingent-valuation study is being conducted, where respondents are asked to consider not just the intrinsic experiential badness of fear, but the deleterious health effects that might result from protracted fear. One group of respondents, some fearful and others calm, are credibly informed that these effects are large; another group, again with fearful and calm subgroups, is credibly informed the opposite. Intuitively, the calm respondents' valuations of the fear states should vary more than fearful respondents'.

A related issue—less cognitive than imaginative—is whether fearful or calm respondents are better able vividly to represent to themselves the emotional states being compared. Calm respondents are given descriptions of the various mental elements constituting a more anxious state (the arousal, the cognition, the affect) and a less anxious state. Ditto for anxious respondents. Which group is better able to imagine what it would be like to be in both states? Again, the attentional characteristics of fear would seem to imply that (*ceteris paribus*) calm respondents are better able to imagine both states than

173. The same would be true (a bit less obviously) in a more holistic contingent-valuation interview.

174. *See* BARLOW, *supra* note 35, at 249–55; Ben Searle et al., *Cognition, Stress and Anxiety*, *in* STRESS: MYTH, THEORY AND RESEARCH, *supra* note 38, at 89, 93–99.

fearful respondents. The "*ceteris paribus*" clause is very important here. It may well be true that a currently fearful individual who's been calm at many points in the past is better able to imagine both fear states and calm states than a calm person who has never been afraid. But, as between a currently calm person with past experience of fear, and a currently anxious person with past experience of calm, the former is plausibly better situated to imagine fearful and calm states, as well as to give deliberational weight to ancillary facts and to process probabilities.

To be sure, the issues discussed in the last few paragraphs are squarely empirical ones. If experimentation in psychology reveals that fearful individuals, albeit worse at processing probabilities in accordance with expected utility theory, are (otherwise) more deliberationally sensitive to relevant facts, and more imaginative, then the case for grounding fear assessment on anxious rather than calm valuations of fear and anxiety would be strong.

C. *Deriving Fear Prices from QALYs*

The "QALY" and contingent-valuation methods are parallel, interview-based techniques for measuring value, differing mainly in the kind of scale used. In the contingent-valuation format, respondents are asked to use a money scale. In the QALY format, respondents are asked to rank outcomes—standardly, health states—on a 0–1 scale, with 1 representing the very best state, and 0 representing death.[175] They may be asked to make an intuitive assignment of numbers to states, or rather instructed to use a technique that generates numbers, most typically the "standard gamble" or "time trade off" techniques.[176] Many hundreds of published QALY studies now exist,[177]

175. The number 0 is sometimes assigned to the worst state, not death. *See* Paul Kind, *The EuroQoL Instrument: An Index of Health-Related Quality of Life, in* QUALITY OF LIFE AND PHARMACOECONOMICS IN CLINICAL TRIALS 191, 194 (Bert Spilker ed., 2d ed. 1996).

176. For overviews of the QALY method for measuring health states, see DOUGLAS MCCULLOCH, VALUING HEALTH IN PRACTICE: PRIORITIES, QALYS, AND CHOICE (2003); ERIK NORD, COST-VALUE ANALYSIS IN HEALTH CARE: MAKING SENSE OUT OF QALYS (1999); Paul Dolan, *The Measurement of Health-Related Quality of Life for Use in Resource Allocation Decisions in Health Care, in* 1B HANDBOOK OF HEALTH ECONOMICS 1723 (A. J. Culyer & J. P. Newhouse eds., 2000); Robert Fabian, *The Qualy Approach, in* VALUING HEALTH FOR POLICY, *supra* note 56, at 118; Robert M. Kaplan, *Utility Assessment for Estimating Quality-Adjusted Life Years, in* VALUING HEALTH CARE: COSTS, BENEFITS, AND EFFECTIVENESS OF PHARMACEUTICALS AND OTHER MEDICAL TECHNOLOGIES 31 (Frank A. Sloan ed., 1996).

177. *See* Chaim M. Bell et al., *An Off-the-Shelf Help List: A Comprehensive Catalog of Preference Scores from Published Cost-Utility Analyses*, 21 MED. DECISION MAKING 288, 289

including some that provide QALY values for anxiety.[178] QALYs are also, sometimes, translated into dollar values using conversion factors.[179] Indeed, this is what FDA did in the gloves rulemaking to value infection-anxiety. It used a conversion value of $373,000 for the loss of a single year of life at QALY level 1.

The QALY-to-dollars conversion technique is not uncontroversial,[180] but is acceptable for purposes of CBA as I conceptualize it *if* respondents are instructed to think of the QALY scale as a welfare scale—a point I will discuss in a moment—and if the conversion factor is appropriate. By an "appropriate" conversion factor, I mean one that produces a reasonably good estimate of subjects' welfare equivalents for changes in states—perhaps the average ratio of WTP/WTA values and QALY increments for changes in health states that have been valued using both techniques;[181] or the conversion factor implied by WTP/WTA for the risk of death, on the assumption that individuals value risks of premature death by valuing the risk of the QALY loss (relative to longer life) that premature death involves.[182] Specifying this conversion factor is an important problem for CBA that needs further analysis, which I cannot provide here, but there seems no reason in principle—on the view that CBA is a decision procedure implementing overall well-being—to resist the very idea of QALY-to-dollar conversions.

(2001) (finding 228 published "cost-utility" studies (*i.e.*, cost-effectiveness studies that use QALYS as the measure of effectiveness) published in English in the period from 1976 until 1997, with a total of 949 QALY valuations of health states).

178. *See infra* note 194 & accompanying text; Dennis G. Fryback et al., *The Beaver Dam Health Outcomes Study: Initial Catalog of Health-State Quality Factors*, 13 MED. DECISION MAKING 89, 94–97 (1993). On the use of QALYS in measuring mental health generally, see D. Chisholm et al., *QALYs and Mental Health Care*, 32 SOC. PSYCHIATRY & PSYCHIATRIC EPIDEMIOLOGY 68 (1997). On the use of non-QALY "quality of life" measures in evaluating anxiety, see, e.g., Mauro Mendlowicz & Murray B. Stein, *Quality of Life in Individuals with Anxiety Disorders*, 157 AM. J PSYCHIATRY 669 (2000). These alternative measures, typically, have multiple noncomparable subscales and do not provide a single overall number measuring the impact of a health state on well-being.

179. *See, e.g.*, Tolley et al., *supra* note 67, at 327–29.

180. On the QALY-to-dollars conversion issue, see Richard A. Hirth et al., *Willingness to Pay for a Quality-Adjusted Life Year: In Search of a Standard*, 20 MED. DECISION MAKING 332 (2000). For a comparison of QALYs and WTP more generally, see James K. Hammitt, *QALYs Versus WTP*, 22 RISK ANALYSIS 985 (2002); Patrick Hofstetter & James K. Hammitt, *Human Health Metrics for Environmental Decision Support Tools: Lessons from Health Economics and Decision Analysis* (EPA Office of Research and Development, 2001).

181. *See* Johnson, *supra* note 67 (correlating QALY and WTP values for short-term health conditions).

182. *See* Tolley et al., *supra* note 67, at 328–29 (converting QALY values to dollar values using a dollar value of a life year derived from the value of statistical life).

In the case of anxiety, an indirect measure of WTP/WTA, generated via QALYs, would be particularly useful given the paucity of direct contingent-valuation studies. Indirect measures, here and elsewhere, also have an epistemic role: they help test the validity of direct measures.

How, then, should a QALY interview for valuing anxiety be structured? Here, as in the contingent-valuation context, the "fear state" being measured might be just an experiential state, or an experiential state plus its causal and constitutive consequences; and the optimal emotional condition for the respondent, be it calm or fearful, is the condition implied by the idealized perspective that defines objective welfare goods. What needs further discussion is the nature of the QALY scale.

Scholarship on QALYs sometimes conceptualizes the QALY scale as a health scale, not a welfare scale.[183] On this view, the numbers assigned to states track their goodness *qua* health, not *qua* well-being. Value is a generic concept, subsuming both welfare-value and nonwelfarist values (for example, aesthetic value).[184] Perhaps one of the nonwelfarist values there subsumed is health-value. If so, a nonwelfarist QALY scale is a meaningful scale; but, even so, measurements on *this* kind of scale cannot serve as inputs into a welfarist policy-analytic tool such as CBA.

A more subtle problem in using QALY measures to derive WTP/WTA arises when the QALY scale is understood as a welfare scale, but the range of the scale is truncated. To see this problem, consider the Health Utilities Index ("HUI")—one of the leading "health classification" methodologies used by QALY scholars.[185] These methodologies characterize health states in a systematic way, by reducing them to packages of attributes; the packages of attributes are then placed by respondents on the 0–1 QALY scale, with 0 measuring death and 1 the best package.[186] In the case of the HUI system,

183. *See* Dolan, *supra* note 176, at 1727–29 (contrasting "welfarist" and "extrawelfarist" conceptions of QALYs).

184. *See* L. W. SUMNER, WELFARE, HAPPINESS, AND ETHICS 20–25 (1996).

185. *See* Bell et al., *supra* note 177, at 291 (finding that the Rosser Index, Quality of Well-Being scale, and Health Utilities Index are the most frequently used health state classification systems in QALY research); David H. Feeny et al., *Health Utilities Index*, *in* QUALITY OF LIFE AND PHARMACOECONOMICS IN CLINICAL TRIALS, *supra* note 175, at 239 (describing HUI system).

186. *See, e.g.*, Dolan, *supra* note 176, at 1731–32, 1744–45 (discussing these classification systems); QUALITY OF LIFE AND PHARMACOECONOMICS IN CLINICAL TRIALS, *supra* note 175, at 161–362 (describing specific systems in detail).

there are seven attributes: sensation, mobility, emotion, cognition, self-care, pain, and fertility. Each of the seven attributes has four or five levels.[187] For examples, the "sensation" attribute divides into the following four levels:

HUI Health Status Classification System

Attribute	*Level*	*Description*
Sensation	1	Able to see, hear and speak normally for age
	2	Requires equipment to see or hear or speak
	3	Sees, hears, or speaks with limitations even with equipment
	4	Blind, deaf or mute

Similarly, the "emotion" attribute divides into the following five levels:

Attribute	*Level*	*Description*
Emotion	1	Generally happy and free from worry
	2	Occasionally fretful, angry, irritable, anxious, depressed, or suffering night terrors
	3	Often fretful, angry, irritable, anxious, etc.
	4	Almost always fretful, angry, irritable, anxious, depressed
	5	Extremely fretful, angry, irritable, or depressed usually requiring hospitalization or psychiatric institutional care

The very best state in the HUI system is a state where the subject is at the best level with respect to all seven attributes. He is able to see, hear, and speak normally for his age (sensation); able to walk, bend, lift, jump and run normally for his age (mobility); generally happy and free from worry (emotion); learns and remembers schoolwork normally for his age (cognition); eats, bathes, dresses, and uses the toilet normally for his age (self-care); is free of pain and discomfort (pain); and is able to have children with a fertile spouse (fertility).

The HUI system seems to be a promising tool for measuring anxiety on a QALY scale and thereby indirectly deriving WTP/WTA

187. *See* Feeny et al., *supra* note 185, at 240–43. The system I am describing here is the HUI Mark II system, which explicitly employs anxiety to differentiate levels within the "emotion" attribute, by contrast with the more recent HUI Mark III system, which does not. *See id.*

for anxiety. Emotion is one of the system's seven attributes; and the levels within this attribute focus (*inter alia*) on anxiety. The problem is that the seven attributes of the HUI system collectively comprise only some of the dimensions of objective welfare: the physical and emotional dimensions, not the social, intellectual, practical-reason, political, or recreational dimensions described by Nussbaum in her full list of human goods.[188] This means that the very best state—the state given a QALY value of 1—need not be the very best state for human well-being. A 0–1 move on the QALY scale (as per the HUI-system) means a move from death to a state where the subject has the very best physical and emotional attributes, plus some package of social, intellectual, practical-reason, political, and recreational characteristics that may be far from perfect. Relatedly, how a given move on the QALY scale (as per the HUI-system) translates into a true interpersonal utility measure, or a dollar measure that roughly approximates a true interpersonal utility measure, will vary tremendously depending on what background set of non-health and non-emotional characteristics are ascribed to the subject.

Imagine, at one extreme, a subject who has no friends, no recreations, no community involvement, no intellectual engagements, and no ongoing goals. Imagine, at the other extreme, a subject who has an active social, professional, and intellectual life. Consider, now, respondents who are asked to attach a QALY value to fear using the HUI classification system. At one extreme, respondents might imagine the first subject, assign 1 to *his* state when he is perfectly healthy and (somehow) happy, 0 to his death, and place his fear on a 0–1 scale. At another extreme, respondents might imagine the second subject, assign 1 to her state when she is perfectly healthy and happy, 0 to her death, and place her fear state on a 0–1 scale. Quite plausibly, respondents might assign a much higher QALY cost to fear for the first subject than for the second—not because fear has a greater interpersonal welfare impact in the first case, but rather because the first subject's life is so impoverished that experiential or hedonic qualities are (proportionally) more important in it.[189]

188. As the creators of the HUI system explain: "[This system] adopt[s] a relatively more narrow 'within the skin' approach to health status that focuses on physical and emotional dimensions of health status and excludes social interaction because it takes place 'outside the skin.'" Feeny et al., *supra* note 185, at 240.

189. The problem does not disappear if 0 is assigned to the worst physical and emotional state (the state where the subject is at the lowest level with respect to all seven HUI attributes) rather than to death, since the welfare goodness of a given package of emotional and physical

The issue here, it should be stressed, is *not* whether the state being measured on a QALY scale is fear itself, or fear packaged with changes along the nonemotional dimensions of welfare. We can come up with a QALY cost for being afraid, as opposed to being calm, holding everything else constant. We can also come up with a QALY cost for being afraid plus suffering losses with respect to the nonemotional dimensions of welfare, as compared to being calm and not suffering those losses. Which kind of measurement, translated into dollars, is best for CBA depends on standardization and deliberation-cost considerations that I have already discussed. My criticism of the HUI variant of the QALY scale, and similarly truncated variants, concerns not what these scales are used to measure, but how they are *calibrated.* The scales should be calibrated, as far as possible, to match an interpersonal welfare scale. Equal units assigned to different subjects should represent, as far as possible, equal changes with respect to overall well-being.

All the major health classification systems currently used to generate QALYs suffer from the same defects as the HUI system.[190] QALY measures of anxiety generated using these systems, or otherwise derived from a truncated scale whose intervals are calibrated by varying some (not all) of the dimensions of welfare, are suspect for CBA purposes. To give one prominent example: Kaplan and coworkers, based on a large general population survey, ascribe a QALY loss of -0.257 to "[e]xcessive worry or anxiety."[191] In other words, a day in which the subject is calm and perfectly healthy has a QALY value of 1; a day in which he suffers "excessive worry or anxiety," but is otherwise perfectly healthy, has a QALY value of 0.743. This implies a dollar value for a fear-day that, intuitively, is high. George Tolley, in his comprehensive, "state-of-the-art" estimates of WTP/WTA for health conditions, used low, medium, and high estimates of $70,000, $120,000, and $175,000 per life year to convert some of Kaplan's QALY numbers (not for anxiety but for other morbidities) into

attributes, as compared to the 0 and 1 states, will still depend upon the background professional, intellectual, social, and other characteristics of the subject.

190. *See* MCCULLOCH, *supra* note 176, at 26–31 (describing the Rosser-Kind system); Kind, *supra* note 175, at 191–201 (describing the EuroQoL system); Harri Sintonen, *The 15D Instrument of Health-Related Quality of Life: Properties and Applications*, 33 ANNALS MED. 328 (2001). The HUI system has already been described, and the Quality of Well-Being system is described below.

191. Robert M. Kaplan & John P. Anderson, *The General Health Policy Model: An Integrated Approach*, *in* QUALITY OF LIFE AND PHARMACOECONOMICS IN CLINICAL TRIALS, *supra* note 175, at 309, 316.

WTP/WTA.[192] These conversion factors, applied to a QALY value for anxiety of 0.743, imply a cost per fear-day (subsuming only the intrinsic cost of fear) ranging from $49 to $123. The FDA's conversion factor of $373,000 implies a cost per fear-day of $262. Compare these estimates with the generally lower WTP/WTA estimates for light morbidity conditions that have been directly elicited using contingent valuation.

WTP To Avoid a Single Day of "Light" Health Conditions[193]

Angina	131
Angina (mild)	88
Angina (severe)	165
Cannot breathe deeply	19
Chest tightness	26
Cough	25
Cough/Sneeze (mild)	12
Cough/Sneeze (severe)	33
Drowsiness	43
Eye irritation	29
Head congestion (mild)	20
Head congestion (severe)	47
Headache	25
Nausea	69
Pain on deep inspiration	35
Runny nose	13
Shortness of breath	9
Shortness of breath (mild)	35
Shortness of breath (severe)	70
Sinus congestion	33
Throat congestion	31

192. *See* Tolley et al., *supra* note 67, at 329–36.

193. These are taken from Johnson, *supra* note 67, at 650–51. The values here are based on contingent-valuation surveys asking for WTP to avoid a single day of the condition. Johnson also reports WTP responses to avoid multiple days of various conditions. The one-day estimates derived from *these* valuations are not included here. (They are generally lower than the directly elicited one-day values.) Where Johnson reports more than one study of a given condition, I have averaged the WTP values.

Kaplan's QALY estimate of anxiety is problematic for CBA purposes because it was derived using his truncated "Quality of Well-Being" scale.[194] Health states were classified with respect to the subject's mobility, physical ability, ability to engage in social activity, and negative experiences (pain, fatigue, cognitive difficulties, anxiety). Respondents were asked to measure the desirability[195] of different concatenations of these attributes on a 0–1 scale, with 0 meaning death and 1 a "perfect" state in which the subject is fully mobile, capable of engaging in the full range of ordinary physical and social activities, and free of any of the hedonic detriments of disease. One important question about Kaplan's survey is whether respondents understood that they were supposed to evaluate the welfare importance of these states rather than its "healthiness" in some nonwelfarist sense. Even if they did understand that, they might have been confused by the evaluative task: What does it mean to assess the welfare-desirability of a state whose welfare-relevant features have been incompletely described? The only way to do that coherently (as already suggested) is to fill in the description by ascribing background nonhealth characteristics, or lotteries over such characteristics, to the subject.[196] If that is what respondents to the Kaplan survey did, what was the source of *those* background characteristics? Were respondents to Kaplan's survey imagining, as the top point on the 0–1 scale, a mobile, physically and socially capable, and pain and anxiety-free subject who had their (the respondents') affiliational, recreational, professional, intellectual, and income characteristics? A subject with

194. *See* Kaplan & Anderson, *supra* note 191; *see also* Robert M. Kaplan et al., *Health Status: Types of Validity and the Index of Well-Being*, 11 HEALTH SERVICES RES. 478 (1976); Robert M. Kaplan & James W. Bush, *Health-Related Quality of Life Measurement for Evaluation Research and Policy Analysis*, 1 HEALTH PSYCH. 61 (1982); Robert M. Kaplan & John P. Anderson, *A General Health Policy Model: Update and Applications*, 23 HEALTH SERVICES RES. 203 (1988).

195. I have not located the questionnaire that Kaplan employed in his research. In a recent article on the Quality of Well-Being system, he characterizes the survey as asking respondents to evaluate the "desirability" of health conditions. Kaplan & Anderson, *supra* note 191, at 316.

196. If the effect of health on a subject's welfare were (somehow!) independent of the subject's nonhealth characteristics, then a respondent to Kaplan's survey could coherently answer it without ascribing nonhealth characteristics to the subject. Imagine that the welfare measure of a subject's overall state can be decomposed into $f_1(D_1) + f_2(D_2) + \ldots + f_n(D_n)$, where the values for the different dimensions range from 0 to 1, and where health is one of these independent dimensions. Then the number on a 0–1 scale assigned to a given health state could represent its value on the health dimension, which does not depend on where the subject is located with respect to the other D_i. But of course health *is not* independent of nonhealth characteristics in this sense. If the subject is dead, or incapacitated, or in crippling pain, that limits his possible professional, intellectual, social, and other non-health attainments, or at the very least changes their welfare-significance for him.

ideal such characteristics? A subject with average such characteristics? Even if we were sure that respondents to the Kaplan survey were engaged in welfarist rather than extrawelfarist valuation, and did so in a coherent way, a conversion factor for deriving monetary amounts from their expressed QALY measures would need (somehow) to take account of the problem of background characteristics. A QALY estimate of -0.257 for anxiety, valued on a scale where death is 0 and 1 is good health but a pretty poor life overall, should hardly be converted into dollar inputs to CBA at the very same rate as a QALY estimate of -0.257 on a scale where death is 0 and 1 represents a terrifically high level of welfare.

The solution to these difficulties, I suggest, is to measure fear/anxiety (and health states more generally) on an inclusive QALY scale—one that takes account of a wider range of life's goods, and therefore better approximates a true interpersonal welfare scale. Were there deliberation-cost disadvantages to using an inclusive scale, a truncated scale might on balance be justified—but it is hard to see what the deliberation-cost disadvantages would be. Truncated scales already involve interview costs and necessitate much conceptual effort on the part of respondents. As it turns out, the World Health Organization is currently developing an inclusive "quality of life" index that might be employed to ground QALY ascriptions.[197] The current version of this index, known as the WHOQOL-100, employs twenty-four attributes ("facets"), grouped into six domains—physical, psychological, "independence," social, environmental, and spiritual—to characterize subjects' states. The first three domains cover the territory of existing health classification systems, but also include a self-esteem attribute, a body-image attribute, and an attribute for positive as well as negative feelings. The last three domains cover much of what is subsumed by Nussbaum's list of objective goods but excluded by traditional QALY indices. The "social" domain asks about the quality of the subject's personal relationships, social support, and sex life. The "environment" domain covers

197. *See* Amy E. Bonomi et al., *Validation of the United States' Version of the World Health Organization Quality of Life (WHOQOL) Instrument*, 53 J. CLINICAL EPIDEMIOLOGY 1 (2000); Silvija Szabo, *The World Health Organization Quality of Life (WHOQOL) Assessment Instrument*, *in* QUALITY OF LIFE AND PHARMACOECONOMICS IN CLINICAL TRIALS, *supra* note 175, at 355; The WHOQOL Group, *The World Health Organization Quality of Life Assessment (WHOQOL): Development and General Psychometric Properties*, 46 SOC. SCI. MED. 1569 (1998); The WHOQOL Group, *The World Health Organization Quality of Life Assessment (WHOQOL): Position Paper from the World Health Organization*, 41 SOC. SCI. MED. 1403 (1995).

personal security, housing quality, wealth, access to information and education, access to social services, recreational activities, pollution, and transport. The spiritual domain asks about the perceived meaningfulness of the subject's life.

A QALY estimate of fear or anxiety derived from a large-scale survey of calm (not fearful) individuals using an inclusive health-state classification system such as the WHOQOL-100 would be an excellent basis for a monetary valuation of these mental states. Alas, I have found no such estimate in the published literature.

CONCLUSION

Fear is a welfare setback and thus, it would seem, should be counted as a cost for CBA purposes. In this Article, I have argued that agencies should indeed engage in fear assessment; they should quantify and monetize the effects of their choices on overall fear and anxiety, where agencies are otherwise engaged in CBA and where *ex ante* the deliberation costs of fear assessment appear to be warranted. The Article has rebutted various objections to fear assessment, other than the deliberation-cost worry: irrational as well as rational fears are real harms for those who experience them; fear can be quantified; worries about uncertainty and causality reduce to deliberation costs; the possibility of reducing fear through information rather than prescription means that agencies should look at a wider range of policy options, not that they should evaluate options without considering fear costs; the concern that the very practice of fear assessment will, on balance, increase fear by creating stronger incentives for fear entrepreneurs seems overblown; and fear is a welfare setback, whether or not it flows from political views. Further, I have argued that fear assessment should take an "unbundled" rather than "bundled" form, at least if the current VOSL method for pricing risk is retained; the notion of incorporating both fear and risk costs in "tailored" VOSLs rests on two implausible assumptions, namely a coincidence between actual and perceived risk and a linear correlation between perceived risk and fear. I have proposed one concrete methodology for "unbundled" fear assessment: predicting changes in aggregate *fear-days* resulting from regulatory interventions, and pricing each fear-day at a standard price. Finally, I have tried to show that contingent-valuation rather than revealed-preference techniques are best suited to reveal the cost—in my lingo, the "welfare equivalent"—for a fear state; that the instrumental as well as intrinsic costs of fear may need to be

accounted for; that, optimally, the respondents to contingent-valuation interviews are calm, not fearful; and that QALY measures of fear may be a useful way to generate estimates of welfare equivalents, but only if the QALY scale is understood as a welfare scale and is calibrated in an inclusive way.