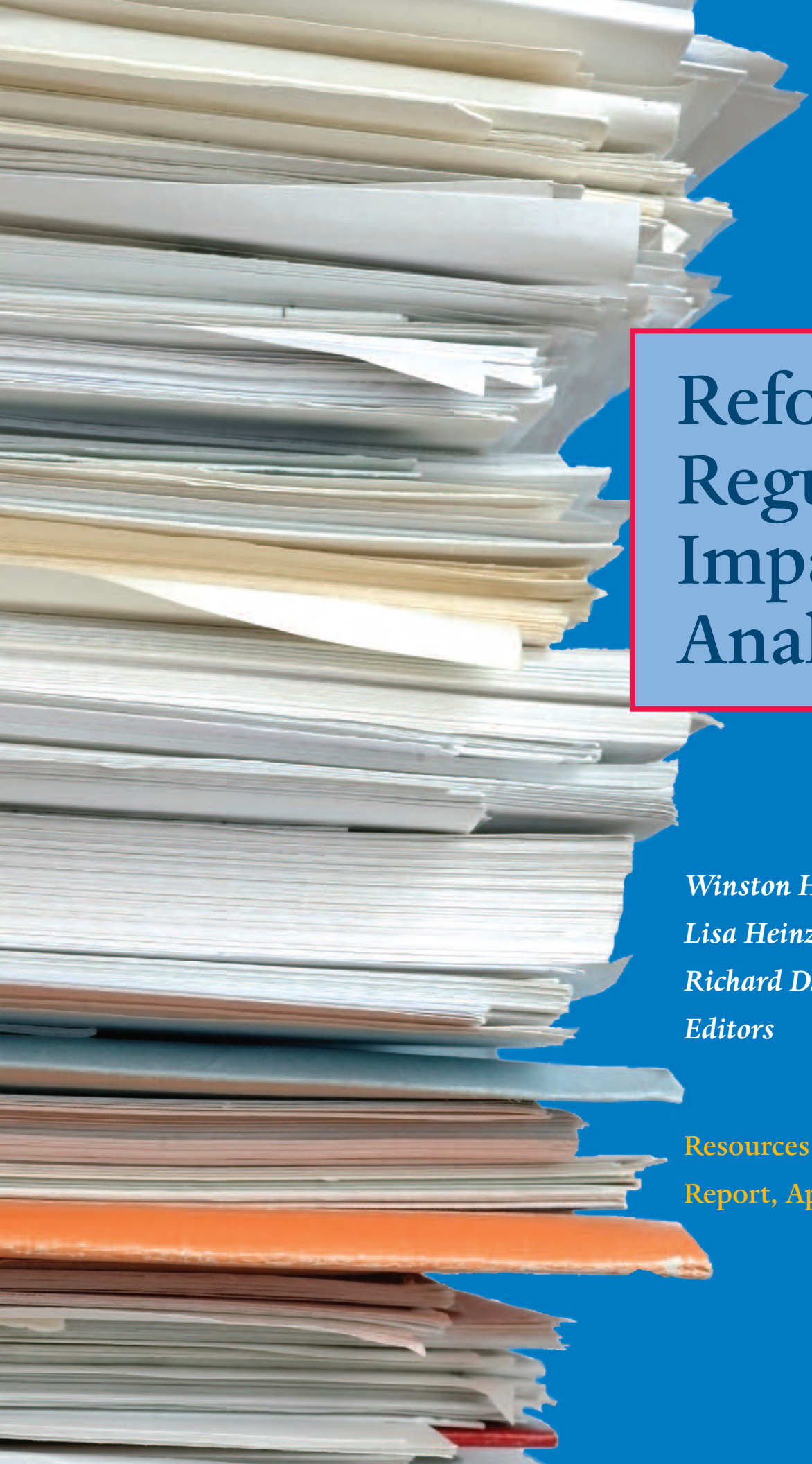

Reforming Regulatory Impact Analysis

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Editors

Resources for the Future
Report, April 2009

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Design and production:
Meadows Design Office Inc., Washington, DC
www.mdomedia.com

Printed in the United States of America

CHAPTER 6

The Mathematics of Mercury

CATHERINE A. O'NEILL[1]

The title for this chapter owes a debt to Cass Sunstein, who, in an article entitled "The Arithmetic of Arsenic," set out to consider the strengths and limitations of cost–benefit analysis (CBA) in the context of a concrete case study, the U.S. Environmental Protection Agency's (EPA) regulation of arsenic in drinking water.[2] Here I similarly aim to wade into the "muck and mire" of EPA's recent effort to regulate mercury emissions from coal-fired utilities to glean what lessons I can for regulatory analysis.[3]

In the first part, I provide a brief background on the nature of mercury contamination and the history of mercury regulation. In the second, I critique EPA's regulatory impact analysis (RIA) for its rule regulating mercury emissions from coal-fired utilities. Seven issues for regulatory analysis that the mercury rule brings to the fore are also identified. Finally, I close with a few observations for improving regulatory analysis assuming, in accordance with the premise for this report, that the existing executive orders—or something very close to them—continue to direct this analysis.

Mercury Contamination and Regulation

The Problem[4]

Mercury has long been known to be highly toxic to humans. Exposure to even small amounts of methylmercury can lead to irreversible neurological damage, placing the developing fetus and children at particular risk. Methylmercury exposure has also been associated with adverse cardiovascular effects in adults and is toxic to other species as well. It has been associated with an array of adverse effects in loons, kingfishers, ospreys, bald eagles, river otters, and mink.

Once released into the environment, mercury's behavior is complex and includes local, regional, and global components. Anthropogenic sources of mercury increasingly account for these releases, although natural processes contribute as well. Anthropogenic emissions in the United States are currently dominated by coal-fired utilities; they are deposited to surrounding land and water at varying distances from these sources. Mercury that enters water bodies becomes methylated by microorganisms present in these aquatic environments. Methylmercury is an extremely bioavailable form of mercury, readily taken up by fish in these waters. Methylmercury bioaccumulates in fish tissue, which in turn is a source of exposure to those species that consume fish. Fish consumption is the primary route by which humans are exposed to methylmercury.

Many fish species that humans rely on for food are highly contaminated with methylmercury. However, humans vary considerably with respect to fish consumption practices, and fish species vary considerably with respect to methylmercury concentration. As a consequence, exposure can differ considerably among people. Some Native Americans, Asian Americans, and low-income subsistence fishers are highly exposed. Members of fishing tribes consume fish in greater amounts, at higher frequencies, and in accordance with different seasonal or cultural constraints than do members of the general population. Members of fishing tribes in the Great Lakes region and elsewhere also rely on fish species—including walleye, muskellunge, lake trout, and northern pike—that are relatively highly contaminated.[5]

Based on studies of methylmercury's adverse human health effects, EPA has derived a reference dose (RfD) for methylmercury of 0.1 microgram per kilogram of body weight per day.[6] This RfD represents a threshold for exposure—in other words, the amount that EPA believes can be ingested each day over the course of a lifetime without adverse health effects.[7] According to a recent study, some 15.7 percent of women of childbearing age in the United States had blood mercury levels above EPA's RfD, thus posing a risk to a developing fetus.[8] Importantly, this study also found marked differences among women in groups characterized by race or ethnicity. Whereas 15.3 percent of self-identified "white" women of childbearing age had blood mercury levels above the RfD, this number more than doubles, to 31.5 percent, for women who identified themselves as "other," a category composed primarily of Native Americans, Pacific Islanders, those of "Asian origin," and those of "mixed race."[9]

As a consequence of mercury contamination, health and environmental agencies have had to issue fish consumption advisories recommending that children and women of childbearing age reduce or eliminate entirely their consumption of some fish species. In the 1990s, advisories about mercury were increasingly issued throughout the United States, with some states placing all of their lakes, rivers, and coastal waters under advisory. In 2001, widespread methylmercury contamination prompted the Food and Drug Administration and EPA to issue the first-ever national fish consumption advisory.

The Law

Federal Indian law

Many tribes in the Great Lakes region and elsewhere are party to treaties with the United States that recognize tribes' fishing rights. By means of these treaties, the tribes reserved their aboriginal rights to take fish throughout their customary fishing areas, while ceding vast portions of the land that now composes the United States.[10] Although the language differs from treaty to treaty, the guarantee each secures is similar. For example, the Treaty of 1837 between the Lake Superior Chippewa and the United States provides: "The privilege of hunting, fishing, and gathering the wild rice, upon the lands, the rivers and the lakes included in the territory ceded, is guaranteed to the Indians …."[11]

Courts interpreting the treaties as a matter of U.S. law have upheld and elaborated the treaty promises. In *Lac Courte Oreilles Band of Lake Superior Chippewa Indians v. Wisconsin,* the court explained that, by dint of the 1837 and 1842 treaties, the Chippewa were:

guaranteed the right to make a moderate living off the land and from the waters in and abutting the ceded territory and throughout that territory by engaging in hunting, fishing, and gathering as they had in the past and by consuming the fruits of that hunting, fishing, and gathering, or by trading the fruits of that activity for goods they could use and consume in realizing that moderate living.[12]

As the court here recognized, the treaty protections include not only tribal members' right to fish in the ceded area, but also their right to consume the fish they catch, or to sell it to others for others' consumption. Logically, if the fish to which tribes have rights are permitted to become so contaminated as to be unfit for human consumption, these treaty-guaranteed rights are greatly compromised.[13]

When it entered into the treaties with the fishing tribes, the United States bound itself and its successors to protect the tribes' right to take fish.[14] Indeed, as courts have observed, "the Indians viewed a guarantee of permanent fishing rights as an absolute predicate to entering into a treaty."[15] Notably, courts have affirmed that these treaties are the "supreme law of the land."[16] Federal agencies, including EPA, are required to consider and comply with the treaties when they make decisions affecting the rights secured by the treaties.[17] Federal agencies are bound, as well, by the trust responsibility and other legal obligations uniquely owed to tribes and their members.

Federal environmental law

Section 112 of the Clean Air Act comprises the comprehensive scheme for reducing hazardous air pollutants (HAPS), including "mercury compounds."[18] Although HAPS had been addressed by the Clean Air Act since 1970, they remained largely unregulated as the 1990 amendments were taking shape. Frustrated at this widely heralded failure, Congress enacted sweeping reforms to this section designed to address the inaction and delay that had plagued earlier versions of the act.

Congress set up a two-step process for regulating HAPS. First, EPA was directed to issue technology-based standards (known as maximum achievable control technology [MACT] standards) for those source categories listed under Section 112.[19] Congress established a 10-year schedule by which EPA was to list the source categories primarily responsible for emitting HAPS and to promulgate a MACT standard for each source category. Congress stipulated that sources were to be given a tight, three-year timeline to comply with the resulting emissions limits (with the possibility of, at most, a one-year extension). Second, EPA was directed to issue additional standards within eight years if this MACT standard left unaddressed any residual risk to human or environmental health. That is, under a Section 112 MACT-based approach, EPA is required in this second step to issue further regulations if necessary "to provide an ample margin of safety to protect public health . . . or to prevent . . . an adverse environmental effect."[20]

Several provisions of the 1990 Amendments evidenced particular concern for pollution problems involving mercury. among these, Section 112(n) tackled HAP emissions from utilities. EPA was directed to conduct and transmit to Congress two studies, one focusing on HAPS more generally and one focusing on mercury from these sources. Again, Congress specified tight deadlines for these tasks. Congress directed EPA to consider these studies and list utilities among the source categories to be regulated under Section 112 if it found such regulation to be "appropriate and necessary."[21]

EPA's Mercury Regulation

During this period, EPA took steps to regulate the major sources of anthropogenic mercury. In the 1990s, it issued standards for two of the top three categories of emitters—medical waste incinerators and municipal waster combustors—requiring that these sources reduce their mercury emissions on the order of 90 percent. In 2000, EPA listed the third of these major contributors, coal-fired utilities, among the source categories to be regulated under Section 112 of the Clean Air Act, having made the requisite finding under Section 112(n) that it was "appropriate and necessary" to do so. As a consequence of this listing, it was widely expected that EPA would require similarly significant reductions in utilities' mercury emissions. Crucially, it was also widely expected that these reductions would be realized quickly, given a deadline for promulgation of the MACT standard to which EPA had agreed to settle a lawsuit, and given the tight timeline for sources to comply with the standard specified by the act. Thus, up until the time EPA announced its proposed rule for coal-fired utilities in December 2003, observers looked forward to a MACT standard that would require coal-fired utilities to achieve roughly 90 percent reductions in their mercury emissions, and to do so by 2007.

Instead, EPA set out two alternative proposals to address mercury from coal-fired utilities: a cap-and-trade program (to be issued either under Section 112 or under Section 111), and a watered-down version of a MACT standard (one that would require only approximately a 55 percent reduction in emissions) under Section 112.[22] EPA's proposed rule was highly controversial. It fomented a record number of public comments, congressional hearings and requests for oversight, and considerable criticism from almost every quarter.

In its final rule, which it dubbed the Clean Air Mercury Rule (CAMR), EPA abandoned any pretense of providing a MACT standard. Rather, it opted for a cap-and-trade program, promulgated under Section 111. The CAMR instates a cap on mercury emissions from utilities in two phases. The Phase I cap is set for 2010 to require no additional reductions beyond those achieved as "co-benefits" of a companion rule, the Clean Air Interstate Rule (CAIR), governing criteria pollutants in the eastern portion of the country. Thus, the CAMR's first-phase cap is set to allow utilities to emit 38 tons of mercury per year—down from roughly 48 tons per year emitted by these sources at the outset of the program.

The Phase II cap is set for 2018 to allow utilities to emit 15 tons of mercury per year. However, given structural features of the cap-and-trade program, the 70 percent reduction in emissions that this second-phase cap represents will not actually be realized until well after the year 2020,[23] and perhaps even as late as the 2030s.[24] Note, too, that the cap-and-trade program, issued as it was under the auspices of Section 111, makes no provision for addressing any residual risk to human health or the environment, as would have been required under Section 112.

The rulemaking process was marked by procedural irregularities and reversals-of-course on EPA's part.[25] For example, in the wake of EPA's 2000 finding that the regulation of utilities was "appropriate and necessary," a high-level multistakeholder working group labored diligently to determine an appropriate MACT standard. But sometime in the spring of 2003, EPA senior political appointee Jeffrey Holmstead ordered staff to develop a cap-and-trade program instead and the working group was disbanded without producing any further information on the feasibility, costs, or benefits of the MACT-based approach. In addition, in 2003, the agency had predicted that mer-

cury-specific control technology would be available by 2007 and could achieve up to 90–95 percent reductions in emissions.

But by the time of its final rule in 2005, EPA changed its mind and claimed that such technology would "not be commercially available until 2010 or later." One consequence of this checkered history is that the RIA, which ordinarily would have accompanied the proposed rule, was missing. Instead, at this point, EPA offered a rough assessment of costs and benefits for the proposed rule that did not account for the benefits of reducing mercury itself (it focused mainly on the co-benefits of reducing particulate emissions). In fact, as Professor Rena Steinzor explains, Holmstead's abrupt decision to eschew MACT and embrace cap-and-trade "caught the Agency's economists off guard," and left them to scramble to produce the supporting economic analysis.[26] Thus, the RIA was not published until March 2005, alongside the final CAMR.[27]

The final CAMR met with a flurry of criticism. Congress issued a rare request for reconsideration. State after state declined to participate in EPA's cap-and-trade program, calling instead for more meaningful and immediate emissions reductions within their borders. Several states, tribes, and environmental groups sued EPA, and industry groups joined the fray on the other side. Ultimately, the DC Circuit in *New Jersey v. EPA* vacated the CAMR in February 2008, and rehearing en banc was denied shortly thereafter.

EPA's Regulatory Impact Analysis

EPA concluded that the total annualized cost of the CAMR in 2020 will be approximately $848 million, whereas the total annual monetized benefits will be $0.4 million to 3 million.[28]

EPA elsewhere offered alternative figures for both the costs and the benefits of the rule.[29] A figure of $50 million in benefits versus $750 million in costs was attributed to EPA officials in the press at the time that the final CAMR was announced.[30]

EPA calculated the costs of the CAMR in terms of coal-fired utilities' capital investments and operating expenditures for pollution controls together with costs stemming from additional fuel expenditures. The benefits of the CAMR were calculated in terms of the change in IQ decrements suffered by humans exposed in utero to mercury in recreationally caught freshwater fish from U.S. waters that EPA deemed attributable solely to utility emissions, after accounting for the implementation of the CAIR.[31] EPA concluded that "a typical child of freshwater fishers lost approximately 0.06–0.07 IQ points because of mercury exposure in 2001."[32]

EPA tallied these benefits by estimating the present value of the lifetime loss in earnings attributable to each point decrease in IQ, less the amount saved in educational costs avoided for each point decrease in IQ. EPA assumed that these benefits would not accrue until 10 to 20 years after the year 2020, given the lag in time that it estimated would occur between the mercury emissions reductions required by the CAMR and the expected environmental response, namely the reduction in fish tissue methylmercury.

EPA's Regulatory Impact Analysis: A Critique

Sunstein's examination of the regulatory analysis for the arsenic rule led him to conclude that, although CBA ought not determine regulatory outcomes, CBA is nonetheless "indispensable" to the decisionmaking process given the need to compile and organize the relevant data, to assess the

effects of regulation in a way that is transparent rather than opaque, and to reveal "exactly why the decision to regulate . . . is genuinely difficult—and why, and where reasonable people might differ."[33] My examination of the regulatory analysis for the mercury rule has left me less sanguine about CBA.

At the outset, it must be stated that EPA faced a daunting task, given, among other things, the complexities and uncertainties of the problem at hand. Against this backdrop, any attempt to assess the impacts of mercury contamination and regulation would be susceptible to criticism. Nonetheless, I identify seven concerns raised by EPA's analysis of the CAMR that focus on principle and practice. The critique that follows is not exhaustive, but is meant to highlight a selection of issues: those that the CAMR uniquely or emphatically brings to the fore; those that are especially contentious, as between proponents and skeptics of CBA as a decisional tool; and those on which progress might be made through critical attention.

Slimmed Pickings

From the outset, the CAMR RIA served to obscure the range and contours of the alternatives on the table. Although proponents offer CBA as a means of enabling decisionmakers and the public to comprehend the various possible courses of action and to select thoughtfully among them, the CAMR RIA provides a cautionary tale: an RIA's usefulness in this regard depends mightily on how the questions are structured and how the alternatives are fashioned. Rather than informing deliberation, the RIA for the mercury rule was structured in a manner that thwarted comparison among the relevant options.

EPA framed its inquiry by asking, What are the incremental costs and benefits of the CAMR in 2020, assuming implementation of the CAIR? In so framing the question, EPA subtly crafted a new baseline—the world in 2020—by which time the benefits of the CAIR, the companion rule that addressed criteria pollutants in the eastern United States, would have been realized. This move, in turn, determined important aspects of both the alternatives to be analyzed and the outcomes of that analysis. Notably, it permitted EPA to exclude from consideration the chief alternative to EPA's preferred approach, which would have imposed its requirements prior to the RIA's 2020 baseline. Further, it permitted EPA to reassign to the CAIR a sizeable category of benefits otherwise attributable to mercury regulation.

In its RIA, EPA purported to consider various alternative scenarios, including its preferred option—a cap-and-trade approach with caps of 38 and 15 tons per year in 2010 and 2018, respectively. In addition to its preferred option, EPA considered an option assuming an identical cap-and-trade approach but with slightly different caps and an option assuming that utility-attributable mercury emissions were to be eliminated entirely in 2020. However, EPA only ran the numbers for these three alternatives relative to its new 2020 baseline, in which the benefits of the CAIR had already been realized.[34] Importantly, EPA did not include an alternative reflecting the primary competing regulatory approach, a Section 112 MACT-based approach. EPA's choices shaped the resulting analysis in important ways.

Costs of Delay

EPA prevented consideration of a crucial difference between the alternative approaches to mercury regulation that were at issue, namely time. EPA's CAMR significantly delays the reductions in mercury emissions relative to a Section 112 MACT-based approach. Indeed, EPA's CAMR delays meaningful emissions reductions for well over a decade—and perhaps as many as two or more decades—relative to the expected Section 112 MACT-based approach. Recall that, under the CAMR, the 70 percent reduction in emissions promised by the Phase II cap will likely not actually materialize until well after 2020, and perhaps into the 2030s. Under Section 112, by contrast, the roughly 90 percent reduction in emissions expected under a MACT standard would have been required by the end of 2007. In fact, this reprieve to sources was one of the most controversial aspects of EPA's rule. But EPA's RIA simply defined away this matter of delay.

Here, as elsewhere, the costs of delay are potentially large in dollar terms and unconscionable in human terms.[35] A sense of these costs is afforded if one considers methylmercury's neurodevelopmental effects. In view of this impact alone, the failure to control mercury emissions from coal-fired utilities can have irreversible consequences, affecting the intelligence and life prospects of the children in each new birth cohort who are exposed in utero to harmful levels of mercury.

Assuming, generously, that the CAMR will result in substantial reductions in mercury emissions by 2023, this represents a delay of 15 years relative to the compliance date for the 90 percent reductions expected under a MACT-based approach in 2007. This 15-year delay will visit permanent harm on millions of children. That is, based on calculations by Drs. Leonardo Trasande, Philip J. Landrigan, and Clyde Schechter, between 4,748,820 and 9,558,495 children will be born with cord blood mercury at levels associated with a loss of IQ in the 15-year period during which utilities enjoy a reprieve from regulation.[36]

This 15-year delay translates into $19.5 billion in the form of losses in future earnings for these children.[37] In each case, these estimates represent the harms attributable solely to mercury emissions and exposure from U.S. utilities.[38] Although these comparisons represent a rough cut,[39] they nonetheless provide a glimpse of the considerable costs—in terms of life prospects for our children, and in terms of social utility—of delay. In fact, the more recent work of Trasande and his colleagues adds to this estimate. By calculating the additional societal costs resulting from the increase in cases of mental retardation (MR; defined clinically as an IQ less than 70) suffered by those children exposed in utero to utility-attributable mercury emissions during the years 2005–2020, they found that more immediate and stringent emissions reductions could prevent an additional 4,450 cases of MR and save an additional $13.1 billion.[40]

Note that these comparisons reflect losses based on data from the general population; data more specific to particular, highly exposed populations provide another window on the costs of delay. Whereas Trasande et al. considered a general population, and concluded that the most highly exposed 5 percent of children in each birth cohort would suffer losses in IQ ranging from 1.60 to 3.21 points, John Persell of the Leech Lake Band of Chippewa considered Great Lakes tribal populations, and concluded that the average child in each birth cohort would suffer losses in IQ ranging from 6.2 to 7.1 points.[41] Persell employed a similar method to Trasande et al. but considered exposure consistent with fish consumption practices appropriate to these fishing peoples (e.g., tribal fish consumption rates; tribal exposure frequencies, including bolus doses, given extraordinary intake during certain seasons or in accordance with certain ceremonial practices;

locally important species, such as lake trout, whitefish, and walleye; and tribal data on local fish tissue methylmercury concentrations).[42]

Additionally, Native peoples in the Great Lakes and elsewhere have recounted in qualitative terms the numerous other costs of a delay in mercury regulation, including impacts to tribal health along interrelated physical, social, cultural, and spiritual dimensions.[43] The Aroostook Band of Micmacs, for example, described these additional costs of delay in comments to EPA, emphasizing the permanent, intergenerational nature of the loss: "Although many of our Tribal members continue to fish and consume fish despite [Maine's statewide] fish consumption advisory, there are many Tribal families that no longer engage in cultural practices associated with fishing, and are thus not passing these traditions to new generations of Tribal members. The loss of our cultural ceremonies, language, and songs associated with fishing represents a significant impact on our Tribe, and results in permanent loss of the culture which defines our Tribe."[44]

In the context of mercury regulation, the temporal aspects of EPA's choice were serious and central. Because a child exposed to mercury can suffer lifelong, irreversible harms, and because each year of inaction meant that a new birth cohort of children would be exposed, the public debate about mercury regulation should have (and did, in public fora) centered around not only the magnitude of the emissions reductions to be required, but also the timing of those reductions. Rather than using its RIA to reflect and inform this public debate on the temporal dimensions of the regulatory alternatives, however, EPA used its RIA to obscure and preempt this debate.

The agency never provided a direct comparison between a Section 112 MACT-based approach and the Section 111 cap-and-trade approach that composes the final CAMR. And by shifting baselines, it presented obstacles to anyone trying to gauge this comparison. When pressed, moreover, as to why it had not estimated the costs and benefits of a Section 112 MACT-based approach, EPA responded that it did not do so because it had already decided to put forth a Section 111 cap-and-trade approach.[45]

Benefits Shell Game

By crafting its new baseline, EPA could also reassign an entire category of co-benefits, permitting these to be attributed not to a mercury rule, but to the CAIR. At some point between its CBA for the proposed rule and its CBA for the final rule, EPA decided to reallocate the co-benefits of controlling emissions from utilities, moving them from the mercury rule to the CAIR. Recall that, had the agency proceeded with a Section 112 MACT-based approach, sources would have been required to control for mercury within three years, that is, as early as 2007.

Controls designed to reduce mercury emissions would have garnered co-benefits in the form of reduced particulate emissions, beginning in 2007 when sources came into compliance with the MACT standard. EPA estimated these co-benefits to amount to roughly $15 billion. EPA had initially assigned these co-benefits to the mercury rule, an assignment that contributed significantly to EPA's finding a favorable benefit-to-cost ratio of 16 to 1 for its proposed MACT standard for coal-fired utilities. In its final estimate for the CAMR, however, EPA found the costs of mercury regulation to far outstrip the benefits.

As observed by James E. McCarthy of the Congressional Research Service, "[t]he primary change appears to be a reassignment of the $15 billion in particulate matter co-benefits to the CAIR rule. By making implementation of mercury controls simultaneous with CAIR, the co-benefits are

attributed to CAIR, instead of to the mercury rule.... Some of this change is simply a paper exercise: the co-benefits are taken from one rule and given to another."[46]

In fact, by shifting the baseline such that the CAIR is incorporated as a given, a portion of the benefits of mercury emissions reductions themselves come to be seen as co-benefits of the CAIR. EPA's baseline in effect siphoned off from a mercury rule all but the incremental benefits of reductions in mercury after 2020 in a post-CAIR world. But an earlier baseline would have attributed much of this same roster of benefits and co-benefits to the regulation of mercury. This is not to suggest that these benefits ought to have been double-counted—which would clearly be inappropriate—but to highlight the considerable impact of EPA's choices on the apparent bottom line for the regulation of mercury.

As a consequence, the CAMR RIA seems less a tool to facilitate thoughtful comparison among the benefits offered by the various options and more a device to belittle the benefits afforded by regulating mercury from coal-fired utilities at all.

Cost or Benefit?

The CAMR RIA demonstrates that CBA is not a means merely of tallying up what are obviously costs and obviously benefits. Rather, impacts must be assigned to the cost or the benefit side of the ledger, an assignment that will often require a judgment of value. In fact, there may be real disagreement over whether a given impact should be understood as a negative or a positive consequence.

In the RIA, EPA recognized that one consequence of mercury contamination is neurological damage to humans exposed in utero, manifested in part by a decrease in IQ. EPA counted as a benefit of regulation, then, that this adverse impact would be alleviated. It measured this benefit in terms of the loss in future earnings that would be expected to accompany a decrease in IQ. But EPA understood neurological damage to have a silver lining: children with lower IQs will seek fewer years of education, and so save society the costs of educating these individuals (measured as the direct costs of educational services together with the opportunity costs of work forgone).[47] A cost of regulation, by EPA's lights, was that it would eliminate this positive effect of mercury contamination. As Steinzor puts it, from EPA's perspective, "the good news is that stupider children need less school and earn just a little more money because they are working rather than sitting in a classroom."[48]

But members of the public saw things differently; they understood mercury's neurodevelopmental impacts to be an unmitigated harm. In comments to EPA, the Children's Health Protection Advisory Committee, for example, lamented the fact that children exposed prenatally "will likely have to struggle to keep up in school and might require remedial classes or special education."[49] The Bad River Band of Lake Superior Tribe of Chippewa Indians cited mercury's links to "learning problems" and other effects, and concluded that "[i]t is unacceptable to continue to let our children be exposed to such a dangerous toxin."[50] These and other commenters used value-laden terms to describe mercury's harms in the real world and to decry the fact that much of the damage is visited on children, who are particularly vulnerable members of society.

Mercury contamination affects humans and the ecosystems of which they are a part in numerous and diverse ways, some of which are poorly understood and some of which are differently appreciated. There may be wide agreement among economists and the public about whether

many of the relevant effects ought to be viewed as negative or positive consequences: an increase in consumers' electricity bills is a *cost* of regulation; a decrease in neurological damage to children is a *benefit* of regulation. But, as the RIA shows, there may be profound disagreements even here, at this most basic step in the method of CBA.

Economists seek to ensure that "the widest practicable range of benefits and costs" has been included in each CBA.[51] Whether a given impact constitutes a cost or a benefit, however, tends to be treated as if it were obvious—a brute fact about the world.[52] But nothing in economists' methods provides an objective basis for making the call. Is it a good or a bad thing when children with diminished IQs opt to enter the workforce directly rather than pursue further education? The assignment of such an impact to one side of the ledger or the other turns out to be more a matter of art than science.[53]

To economists, the assignment that EPA made in its RIA may well be unobjectionable. Society does save an amount of money when the children exposed to mercury grow up to demand fewer years of schooling. And this amount cuts in the opposite direction of the loss society incurs when these children are left with a diminished earning capacity. If one is going to count the latter, economists might argue, one ought, for the sake of comprehensiveness, to weigh this against the former.[54] But, although economists might find EPA's call defensible in terms of method, the implications of EPA's assignment are clearly disturbing to many: it makes the case for more, rather than less, of a contaminant that leaves us with neurologically damaged children.

In the end, this aspect of the CAMR RIA highlights an important criticism of CBA: in the context of environmental policy decisions, economists' work has not been (and cannot be) confined to the value-free realm of "questions about the correct measure of benefits and costs."[55] Although offered in the positivist tradition, as an objective social scientific tool,[56] CBA's practitioners cannot avoid making judgments of value as well as findings of fact.

A Partial Accounting

The CAMR RIA provides an accounting of the costs and benefits of mercury regulation that is partial—in both senses of the term. The RIA shows CBA to be a tool that is highly malleable, given the context in which it is employed for environmental policy analysis. The RIA also shows CBA to produce an incomplete assessment of the benefits of environmental regulation, given the current state of the method.

CBA is highly malleable

The RIA's benefits analysis illustrates CBA's extraordinary malleability. EPA seems here to have taken every opportunity to choose inputs and make assumptions that minimize the apparent value of the benefits to be gained from reducing mercury. Examples litter the RIA:

- EPA narrowly circumscribed the exposed population: it counted only prenatally exposed individuals whose mothers eat freshwater fish caught by recreational anglers on inland U.S. lakes. Missing are all those exposed during childhood,[57] all those exposed via ingestion of freshwater fish caught commercially on inland U.S. lakes, and all those exposed via ingestion of nonfreshwater fish caught recreationally or commercially in coastal or other waters.[58] By EPA's own estimate, the

exposed population it modeled for its primary benefits analysis "represents only 13% of total fish consumption in the U.S."[59]

- EPA chose a fish consumption rate, eight grams per day, that is less than half that of the general population according to its own more recent guidance (let alone the much greater rate for those who rely on fish for subsistence or who look to fish for cultural reasons).[60]
- EPA opted for a dose–response curve to relate maternal mercury levels to IQ decrements in children exposed in utero that is roughly one-third of that employed by Dr. Trasande and his colleagues—a team of specialists in pediatric medicine.[61]
- EPA based its calculation of the loss that would accompany an IQ decrement on dated figures for total lifetime earnings that produced a value roughly half of that employed by Dr. Trasande and his colleagues. If EPA's 1992 earnings data were to be presented in 2000 dollars for purposes of comparison, this value would be $472,465.[62] Transande et al. used data from 2004, which estimated total lifetime earnings at $1,032,002 for men and $763,468 for women.[63]
- EPA deemed too speculative the cardiovascular impacts of methylmercury exposure, whereas other analysts felt compelled to account for this consequence. The alternative benefits assessment undertaken by Glenn Rice and James K. Hammitt, of the Harvard Center for Risk Analysis, shows the significance of this single exclusion.[64] Whereas they estimated the benefits of mercury regulation to be $119 million, if one considers only the averted IQ decrements for those exposed in utero, as EPA did, this number soared to $4.9 billion, if one considers averted cardiovascular impacts in adults.[65]
- EPA undercounted those in "high-risk" populations. EPA constructed an estimate of the number of Chippewa children who will be exposed in utero, in an effort to account for high-risk populations, but used a census-based approach that, by its own estimate, likely undercounted the exposed population by some 50 percent.[66]

Even this short list makes two points. First, given the uncertainty and variability that characterize many of the necessary informational inputs, the occasions for choice were many. Second, in the George W. Bush EPA, the judgment calls all went one way. That is, although any given input to the CAMR CBA might have fallen somewhere along a plausible range, EPA seemed always to have selected the low end of the range when it came to assessing benefits. As a consequence, EPA's final benefits tally is so low that it anchors the various estimates produced at the time. The next lowest estimate, that by Ted Gayer and Robert Hahn of the American Enterprise Institute (AEI)–Brookings Joint Center for Regulatory Studies, is an order of magnitude greater than EPA's.[67]

Of course, EPA also offered sensitivity analyses, in which it purported to consider bounding assumptions for many of the relevant parameters. But the bottom line for EPA's primary benefits analysis was undeniably affected by judgment calls of the sort canvassed here.

CBA incompletely accounts for benefits

The RIA also illustrates the inability of CBA to produce a complete account of the benefits. Any benefits of mercury regulation that had not been—or cannot be—monetized simply went unaccounted for.

The CAMR RIA assessed the benefits of mercury regulation solely in terms of one human health endpoint, IQ decrements, "because it [had been] monetized."[68] This criterion served to winnow

the benefits analysis. EPA counted only benefits to human health, and so excluded all benefits in terms of ecological health.[69] EPA considered only human physiological health, narrowly understood, and so excluded benefits in terms of economic, social, political, cultural, and spiritual well-being for the fishing tribes and, indeed, for other commercial and recreational fishers. Of these human physiological health benefits, EPA counted only neurodevelopmental effects and so excluded cardiovascular and other health effects.

Because the method calls for an accounting in dollars, the RIA's quantitative tally simply ignored any benefit of reducing mercury contamination that had not been monetized. If an impact—say, the fraying of the social fabric of a fishing tribe when fish, fishing, and the associated practices are no longer a part of members' daily lives and no longer a source of the intergenerational transfer of traditional ecological knowledge—had not been (or could not be) monetized, it was entered in the ledger as a "0" value. To be sure, EPA acknowledged that reducing mercury would bring about additional benefits that had not been quantified. But several concerns remain, including the point that such qualitative descriptions and caveats may tend to get left behind, whereas the quantitative account comes to dominate the public debate.

Even if one believed that, theoretically, every benefit can be monetized, in practical terms, every benefit has not been monetized. So, for the moment at least, we do not have a true cost–benefit analysis, but only what Professors Frank Ackerman and Lisa Heinzerling have termed a complete cost–incomplete benefit analysis.[70] Indeed, the CAMR RIA appears to bolster the claim that CBA operates in practice as a one-way ratchet, systematically understating the benefits of environmental and other regulations.[71] Whereas the RIA's estimate of the costs of mercury regulation is likely at least to be close (although, in the case of the CAMR, as elsewhere, it has already become clear that EPA's initial estimate of the costs is too high[72]), its estimate of the benefits is sure to be off. Given the current state of the method, much that is at stake is simply missing from the CBA calculus. And what is missing belongs overwhelmingly on the benefits side of the ledger.

The CAMR RIA raises the concern that, given the current state of the method, CBA produces a much less complete accounting of regulatory benefits than it does of regulatory costs. This asymmetry, moreover, can be exacerbated when those wielding the calculator are hostile to environmental regulation.[73]

You Are What You Earn

The CAMR RIA illustrates some of the difficulties with CBA's dollar metric. Many of the benefits of mercury regulation resist monetization. These benefits are realized in the form of children's life prospects undiminished by neurological damage; in the form of political and cultural self-determination on the part of the fishing tribes; in the form of treaty obligations honored by the federal government; and in the form of intact and functioning aquatic ecosystems. The problem of incommensurability—in this context, the point that society arguably values what is at stake in efforts to address mercury contamination in ways that cannot be captured in monetary terms—presents particularly challenging issues for proponents of CBA.[74]

The CAMR RIA assessed the benefits of mercury regulation solely in terms of the loss in future income that is estimated to accompany a decrease in IQ of those children exposed in utero. EPA derived its estimate by determining the present value of lifetime earnings for a person born in the

United States, which it calculated to be $366,021 (in 1992 dollars).[75] It then estimated the monetary value of a loss of an IQ point, assuming a 2.379 percent decrease in future earnings per one-point decrease in IQ, leavened by a 0.1007 percent decrease in future years of schooling, and its attendant costs.[76] The end result was an estimate that the average present value of net earnings losses per IQ point decrease is $8,807 (in 1999 dollars).[77]

The agency conceded that the loss-in-earnings method fails to account for many facets of the harms to humans as a result of methylmercury contamination.[78] For example, this method does not account for any increased medical costs that go along with neurological damage. Nor does it account for the anguish and suffering occasioned by this damage. EPA thus allowed that there might be a measurement problem, but suggested that it was one that could be corrected, in theory, if one were to use a better method of valuation, such as willingness to pay (WTP).[79]

But the problem is not simply a matter of getting an imprecise answer to the question, as proponents of CBA suggest. Rather, for many, it is a matter of asking the wrong question. A loss-in-earnings approach does not comport with many beliefs and ideals to which our society is deeply committed. For example, this approach is reductionist and nonegalitarian: it rests on a view that a person's worth is determined by his or her earning power. As such, it effectively values more highly those who are young, male, white, and rich.

As Ackerman and Heinzerling have argued, the implications for public policy are highly unpalatable in a society that holds dear the "ideals of democracy and equal treatment under the law, let alone the sacredness of every human being."[80] Moreover, as Ackerman and Heinzerling have pointed out, a particularly egregious consequence of the loss-in-earnings approach "is that it implies that the lives of retired people are worth nothing—or perhaps less than nothing, since they consume scarce goods and services without earning or producing any marketed goods themselves."[81] Taken to its logical conclusion, they observe, this perspective would suggest a net social benefit to a policy that kills off a lot of older people.[82]

As repugnant as this conclusion might sound to many people in the United States, it is probably even more profoundly at odds with the perspectives of the groups most affected by mercury contamination, namely, various Native peoples. For these peoples, elders are not the least valued, but among the most prized members of the community.[83] Their contributions—as holders of traditional knowledge, custodians of cultural practices, keepers of historical records, and guardians of the youngest tribal members—are recognized as irreplaceable, an important asset comprising the intergenerational legacy of the tribe.[84] Importantly, their value to the tribal community comes not chiefly from market-based employment, but from other contributions.[85] In fact, if elders must participate as earners in the market economy, their ability to perform traditional duties can be compromised.[86]

Proponents of CBA have proffered some responses to versions of this criticism. They have pointed out that EPA in practice, as in the CAMR RIA, employs an average figure for lifetime earnings, which does not distinguish among beneficiaries of mercury regulation on the basis of their earning potential. So, in effect, impacts to elders or to those born to tribes with astronomical unemployment rates (and so whose lifetime earning prospects are bleak) are valued as if they enjoyed the earning potential of the "average American"—that is, in the same dollar amount. Thus, they might argue, CBA, in practice, values each individual equally.[87]

Although this response may allay some of the relevant concerns, it does not address the more fundamental problem that, for many, what is at stake in addressing mercury contamination is understood in ways that are not commensurable with money. That is, even if analysts were to gauge the value of lifetime earnings by the highest earner in the United States, and so increase EPA's $8,807 figure several-fold, this problem would not be resolved. The problem is not that $8,807 is an incorrect answer to the question because it gives too small a dollar amount; it is that the question seeks an answer in dollars at all. CBA's requisite of monetization continues to pose serious hurdles for those who believe that one cannot price every facet of human and ecological health as if it were traded on markets—and that the attempt to do so is not only absurd, but an affront to things held sacred.

The Minnesota Chippewa Tribe provided comments to EPA that arguably suggest precisely this, that is, that the tribe values an environment uncontaminated by mercury differently than it values money:

Over the last several decades this toxic substance, mercury, has caused many human and ecological problems for Indian people. The potential impacts to Tribes who traditionally consume fish as a large part of their diet is alarming. . . . And, the human health impacts of mercury and other contaminants bear hardest on those who cannot speak for themselves, our children. Mercury is [also] known to seriously impact fish eating wildlife such as loons and mink. These animals are a value to the ecosystem they inhabit and they are clan symbols for Tribal members. If these animals are threatened, Tribal culture is threatened.

For our Tribe, the stakes are high in this fight to limit mercury emissions. The science is clear, mercury is toxic and negatively impacting many facets of the health, well being, and social fabric we all value. With this in mind, it is unclear to me why there is a controversy surrounding efforts to limit mercury emissions to the best of our technical capacity, and in the most expedient fashion. If it is a cost and benefit question then I must ask what profits are worth the health of our children and grandchildren?

Other tribal commenters spoke more directly to this point, stating that "the cost–benefit analysis performed by the EPA is wholly deficient with respect to tribes" because many impacts to tribes were "unquantifiable" by the method of CBA.[88]

Economists have attempted to respond to the unease with efforts to "price the priceless." They explain that the concept of *economic value* refers to a theoretical construct in which analysts infer monetary values from choices made by individuals reflecting "how important aspects of the environment are to them."[89] Thus, economists point out, they are not actually putting a price tag on, say, the Great Lakes. Rather, they are inferring the value—in monetary terms—of the Great Lakes to some person by looking at what she gives up (or says she would give up) to see the Great Lakes, such as the cost of travel to get to a viewing point on the shore, or to ensure that the Great Lakes are not contaminated by mercury, such as the additional cost of electricity supplied by a source that does not emit mercury. "To economists, the importance of things (tangible or intangible) is revealed by what a person will give up to obtain them. The lower bound on the value of the item obtained is equated to what is given up. If the thing given up was money, the value can be expressed in monetary units; otherwise, it is expressed in the natural units of the thing given up."[90] Economists, therefore, are confident that they can overcome the objections of those like the Minnesota Chippewa Tribe and render, in dollars, every facet of human understanding and experience—the importance of everything whether tangible or intangible.

Although more might be said about economists' efforts in this regard, two points might usefully be considered in view of the current context. First, economists describe a process of translating values to dollars that may do more than merely translate. As Professor Mark Sagoff has observed, economists take individuals' *preferences* to be their primary data, but preferences themselves are not observable facts about the world.[91] Rather, economists must *infer, discover,* and *elicit* preferences from people's behavior or statements. To do this in the context of environmental regulatory policy analysis, they must construct hypothetical projects or questions about which people are supposed to have a measurable WTP (because the point in policy analysis is to gather information on questions for which real markets do not exist). Economists have given considerable attention to the context in which individuals are placed to elicit preferences, seeking to conduct experiments that generate numbers as if there were a real market.[92] In fact, they have devoted a fair amount of research to designing surveys that produce numbers representing what people are *actually* willing and able to pay, given the hypothetical role in which they have been put. But notice that this virtual market, as Professor Louis Wolcher has explained, "becomes the framework that [economists] impose on the concrete flow of historical time."[93] This imposition may, in fact, be difficult to square with the actual position that people occupy within the concrete flow of historical time. Consider, for example, an economist's question to an Ojibwe parent about his WTP for his child's mercury chelation therapy, in order to infer the ways in which the existence of fish, uncontaminated with mercury, are important to him and to his people.[94] How does this question speak to the real and relevant history in which the fishing tribes already gave up vast tracts of land—not to mention other sacrifices—to secure their continued right to fish and consume fish as they had?[95]

Second, economists work to infer preferences from individuals' behavior, but, as Sagoff has demonstrated, people act, choose, vote, and even buy for reasons that are often complex, and not always self-evident.[96] In a multicultural society, moreover, these reasons are surely plural and diverse. Although there may be some advantages to be gained from the pursuit of a unitary metric along which comparisons can be made, there are also surely some losses. In fact, as the CAMR demonstrates, a need to reduce every relevant consideration to dollars may work as an obstacle to reasoned analysis, inasmuch as it flattens important qualitative dimensions of the effects of contamination and regulation that, as Sunstein once said, "are important in both life and law."[97] Thus, even if one assumes that an economist can assign a dollar value to the importance of fish to the Minnesota Chippewa Tribe, it seems that vital information has been sacrificed in the process. A dollar figure simply doesn't tell us as much as we might learn when we are told that mercury contamination threatens mink and loons, which are clan symbols for tribal members.

Proponents of CBA have grappled with some of the issues raised by this discussion, but they have yet to adequately allay all of the concerns raised by the requisite of monetization, for the quite good reason that this is not easy—and perhaps not possible—to do. Some proponents have usefully begun to explore analytical techniques that abandon a quest to monetize every impact and look instead to structure deliberation among the options in terms of natural units, concrete time and place, and real people. The CAMR RIA illustrates the real work that will need to be done if regulatory analysis is to surmount the limitations of its current dollar metric.

Justice Denied

The CAMR RIA illustrates that questions of justice present terrain that is not adequately comprehended by a CBA-dominated analysis. Given the route of exposure involved, those who consume relatively large quantities of fish will be among those most exposed to mercury in the environment. Various Native peoples, Asian Americans, and low-income subsistence fishers are disproportionately among the most highly exposed; as such, the burdens of mercury contamination are not equally distributed in the United States. CBA, however, is insensitive to questions of distributive justice—a point proponents concede.[98] That is, CBA is a tool that is meant to get at the costs and benefits of a decision in aggregate terms, at the societal level. It is not designed to inquire into who will bear the costs and who will reap the benefits of any particular decision, nor whether the decision ameliorates or exacerbates current inequities. Yet various executive orders instruct EPA to attend to matters of equity and justice. Executive Order 12866 itself directs each agency to seek the regulatory approaches that "maximize net benefits" and includes among these benefits "distributive impacts" and "equity."[99] Executive Order 12898 requires each agency to "make achieving environmental justice a part of its mission" and directs each agency to identify and address the "disproportionately high and adverse human health or environmental effects" of its actions. EPA did, in the context of the CAMR RIA, attempt an analysis of equity and disproportionate impacts.[100]

In the preamble to the final CAMR, EPA recognized that, in the absence of regulation, certain groups, including "low-income and minority populations," will disproportionately suffer adverse health effects, given their fish consumption practices.[101] EPA further acknowledged that these practices may have "economic, cultural, and religious" dimensions.[102] EPA explained that Executive Order 12898 requires it to "assess whether minority or low-income populations face risks or a rate of exposure to hazards that are significant and that 'appreciably exceed or is likely to appreciably exceed the risk or rate to the general population.'"[103] EPA's environmental justice inquiry consisted of two parts.

First, EPA satisfied itself that the relevant groups would be no worse off and, in fact, somewhat better off with the CAMR than with the status quo. On the positive side, EPA expected the rule "to lead to beneficial reductions in air pollution and exposures generally."[104] CAMR was also expected to have "a small negative impact through increased utility bills," which would be "shared among all members of society equally."[105] So those highly exposed would be better off with the CAMR than in the absence of the CAMR.

Second, EPA considered what it posed as a further question of distributive justice: whether the CAMR makes these groups *too much* better off. "To further examine whether high fish-consuming (subsistence) populations might be disproportionately benefited by the final rule (i.e., whether distributional equity is a consideration)... EPA conducted a sensitivity analysis [using fish consumption rates for Ojibwe in the Great Lakes region] focusing on the distributional equity issue."[106] EPA found the benefits to this group to be modest in absolute terms. Assessing the question through the lens constructed in its RIA, EPA found that "this group would accrue total benefits... of $6,300 to $6,700 in 2020 when using a 3 percent discount rate."[107] Thus, EPA concluded, "although Native American subsistence populations (and other high fish-consuming populations) might experience relatively larger health benefits from the final rule compared with

general recreational anglers, the absolute degree of health benefits are relatively low (i.e., less than a 1.0 IQ point change per fisher for any of the locations modeled)."[108]

The first part of EPA's inquiry is laudable, so far as it goes. That is, attention to distributive justice seems at least to require that an agency assess whether a rule actually makes things worse. EPA was thus correct to ask whether its rule increased or decreased exposure to those whose exposure "appreciably exceeds" that of the general population.[109] EPA was also correct to consider who would pay for a given regulation, in other words, to ask whether the costs of its rule would be shouldered primarily by the poor or whether, as it found here, they would be "shared among all members of society equally."

But the agency stopped too short. EPA declined to ask whether "somewhat better off" meant "adequately protected." EPA's assurance that some degree of beneficial reductions in exposures would occur did not speak to its own calculation that as many as 45 percent of Native Americans would be left exposed above EPA's RfD for mercury, considering utility-attributable mercury emissions alone[110]—a rate of exposure that is surely "significant," and thus ought to have been a matter of concern under EPA's environmental justice analysis. EPA also declined to ask whether more significant and timely emissions reductions would go further toward ameliorating the fact that Native people "face risks or a rate of exposure" to methylmercury that "appreciably exceed[s] the risk or rate to the general population."

The second part of EPA's inquiry is troubling. EPA's take on the environmental justice inquiry, that is, its concern that high fish-consuming populations not be disproportionately benefited by the final rule, however, is not out of step with that urged by proponents of CBA. Proponents are fond of the claim that low-income communities and communities of color are the "net gainers" from environmental regulations.[111] Professor Sunstein, for example, cites a study of the effects of air pollution regulation in California, which found that the largest emissions reductions occurred in the poorest neighborhoods, but that much of the cost of these reductions was borne by those wealthy enough to purchase new cars, which were required to be outfitted with $1,000 to $2,000 worth of pollution control equipment.[112] These relatively wealthy individuals, according to Sunstein, had to pay "emissions penalties that many of the poor are avoiding."[113] The view that the poor in this example are "net gainers" and the rich are "net losers" is worth examining.

The poor might be viewed as net gainers if one considered only a snapshot in time, devoid of historical and social context. Considering only this snapshot, one might find that a quantum of benefits, for example, an amount of emissions reductions, or a decrease in neurological damage, or "total benefits of $6,300 to $6,700," would accrue to those who are poor, whereas only a lesser quantum of benefits would accrue to those who are rich. With no more context than this, a rule with this result appears inequitable on its face—a boon to the poor. But as soon as one contextualizes the inquiry, one learns that the poor communities and communities of color in the California study enjoyed the greatest emissions reductions relative to the "especially high pollution levels" to which they had previously been subjected—levels that meant 25 percent greater exposure to nitrogen dioxide (NO_2) in poor communities compared with wealthy ones for years prior to the air quality regulations studied.[114]

Thus, the notion of gain cannot reasonably or ethically be understood apart from an examination of the status quo. If one is concerned, as environmental justice advocates have suggested we ought to be, that the benefits and burdens of economic life have been systematically maldistributed, with the poor and people of color disproportionately among those suffering the harms

of contamination, then one should question the characterization of regulation that remedies inequities in NO_2 exposure as a "net gain" to the poor. A problem with this view, then, is that, if pursued seriously, it could always be invoked to disqualify efforts to ameliorate a current maldistribution—or at least to support a claim that low-income communities and communities of color are "disproportionately benefited" by such efforts. More fundamentally, it presumes an allocation of entitlements, with the right to pollute at current levels comprising the relevant baseline.

To be fair, EPA has had relatively less time to develop its analytical techniques for the relevant environmental justice questions. The precise contours of an environmental justice or "equity" analysis are not completely specified on the face of the relevant executive orders, so EPA has worked to elaborate the requirements of this inquiry.[115] The understandings suggested by the environmental justice literature, however, have been countered by proponents of welfare economics-based approaches.[116] Professor W. Kip Viscusi, for example, has challenged the concern "that hypothetical individual risks not be too great" and urged that "a more meaningful and compelling risk equity concept is to have equity in terms of the cost per life saved rather than equity in terms of risk outcomes."[117]

In its analysis of the CAMR, EPA embraced such economists' understanding of the equity issues at play, substituting it for the conception developed in the environmental justice guidance and literature. This embrace led EPA to worry that the Ojibwe and other fishing peoples might be "disproportionately benefited" by the CAMR, a worry that ignores the current maldistribution of the burdens of mercury contamination; denies a long history of efforts to colonize and assimilate Native peoples; and displays a callousness to the impacts on real people—impacts on human well-being with aspects both practical and profound, given the "economic, cultural, and religious" significance of fish that EPA acknowledges.[118] In so doing, the agency presumed a contaminated baseline in which fish consumption advisories and large methylmercury body burdens are the starting points from which departures must be justified. This presumption, it should be noted, deviates considerably from the baselines embedded in the relevant statutory and legal directives, including those recognizing tribes' reservation of their fishing rights. From the tribes' perspective, this reassignment of entitlements is unsupportable legally or morally.[119]

Enhanced Oversight?

There is reason to doubt that the CAMR RIA served as a transparent vehicle to inform agency decisionmaking and permit oversight. Proponents of CBA hold out hope that, by increasing transparency, CBA will lead ultimately to better regulatory policy. Professors Matthew Adler and Eric Posner, for example, make this case: "[o]ne overlooked virtue of CBA is that it, more than other decision procedures, increases the transparency of agency decisions, thus facilitating oversight by elected officials and the public."[120] Although those outside EPA were perhaps unusually engaged in the debate surrounding mercury regulation, the CAMR RIA arguably did little or nothing to inform this debate. Part of the problem in this instance surely stems from the fact that the RIA came only late in the day: it was only made available when EPA published the final rule (with several rounds of revisions to EPA's estimates of both the cost and benefit estimates following months later). In addition, the CBA for the final rule bore almost no resemblance to the CBA for the proposed rule, given EPA's decision to abandon a Section 112 MACT-based approach in favor of its cap-

and-trade approach in the final rule. But there is reason to question whether even a more timely RIA would have enhanced the regulatory process by informing debate.

The CAMR RIA illustrates some of the issues and trade-offs in terms of complexity and accessibility and, with accessibility, meaningful oversight. As a preliminary observation, EPA's imposing RIA presents obvious barriers to access in terms of sheer heft. It is 566 pages long and includes a host of technical charts, graphs, and tables. It draws on (although, maddeningly, is not always consistent with) an additional layer of lengthy technical support documents, which are in turn supported by elaborate computer models. As Professor Steinzor observes, even if one wanted to understand only how EPA arrived at its dollar value for IQ points, one would be up against it: "[n]o one but an experienced team of economists with weeks of free time on their hands could possibly hope to evaluate these or any of the assumptions made in the [RIA]."[121]

To be sure, one must try to understand a considerable amount of information when one contemplates the problem of mercury contamination. Mercury is a complex pollutant, and its regulation no simple matter. Any reasonable effort to grapple with the issues will necessarily itself be complex, demanding sustained attention by anyone who hopes to comprehend what is at stake and for whom. But, although the CAMR RIA is touted as being highly sophisticated and complex, some of this complexity arguably was manufactured. For example, EPA constructed two highly elaborate scenarios—the "angler destination" and "population centroid" approaches—to determine how many people in the United States are exposed to methylmercury by consuming fish.

These circuitous approaches had EPA piecing together data on everything from the number of fishing licenses issued to the number of miles people are presumed willing to travel from their homes to go fishing. After pages of analysis, EPA derived two alternative estimates of what it viewed as the relevant exposed population (prenatally exposed infants born in 2001 whose mothers consume recreationally caught fish): 434,000 and 587,000 individuals (respectively).[122] EPA then ran these alternative numbers through most (but not all) of its scenarios for its benefits estimate.

But how much have we learned from this sophisticated presentation of these two scenarios? EPA here dazzled with detail, but never addressed the question begged by its approach, namely, is it appropriate to consider exposures only from the narrowly circumscribed universe of "recreationally caught freshwater fish" from inland waters when there are clearly other sources of exposure (fish caught in coastal waters, for example) to mercury emitted by U.S. utilities?[123] In fact, if EPA had not needed to shore up its choice to limit its benefits analysis to just this fraction of total fish consumption, EPA could readily have used the National Health and Nutrition Examination Survey (NHANES) results,[124] which provide empirical data on just how many women in the United States have elevated blood methylmercury levels associated with intake of contaminated fish, and from which an EPA scientist had already calculated that some 630,000 children were born each year in the period 1999–2000 with umbilical cord blood mercury levels above EPA's RfD.[125] The NHANES results had already been quoted in the media, cited in congressional hearings, and relied on to inform public debate; as such, they were probably more familiar and accessible to the public than either the "angler destination" or the "population centroid" approach constructed for the RIA.

Whatever the gains from such complexity, losses in accessibility and a consequent impairment of oversight are likely. This may be true even for high-level agency administrators and members of Congress. And it is certainly true for many members of the public, some of whom will be the ones left to bear the burden of methylmercury contamination left unaddressed. Here, those most affected by EPA's decision included, as the agency recognized, Native Americans, Southeast Asian

Americans, and low-income people who rely on fish for food. Yet, as Eileen Gauna has observed, members of such groups are generally less likely to have the technical expertise to pore over the agency's RIA or the financial means to hire "an experienced team of economists."[126]

The more sophisticated and voluminous the materials supporting regulatory decisions become, the larger these obstacles to public participation will loom. How can a low-income woman who fishes for food be expected to have the time to locate, digest, and comment on hundreds of pages of documents or to have the money to hire someone to do it for her? In view of this reality, proponents' claim that CBA will ensure transparent decisions and facilitate informed public oversight seems somewhat fanciful. Yet those affected often possess unique expertise: they may be the only ones able to alert an agency to relevant exposure data (for example, a survey of Ojibwe fish consumption practices) or to educate it about pertinent impacts (for example, the interrelated impacts to human and ecological health, from the perspective of the Minnesota Chippewa Tribe, when mink and loons, their clan symbols, are harmed by methylmercury contamination). With diminished oversight by elected officials and the public comes a loss in accuracy. Regulatory decisionmaking is not enhanced, but compromised.

In fact, it is not only CBA's sophistication that may thwart public participation and oversight; a potentially more problematic hurdle stems from the formal demands of the method. As noted above, the public was in fact highly engaged in the mercury rulemaking. EPA received a record number of public comments on its proposed rule, and additional comments on its subsequent rulemaking activities. Yet, because many of these points were not lodged in the form of, say, a quibble with the dollar value that EPA placed on an IQ decrement, they were taken not to speak to the CBA.[127] That is, because of the formal demands of the method, many comments appeared irrelevant. EPA made no attempt to translate such comments—for example, the Minnesota Chippewa Tribe's concern for methylmercury's threat to tribal culture—into a form that could be entered in the CBA ledger (if, indeed, translation were possible).

Nor did EPA recognize that such comments were sometimes protests to the use of the CBA method at all. These statements by the public were simply not registered by the CBA-centered RIA. Without any real conversation in this regard, it is hard to imagine that the CBA here actually helped decisionmakers and the public understand why the issues involved in regulating mercury were "genuinely difficult" and "why, and where, reasonable people might differ," as Sunstein hopes.[128]

Unconnected to Legal and Moral Obligations

The CAMR RIA addressed itself to questions unrelated to EPA's legal obligations to the tribes and untethered to its legal mandate under the Clean Air Act. Although proponents may see a role for CBA even if (or perhaps precisely because) the relevant statutes or other legal directives eschew a cost–benefit test, a tally of costs and benefits in these instances stands wholly apart from the appropriate bases for an agency's decision. This point raises questions about the appropriate role of CBA in regulatory analysis.

Consider, for example, the matter of tribal fishing rights, which are secured in many cases by treaty and protected in all cases as a matter of the federal trust responsibility. EPA recognized early on, in its preamble to the proposed rule, that "Native Americans . . . may rely on fish as a primary source of nutrition and/or for cultural practices."[129] EPA should have immediately been aware of the unique constellation of legal obligations and, arguably, normative considerations that gov-

erned its work. EPA was also reminded during the public comment period that tribes' treaty-protected fishing rights were impacted by the mercury rule and was alerted to the precise ways in which mercury contamination threatens the tribes' treaty fisheries.[130]

These threats might be thought of in three categories.[131] First, methylmercury contaminates fish tissue, harming directly the health of those tribal members who consume (or whose mothers consume) fish, in the form of neurological and cardiovascular damage. Second, methylmercury contaminates fish tissue and renders it less saleable to others, thereby impairing the tribes' treaty-protected rights to earn "a moderate living" by fishing. Third, methlymercury impairs various physiological functions in the fish and inhibits their ability to reproduce, ultimately causing depletion of the fisheries resource on which tribes are entitled to depend.

Although the RIA offered estimates of the impact of mercury contamination on tribal members' health, it said nothing—and the final rule said nothing—of the other dimensions of the treaty-protected rights that are threatened by mercury contamination. Indeed, the word *treaty* appears nowhere in the RIA.[132] In the end, it is unclear how or even whether EPA viewed its analysis as engaging the tribes' legally protected rights to fish.

EPA's inattention to tribal rights in the CAMR RIA may be attributable in part to the Bush administration's steadfast commitment to a predetermined set of objectives for regulating utilities' mercury emissions. Scholars who followed the rulemaking process have observed that it revealed an agency intent on providing a reprieve from regulation to coal-fired utilities; enamored of a cap-and-trade approach to regulating mercury; and determined to salvage as much as possible of the president's Clear Skies Initiative, which had failed repeatedly to persuade Congress.[133] The portrait of an agency so wedded to this agenda that it felt itself unfettered by the relevant statutory directives is arguably supported by the DC Circuit's stern rebuke to EPA in *New Jersey v. EPA*. On this view, the RIA may well have been pressed into service to justify the administration's predetermined ends.[134] That the RIA arguably did not serve here to cabin the agency's discretion is probably a source of disappointment for those proponents, such as Professor Sunstein, who see this role for CBA.

As I suggest in this chapter, however, questions remain as to whether and how CBA ought to figure in agencies' decisions, particularly those structured by laws that reject an efficiency criterion. That the CAMR RIA did not serve to remind EPA of the relevant treaties and other legal directives is perhaps unsurprising. As Sid Shapiro and Chris Schroeder have observed, a preoccupation with CBA "unhinges" regulatory analysis from the legal directives that govern agency decisions.[135] Environmental statutes, they point out, "almost never" embrace a cost–benefit criterion.[136] Instead, these statutes direct EPA to set a standard based on the best available technology or to balance several considerations and values, exclusive of cost. As such, they require EPA to ask questions that differ from those asked in a CBA, for example: What level of emissions control is "achieved by the best performing 12 percent of existing sources?"[137] How does EPA's decision bear on Ojibwe rights to "make a moderate living . . . from the waters . . . [by] fishing . . . as they had in the past?" Indeed, Shapiro and Schroeder point out, "since cost is not a consideration in setting the level of regulation in [many] statutes, CBA is irrelevant to the outcome."[138] The same, of course, could be said of the legal mandates that protect tribes' fishing rights, including the treaties and the federal trust responsibility.

But, as Douglas Kysar suggests, there may be a deeper problem. CBA may work subtly to unseat these legal mandates. Although moderate proponents have disavowed any designs on sup-

planting other decisional criteria with an efficiency-driven "super-procedure," there may nonetheless be reason for concern. CBA's method upends a host of determinations, including basic allocations of entitlements and rights, that have been made in democratic fora.[139] CBA proceeds as if the relevant determinations—U.S. recognition in treaty of tribal resources and rights, or the federal commitment in the Clean Air Act to require the maximum achievable reduction in HAP emissions—were up for grabs, to be (re)negotiated via economists' disciplinary lens, that is, on the basis of one's WTP.

How can the lessons of this case study assist in shaping regulatory analysis for the future?

Toward Improved Regulatory Analysis

There is surely wide agreement that, in the end, regulatory analysis ought to be designed to improve the quality of regulatory decisions. To improve regulatory decisions, we need to employ our best analytical tools. These tools ought to assist us, insofar as possible, in making an accurate and nuanced assessment of the problem at hand and the potential solutions to it.

Proponents seem to worry that, without CBA, there are no tools for rigorous regulatory analysis. Sunstein argues that CBA is "indispensable" to regulatory decisionmaking and states that "[w]ithout some effort to ascertain the effects of regulation, agencies are making a mere stab in the dark," intimating that it is CBA or nothing.[140] Richard Revesz and Michael Livermore similarly portray the options as being "gut-level decisionmaking" on the one hand or "economic analysis" on the other.[141]

But we need not "abandon reasoned analysis"[142] if we draw on multiple analytical tools from differing disciplinary perspectives. In fact, we could expect to enhance the quality of our analysis. Environmental problems are complex, as the case study of EPA's mercury regulation shows, and the expertise of multiple disciplines will need to be brought to bear to begin to solve them. Economics is one discipline that can make contributions, but it is not the only one.

Shapiro and Schroeder have recently outlined a pragmatic, problem-oriented approach to regulatory analysis that embodies this understanding.[143] This approach would be interdisciplinary, with the analytical tools of each discipline offered as an aid to deliberation, but with no single analytical approach purporting to incorporate every relevant consideration. Decisionmakers and the public would be expected to defer to each discipline—including economics—on matters within its sphere of competence, but to look elsewhere when the nature of the question dictated.

This approach would be problem-oriented, in that it would recognize that the regulatory questions are, in many instances, structured in advance by the governing statutes and laws. The regulatory analysis would, therefore, be framed so as to produce answers that are usable within the relevant legal structure. Finally, this approach would be sensitive to issues of justice, including intergenerational justice. These issues would not be defined by the normative commitments of welfare economics, nor would they be considered only as an afterthought to a decision evaluated on the basis of an efficiency criterion.

And we need not forgo rational analysis if we look to multiple individuals from differing cultural traditions to understand the impacts of contamination. Such an approach to regulatory analysis would enhance rationality because, as Sagoff urges, it would promote decisions that are reasoned, intelligent, and the product of open-minded deliberation that, importantly, countenances qualitative evidence, including evidence about purposes, values, and beliefs.[144] Instead of

accepting only those inputs that can be quantified, such an alternative analytical approach would accept useful information and arguments from various disciplines, traditions, and sources. Instead of impoverishing the debate by excluding all effects that cannot readily be monetized, it would facilitate and enrich deliberation. And instead of limiting its knowledge base to the expertise of a single group or intellectual tradition, it would enhance accuracy by considering the often unique contributions of those affected.

Many economists, in fact, have propounded a view that is not at odds with this interdisciplinary approach to regulatory analysis. They have evidenced an understanding that their disciplinary contributions are important, but not outcome-determinative—"a tool, not a rule" for regulatory decisionmaking. This understanding, in fact, has supported research into, for example, the interplay among quantitative and qualitative inputs to decisions; the possibility of assessing impacts in terms of their natural units; and the practice of the art and science of economics. Further work in this vein seems useful, so that the tools of economic analysis inform, but do not take over decisions.

Ultimately, the task for regulatory analysis will be to harness the insights of economics, while avoiding the losses that attend a strict adherence to CBA as currently practiced. This task is necessary, for example, to contemplate the effect of mercury contamination on the generation of girls in the Leech Lake Chippewa tribe who, in the absence of meaningful regulation, will be advised to reduce or eliminate fish from their diets for more than half of their lives—throughout their childhood to age 20 (when they are vulnerable to neurodevelopmental toxins) and then throughout their childbearing years to age 44 (when they might expose a developing fetus to irreversible neurological damage).

If the losses that this would entail are understood in terms of loss in earnings, decisionmakers learn only that these girls will suffer a setback that is worth $5,372, in 1999 dollars. If, on the other hand, the losses that this would entail are understood in the ordinary, qualitative terms of public discourse, decisionmakers might come to appreciate the multiple and interrelated dimensions of the harms to these girls and to their people, with all their physiological, social, economic, cultural, spiritual, and political facets. To ensure that decisionmakers are not deprived of a rich and nuanced understanding, we ought to arm them with the information that economics can provide, but also with the information that economics can't provide.

■ ■ ■

Notes

1. I am indebted to David Driesen, Lisa Heinzerling, Amy Sinden, and my colleagues who participated in a work-in-progress colloquium at Seattle University, for helpful comments. I am also grateful to Mike Morita, for his excellent research assistance. Portions of this chapter draw on material published in an earlier article, Environmental Justice in the Tribal Context: A Madness to EPA's Method, 38 Environmental Law, 495 (2008).

2. Cass R. Sunstein, The Arithmetic of Arsenic, 90 *Georgetown Law Journal,* 2255 (2002) [hereinafter Sunstein, Arithmetic].

3. Thomas O. McGarity, Professor Sunstein's Fuzzy Math, 90 *Georgetown Law Journal,* 2341, 2376 (2002) (emphasizing the importance of wading into the "muck and mire" to examine cost–benefit analysis in context).

4. Unless otherwise noted, the account of mercury contamination and exposure that follows is taken from two prominent studies, which were to guide EPA during its rulemaking process: Committee on the Toxicological Effects of Methylmercury, National Research Council (NRC), *Toxicological Effects of Methylmercury* 175–81 (2000) [hereinafter NRC, *Methylmercury*]; Office of Air Quality Planning & Standards and Office of Research & Development, U.S. Environmental Protection Agency, *Mercury Study Report to Congress* (1997), available at www.epa.gov/ttn/caaa/t3/reports/volume1.pdf [hereinafter *Mercury Study Report to Congress*].

5. *See* Catherine A. O'Neill, Mercury, Risk, and Justice, *34 Environmental Law Reporter* (Environmental Law Institute) 11,070, 11,078–11,079 (Dec. 2004) [hereinafter O'Neill, Mercury, Risk, and Justice] (comparing levels of methylmercury in fish species consumed by various groups).

6. *Mercury Study Report to Congress,* supra note 4, at O-2.

7. NRC, *Methylmercury,* supra note 4, at 2 n.2.

8. Kathryn R. Mahaffey et al., Blood Organic Mercury and Dietary Mercury Intake: National Health and Nutrition Examination Survey, 1999 and 2000, 112 *Environmental Health Perspectives.* 562, 565 (2004).

9. Id. at 565. Among the categories of "race/ethnicity" employed by the National Health and Nutritional Examination Survey analyzed by Mahaffey et al. are the categories "[n]on-Hispanic white" and "[o]ther." With respect to the latter, the authors explain, "[p]articipants who designated themselves as Other include Native American Tribal people, individuals of Pacific Island origin, persons of Asian origin, and persons of mixed race who did not designate another category." Id.

10. Some tribes' rights to fish are not secured by treaty, but instead are protected by executive orders and other federal laws. See, e.g., *Parravano v. Babbit,* 70 F.3d 539, 546–47 (9th Cir. 1995).

11. Treaty with the Chippewas, art. V, July 29, 1837, 7 Stat. 536. See also Treaty with the Chippewas, art. II, Oct. 4, 1842, 7 Stat. 592.

12. 653 F. Supp. 1420, 1426 (W.D. Wis. 1987).

13. A similar logic supported the district court's finding in the second phase of *United States v. Washington,* which interpreted the treaties guaranteeing to the fishing tribes in the Pacific Northwest the right "to take fish." *United States v. Washington,* 506 F. Supp. 187 (W.D. Wash. 1980) (Phase II), vacated, 759 F.2d 1353 (9th Cir. 1985). There, the court reasoned that "implicitly incorporated in the treaties' fishing clause is the right to have the fishery habitat protected from man-made despoliation.... The most fundamental prerequisite to exercising the right to take fish is the existence of fish to be taken." Id. at 203. Although this opinion was vacated on what were essentially procedural grounds, its unassailable logic remained available to EPA in its deliberations. Since EPA's issuance of the final CAMR, note that the district court has reiterated this understanding in the particular context of the state's duty to refrain from diminishing fish runs by constructing or maintaining culverts that block fish passage. *U.S. v. Washington,* No. 9213RSM, slip op. at 11 (W.D. Wash. Aug. 27, 2007) (Subproceeding 01-01) (finding that the treaty negotiators "specifically assured the Indians that they would have access to their normal food supplies now and in the future" and that "[t]hese assurances would only be meaningful if they carried the implied promise that neither the negotiators nor their successors would take actions that would significantly degrade the resource.").

14. *See*, e.g. *United States v. Washington,* 520 F.2d 676, 685 (9th Cir. 1975) ("[N]either the treaty Indians nor the state... may permit the subject matter of these treaties to be destroyed.").

15. *United States v. Washington,* 873 F. Supp. 1422, 1437 (W.D. Wash. 1994).

16. *Worcester v. Georgia,* 31 U.S. (6 Pet.) 515, 531 (1832).

17. *See*, e.g., *Nw. Sea Farms v. U.S. Army Corps of Engineers,* 931 F. Supp. 1515, 1520 (W.D. Wash. 1996); but cf. *George E. Warren Corp. v. EPA,* 159 F.3d 616, 624 (D.C. Cir. 1998).

18. Clean Air Act, 42 U.S.C. § 7412(b) (2000).

19. Clean Air Act, 42 U.S.C. § 7412(d)(2) (2000).

20. Clean Air Act, 42 U.S.C. § 7412(f)(2)(A) (2000).

21. Clean Air Act, 42 U.S.C. § 7412(n)(1) (2000).

22. Proposed National Emissions Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards for Performance for New and Existing Stationary Sources: Electric Utility Steam-Generating Units; Proposed Rule, 69 Fed. Reg. 4652 (Jan. 30, 2004) [hereinafter EPA, Proposed Mercury Rule]. For a discussion of the proposed rule, see, generally, Lisa Heinzerling & Rena I. Steinzor, A Perfect Storm: Mercury and the Bush Administration, *34 Environmental Law Reporter* (Environmental Law Institute) 10,297 (April 2004); Lisa Heinzerling & Rena I. Steinzor, A Perfect Storm: Mercury and the Bush Administration, Part II, 34 Environmental Law Reporter (Environmental Law Institute) 10,485 (June 2004); and O'Neill, Mercury, Risk, and Justice, supra note 5. EPA's Office of the Inspector General criticized the proposed MACT standard as anemic. Office of the Inspector General, U.S. Environmental Protection Agency, Additional Analyses of Mercury Emissions Needed before EPA Finalizes Rules for Coal-Fired Utilities, at "At a Glance," and 11–16 (Feb. 3, 2005), available at www.epa.gov/oig/reports/2005/20050203-2005-P-00003.pdf ("Evidence indicates that EPA senior management instructed EPA staff to develop a Maximum Achievable Control Technology [MACT] standard for mercury that would result in national emissions of 34 tons annually, instead of basing the standard on an unbiased determination of what the top performing units were achieving in practice.... [T]he standard likely underestimates the average amount of mercury emissions reductions achieved by the top performing 12 percent of utilities, the minimum level for a MACT standard required by the Clean Air Act.").

23. U.S. Environmental Protection Agency, Methodology to Generate Deposition, Fish Tissue Methylmercury Concentrations, and Exposures for Determining Effectiveness of Utility Emission Controls 3, Tables 1.1 and 1.2 (2005), available at www.epa.gov/ttn/atw/utility/eff_fnl_tsd-031705_corr_oar-2002-0056-6301.pdf [hereinafter EPA, CAMR Effectiveness TSD] (figures for emissions reductions presented in kg/yr; author's conversions). According to EPA's models, under the CAMR in 2020, total national mercury emissions will be approximately 25 tons. This amounts to a 48 percent reduction from 1999 baseline emissions of approximately 48 tons.

24. *See* James E. McCarthy, Mercury Emissions from Electric Power Plants: An Analysis of EPA's Cap-and-Trade Regulations Cong. Res. Serv. Rep. 7–8 (Updated Jan. 13, 2006). "It appears that full compliance with the 70% reduction might be delayed until 2030," and noting that "EPA has not provided an estimate of the year in which the 70% reduction will be attained. The Integrated Planning Model [IPM], which the agency uses to calculate regulatory impacts, runs to the year 2030 and assumes that all allowances will be used by the end date. Discussions we held with EPA staff indicate that some think the allowances will be used more quickly (perhaps as early as 2025), while others think use of allowances will be stretched into the 2030s." Id. at n.24.

25. Rena I. Steinzor, *Mother Earth and Uncle Sam: How Pollution and Hollow Government Hurt Our Kids.* University of Texas Press. 103–125 (2008) [hereinafter Steinzor, *Mother Earth*] (recounting numerous irregularities and abrupt changes in course of mercury rulemaking at EPA).

26. Steinzor, *Mother Earth,* at 120.

27. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, *Regulatory Impact Analysis of the Clean Air Mercury Rule Final Report* (2005), available at www.epa.gov/ttn/atw/utility/ria_final.pdf [hereinafter EPA CAMR RIA].

28. Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units; Final Rule, 70 Fed. Reg. 28,606, 28,642 (May 18, 2005) [hereinafter EPA, Final CAMR]. These figures assume a 3 percent discount rate. EPA also calculated costs and benefits assuming a 7 percent discount rate, arriving at $848 million in costs and $0.2 million to $2 million in benefits on this assumption. Id.

29. Upon reconsideration, EPA concluded that "the upper bound estimate of aggregate economic benefits of reduced IQ decrements from eliminating utility-attributable mercury exposure in 2020 after CAIR are approximately $50 million." U.S. Environmental Protection Agency, *Technical Support Document: Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units from the Section 112((c) List: Reconsideration* 35–37 (2005) available at www.epa.gov/ttn/atw/utility/tsd_oar-2002-0056-6303.pdf. [hereinafter EPA, *Reconsideration TSD*]. EPA presented benefits as "$50 million plus some additional amount from the consumption of commercial freshwater, estuarine, and aquaculture fish by the general public." Id. at 35. In addition, EPA had estimated costs of compliance to be $560 million in the technical documents accompanying the final rule; but later, upon reconsideration, suggested that $750 million "reflects our best estimate." Id. at 37, n.20; note that these figures differ from the $848 million figure cited above in that the $560 million and the $750 million figures reflect the costs to industry of compliance, whereas the $848 million figure reflects the cost to society at large. See McCarthy, supra note 24, at 11. EPA also cited a range of benefits from $0 to $190 million in its *Reconsideration TSD,* but later revised the "upper bound" of its benefits estimate to $210 million. EPA, *Reconsideration TSD* at 32–33; McCarthy, supra note 24, at 11.

30. Shankar Vedantam, New EPA Mercury Rule Omits Conflicting Data, *The Washington Post,* March 22, 2005, at A1 ("[EPA] officials said the health benefits were worth no more than $50 million a year while the cost to industry would be $750 million a year.").

31. EPA allowed, additionally, that the controls installed to reduce mercury under the CAMR could be expected to result in a slight reduction in emissions of fine particulate matter, saving up to seven lives annually, for monetized benefits of $1.4 million to $40 million per year. EPA, Final CAMR, supra note 28, at 28,642; EPA, CAMR RIA, supra note 27, at Section 12.

32. EPA, CAMR RIA, supra note 27, at 10-3.

33. Sunstein, Arithmetic, supra note 2, at 2259.

34. EPA also considered two other alternatives, each of which referenced a 2001 baseline: an estimate of the benefits that would result if utility-attributable mercury emissions were to be eliminated entirely in 2001 (assuming "base case" conditions), and an estimate of the benefits that would result from the co-benefits to be realized in 2020 through the implementation of the CAIR alone relative to this 2001 baseline. But EPA did not present any estimates of the benefits that would flow from its three main alternatives relative to this 2001 baseline. Instead, EPA reset the baseline (with a new "base case" as of 2020, assuming that the CAIR had already been implemented) and presented the benefits of the three alternative scenarios only vis-à-vis this new 2020 baseline.

35. *See,* generally, David M. Driesen, Is Cost-Benefit Analysis Neutral?, 77 *University of Colorado Law Review* 335, n.94 (2006) (citing sources discussing the costs of delay in issuing environmental health and safety regulation); see also, William J. Nicholson & Philip J. Landrigan, Quantitative Assessment of Lives Lost Due to Delay in the Reg-

ulation of Occupational Exposure to Benzene, 82 *Environmental Health Perspectives* 185 (1989) (estimating that an 11-year delay in regulating occupational exposure to benzene resulted in some 30 to 490 excess deaths to those exposed between 1978 and 1987).

36. Leonardo Trasande et al., Public Health and Economic Consequences of Methyl Mercury Toxicity to the Developing Brain, 113 *Environmental Health Perspectives* 590 (May 2005) [hereinafter Trasande et al., Economic Consequences of Mercury]; see also, Trasande et al., Applying Cost Analyses to Drive Policy That Protects Children: Mercury as a Case Study, 1076 *Annals of the New York Academy of Sciences* 911, 919 (2006) [hereinafter Trasande et al., Cost Analyses and Mercury Policy]. Trasande et al. enlisted recent data from the Centers for Disease Control and Prevention, finding that between 316,588 and 637,233 children are born each year with cord blood mercury levels greater than 5.8 μg/L, a level associated with loss of IQ; they assumed reductions on the order of 70–90 percent, in line with legislative proposals on the table at the time of the CAMR; and they concluded that the failure to control U.S. coal-fired utilities would cost $1.3 billion each year, tallied mainly in terms of lost future earnings. Id.

37. Id.

38. Note that no discount rate has been applied for those born in 2023 compared with 2007.

39. First, these figures calculate the benefits that would result from the complete elimination of utility-attributable mercury emissions, which overstates both the effect of a MACT-based approach (which would result in 90 percent reductions) and the effect of the CAMR (which would result in 70 percent reductions). In this respect, these figures probably underestimate the number of children harmed by the delay. (This assumption comports, however, with EPA's assumption for its IPM runs and for its upper-bound benefits analysis, so provides a useful basis for comparison.) Second, these figures compare benefits that would result when significant reductions are assumed to be achieved, respectively, in 2007 and in 2023, but this simplifying assumption does not account for the more modest reductions under the CAMR that are predicted to occur earlier, resulting from the operation of the Phase I cap in 2010 and, in some models, from structural features of the cap-and-trade program—namely, its banking mechanism. EPA estimates mercury emissions to be reduced by 21 percent in 2010 (from 48 to 38 tons). EPA, *CAMR Effectiveness TSD,* supra note 23. The Congressional Research Service puts emissions reductions at 35 percent in 2010 (from 48 to 31.3 tons). McCarthy, supra note 24, at 7, Table 2. In this respect, these figures probably overestimate the number of children harmed by the delay. On the other hand, it must be kept in mind that, under the second step of a Section 112 MACT-based approach, further emissions reductions might be required as early as 2015, which would mean that the figures above may come closer to an accurate estimate of the effect of a MACT-based approach after this point in time. Clean Air Act, 42 U.S.C. § 7412(f)(2)(A) (2000). Third, these figures obviously represent only a partial account of the harms wrought by delay, accounting as they do only for IQ decrements to prenatally exposed children. In this respect, these figures underestimate the costs of delay.

40. Trasande et al., Mental Retardation and Prenatal Methylmercury Toxicity, 49 *American Journal of Industrial Medicine,* 153, 156 (2006) [hereinafter Trasande et al., MR]. Note that these estimates include only the "direct" costs to society, such as the increased medical and other costs of caring for those damaged in utero by mercury from U.S. utilities, but exclude the "indirect" costs, "such as lost economic productivity due to morbidity." Id. at 156; Trasande et al., Cost Analyses and Mercury Policy, supra note 36 at 919.

41. Honorable George Goggleye, Jr., Chairman, Leech Lake Tribal Council, Speech at the International Conference on Mercury as a Global Pollutant, Madison, WI (Aug. 6, 2006); telephone interview with John Persell, Leech Lake Band Department of Natural Resources (Jan. 15, 2008).

42. Id.

43. *See,* e.g., Great Lakes Indian Fish & Wildlife Commision Staff, Tribal Perspective Shared at International Mercury Conference, *Mazina'igan: A Chronicle of the Lake Superior Ojibwe,* Winter 2006–07 at 1, available at www.glifwc.org/Publications/mazinaigan/Winter2006.pdf (noting disproportionate impact on tribes).

44. Letter from William W. Phillips, Tribal Chief, Aroostook Band of Micmacs, to U.S. Environmental Agency (Apr. 30, 2004), available at www.regulations.gov/fdmspublic/ContentViewer?objectId=09000064800ae485&disposition=attachment&contentType=pdf (providing comments on Proposed National Emissions Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards for Performance for New and Existing Stationary Sources: Electric Steam-Generating Units, Docket No. OAR-2002-0056-2483).

45. U.S. Environmental Protection Agency, Response to Significant Public Comments Received in Response to: Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Steam Generating Units from the Section 112(c) List and Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units 295–96 (2006).

46. McCarthy, supra note 24, at 11–12; note that utilities in the eastern portion of the United States would have to comply with the CAIR beginning in 2009 and 2010. U.S. Environmental Protection Agency, *Clean Air Interstate Rule: Basic Information.* www.epa.gov/interstateairquality/basic.html (last visited Jan. 19, 2008).

47. EPA, CAMR RIA, supra note 27, at 10-46 to 10-47.

48. Steinzor, *Mother Earth,* supra note 25, at 122.

49. Letter from Melanie A. Marty, Children's Health Protection Advisory Committee, to Michael Leavitt, Administrator, U.S. Environmental Protection Agency 6 (Jan. 26, 2004) [hereinafter CHPAC Comments] (providing comments to the Proposed Mercury Rule, Docket 2002-0056-5570).

50. Letter from Donald Moore Sr., Tribal Chairman, Bad River Band of Lake Superior Tribe of Chippewa Indians, to Micheal Leavitt, Administrator, U.S. Environmental Protection Agency (Apr. 19, 2004), available at www.regulations.gov/fdmspublic/ContentViewer?objectId=09000064800ac810&disposition=attachment&contentType=pdf (comments on Proposed Utility Mercury Reductions Rule, OAR 2002-0056-2118).

51. Raymond J. Kopp, Alan J. Krupnick, and Michael Toman, Cost-Benefit Analysis and Regulatory Reform: An Assessment of the Science and the Art 40 (Jan. 1997) (Resources for the Future Discussion Paper 97-19).

52. *See*, e.g., Office of Management and Budget, Circular A-4 (September 17, 2003), available at www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

53. *See*, generally, Kopp et al., supra note 51; David Calonder, The Lost Art of Economics: Essays on Economics and the Economic Profession (2001); according to Chapter 9 of this report, ("In short, the nature of 'adverse ecological consequences' was incompletely specified, a not unusual occurrence for ecological impacts. Even what is 'adverse' implies some value judgment.").

54. Of course, one could always argue that additional impacts, cutting in each direction, ought to be included. For example, in the case of mercury regulation, EPA stopped short of including the societal costs when the IQ of those exposed to methylmercury dipped below 70, the clinical threshold for MR. See Trasande et al., MR, supra note 40; Trasande et al., Cost Analyses and Mercury Policy, supra note 36 (finding that the CAMR would prevent some 1,475 cases of MR and save $4.1 billion in societal costs, including lost productivity, increased special education costs, and increased health care costs).

55. Robert Stavins, as quoted by Douglas Kysar (Chapter 10 of this report).

56. Sidney A. Shapiro & Christopher H. Schroeder, Beyond Cost–Benefit Analysis: A Pragmatic Reorientation, 32 *Harvard Environmental Law Review* 433, 446–50 (2008).

57. Trasande and his colleagues cite, but do not quantify, additional adverse effects on those exposed as neonates and infants up to age two, when the blood–brain barrier remains vulnerable. Trasande et al., Economic Consequences of Mercury, supra note 36, at 594; see also Children's Health Protection Advisory Committee (CHPAC), observing "[i]n addition to exposure in utero, infants and children have ongoing dietary exposure to methylmercury. Children and infants are sensitive to mercury's effects because their nervous systems continue to develop until about age 20." CHPAC Comments, supra note 49, at 6.

58. *See,* e.g., Lisa Heinzerling et al., Mercury, Center for Progressive Reform Perspectives Series www.progressivereform.org/perspectives/mercury.cfm (2005); Glenn Rice and James K. Hammitt, *Economic Valuation of Human Health Benefits of Controlling Mercury Emissions from U.S. Coal-Fired Power Plants* (Feb. 2005), available at www.nescaum.org/documents/rpt050315mercuryhealth.pdf (including, in assessment of costs and benefits, exposure to those consuming fish caught in coastal waters. Report for the Northeast States for Coordinated Air Use Management (NESCAUM)).

59. EPA, CAMR RIA, supra note 27, at 4-46.

60. EPA selected the mean fish consumption rate from its 1997 Exposure Factors Handbook, eschewing its more recent guidance from its Ambient Water Quality Standards Methodology, which suggested that the general population default rate should be more than twice this high, in other words, 17.5 grams per day. EPA, CAMR RIA, supra note 27, at 10-44. Among other things, EPA justified its selection of the 8-grams-per-day figure because it represents both consumers and nonconsumers of fish. But the choice to include nonconsumers has the effect of depressing the mean and, especially, high-end values, because of the inclusion of so many "0" values reflecting those who do not eat fish. Id. at 10-44. As I have argued elsewhere, this is an unsupportable choice in the context of public health regulation. Catherine A. O'Neill, Variable Justice: Environmental Standards, Contaminated Fish, and "Acceptable" Risk to Native Peoples, 19 *Stanford Environmental Law Journal* 3, 60–61, 80 (2000).

61. EPA ultimately assumes a relationship of –0.16 IQ points for each ppm of maternal hair mercury, whereas Trasande et al. calculate a relationship of –0.465 IQ points per ppm of maternal hair mercury. Note that the EPA CAMR actually gives this figure as –0.13 IQ points per ppm maternal hair mercury. EPA, CAMR RIA, supra note 27, at 9-7. However, EPA revised its estimate to –0.16 IQ points per ppm maternal hair mercury upon reconsideration. Charles Griffiths et al., A Note on Trasande et al., "Public Health and Economic Consequences of Methylmercury Toxicity to the Developing Brain," 8, n.3 (National Center for Environmental Economics, Working Paper No. 06-02, 2006), available at http://yosemite.epa.gov/ee/epa/eed.nsf/ffb05b5f4a2cf40985256d2d00740681/dd32a21a7da2bdf385257155004856 42/$FILE/2006-02.pdf (explaining that this revision came in response to public comment). Transande and his colleagues present the dose–response curve in terms of ppb of mercury in cord blood; this figure can be converted into ppb of mercury in hair for purposes of comparison. Trasande et al., Economic Consequences of Mercury, supra note 36, at 591–92. The conversion here was undertaken by Griffiths et al., supra, at 8.

62. Translation by Griffiths et al., supra note 61, at 9; CAMR RIA, supra note 27, at 10-46 (citing a figure of $366,021, discounted at 3 percent).

63. Trasande et al., Economic Consequences of Mercury, supra note 36 at 592 (discounted at 3 percent).

64. Rice & Hammitt, supra note 58.

65. Rice & Hammitt, supra note 58, at xix.

66. EPA, CAMR RIA, supra note 27, at 10-113,10-120 to 10-122. Note that EPA then greatly understated the fish consumption rate for this population, a point that is taken up infra.

67. Ted Gayer and Robert W. Hahn, Designing Environmental Policy: Lessons from the Regulation of Mercury Emissions, *Regulatory Analysis* 05–01, 22, 33 (2005) (in 2004 dollars, depending on whether one assumes Model 1 or 2 for the rate of reductions, and depending on whether one employs a discount rate of 3 percent or 7 percent). Note that Gayer & Hahn assume the proposed version of the cap-and-trade program, which would have set the Phase I cap at 34 rather than 38 tons; as a consequence, they note, "[t]his may mean that our estimates slightly overstate the benefits as well as the costs of the final rule." Id. at 5–6.

68. EPA, Final CAMR, supra note 28, at 28,641 ("EPA determined that IQ decrements due to Hg exposure is one endpoint that EPA should focus on for a benefit analysis, because it can be monetized.").

69. EPA, CAMR RIA, supra note 27, at 10-1 to 10-2. To its credit, EPA acknowledged the omission of ecological benefits, which it was "unable to quantify," and the fact that the exclusion of these and other categories of benefits, taken together, means that its assessment "likely underestimate[s] the total benefits of reducing mercury emissions from power plants." Id.

70. Frank Ackerman and Lisa Heinzerling, *Priceless: On Knowing the Price of Everything and the Value of Nothing* 40 (2004).

71. David M. Driesen, Is Cost–Benefit Analysis Neutral?, 77 *University of Colorado Law Review* 335 (2006).

72. According to one analysis, EPA's estimate of the CAMR's costs "relies on estimates of mercury control costs that are 4 to 20 times higher than current projections by pollution control industry sources." McCarthy, supra note 24, at 9, 20. *See,* generally, Thomas O. McGarity and Ruth Ruttenberg, Counting the Cost of Health, Safety, and Environmental Regulation, 80 *Texas Law Review.* 1997 (2002); Winston Harrington, Richard D. Morgenstern, and Peter Nelson, On the Accuracy of Regulatory Cost Estimates, 19 *Journal of Policy Analysis & Management.* 297 (2000) (EPA tends to overestimate the costs of regulations); Ackerman & Heinzerling, supra note 70 at 37–39.

73. *See* Shapiro and Schroeder, supra note 56, at 450 (describing the call for "regulatory relief" as one of the primary motivating factors behind the adoption of CBA).

74. Ackerman and Heinzerling, supra note 70, at 39-40; Cass R. Sunstein, Incommensurability and Valuation in Law, 92 *Michigan Law Review.* 779 (1994) [hereinafter Sunstein, Incommensurability].

75. EPA, CAMR RIA, supra note 27, at 10-46. EPA uses earnings data from 1992 and employs a discount rate of 3 percent.

76. Id. (also discounted at a 3 percent rate).

77. Id. at 10-47. EPA informs, in a footnote, that the average present value of net earnings losses per IQ point decrease is $1,580, if one assumes a 7 percent discount rate instead. Id. at 10-47, n.17.

78. Id. at 10-47.

79. Id. (observing that its loss-in-earnings method is serviceable, nonetheless, because a "cost-of-illness estimate may be considered a lower bound estimate of WTP"); accord Griffiths et al., supra note 61, at 9, n.5 ("It should be noted that lost earnings from IQ loss is not the conceptually correct metric for valuing benefits of reduced mercury exposure. Ideally, we should use a measure of willingness-to-pay (WTP) to avoid neurological damage caused by mercury exposure.").

80. Ackerman and Heinzerling, supra note 70, at 72.

81. Id.

82. Lest someone think that Ackerman and Heinzerling's observation is far-fetched and would never see the light of day in a policy context, consider that economist W. Kip Viscusi undertook research that concluded that states, in fact, saved money when their citizens smoked: because smokers die early, states were saved the expense of providing elder care and other services associated with an aging population. This study was undertaken at a time when the question was very much in the public realm, as states were in litigation with the tobacco companies, seeking reimbursement for the medical costs the states incurred as a result of smoking. As Ackerman and Heinzerling note, "[a]ccording to Viscusi, the financial benefit to the states of their citizens' premature deaths was so great that, if some of his results were 'taken at face value,' then 'cigarette smoking should be subsidized rather than taxed.'" Ackerman and Heinzerling, supra note 70, at 72.

83. *See,* e.g., Swinomish Tribal Mental Health Project, *A Gathering of Wisdoms: Tribal Mental Health—A Cultural Perspective* 145–63 (1991). "Elders have a unique and honored place in Indian society . . . . Elders are the teachers and carriers of tradition. Their greater life experience, historical perspective, spiritual knowledge and closer ties to the old ways of tribal ancestors make them a valuable resource for younger people . . . . [Y]ounger people without elders may be considered 'poor.'" Id. at 154, 156.

84. Id.

85. Id. For example, "[o]lder people, especially grandparents, are often the primary teachers of children, and not infrequently are their primary care givers." Id. at 154.

86. *See,* e.g., Jamie Donatuto, environmental specialist, Swinomish Indian Tribal Community, "Risk in the Tribal Context," Presentation to EPA workgroup (Nov. 2007). This is a perspective that seems largely to be missing from the literature debating quality-adjusted life years and similar approaches that involve controversial judgments about the relative value of human life in its various stages. *See,* e.g., Robert W. Hahn and Scott Wallsten, Is Granny Worth $2.3 Million or $6.1 Million?, AEI–Brookings Joint Center Policy Matters 03-13 (undated article) available at www.aei-brookings.org/policy/page.php?id=138&.

87. In fact, they might suggest, EPA's practice can be seen as progressive—a sort of regulatory redistribution. That is, it justifies more protective mercury regulation than the actual earning potential of those most affected by the rule would warrant. *See,* e.g., Richard L. Revesz and Michael A. Livermore, *Retaking Rationality: How Cost–Benefit Analysis Can Better Protect the Environment and Our Health*. Oxford University Press 14, 82–84 (2008) (making an analogous argument in the context of EPA's use of average WTP or willingness-to-accept figures to determine the "value of a statistical life"). But this claim is circular. EPA's practice is "progressive" only if one accepts that the lives of those with little earning potential actually are worth less than those who can expect to earn more. If one believes, instead, that each individual is equally valuable, the use of average values does not appear redistributive.

88. Letter from Pearl Capoeman-Baller, Chairperson, National Tribal Environmental Council, to Michael Leavitt, Administrator, U.S. Environmental Protection Agency, Comments on the Proposed Utility Mercury Reductions Rule 5 (June 4, 2004) (providing comments to the Proposed Mercury Rule, Docket 2002-0056-2695).

89. Kopp et al., supra note 51 at 12.

90. Id.

91. Mark Sagoff, *Price, Principle, and the Environment*. Cambridge University Press 57–79 (2004) [hereinafter, Sagoff, *Price, Principle*].

92. Scott Farrow, Chapter 9 of this report.

93. Louis E. Wolcher, Senseless Kindness: The Politics of Cost–Benefit Analysis, 25 *Law and Inequality.* 147, 184 (2007).

94. *See,* e.g., Gayer & Hahn, supra note 67 at 20–21 (deriving the value of an IQ point from WTP surveys that asked precisely this question of parents in the context of lead chelation).

95. *See,* e.g., Stuart Harris et al., Presentation to the 8th International Conference on Mercury as a Global Pollutant (Aug. 8, 2006).

96. Mark Sagoff, *The Economy of the Earth: Philosophy, Law and the Environment.* Cambridge University Press (1988) (observing that people's choices as consumers are not the same as their choices as citizens); Sagoff, *Price, Principle,* supra note 91, at 64–66 (arguing that multiple reasons might explain even the choice to purchase Girl Scout cookies).

97. Sunstein, Incommensurability, supra note 74, at 797. In this earlier article, Sunstein observed that people value things, goods, relationships, and states of being in qualitatively different ways, and that these values cannot without significant loss be reduced to a single metric, such as money or utility. Not only would the metric fail adequately to describe experience, but also, crucially, it "would actually transform it, in a way that would make a great deal of difference . . . because it would elide certain qualitative differences that are important in both life and law." Id.

98. Matthew D. Adler and Eric A. Posner, *New Foundations of Cost–Benefit Analysis.* Harvard University Press, 156 (2006) ("[W]e happily concede that CBA does not track deontological, egalitarian, or non-welfare-based values."); Matthew D. Adler, Risk Equity: A New Proposal, 32 *Harvard Environmental Law Review,* 1, 2 (2008) ("[T]he net-benefits-maximization test of traditional cost–benefit analysis is insensitive to distributional considerations.")

99. Exec. Order No. 12,866 § 1(a), 58 Fed. Reg. 51,735 (Sept. 30, 1993).

100. *See* EPA, CAMR RIA, supra note 27, at 10-121 ("equity analysis"); EPA, Final CAMR, supra note 28, at 28,648.

101. EPA, Final CAMR, supra note 28 at 28,648.

102. Id.

103. Id.

104. Id.

105. Id.

106. Id.

107. Id.

108. Id.

109. This is not necessarily to say that EPA's conclusion was satisfactorily supported, only that it asked a correct question. See O'Neill, *Mercury, Risk, and Justice,* supra note 5 (discussing potential for hot spots under cap-and-trade actually to make things worse in some locations).

110. EPA, CAMR *Effectiveness* TSD, supra note 23. These values assume a scenario of highly contaminated fish—in other words, methylmercury contamination held at the 99th percentile—a reasonable assumption for many tribal fishers and their families, given that the species traditionally consumed are highly contaminated (e.g., walleye, pike, and others, for the Great Lakes tribes). On these assumptions, exposures will be above the RfD, considering only utilities' emissions, for all those consuming at or above the 55th percentile for this population. Id.

111. *See,* e.g., Matthew E. Kahn, The Beneficiaries of Clean Air Act Regulation, 24 *Regulation* 34 (Spring 2001) ("What we find is that better educated, wealthier populations do experience cleaner air, but that poorer, less educated populations have experienced a greater overall improvement in air quality between 1980 and 1998.").

112. Cass R. Sunstein, Willingness to Pay versus Welfare. Public Law & Legal Theory Working Paper No. 150 7 (Jan. 2007), available at www.law.uchicago.edu/academics/publiclaw/150.pdf (citing Matthew E. Kahn, The Beneficiaries of Clean Air Act Regulation, 24 *Regulation* 34 (2001)).

113. Id.

114. Id.

115. *See,* e.g., U.S. Environmental Protection Agency, *EPA Guidance for Consideration of Environmental Justice in Clean Air Act Section 309 Reviews* (1999).

116. Compare Robert Kuehn, A Taxonomy of Environmental Justice, 30 *Environmental Law Reporter* (Environmental Law Institute) 10,681 (2000); Sheila R. Foster, Meeting the Environmental Justice Challenge: Evolving Norms in Environmental Decisionmaking, 30 *Environmental Law Reporter* (Environmental Law Institute) 10,992 (2000); and Catherine A. O'Neill, Environmental Justice in the Tribal Context: A Madness to EPA's Method, 38 *Environmental Law,* 495 (2008) [hereinafter, O'Neill, Environmental Justice in the Tribal Context] with W. Kip Viscusi, Risk Equity, 29 *Journal of Legal Studies* 843 (2000); and Mathew D. Adler, Risk Equity: A New Proposal, 32 *Harvard Environmental Law Review,* 1 (2008).

117. Viscusi, supra note 116, at 843, 855.

118. *See* O'Neill, Environmental Justice in the Tribal Context, supra note 116.

119. *See*, e.g., Lynda V. Mapes, Culverts Add Obstacles to Salmon, State, Politics, *Seattle Times,* Jan. 24, 2008. Mapes reports that, although tribes' treaty rights were recently reiterated in court, the State of Washington, the defendant in the case, is citing the large costs of fixing culverts that block habitat and so deplete salmon populations. She cites Billy Frank, Jr., a Nisqually tribal elder and chairman of the Northwest Indian Fisheries Commission: "Frank, for one, likes to remind people that amid all the grumbling about the costs of fixing culverts and rebuilding salmon runs, non-Indians enjoy uncountable economic prosperity from the lands the tribes gave up in the treaties so long ago. In fighting to get the culverts fixed, tribes are simply seeking their part of the bargain, Frank said." Id.

120. Adler and Posner, supra note 98, at 101.

121. Steinzor, *Mother Earth,* supra note 25, at 122.

122. EPA, CAMR RIA, supra note 27, at 10-23, Table 10-5.

123. Compare the analysis by Rice and Hammitt, for example, which included fish caught in three coastal regions. See Rice and Hammitt, supra note 58.

124. Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey (NHANES), www.cdc.gov/nchs/nhanes.htm.

125. Mahaffey et al., supra note 8 at 565. Note that Mahaffey's analysis of the NHANES data was relied on by Trasande et al. *See* Trasande et al., *Economic Consequences of Mercury,* supra note 36, at 591.

126. Eileen Gauna, The Environmental Justice Misfit: Public Participation and the Paradigm Paradox, 17 *Stanford Environmental Law Journal* 3 (1998).

127. Griffiths et al., supra note 61, at fn.2 suggests that EPA revised its upper bound estimate of benefits from $168 million to $210 million in response to public comments; Griffiths cites the responsiveness summary as the document in which this upward revision occurred. Note that this document was not published until 2006, well after EPA had published its final rule.

128. Sunstein, Arithmetic, supra note 2, at 2259 ("[CBA] is indispensable to informing the inquiry and to ensuring that [agency] discretion is exercised in a way that is transparent rather than opaque.... At the very least, an understanding of the data helps show exactly why the decision about how to regulate [arsenic and similar toxic substances] is genuinely difficult—and why, and where, reasonable people might differ. This is itself a significant gain.").

129. Proposed Mercury Rule, 69 Fed. Reg. 4652, 4709.

130. Brief of Petitioners National Congress of American Indians, *New Jersey v. EPA* Case 05-1097 (DC Cir., Jan. 12, 2007).

131. Id. at 21–22.

132. In fact, according to the brief for the tribes, the word *treaty* appears only once in EPA's decision documents, in the Response to Significant Comments. Id. at 28.

133. *See*, e.g., Steinzor, *Mother Earth,* supra note 25; Heinzerling and Steinzor, A Perfect Storm I & II, supra note 22; O'Neill, Mercury, Risk, and Justice, supra note 5; O'Neill, Environmental Justice in the Tribal Context, supra note 116; Catherine A. O'Neill, Clear Facts about Clear Skies, *San Francisco Chronicle* at B9 (March 9, 2005).

134. Steinzor, *Mother Earth,* supra note 25, at 120; Wendy Wagner (Chapter 4 of this report).

135. Shapiro and Schroeder, supra note 56, at 37.

136. Id.

137. Clean Air Act, 42 U.S.C. 7412(d)(3)(A).

138. Shapiro and Schroeder, supra note 56, at 482.

139. Douglas Kysar (Chapter 10 of this report). ("Although portrayed as an 'objective, transparent standard for cost-effective decision-making,' welfare economics is an emphatically political program, one with foundational assumptions very much at odds with many of the premises and aspirations of environmental law.")

140. Sunstein, Arithmetic, supra note 2, at 2259.

141. Revesz and Livermore, supra note 87, at 3.

142. Id.

143. Shapiro and Schroeder, supra note 56, at 476–82.

144. Mark Sagoff, *The Economy of the Earth: Philosophy, Law and the Environment*. Cambridge University Press 12–14, 220–24 (1988).

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