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Statistical Children

Sean Hannon Williams†

This Article provides the first comprehensive analysis of how cost-benefit analysis should value child mortality. Recent research suggests that parents are willing to pay twice as much to reduce risks that their children face, compared to the amount that they are willing to pay to reduce their own risks. In fact, all demographic groups—old, young, parents, and non-parents—give priority to children when allocating scarce health-care resources. This simple fact is currently ignored in cost-benefit analyses even though this "child premium" has strong theoretical and empirical support. This Article uses the child premium to illuminate a potential point of agreement between proponents and critics of cost-benefit analysis and then uses it to highlight recurring deficiencies in the way agencies respond to scientific innovation more generally. Drawing on adaptive management theory and the concept of model uncertainty, this Article proposes a framework—the alternate-models approach—that allows agencies to experiment with innovations to cost-benefit analysis like the child premium. This approach helps mitigate two problems in administrative law. First, it allows agencies to drive innovation rather than merely following it. Second, it forces agencies to communicate model uncertainty more effectively than existing proposals. Overall, this Article seeks to offer proponents and critics of cost-benefit analysis a way to move forward and explore a host of innovations to cost-benefit analysis and its main competitor, cost-effectiveness analysis.

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Introduction

In 2010 a car thief attempted to steal a car with a baby in the back seat. The baby’s parents, Aaron and Melanie Richman, were standing near the car at the time. They grabbed the door handles and were dragged across the parking lot. Melanie was thrown off the car just after breaking a window; Aaron held on until he could climb in and beat the thief until he crashed the car. This

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A pattern of parental behavior is an extreme example of a ubiquitous phenomenon: adults value child safety more than their own. Because regulatory cost-benefit analysis (CBA) measures the benefits of risk reductions by asking about people's preferences for those risk reductions, agencies should arguably incorporate a child premium into their analyses. In fact, there is copious support for a child premium from stated-preference studies, field studies of parental behavior, bioethics studies, and emergency vaccine distribution plans. These ubiquitous preferences for child safety are currently ignored in the cost-benefit analyses that calculate the benefits of such myriad things as decreasing air pollution and increasing the crush-resistance of car roofs.

Although CBA remains a controversial decision-making tool, and it is a polarizing force among many legal academics, this Article seeks to improve rather than abandon CBA. Many environmental, health, and safety advocates are opposed to CBA. They argue that CBA does not, and perhaps cannot, incorporate many values that are important to policy decisions. For example, CBA ignores distributive justice and our potential moral commitments to endangered species. Even if CBA models could capture more value judgments, the inherent uncertainties in risk assessment arguably undermine its usefulness as a decision tool. CBA is perhaps better at delaying regulatory action than illuminating it. Despite its limitations, CBA can inject rigor into decision-making to help discipline regulators and politicians who are acting in good faith. Its rigor and conventions also make it harder (although certainly not impossible) for political forces to dictate a regulatory decision. Regardless of its merits, however, it is important to improve CBA, which is firmly entrenched in administrative decision-making. President Obama's Executive Order 13,563 maintains the same core commitment to CBA as President Clinton's Executive Order 12,866, which was itself a modified version of President Reagan's

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4. See id. at 58.
5. Id. at 56.
6. Id. at 26; see also Thomas McGarity, Professor Sunstein's Fuzzy Math, 90 Geo. L.J. 2341, 2343 (2002) (arguing that the requirements of CBA have effectively stymied action under the Federal Insecticide, Fungicide and Rodenticide Act Amendments of 1972 and the Toxic Substances Control Act).
8. Compare Thomas McGarity, Reinventing Rationality: The Role of Regulatory Analysis in the Federal Bureaucracy 156 (1991) ("[R]egulatory analysis can have the virtue of restraining, or at least of exposing, inappropriate political considerations . . . ."), with Douglas A. Kysar, Politics by Other Meanings: A Comment on "Retaking Rationality Two Years Later," 48 Hous. L. Rev. 43, 47 (2011) (noting that CBA is more pliable than ever before, leaving plenty of room for political considerations to dominate rulemaking).
Executive Order 12,291.\textsuperscript{10} In practice, "most major new environmental, health and safety regulations must pass a cost-benefit test before they can be adopted."\textsuperscript{11} As Michael Livermore and Richard Revesz have succinctly noted, "cost-benefit analysis is here to stay."\textsuperscript{12} Because CBA is pervasive and influential, it is important to "mend" it.\textsuperscript{13} This is true even for those who would ultimately prefer to end it.\textsuperscript{14}

This Article offers a way for both proponents and critics of CBA to move forward and improve CBA, even if they continue to engage in foundational debates about whether or when agencies should conduct CBA.\textsuperscript{15} In order to help motivate this process of mending CBA, this Article seeks to illuminate two areas of potential agreement between CBA proponents and CBA critics: the child premium and the alternate-models approach. The child premium illustrates the potential to rigorously incorporate altruistic values within CBA's primary measure of benefits—the value of a statistical life (VSL).\textsuperscript{16} This defense of the child premium also suggests that social science research can uncover and justify other premiums. To help facilitate the incorporation of these premiums into CBA, this Article outlines the alternate-models approach. This approach provides agencies with a framework within which to experiment with the child premium as well as other, potentially more impactful, CBA innovations.

This Article begins with the seemingly uncontroversial idea of the child premium. The general thrust of the child premium is unlikely to be controversial among CBA critics.\textsuperscript{17} Many of these critics criticize CBA for failing to incorporate moral obligations and argue that agencies should use more holistic decision procedures that allow them to consider obligations to other citizens, foreign citizens, non-human animals, and perhaps even

\begin{itemize}
  \item \textsuperscript{11} Richard Revesz & Michael Livermore, Retaking Rationality 11 (2008).
  \item \textsuperscript{12} Livermore & Revesz, supra note 2, at 13.
  \item \textsuperscript{13} Revesz & Livermore, supra note 11, at 10.
  \item \textsuperscript{14} Kysar, supra note 8, at 76 ("[C]ost-benefit analysis may only represent lobbying in a different, more specialized vernacular . . . . [P]roponents of environmental, health, and safety regulation would do well to start talking the talk as best they can.").
  \item \textsuperscript{15} For an overview of these debates from the perspective of CBA advocates, see Matthew Adler & Eric Posner, New Foundations of Cost-Benefit Analysis (2004) and Matthew Adler, Well-Being and Fair Distribution 108-111 (2012). For an overview from the perspective of a CBA critic, see Douglas Kysar, Regulating from Nowhere (2010).
  \item \textsuperscript{17} Although CBA critics would probably embrace the general thrust of the child premium, many are likely to consider the explicit monetization of childhood risk to be, at best, a regretful second-best strategy that would be required only if CBA maintains its prominence in agency decision making. See Frank Ackerman & Lisa Heinzerling, Priceless: On Knowing the Price of Everything and the Value of Nothing 69-70, 74, 177 (2004); Kysar, supra note 15, at 100-01, 113-14, 219-23.
\end{itemize}
ecosystems. Such a holistic, obligation-regarding decision procedure is likely to provide extra weight to protecting children. However, some scholars are likely to view the child premium with suspicion because of methodological concerns with the relevant empirical studies and because of a structural similarity between the child premium and controversial existence values in environmental law. Therefore, Parts I and II of this Article defend this seemingly simple innovation to CBA.

This defense of the child premium suggests that other premiums might be defensible as well. Standing alone, the child premium provides a modest change to CBA. It will have the greatest effect on regulations that primarily prevent childhood fatalities and illnesses. It will have only a small impact on regulations that reduce risks in the context of long-latency harms like cancer. The child premium is most important as a proof-of-concept that CBA can incorporate judgments about risk that would not fit into a standard actuarial model. Larger payoffs come later when agencies adopt other alternate models. Consider cancer premiums. Although a cancer premium faces difficult challenges, the defensibility of the child premium should lead CBA critics to be optimistic about the capacity of further research to establish—in a rigorous way—that the cancer premium or other VSL innovations reflect legitimate, well-informed, welfare-relevant preferences.

In order to motivate this further research, this Article explores a second seemingly uncontroversial idea. When agencies conduct CBA, they should acknowledge the uncertainties involved in their calculations. This idea is likely to be least controversial when the relevant uncertainties concern value judgments rather than merely technocratic judgments. Agencies do not have expertise in value judgments, nor do they have a sufficient democratic pedigree to conclusively make those judgments. Because valuing different lives differently has obvious normative implications, agencies could report CBA both with and without a child premium. Similarly, they could report CBA both with and without other VSL innovations.

Both advocates and critics of CBA appear to agree on the advisability of reporting CBA with multiple conceptions of how to value lives and diseases. Matthew Adler, a proponent of CBA, has made a similar suggestion with regard to his proposed alternative to traditional CBA, which entails specifying a social welfare function that can incorporate both efficiency and equity

19. ACKERMAN & HEINZERLING, supra note 17, at 69-70, 74. See Section 1.B for empirical support for this prediction.
He argues that agencies should employ both traditional CBA and his variant of it side by side. If the analyses point to the same policy outcome, then the case for that outcome is strong. If they diverge, then agencies could seek input from Congress or the President. Douglas Kysar, a critic of CBA, has also embraced the general idea of reporting CBA results using multiple assumptions about how CBA should value mortality and morbidity. At least in those cases where agencies should use CBA, Kysar suggests that they should report the results of a traditional CBA alongside alternative results that rely on other ways of valuing lives or other ways of aggregating those values.

Because a great deal of work must be done even to justify the seemingly uncontroversial child premium, this Article can only offer an initial outline of the alternate-models approach. After providing this outline, this Article breaks off and addresses one piece of a fuller defense of this approach. It outlines the promise of adopting the alternate-models approach and argues that its potential benefits are sufficiently weighty as to justify a more detailed treatment, which will be the subject of future work.

Part I of this Article provides a broad overview of the evidence supporting the child premium. Parents are willing to pay almost twice as much to reduce a given risk that their child faces compared to the amount they are willing to pay to reduce an equivalent risk that they themselves face. In fact, all groups of people—parents, non-parents, the young, and the elderly—give priority to children. Part II addresses a long series of objections to the child premium and ultimately concludes that the child premium reflects well-informed, welfare-relevant preferences that should be incorporated into CBA. Part III discusses the advantages of the alternate-models approach as a mechanism of incorporating the child premium and other VSL innovations into CBA. Part IV

23. Matthew Adler, Risk Equity, 32 HARV. ENVTL. L. REV. 1, 4-6 (2008). Adler’s proposal is narrower and addresses different problems than the alternate-models approach. He does not seek to institutionalize the practice of considering alternate models and does not discuss the possibility that doing so would spur technocratic research and normative debate. Instead, his proposal is meant to help agencies develop experience with his social welfare function (SWF) approach so that they can incorporate equity concerns into CBA. Id. at 46, 47. For other suggestions similar to the alternate-models approach, see OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, CIRCULAR A-4, REGULATORY ANALYSIS 30 (2003) available at http://www.whitehouse.gov/sites/default/files/omb/assets/omb/circulars/a004/a-4.pdf [hereinafter OMB CIRCULAR A-4] (“You should consider providing estimates of both VSL and VSLY [the value of a statistical life-year], while recognizing the developing state of knowledge in this area.”), and Matthew Adler, Welfare Polls, 81 N.Y.U. L. REV. 1875, 1895 (2006) (“[I]t seems at least plausible that policy evaluation with a nonmonetary scale should be considered as an alternative or supplement to cost-benefit analysis . . . .”).

24. Adler, supra note 23, at 46 (“My proposal, therefore, is that agencies and policy analysts employ [an equity-sensitive social welfare function approach] in conjunction with CBA.”).

25. Id.

26. Id.

27. See KYSAR, supra note 15, at 256.

28. Id. (“[W]hen engaging in an economic benefit analysis . . . the agency shall also present calculations using alternative measures of value, such as willingness-to-accept . . . equity-weighted welfare functions, or objective measures, such as those underlying the United Nations Human Development Index.”).
discusses two extensions. First, it explores another VSL innovation—the cancer premium. Second, it discusses the implications of the child premium for cost-effectiveness analysis (CEA), an alternative to CBA that is particularly popular in the health care field.

I. The Value of a Statistical Child

Valuing the lives of children presents a puzzle for CBA. CBA measures regulatory benefits by inquiring into people's risk-wealth tradeoffs. But children have neither the money nor the maturity to make those tradeoffs. Agencies should look to parents to make those tradeoffs for their children. Numerous methodologically diverse studies reveal that parents value their children's safety more highly than their own. This same child premium is visible in studies of the general public.

The parental and societal studies that support the child premium illustrate that people value childhood risk reductions more than equivalent risk reductions that benefit adults. This is distinct from the idea that children are sometimes more vulnerable than adults, and hence at greater risk given the same stimulus. For example, children are at greater risk from food-borne pesticides because they eat more food (as a function of their body weight) than adults, and are also differentially vulnerable to chemicals that interfere with developmental processes.²⁹ Others have discussed differences in vulnerability;³⁰ the studies in the next two sections control for differences in vulnerability and focus on differences in value. Of course, if a child is more vulnerable and reducing her risk is more valuable, then agencies have twice the number of reasons to focus on protecting children.

A. The Parental Perspective

Cost-benefit analysis is rooted in a commitment to increasing welfare.³¹ It uses a preference-based account of welfare; a person's welfare is improved

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²⁹. Alexandra B. Klass, Pesticides, Children's Health Policy, and Common Law Tort Claims, 7 MINN. J.L. SCI. & TECH. 89, 97, 128 (2005) (stating that children are more vulnerable than adults to pesticides).

³⁰. See, e.g., id. at 97-98, 128. Both an Executive Order and the Food Quality Protection Act (FQPA) already encourage agencies to consider increased child vulnerability. 21 U.S.C. § 346a(b)(iv) (implementing a 10x additional safety factor for children); Exec. Order No. 13,045, 62 Fed. Reg. 19,885 (Apr. 21, 1997) ("[C]hildren may suffer disproportionately from environmental health risks and safety risks. These risks arise because: children's neurological, immunological, digestive, and other bodily systems are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults . . . . Therefore . . . each Federal agency . . . shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children . . . .") (discussing the FQPA).

when her preferences regarding how to make trade-offs between risk and wealth are satisfied. The EPA, for example, uses twenty-six studies to ascertain the average person’s risk-wealth trade-off. Twenty-one of these studies examine the relationship between wages and on-the-job risks, and calculate workers’ risk-wage tradeoff. Five other studies rely on stated-preference surveys, which ask people’s willingness to pay (WTP) to reduce a certain risk in a certain context. The EPA then averages these results, and comes up with the VSL.

Because CBA is rooted in a preference-based account of welfare, it has difficulty accounting for children. Infants, for example, have no discernible preferences for the vast majority of risks. Even once children can comprehend risk, they are insufficiently mature to make the relevant decisions. Finally, even mature children would face an extreme wealth effect. Having no money, their WTP would be zero.

How then might agencies value risk reductions for children? There are two main contenders. First, agencies might hypothesize about what the average child would be willing to pay if she had the average amount of money and an adequate understanding of risk. The answer might be that the child would be willing to pay what the average adult is willing to pay under similar risk-reducing circumstances. So agencies might simply use their existing VSL for both adults and children. Second, agencies might look to the preferences of the child’s parents. A parent would then be able to provide one VSL for herself, and another for her child. In theory, the VSL she provides for her child may be higher than, lower than, or equal to her own. Agencies should favor the second approach. Both approaches provide estimates of the welfare effects of risk reductions for children, but the second is more tailored, more in line with other legal practices, and more consistent with a preference-based account of welfare.

The hypothetical preference approach—setting a child’s VSL equal to the average adult’s VSL—has the advantages of ease and practicability. But these advantages come at a cost. Adults and children might respond differently to

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32. ADLER & POSNER, supra note 15, at 12, 19.
34. Id. (referring to wage studies as studies using “labor market” methodology).
35. Id. (referring to stated-preference studies as using a “contingent valuation” methodology).
36. Id.
37. For a discussion of whether and to what extent children can meaningfully make decisions about their own risk-tradeoffs, see Sandra Hoffmann, Since Children Are Not Little Adults—Socially—What’s an Environmental Economist To Do?, 17 DUKE ENVTL. L. & POL’Y F. 209, 221-28 (2007).
38. A more sophisticated version might attempt to predict and correct for generational effects in risk preferences. For example, if each generation tends to be richer than the one before it, and increased wealth increased WTP for safety, then agencies might adjust the current adult VSL upward when translating it to apply to children.
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exposure to pesticides. If so, then measures of adult preferences might undervalue risk reductions for children. Additionally, because adults have already developed human capital and amassed savings, they are differently affected by some non-fatal injuries.

The parental-preference approach has three key advantages over one rooted in hypothetical preferences. First, it can take account of the various differences between children and adults. Parents have the best information about their child’s welfare, and most parents will use this informational advantage to improve their child’s welfare. Parents are therefore in a particularly good position to make risk-wealth tradeoffs for children.

Second, relying on parental preferences aligns agency practice with other areas of the law that regulate child safety. The vast majority of child safety decisions are delegated to parents. Parents decide which safety devices to buy, how to supervise their children, and which activities to prohibit. Parents have wide latitude to make these decisions in part because parents normally make choices that benefit their children.

Third, agencies that wish to impose more risk reduction than parents prefer may be wasting their time. We do no favors to parents or children by forcing well-informed and well-motivated parents to purchase more safety than they desire. This just prevents them from spending money to improve their children’s welfare along some other dimension. Disregarding parental preferences also has the potential to reduce the effectiveness of safety


40. Using such preferences appears at first glance to be in tension with a major justification of CBA. The traditional defense of CBA is that it (mostly) tracks Kaldor-Hicks efficiency. ADLER, supra note 15, at 98, 100, 104. The Kaldor-Hicks test was designed so that outcomes could be ranked without having to rely on interpersonal utility comparisons. See id. at 89, 92, 98. A regulation satisfies the Kaldor-Hicks test if the winners could compensate the losers through a costless lump-sum transfer such that no one was left worse off and at least one person was made better off. Id. at 98-99. Each regulatory winner decides herself how much she is willing to pay for the regulation, and each regulatory loser decides herself what amount of money she would require in compensation. Id. at 92. Thus, no interpersonal utility comparisons are needed. Id. Although the Kaldor-Hicks test eschews interpersonal utility comparisons, using parental preferences as proxies for child preferences requires interpersonal utility comparisons between parents and children. However, this should not be controversial. Economists who study the family routinely allow them. Robert Pollack, Gary Becker’s Contributions to Family and Household Economics, 1 REV. ECON. HOUSEHOLD 111, 117 (2003); see also, e.g., JOHN F. ERMISCH, AN ECONOMIC ANALYSIS OF THE FAMILY 53 (2003). Further, other defenses of CBA embrace the possibility of interpersonal utility comparisons between all persons, ADLER & POSNER, supra note 15, at 25, 39-43, and hence do not create barriers to using one person’s preferences as a proxy for another’s.

41. Parham v. J.R., 442 U.S. 584, 602 (1979) (“The law’s concept of the family rests on a presumption that parents possess what a child lacks in maturity, experience, and capacity for judgment required for making life’s difficult decisions. More important, historically it has recognized that natural bonds of affection lead parents to act in the best interests of their children.”). Of course, parental authority is not unlimited. Id. at 606.


43. For an analogous argument about regulation and poverty, see Cass Sunstein, Valuing Life: A Plea for Disaggregation, 54 DUKE L. J. 385, 441 (2004).
regulations aimed at children. A parent who believes that a safety regulation is unnecessary might reallocate other resources to undo the effects of the regulation. For example, a parent who believes her children are already adequately safe when they ride bikes might react to a mandatory helmet law by supervising her children's biking less often or less thoroughly.\(^{44}\) In this way the parent can convert the extra safety into a more fungible medium—here, time—and invest that time in the way she thinks best. This phenomenon is often referred to as risk compensation and is significantly more likely to occur when people think the relevant regulation is unnecessary.\(^{45}\)

So far, this section has argued that parental preferences can serve as a proxy for child preferences and hence provide a good estimate of the welfare effects of childhood risk reduction.\(^{46}\) In part this is so because parents are well-informed about their children and are normally motivated to improve the welfare of their children.\(^{47}\) But, of course, not all parents are well-informed or well-motivated.

To deal with parents who are not well-informed about their children, or who are not well-motivated, agencies should look to family law for guidance.

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44. B. A. Morrongiello & K. Major, The Influence of Safety Gear on Parental Perceptions of Injury Risk and Tolerance for Children's Risk Taking, 8 INJ. PREVENTION 27, 27-29 (2002) (finding that parents allowed their children to take more risks when their children were using safety equipment, including allowing their child to ride a bicycle at greater speed if the child was wearing a helmet).


46. Once we decide to rely on parental preferences, a second question emerges: How should we elicit those preferences? Standard WTP surveys ask subjects to make a tradeoff between their own safety and their own wealth. As applied to children, this structure would require the parent to make tradeoffs between the child's safety and the child's wealth. Studies of parental preferences instead ask parents to make tradeoffs between their child's safety and the parent's wealth. There are two reasons to believe that the latter question is likely to provide a better estimate of the welfare effects of childhood risk reductions, despite the fact that it does not perfectly map onto the structure of standard WTP surveys.

First, the two questions overlap. Parents contribute to their children's future income, not just their children's safety. Parents often pay for college if they can, and contribute in numerous ways to preparing their child to earn a living. When parents consider tradeoffs between their money and their child's safety, they are also making tradeoffs between their child's safety and the child's future income. Thus, existing studies already capture the child-safety vs. child-income, albeit in an imperfect way.

Second, it is likely that these imperfections are preferable to the imperfections that would accompany asking parents to make tradeoffs between the child's safety and the child's wealth. Such a tradeoff is likely to be quite unfamiliar; generally parents cannot borrow against their child's future income both because it is too difficult to predict and because they have no rights to encumber that future income stream. More importantly, such a tradeoff requires the parent to ignore her own desire (and perhaps also her deeply felt obligation) to provide for her child. Because questions that ask parents to make these tradeoffs would require the parent to engage in an unfamiliar and objectionable type of transaction, these questions are likely to result in a large number of protest responses and untrustworthy data.

47. The fact that children have motivated and knowledgeable proxies (their parents) to speak for their welfare distinguishes the child premium from the issues surrounding future generations. See KYSAR, supra note 15, at 174 (noting the need to "render future generations more visible to us, closer, less alien" in order to get the current generation to consider their potential obligations to them).
Child welfare law imposes a minimum standard of protection that parents owe their children. Agencies concerned that parents may not value children highly enough might similarly impose a floor. This is exactly what the Office of Management and Budget (OMB) did in 2003. It recommended that child VSLs be at least as high as adult VSLs, but left open the possibility that child VSLs would be higher. It is perhaps telling that this is the only deviation from a uniform VSL that the OMB endorses. The OMB ignores all other heterogeneity despite robust evidence that the VSL is influenced by the nature of the risk and various demographic characteristics of the person facing that risk.

This Article's primary concern is with the average parent, not with outlier parents. A copious amount of data suggests that the average parent is far from this floor already. She is willing to pay significantly more to reduce risks to her children than to reduce risks to herself. There are eleven relevant studies that calculate and compare the WTP of parents for equivalent risk reductions that benefit themselves or their children. The nine published studies unanimously find a child premium. The child premium emerges from three studies examining real-world parental behavior, and six studies that rely on survey data. These studies have found a child premium in the context of both fatal and non-fatal harms, and for both risky and riskless choices. Despite this study diversity, estimates for the child premium are roughly consistent, ranging from 32% to 160%, with a median of 80%. Two unpublished studies find mixed support for a child premium.

The remainder of this section describes and defends these studies in detail. Readers who wish to skip the sometimes-detailed discussions in this section should feel free to turn to Part I.B.

The three published revealed-preference studies that examine the child premium find support for it. Each of these studies analyzed real-world parental consumption in order to test whether parents exhibited a child premium. The first study analyzed health status and actual health utilization data for 6,557 U.S. households. These households were more likely to seek out health care when the child, as opposed to the parent, was in a poor health state (as reported by the parent). This pattern was robust to several different definitions of

49. OMB CIRCULAR A-4, supra note 23, at 31.
51. Sunstein, supra note 43, at 405-16.
52. For a list of studies that I excluded and the reasons justifying that exclusion, see infra notes 61 & 72.
54. Id. at 246.
health-care utilization and appeared in various subsamples of the data. Overall, the data suggest an 80% child premium. The second study examined the smoking behavior of 1,500 smoking mothers who reported the amount of second hand smoke their child is exposed to. Utilizing variation in the price of cigarettes and health care, the authors estimated a series of substitution rates between a mother’s consumption and her and her child’s health. The authors estimated that mothers value their children’s health 58% higher than their own. The third study compared adults’ seat belt usage with their usage of child safety seats in cars. The authors derived VSL estimates for adults and children and found a 32% child premium.

Stated-preference studies provide additional evidence for a child premium. Stated-preference studies use hypothetical questions to elicit WTP for a given risk reduction. These studies face a number of well-worn criticisms that stem from their use of hypothetical questions. For example, people may not have sufficient incentives to answer hypothetical questions accurately. Despite these limitations, the OMB recommends using both revealed and stated-preference studies to value the benefits of regulation. This is in line with current agency practice. Agencies use stated-preference surveys to help measure the VSL and to measure the benefits attributable to preventing injuries, bronchitis, upper and lower respiratory symptoms, asthma, and decreased visibility from air pollution.
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Stated-preference surveys are particularly unproblematic in the context of the child premium. Suppose that subjects are likely to provide inflated WTP estimates in response to hypothetical questions because they do not adequately consider their budget constraints.\footnote{71} This would bias the resulting VSL upward. But, as long as subjects are profligate for both themselves and their children, the ratio of the two VSL estimates will be less biased than the underlying VSL estimates themselves. Using stated-preference studies to ascertain the child premium—or any other ratio of two WTP estimates given by the same subject—also mitigates wealth effects, framing effects, scope insensitivity, social desirability bias, and the effects of cognitive errors related to risk perception. Subsection II.A.3 confronts these and other standard critiques of stated-preference surveys in detail, and shows that each critique is less powerful in the context of the child premium than it is in the context of estimating the subjects' WTP for their own safety. Because agencies commonly use stated-preference studies to estimate subjects' WTP to reduce their mortality and morbidity risk, using these studies to calculate a child premium should be uncontroversial.

The six published stated-preference studies that examined the child premium found results that are consistent with the revealed-preference studies.\footnote{72} The first two examined fatal risks, the second two examined both fatal and non-fatal risks, and the final two examined non-fatal illnesses.

\begin{itemize}
\item 2011 Interim Adjustment (July 29, 2011) (citing REBECCA S. Spicer & TED R. MILLER, FINAL REPORT TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION: UNCERTAINTY ANALYSIS OF QUALITY ADJUSTED LIFE YEARS LOST (Pacific Inst. for Res. & Evaluation) (2010)).
\item 67. ENVTL. PROT. AGENCY, NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICLE POLLUTION, CHAPTER 5: BENEFIT ANALYSIS AND RESULTS 50 (2006).
\item 68. Id. at 52.
\item 69. Id. at 53.
\item 70. Id. at 60-61.
\item 71. Blumenschein et al., supra note 62, at 115 (“[H]ypothetical responses sometimes substantially overestimate willingness to pay.”).
\item 72. I excluded two published stated-preferences studies that, because of the risks they studied, could not make clear theoretical predictions about whether children or adults would benefit more from the hypothetical intervention. The first study elicited WTP for a device that would prevent its user from being involved in any type of traffic accident (as a pedestrian, biker, driver, passenger, etc.) and compared WTP for adults and children. Henrik Andersson & Gunnar Lindberg, Benevolence and the Value of Road Safety, 41 ACCIDENT ANALYSIS & PREVENTION 286, 288 (2009). It found a child premium. Id. at 291-92. But it did not attempt to control for the possibility that subjects may have thought that children were at greater risk. See id. Therefore, it is difficult to know whether the subjects valued children's lives more highly, or rather thought that children would benefit more from the safety device. The second study elicited household level WTP to relocate to a neighborhood with a “lower risk level” and WTP for a public safety program that would lower everyone’s “risk” by 20%. Joanne Leung & Jagadish Guria, Value of Statistical Life: Adults Versus Children, 38 ACCIDENT ANALYSIS & PREVENTION 1208, 1210 (2006). It compared WTP estimates for households with children to WTP estimates of households without children and found mixed support for a child premium. Id. at 1215 tbl.6. But because the study used an undefined “risk” and did not specify baseline risks, see id. at 1210, it is impossible to know whether a head of household who wanted to value all members of her household equally would increase or decrease her WTP if one household member were a child. If children were relatively unaffected by the “risk,” then we would expect lower WTP for equally sized households with children simply because they get less benefit from the program. For example, if children travel fewer
\end{itemize}
In 2010 researchers asked a large national sample of parents about their WTP to reduce food-borne pesticide risks to themselves and their children. More specifically, they were asked their WTP to reduce the risk of a disease that, after various latency periods, would result in two years of sickness followed by death. Based on their responses, the authors calculated VSLs for children and parents. The VSL for parents was $7.5 million. This is in line with other VSL estimates in the adult population. The VSL for children was $13.5 million. This reflects an 80% child premium.

This study contained features that mitigate several common concerns about stated-preference studies, including the use of visual aids to communicate risk information, giving parents practice questions, and controlling for the parents’ subjective risk assessments where they deviated from the risk information given in the survey. These methodological safeguards appear to have helped: very few respondents refused to answer the questions, and WTP was a function of the risk reduction.

A 2011 article reported the results from two surveys that assessed adult and child VSLs separately. In the first, they asked parents of children with asthma to make a series of hypothetical choices among asthma medications for their child. In the second study, they asked adults from the general population to imagine that they suffered from asthma, and to make hypothetical choices among asthma medications for themselves. These medications presented a trade-off between efficacy and the risk of a fatal side effect. The study then compared the parents’ WTP to reduce their children’s risk with other adults’

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74. Id. at 63-65.
75. Id. at 70.
76. Id.
77. W. Kip Viscusi, The Heterogeneity of the Value of Statistical Life: Introduction and Overview, 40 J. RISK & UNCERTAINTY 1, 9 (2010). This suggests that the disparity between the parent’s VSL and the child’s VSL represents a child premium rather than a parent discount.
78. Hammitt & Haninger, supra note 73, at 70.
79. Id. at 81.
80. Id. at 63-67.
81. Id. at 65, 67, 72, 80.
83. Id. at 414.
84. Id. at 415.
85. Id. at 414.
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WTP to reduce their own.\textsuperscript{86} Adult VSLs were lower than child VSLs.\textsuperscript{87} Overall, parents were willing to pay about 70% more for equivalent risk reductions.\textsuperscript{88}

Like the 2010 study, these studies contained features that mitigated common concerns about stated-preference surveys. In each, subjects were informed about the risks of the asthma and the comparative risk of the medicine vs. driving (all medicines were safer than driving).\textsuperscript{89} To reduce the potential differences between hypothetical choices and actual ones, the researchers measured the subjects’ confidence in their choices; only those that said they would “definitely” buy the medicine at a given price/risk/efficacy tradeoff were counted as willing to purchase it.\textsuperscript{90} This improves the accuracy of hypothetical choice studies because the correlation between hypothetical intent to purchase and actual purchasing behavior is strong when subjects report a high degree of confidence.\textsuperscript{91}

Two studies examined the child premium in the context of risks that presented the possibility of both illness and death. In one, subjects were informed about the risk of food-borne illnesses, which could, in some cases, lead to death.\textsuperscript{92} Parents were willing to pay about 1.7 to 2.6 times more to reduce the probability that their child would contract one of these diseases.\textsuperscript{93} In the second study, subjects were informed about skin cancer risks and asked about their WTP for sunscreens that would reduce those risks.\textsuperscript{94} Parents again exhibited a 2x child premium.\textsuperscript{95}

Parents also exhibit a child premium when making decisions about alleviating symptoms of a child’s non-fatal illness. In one study, parents were willing to pay approximately twice as much to relieve bronchitis symptoms in their children as they were to relieve bronchitis symptoms in themselves.\textsuperscript{96} An earlier study found a 2x child premium for preventing colds.\textsuperscript{97}

\textsuperscript{86} Id. at 423.
\textsuperscript{87} Id. at 420.
\textsuperscript{88} Id. at 423 (comparing the VSL for adults who were around the average age with the VSL for mean-aged children).
\textsuperscript{89} Id. at 414.
\textsuperscript{90} Id. at 414-19.
\textsuperscript{91} Blumenschein et al., \textit{supra} note 62, at 115-16, 130 (collecting studies and confirming results with a field experiment).
\textsuperscript{93} Id. at 1175.
\textsuperscript{94} Mark Dickie & Shelby Gerking, \textit{Valuing Children’s Health: Parental Perspectives, in Economic Valuation of Environmental Health Risks to Children} 137-40 (P. Scapecchi ed., 2006).
\textsuperscript{95} Id. at 144.
\textsuperscript{97} Jin-Tan Liu et al., \textit{Mother’s Willingness to Pay for Her Own and Her Child’s Health}, 9 HEALTH ECON. 319 (2000).
Although each of the nine published studies finds evidence of a child premium, two unpublished studies find only mixed support for it. The first compared the car purchases of households with children to those of households without children.\footnote{Mount et al., supra note 72, at 1.} Because purchasing a car is, in part, a tradeoff between cost and safety, the authors could estimate the household's VSL. By presuming that all adults have the same VSL, they could then estimate the VSL of adults and children separately.\footnote{Id. at 40-41.} The data revealed a child premium under some assumptions but not others. The existence and amount of the child premium depended on assumptions about the number of miles that children are in the car\footnote{Id. at 35-37, 62.} and on how the authors controlled for income.\footnote{Id. at 41. As income rises, so too should one's WTP for safety and hence one's VSL. An "income elasticity" of one means that a 10% rise in income yields a 10% rise in the VSL. An income elasticity of two means that a 10% rise in income yields a 20% rise in the VSL. Using an income elasticity of 0.3 yielded an adult premium, using an income elasticity of one yielded a child premium. Id. at 41. There is no consensus on which elasticity estimate is more accurate, but both theory and the most recent data suggest that the income elasticity of the VSL is at least one. Thomas J. Kniesner et al., Policy Relevant Heterogeneity in the Value of Statistical Life: New Evidence from Panel Data Quantile Regressions, 40 J. Risk & Uncertainty 15, 18-19 (2010) (reporting income elasticities of 1.23-2.24 and arguing that these are more accurate and more consistent with theory than past estimates).} The second unpublished study analyzed the stated preferences of Italian and Czech parents.\footnote{Anna Alberini & Milan Scasny, Context and the VSL: Evidence from a Stated Preference Study in Italy and the Czech Republic 2 (Fondazione Eni Enrico Mattei, Working Paper No. 455, 2010).} It found a 40-60% child premium for preventing respiratory illnesses and traffic accidents but failed to find a child premium for preventing cancers.\footnote{Id. at 28.}

The studies discussed above provide fairly strong evidence of a child premium.\footnote{One clarification is in order. The various risks in the studies above reflect harms that could come about during childhood, such as a cold, bronchitis, cancer with a short latency period, sudden injury from auto accident, asthma medication side effects, or acute health problems. The evidence for a child premium, therefore, is rooted in parental preferences to reduce risks that children face while children. The evidence does not yet support a premium for risks that children face that will not mature into harm until they are adults, such as cancer risks with long latency periods.} Although the two unpublished studies only find a child premium under some assumptions, the nine published studies unanimously find a child premium, and they do so with a range of different methodologies (stated and revealed-preference studies of both fatal and non-fatal harms in both risky and riskless choice settings). Estimates of the child premium from published studies range from 32% to 160%, with a median of 80%.

\textbf{B. The Societal Perspective}

The studies described in the previous section go a long way toward advocating a child premium. But there is no need to rely just on stated and revealed-preference studies of parental preferences to support the child

\footnotesize{98. Mount et al., supra note 72, at 1.
99. Id. at 40-41.
100. Id. at 35-37, 62.
101. Id. at 41. As income rises, so too should one's WTP for safety and hence one's VSL. An "income elasticity" of one means that a 10% rise in income yields a 10% rise in the VSL. An income elasticity of two means that a 10% rise in income yields a 20% rise in the VSL. Using an income elasticity of 0.3 yielded an adult premium, using an income elasticity of one yielded a child premium. Id. at 41. There is no consensus on which elasticity estimate is more accurate, but both theory and the most recent data suggest that the income elasticity of the VSL is at least one. Thomas J. Kniesner et al., Policy Relevant Heterogeneity in the Value of Statistical Life: New Evidence from Panel Data Quantile Regressions, 40 J. Risk & Uncertainty 15, 18-19 (2010) (reporting income elasticities of 1.23-2.24 and arguing that these are more accurate and more consistent with theory than past estimates).
103. Id. at 28.
104. One clarification is in order. The various risks in the studies above reflect harms that could come about during childhood, such as a cold, bronchitis, cancer with a short latency period, sudden injury from auto accident, asthma medication side effects, or acute health problems. The evidence for a child premium, therefore, is rooted in parental preferences to reduce risks that children face while children. The evidence does not yet support a premium for risks that children face that will not mature into harm until they are adults, such as cancer risks with long latency periods.}
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. As this section shows, the general population also exhibits a child

Bioethics researchers have sought to understand how the general public
would allocate scarce livers, vaccines, and even highway safety funds. These
studies consistently find that the general public gives priority to children.
Perhaps surprisingly, all age groups—young, old, and in between—show the
same preference for child safety. These studies serve two important roles. First,
they show that even non-parents value children more than adults. Second, these
studies suggest that giving priority to children is widely viewed as a legitimate
goal of government.

Although most bioethics studies do not attempt to estimate the magnitude
of subjects’ age-based preferences, the few that do support the estimates
derived from stated-preference studies. One Swedish study asked adults to
choose between traffic-safety programs that had different effects on different
age groups. By altering the number of people saved from each age group, the
researchers were able to estimate the relative value that subjects put on saving
people in one age group over another. Subjects valued 5- to 15-year-old
pedestrians 50% higher than 25- to 35-year-old pedestrians, and 94% higher
than 45- to 55-year-old pedestrians. Men and women, parents and non-
parents, and subjects both over and under fifty-seven all favored the same basic
ranking. Another Swedish study found similar results when people were
asked about traffic and fire hazards: subjects implicitly indicated that saving
one 5- to 15-year-old was equivalent to saving 1.4 35- to 45-year-olds, or 3.3
65- to 75-year-olds. A recent study in the U.S. found even more extreme
results; American subjects were indifferent between programs that saved one
ten-year-old and ten sixty-year-olds. This pattern held for programs that
prevented illnesses rather than fatalities, and held even for older subjects.

Many more studies find a child premium without attempting to quantify it.
For example, when British subjects were asked to distribute an unidentified
life-saving treatment, they chose to give priority to five-year-olds first. The

Ethical Preferences Approach, 27 J. HEALTH ECON. 739, 744 (2008).
106. Id.
107. See id. at 744, 746, 747.
108. Id. at 746.
Survey, 42 ACCIDENT ANALYSIS & PREVENTION 1814, 1814 (2010).
110. Daniel Eisenberg et al., Valuing Health at Different Ages: Evidence from a Nationally
111. Id. at 152 (finding that 64% of older subjects without children under eighteen chose to
save 100 ten-year-olds over 1000 sixty-year-olds).
112. Aki Tsuihaya et al., Measuring People’s Preferences Regarding Ageism in Health, 57
same pattern appeared for both students and adults from the U.S. who were asked to allocate scarce flu vaccines. Other studies confirm this pattern.

The British study mentioned above also contained a qualitative follow-up in which people were asked to explain their rankings. They offered four touchstones, three of which support the child premium. First, favor those who have lived less life. Second, favor those who have the greatest capacity to benefit. Third, favor those who will produce the greatest benefit to society. Fourth, favor those with family responsibilities. The most common explanation was that allocations should favor those who had lived less life. This obviously favors children. The capacity to benefit from the intervention also seems to favor the young, at least if there are no special reasons to think that the young would have a lower survival rate or some other complication from the intervention. Allocating resources based on the benefits to society is the only factor that does not appear to favor children; it favors young adults. Although both young adults and children have many productive years in front of them, society has already invested in young adults to prepare them to be productive. Lastly, people cited family responsibilities. This suggests that even when making allocation decisions between adults, child well-being is a powerful touchstone.

Federal vaccine priority plans also favor children. The Department of Health and Human Services and the Department of Homeland Security have jointly developed a vaccine priority system that allocates vaccines to essential

114. One such study presented people with detailed patient vignettes and asked them to allocate scarce liver transplants; the greatest point of agreement was that the nine month old should receive one of the livers. James Neuberger et. al., Assessing Priorities for Allocation of Donor Liver Grafts, 317 BRIT. MED. J. 172, 172-73 (1998). The next greatest point of agreement was that the mother of a very young child should receive a liver. Id.; see also Paul Dolan et al., QALY Maximisation and People’s Preferences: A Methodological Review of the Literature, 14 HEALTH ECON. 197, 203 (2005) [hereinafter Dolan, QALY Maximisation] (reporting that most studies find that people give priority to patients with dependents). Another study replicated these results in cases where the subjects were allowed to deliberate with one another before making a choice; the greatest consensus was reached on the proposition that children should get priority over adults. Paul Dolan et al., Effect of Discussion and Deliberation on the Public’s Views of Priority Setting in Health Care: Focus Group Study, 318 BRIT. MED. J. 916, 918 (1999).
115. Tsuchiya et al., supra note 112, at 694 & tbl.6.
116. Id.
117. Id.
118. Id.
119. Id.
120. Id.
121. Note that age is likely to be the only relevant variable in determining a person’s productivity because other studies suggest that people refuse to base allocation decisions on income or occupation (each of which might arguably be a proxy for the benefits that the patient provides to society). Colette J. Browning & Shane A. Thomas, Community Values and Preferences in Transplantation Organ Allocation Decisions, 52 SOC. SCI. & MED. 853, 857 tbl.1 (2001) (reporting that over 90% of an Australian sample stated that employment, class, and sex should be irrelevant to health care allocation).
122. Id.
workers first, and then to pregnant women, children zero to two, children three to eighteen, persons sixty-five or older, then to the rest of the population.\textsuperscript{123} Similarly, a large-scale collaboration between academics and community members in Minnesota sought to design a plan to allocate scarce vaccines during a flu pandemic.\textsuperscript{124} The resulting guidelines gave priority to people based on a combination of their risk of dying and the effectiveness of the vaccine.\textsuperscript{125} Within each of these risk/effectiveness groups, children under eighteen received priority.\textsuperscript{126}

Some of these allocation decisions can be explained without recourse to the idea of a child premium. Children may have a lesser capacity to protect themselves from adverse health outcomes, and therefore are less responsible for those outcomes.\textsuperscript{127} Subjects may be partially responding to differences in culpability or moral hazard concerns when they allocate livers, vaccines, and safety-project funds to children. However, it is unlikely that culpability and moral hazard concerns fully explain these patterns. When subjects were asked to rank the importance of various criteria for allocating livers to adults, they were attentive to whether the donee's liver disease was naturally occurring or the result of alcoholism, but they indicated that age was a more important factor.\textsuperscript{128} Similarly, plans designed to distribute vaccines during flu pandemics favor children even though adults may not be able to do much to avoid infection.

\textbf{C. The Child Premium vs. Life-Years}

The reader might rightly ask why agencies should use a child premium as opposed to life-years. Several studies suggested that subjects preferred a linear ranking of ages, and people offered explanations that would be consistent with a focus on life-years.\textsuperscript{129} A closer look at the evidence, however, shows that people's preferences for risk-wealth tradeoffs are not a clean function of life-years, regardless of whether people are making those tradeoffs for themselves or their children.

\begin{itemize}
  \item \textsuperscript{125} \textit{id.} at 47. Certain essential workers were also given elevated priority. \textit{id.}
  \item \textsuperscript{126} \textit{id.} at 47, 61.
  \item \textsuperscript{127} Scott, supra note 42, at 547.
  \item \textsuperscript{128} Julie Ratcliffe, \textit{Public Preferences for the Allocation of Donor Liver Grafts for Transplantation}, 9 \textbf{HEALTH ECON.} 137, 144-45 (2000).
  \item \textsuperscript{129} See supra Section I.B.
\end{itemize}
Evidence that adult preferences for their own risk reductions follow a life-years approach is mixed at best. Evidence from the labor market suggests that the relationship between WTP and age follows a flattened inverted “U” shape. WTP increases gradually between eighteen and forty, and then decreases gradually after about forty or fifty. Stated-preference studies are consistent with this general pattern. Although older people have fewer life-years left, they tend to value those remaining life-years more. This should not be a surprise. It results from both emotional reactions to mortality (you may not appreciate what you have until you realize that you might lose it), and rational reactions to it (because you cannot take your money with you, WTP increases along with the probability of death in the near future).

In the context of child risk reductions, there is only meager evidence that parental preferences track life-years. The three studies that estimated child premiums for children of different ages found the same trend: Parents are willing to pay most to reduce risks faced by younger children, and their WTP decreases with the age of the child. In one study, the VSL for a four-year-old was $14 million, while the VSL for a seventeen-year-old was $5.2 million. The VSLs for children of other ages ranged between these two extremes. Two earlier studies confirm this trend. There are two reasons that this trend does not show that parents use life-years to value their children’s safety. First, these WTP figures simply do not line up with life-years. Second, none of the studies asked parents to make allocation decisions between their children.

The above trend is not consistent with a life-years approach. A five-year-old has 74 life-years left, and a fifteen-year-old has 64 life-years left. We might then expect the five-year-old to be valued at 74/64 = 1.16 times the value of the 15-year-old. If we discount future life years at three percent, the five-year-old would be valued 1.05 times higher. The differences in WTP, however, are much more dramatic. A life-years approach cannot explain this pattern.

132. Hammitt & Haninger, supra note 73, at 60-61 (reporting that adults’ VSL peaked between ages forty and forty-five).
133. Ariel Porat & Avraham Tabbach, Willingness to Pay, Death, Wealth, and Damages, 13 AM. L. & ECON. REV. 45, 45-49 (2011) (arguing that this overinvestment in risk reduction when people face a risk of death undermines the use of WTP to measure overall welfare).
134. Blomquist et al., supra note 82, at 420.
135. Id.
136. Agee & Crocker, supra note 53, at 244 (finding a 5-fold premium for children less than one-year-old, a 1.7-fold premium for seven- to ten-year-old children, and no premium for fourteen- to seventeen-year-olds); Dickie & Messman, supra note 96, at 1165.
138. See Eisenberg et al., supra note 110, at 153 (noting that the valuation of ten-year-olds relative to sixty-year-olds is at least 10:1 for most respondents even though a life-years approach would predict a 3:1 ratio); see also sources cited supra note 136.

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More importantly, these studies did not ask parents about multiple children. Each asked parents to make risk-wealth tradeoffs for one target child. This masks the potential equity concerns that might be more salient if parents were valuing multiple children at once. It is likely that parents would weigh the interests of all of their children roughly equally. This preference for equal treatment is a standard pattern in bequests. People tend to leave equal amounts to all of their children. Although bequests are a much different context, they offer at least some reason to doubt that parents will be willing to pay more for equivalent risk reductions for younger children.

Societal preferences are also in tension with treating children differently based on their age. One study asked British adults to allocate a scarce lifesaving treatment to either an eight-year-old or a two-year-old. Forty six percent of respondents refused to rank the two, and another 47% said that the decision was “difficult.” Ultimately, a narrow margin favored the eight-year-old, because the eight-year-old was more aware and more of a person, and her parents might be more invested in her. Other studies confirm this resistance to ranking children and the tendency for people to favor older children. The same pattern exists in the Federal vaccine distribution plan, except that the federal plan splits children into two groups: ages zero to two and ages three to 18. Within these groups, it does not give priority based on age. Nor does it use age to allocate vaccines among 19- to 64-year-olds or among those sixty-five and older. This suggests that societal preferences at most categorize people into rough age groups and do not support using life-years to allocate resources within these groups.

Life-years also do a poor job of reflecting preferences for allocating resources between adults and children. Although life-years contain an implicit child premium (because saving a child normally saves more life-years than saving an adult), it appears to be lower than the premium suggested by the studies in Part I. Saving a five-year-old yields about seventy-four life-years,

139. See Agee & Crocker, supra note 53, at 237; Blomquist et al., supra note 82, at 414; Dickie & Messman, supra note 96, at 1151.
142. Id.
143. Id. at 1337.
144. Jan Busschbach, The Utility of Health at Different Stages in Life, 37 SOC. SCI. & MED. 153, 154-56 (1993) (reporting indirect evidence that people valued the health of a ten-year-old more highly than the health of a five-year-old); Erik Nord et al., Maximizing Health Benefits vs Egalitarianism, 41 SOC. SCI. & MED. 1429, 1433 (1995) (finding that only 1% of subjects gave a scarce organ to an infant over a young child, and 52% found the decision very difficult).
145. PANDEMIC FLU GUIDANCE, supra note 123, at 6.
146. Id.
147. Id.
while saving a thirty-five-year-old saves about forty-five life years. If these life-years are discounted at 3%, then valuing regulatory benefits using life-years would be roughly equivalent to a 21% child premium. Of course, this figure depends on the particular ages chosen. For a thirty-year-old parent of a five-year-old, the implicit premium is 15%; for a forty-year-old parent of a five-year-old, the implicit premium is 28%. These implicit child premiums appear to be too low. Recall that the median child premium from the studies in Section I.A was 80%. This discrepancy makes sense. The concept of life-years accounts for the fact that children have more life years ahead of them than adults. But people may also care about other factors as well, like the fact that children have not had their “fair innings” yet. I will discuss these fair innings arguments in more detail below. For now it is sufficient to note that life years are not a good proxy for adults’ risk-preferences for themselves or their children and at best capture only part of the child premium.

II. Objections

This Part addresses three sets of objections to the child premium. It first addresses technical objections about the strength and sufficiency of the evidence undergirding the child premium. It then addresses welfarist objections about whether the preferences that undergird the child premium are misinformed or otherwise do not provide a good guide to the welfare effects of childhood risk-reductions. Finally it addresses two non-welfarist normative objections.

A. Technical Objections

The child premium is, at first glance, vulnerable to three technical objections. First, there are perhaps too few studies that have examined the child premium to make solid conclusions from this body of research. Second, CBA normally excludes altruism. Third, much of the evidence for the child premium comes from stated-preference studies, which have a host of known methodological problems.

1. Insufficient Evidence

The evidence described in Part I goes a long way toward advocating a child premium. To see why, it will be useful to compare the above evidence with the evidence that recently motivated the EPA to recommend a cancer premium.

149. Tsuchiya et al., supra note 112, at 694.
150. See infra notes 289-292 and accompanying text.
In 2010, the EPA proposed adopting a 50% cancer premium. The number was derived from nine stated-preference studies that compared WTP figures for cancer and non-cancer risks. Although four of these studies found no cancer premium, five found evidence of a cancer premium. The EPA settled on a 50% figure because this was close to the average reported cancer premium of 52% across the nine studies. This proposal would align U.S. policy with that of the U.K. and the E.U. The U.K. uses a 100% cancer premium and the European Commission has recommended a 50% cancer premium.

The child premium has more empirical support than the cancer premium. The studies finding a child premium are more methodologically diverse (both stated and revealed-preference studies) and more uniformly supportive (all published studies found a child premium) than the studies that support a cancer premium. Using the cancer premium as a guide, it would appear that agencies should embrace the child premium. Additionally, the evidence in favor of the child premium goes well beyond stated and revealed-preference studies, and stems from bioethics studies and vaccine response plans as well.

2. Altruism and Double Counting

Stated and revealed-preference studies gather data on the subject’s WTP to avoid a certain risk. These studies do not gather data on how much others might be willing to pay to reduce the subject’s risk. If multiple people are willing to pay to reduce a subject’s risk, then reducing that risk will satisfy all of their preferences and thereby improve all of their welfare. One might therefore think that CBA should add altruistic WTP measures to its existing individual WTP measures. However, standard CBA excludes altruistic preferences.

151. ENVTL. PROT. AGENCY, NAT’L CTR. FOR ENVTL. ECON., VALUING MORTALITY RISK REDUCTIONS FOR ENVIRONMENTAL POL’Y: A WHITE PAPER 26 (Draft 2010) [hereinafter WHITE PAPER].
152. Id. at 25 n.14.
153. Id. at 23-24. Simply counting the studies, however, is slightly misleading. One of the studies that did not find a cancer premium contained a clear methodological limitation that biased it against finding such premiums. Id. (discussing Wesley A. Magat et al., A Reference Lottery Metric for Valuing Health, 42 MGMT. SCI. 1118 (1996), which failed to control for the latency period of cancer). Another one was since revised to find mixed support—rather than no support—for a cancer premium. Wiktor Adamowicz et al., Valuation of Cancer and Microbial Disease Risk Reductions in Municipal Drinking Water: An Analysis of Risk Context Using Multiple Valuation Methods, 61 J. ENVTL. ECON. & MGMT. 213, 213 (2011); WHITE PAPER, supra note 151, at 25 n.14 (citing an earlier working paper version of Adamowicz et al.).
154. WHITE PAPER, supra note 151, at 25.
155. Id. at 21.
156. This presumes a preference-based account of welfare.
The main argument against incorporating altruism into CBA turns on the distinction between “non-paternalistic” and “paternalistic” altruists. Non-paternalistic altruists prefer to increase others’ welfare, and assume that others can be trusted to maximize their own welfare. If this assumption holds, then the non-paternalistic altruist is always better off by giving the subject additional money rather than additional safety. The subject will, of course, benefit either way, but she will benefit more if she is allowed to choose her optimal mix of safety and other goods. Thus, non-paternalistic altruists would never want to intrude on the subject’s risk-wealth tradeoff. A paternalistic altruist, on the other hand, would perhaps value the subject’s safety more than the subject values her own safety. Thus, a paternalistic altruist would intrude on the subject’s risk-wealth trade-off, and would want her WTP added to the subject’s WTP for a given risk reduction. Although CBA should ignore non-paternalistic altruism, it should incorporate paternalistic altruism. There is widespread consensus on this point: economists, the OMB, and current U.K. regulatory guidelines all recommend including paternalistic altruism in CBA.

Although the theoretical case for incorporating paternalistic altruism into CBA is strong, agencies currently ignore it. The most likely explanation is that measuring such altruism would be costly, and regulators may doubt that the added precision would be worth that cost. Regulators may also doubt their capacity to disentangle non-paternalistic and paternalistic preferences using existing research.

Although these pragmatic arguments suggest that agencies can potentially ignore some adult-adult altruism, they do not apply to parent-child altruism. Parent-child altruism is likely to be extremely common and exceptionally strong. Many studies already measure parents’ WTP to protect their children. Most importantly, there is no need to disentangle paternalistic and non-paternalistic altruism in the parent-child context. To the extent that parental altruism is paternalistic, agencies should incorporate it into CBA. But agencies should also incorporate a parent’s non-paternalistic altruism. CBA ignores non-paternalistic altruism because these altruists assume that others can be trusted to maximize their own welfare, and thus they would not want to intrude on

159. *Id.*
160. *Id.*
161. Hoffmann, *supra* note 37, at 219 (noting the consensus among economists that only paternalistic altruism should enter cost-benefit analysis); OMB CIRCULAR A-4, *supra* note 23, at 22 (using the terms “general altruism” and “selective altruism” to refer to non-paternalistic and paternalistic altruism respectively, and recommending that agencies include selective altruism in CBA); HM TREASURY, THE GREEN BOOK: APPRAISAL AND EVALUATION IN CENTRAL GOVERNMENT 62 (2011) [hereinafter THE GREEN BOOK] (“In the UK, the main measure of VPF [(value of a prevented fatality)] incorporates the ‘extra’ value placed on relatives and friends, and any further value placed by society on avoiding the premature death of individuals.”).
others’ risk-wealth tradeoffs. However, this assumption doesn’t hold for children; children lack the maturity and knowledge to make the necessary decisions. A parent’s non-paternalistic altruism can serve as the proxy for the child’s risk-welfare tradeoffs, and a parent’s paternalistic altruism can augment this preference. Thus, there is no need to disentangle paternalistic and non-paternalistic altruism in the parent-child context.\textsuperscript{163}

3. Methodological Objections to Stated-Preference Studies

Six of the nine studies supporting the child premium relied on hypothetical stated preferences. Although there are a number of known weaknesses with such stated-preference studies, these weaknesses are all mitigated in the context of the child premium. Given that agencies currently use stated-preference studies to measure the VSL and the benefits attributable to reducing injuries, bronchitis, upper and lower respiratory symptoms, asthma, and increasing visibility,\textsuperscript{164} using stated-preference studies to measure the child premium should be uncontroversial.

This Section addresses six standard critiques of stated-preference studies.\textsuperscript{165} Each of these critiques is much less potent when researchers are seeking to ascertain the ratio of two WTP measures given by the same subject.

First, people may systematically inflate their WTP in response to hypothetical questions because they do not feel the sting of actually paying the money.\textsuperscript{166} It is not clear that this is always a substantial concern. Hypothetical WTP is correlated with income,\textsuperscript{167} and several studies find no statistically significant differences between WTP estimates based on actual behavior and

\begin{footnotesize}
\begin{enumerate}
\item Each parent may have a different estimate of what is in the child’s interest, and a different degree of paternalistic altruism. This would not undermine the child premium. The revealed preference studies discussed in Section I.B probably reflect a negotiated compromise between differing attitudes toward childhood risks. For reasons discussed in Section I.A, agencies should respect these negotiated parental preferences. The possibility that parents will diverge in their WTP, however, could affect the proper interpretation of stated-preference studies, which usually solicit WTP information from only one parent. Several of these studies examined whether fathers were willing to pay a different amount than mothers and yielded mixed results. See Dickie & Messman, supra note 96, at 1163 n.19 (finding racial differences in WTP for self and child but no racial differences in the ratio of the two WTP estimates). Compare Blomquist et al., supra note 82, at 418, 421 tbl.5 (finding that the parents’ sex did not affect WTP estimates), with Hammitt & Haninger, supra note 73, at 73 tbl.3 (finding that fathers’ WTP was lower than mothers’ WTP for both themselves and their children but not reporting whether this affected the ratio of WTP for self and WTP for the child), and Hammitt & Haninger, supra note 92, at 1172 tbl.1 (same). If parents exhibit greatly divergent child premiums, agencies should adjust the results of stated-preferences studies to estimate the actual household WTP.
\item See supra notes 65-70 and accompanying text.
\item For general discussions of these critiques, see ACKERMAN & HEINZERLING, supra note 17, at 153-78; ADLER & POSNER, supra note 15, at 124-53, 166-73.
\item Blumenschein et al., supra note 62, at 114-16.
\end{enumerate}
\end{footnotesize}
hypothesis stated-preference studies. But even if subjects are too profligate, they are likely to be profligate for both themselves and their children. As long as both WTP figures are inflated, the ratio between them will remain relatively stable.

Second, subjects often exhibit a social desirability response bias, whereby they respond in ways that make them look good, rather than in ways that reveal their true preferences. “Good” parents protect their children. Therefore, the social desirability response bias might inflate WTP estimates for children and thereby inflate the child premium. Although this is a theoretical concern, the child premium derived from stated-preference studies is similar to the child premium derived from actual real-world purchase decisions. This suggests that subjects in the relevant stated-preference studies were not overly influenced by a desire to present themselves to the researchers as good parents.

Third, stated-preference studies are sometimes plagued by protest responses. When people are asked how much they are willing to pay for cleaner air around the Grand Canyon, for example, many might say that they would pay an infinite amount or refuse to answer the question. At best, this reduces the number of usable responses and biases the ultimate WTP figures. At worst, this indicates that the entire enterprise of asking people to price clean air is senseless. We might expect parents to offer protest responses when asked to make tradeoffs between wealth and child safety. But that has not been the case. Research into parents’ WTP has consistently used realistic scenarios that reflect the everyday tradeoffs like buying pesticide-free food. These studies have produced very few protest responses.

Fourth, although people are willing to pay more for a larger risk reduction, they are not sensitive enough to the scope of additional risk reductions. For example, if people are willing to pay $100 to reduce a risk by 1 in 1,000, they might only be willing to pay $160 to reduce that risk by 5 in 1,000. But again, as long as parents are insensitive to scope for both themselves and their
children, then the ratio of their WTP measures will be less biased by scope insensitivity than the WTP measures themselves.

Fifth, subjects give different responses depending on the framing of the question. The most important of these framing issues is the difference between WTP and willingness to accept (WTA).\textsuperscript{178} WTA questions give the subject a right to be free from a risk, and then ask subjects to report the amount of money that they would require to relinquish that right.\textsuperscript{179} WTP questions implicitly deny that the subject has a right to be free from risk and then ask about the subject's willingness to purchase risk reductions.\textsuperscript{180} In the context of publically provided goods like protection from environmental harms, WTA estimates are about ten times higher than WTP estimates.\textsuperscript{181} Survey responses are also sensitive to whether the questions present probabilities in the form of a percentage or a frequency and their particular wording.\textsuperscript{182} These framing effects present a challenge for incorporating the results of stated-preference studies into CBA. But these challenges are far smaller in the context of a child premium. As long as the questions about parental and child risk are similarly framed, it is likely that those frames will at least bias the result in the same direction for both parent and child risk reductions. If so, then at a minimum, framing effects should have less effect on the child premiums than on the myriad existing agency estimates derived from stated-preference studies.

Sixth, wealth effects may bias the results of both stated and revealed-preference studies. Richer people can afford to pay more for risk reductions,\textsuperscript{183} and they do.\textsuperscript{184} This is arguably a problem because it is not clear that equivalent risk reductions affect the welfare of the rich and poor differently. Wealth effects, however, should not affect the child premium. One study confirmed this prediction: As households face greater budget constraints, WTP for risk reductions decreases, but the ratio of WTP to reduce the parents' and children's risk remains constant.\textsuperscript{185}

Although the child premium faces methodological objections, none of these objections ultimately undermines the child premium. If anything, the

\begin{itemize}
  \item\textsuperscript{178} There is an ongoing debate about whether to use WTP or WTA to measure the benefits of a regulation. Despite this unresolved debate, agencies consistently use WTP. McGarity, supra note 3, at 67-69; Adler & Posner, supra note 15, at 166-73.
  \item\textsuperscript{179} McGarity, supra note 3, at 67-69.
  \item\textsuperscript{180} Id.
  \item\textsuperscript{181} John Horowitz & Kenneth E. McConnell, A Review of WTA/WTP Studies, 44 J. ENV. ECON. & MGMT. 426, 433 (2002).
  \item\textsuperscript{182} See, e.g., Nicholas Scurich & Richard John, The Effect of Framing Actuarial Risk Probabilities on Involuntary Civil Commitment Decisions, 35 LAW & HUM. BEHAV. 83, 83-85 (2012).
  \item\textsuperscript{183} Wealthier people can also afford to hold out for more money, in the case of willingness to accept measures.
  \item\textsuperscript{184} Hammitt & Robinson, supra note 167, at 7.
  \item\textsuperscript{185} See Dickie & Messman, supra note 96, at 1168 tbl.7 (showing decreased WTP for both parent and child safety as number of children in the household rises).
\end{itemize}
child premium is built on a more solid foundation than many existing benefits estimates that agencies routinely use in CBA.

B. Welfarist Objections: Heuristics, Biases, and Preference Laundering

Identifying a premium is only the first step in an argument that policymakers should incorporate that premium into CBA. The second step is to ascertain whether the preferences that undergird the premium are well-informed. Generally, policymakers should only incorporate well-informed premiums into their analyses and should ignore premiums that are rooted in biases. This section outlines a series of potential biases and then argues that none of them drive the child premium. It also argues that the child premium passes a “laundering” test recently proposed by Matthew Adler and Eric Posner in an effort to exclude welfare-irrelevant preferences from CBA.

1. Overview of Important Biases

Many preferences, especially those surrounding risk, are likely to be the result of various biases. People may overestimate the relevant probabilities due to the availability heuristic or the affect heuristic, or they may underestimate the relevant probabilities due to overoptimism. Even if people accurately predict the relevant probabilities, they may exhibit probability neglect. Affective forecasting errors and self-other decision-making dynamics may be relevant as well. None of these biases, however, undermines the child premium.

186. These steps are presented in order (first, second . . .) for convenience only. There is no logical necessity to proceed through the analyses in any particular order. Further, I do not discuss other potential steps because they are not very relevant to the child premium. A third step might be for policymakers to examine whether a set of preferences has negative externalities before incorporating it into CBA. This concern is not relevant to the child premium because children, if anything, create positive externalities. Paula England & Nancy Folbre, Who Should Pay for the Kids?, 563 ANNALS AM. ACAD. POL. & SOC. SCI. 194, 200 (1999) (arguing that children create positive externalities by, for example, financing programs like Social Security and giving nations the means to pay back previously incurred debt); Ronald Lee & Tim Miller, Population Policy and Externalities to Childbearing, 510 ANNALS AM. ACAD. POL. & SOC. SCI. 17, 17 (1990) (finding “large positive externalities”); S. Philip Morgan & Rosalind Berkowitz King, Why Have Children in the 21st Century? Biological Predisposition, Social Coercion, Rational Choice, 17 EUR. J. POPULATION. 3, 15 (2001) (“[O]ver his or her lifetime a child would contribute over $100,000 (in 1985 dollars) more to public coffers than they extract.”). A fourth step might be to assess whether the child premium is objectively bad. Some commentators have suggested that objectively bad preferences—such as racism—should be excluded from welfarist policy analyses. Compare ADLER & POSNER, supra note 15, at 138-40 (arguing that objectively bad preferences should be ignored), with LOUIS KAPLOW & STEVEN SHAVELL, FAIRNESS VERSUS WELFARE 412-71 (2002) (arguing that all preferences should count).


188. Id. at 35-37.


190. Ellen Peters et al., The Functions of Affect in Health Communications and in the Construction of Health Preferences, 56 J. COMM. at S146 (2006).
i. The Availability Heuristic

The availability heuristic was a mainstay of early behavioral law and economics scholarship.\(^{191}\) It refers to the tendency for people to judge the probability of an event by how easy it is to recall the occurrence of other events of that type.\(^{192}\) For example, it is much easier to think of words that end in "-ing" than to think of words with "n" as the second to last letter.\(^{193}\) Accordingly, people judge that "-ing" words are much more common even though all words ending in "-ing" (and many others) have "n" as the second to last letter.\(^{194}\) Relatedly, if the media often covers dramatic events like tornados, then people will be able to recall instances of tornados quite easily, and therefore they might drastically overestimate the likelihood of dying in a tornado.\(^{195}\)

The availability heuristic could plausibly influence probability judgments about the risks of various harms to children. Media outlets may provide more coverage to child tragedies than adult tragedies. If so, people may overestimate childhood risks relative to adult risks.

ii. The Affect Heuristic

The affect heuristic refers to the tendency for people to make judgments—including probability judgments—based on their immediate emotional response to a stimulus.\(^{196}\) In one study, toxicologists gave "quick intuitive ratings" from "bad" to "good" of various chemicals.\(^{197}\) They were then asked to judge the risk posed by exposure to very small amounts of the chemicals (defined as 1/100th of the dose that regulatory agencies would be concerned about).\(^{198}\) Because all of the risks were two orders of magnitude below the level that regulatory agencies defined as safe, one would suspect that expert toxicologists would report that the risks were uniformly low. Instead, risk ratings were highly correlated with the quick intuitive rating.\(^{199}\) This study suggests that probability

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192. Id. at 1477.
194. Id.
196. Cutter, supra note 195, at 2 (defining the affect heuristic as a "simplifying rule" where "activities or technologies that are disliked or feared (an emotional response) influence both the perception of the risk (high) and the perceptions of the benefits of that technology or activity (low)."
198. Id. at 316.
199. Id.
judgments are influenced by the affect attached to any given outcome. Affect-rich outcomes like being exposed to a dangerous chemical are likely to have a greater effect on probability judgments than affect-poor outcomes like taking an aspirin.

The affect heuristic could plausibly influence probability judgments about the risks of various harms to children. Because such harms are extraordinarily affect-rich, people may overestimate the relevant probabilities.

iii. Overoptimism

"[P]eople have a pervasive tendency to believe they are better than others in a multitude of ways and that life's negative events are less likely to befall them than their peers." Compared to others, people think that they are less to experience heart attacks, heart disease, strokes, skin cancer, alcoholism, and car accidents. This overoptimism is especially pronounced when people think they have more control over whether the negative event occurs.

Overoptimism has an ambiguous effect on the child premium. Overoptimism could inflate the child premium if parents felt that they had a relatively large degree of control over the risks that they faced, but had a relatively small degree of control over the risks that their children faced. In such situations, overoptimism would lead parents to underestimate their own risks, which would inflate the child premium. But this control-asymmetry is unlikely to affect all risks. Parents are unlikely to have asymmetric perceptions of control for cancer or car accidents, but this pattern is more plausible for other risks such as the risk of breaking an arm.


202. Id. at 135.


205. Weinstein & Klein, supra note 201, at 135.

206. Id. at 134.

207. "Overoptimism" is an umbrella term that covers several plausibly distinct biases. For an overview, see David Dunning et al., Flawed Self-Assessments, 5 PSYCHOL. SCI. PUB. INT. 69 (2004).


209. Cancer is relatively uncontrollable, and in most cases the parent and child are both in the same car.
iv. Probability Neglect

Even if peoples’ probability estimates are reasonably accurate, they might nonetheless exhibit probability neglect.\textsuperscript{210} When faced with an affect-rich outcome, people often depart from expected utility theory and discount the importance of the relevant probabilities.\textsuperscript{211} In one study, subjects were given the opportunity to win a prize by drawing a red jellybean out of a transparent bowl that contained both red and white jellybeans.\textsuperscript{212} They could draw either from a bowl containing one red jellybean and nine white jellybeans (resulting in a 10\% chance of winning) or a bowl containing seven red jellybeans and ninety-three white jellybeans (resulting in a 7\% chance of winning).\textsuperscript{213} Many subjects knowingly made non-optimal choices and made comments like: “I picked the ones with the more red jelly beans because it looked like there were more ways to get a winner, even though I knew there were also more whites, and that the percents were against me.”\textsuperscript{214} Relatedly, affect-rich outcomes also cause people to focus disproportionately on the mere possibility rather than on the numeric probability of the outcome.\textsuperscript{215} In one illuminating study, subjects were willing to pay about $20 to avoid a painful electric shock with certainty.\textsuperscript{216} Yet they were radically insensitive to the probability that the shock would occur; the data suggest that they would be willing to pay only $3 to reduce the probability of the shock from 99\% to 1\%.\textsuperscript{217} When subjects were facing a less emotionally salient risk—the loss of $20—they responded in ways that were much more consistent with expected utility theory.\textsuperscript{218}

Probability neglect could plausibly influence probability judgments about the risks of various harms to children. Again, it is likely that harms to children are very affect-rich. Because these events are so salient, people may react to the mere possibility of such harms rather than weighing their probabilities.

\begin{thebibliography}{99}
\bibitem{211} \textit{Id.}
\bibitem{213} \textit{Id.}
\bibitem{214} \textit{Id.} at 823.
\bibitem{215} See, e.g., Cass R. Sunstein, \textit{The Laws of Fear}, 115 HARV. L. REV. 1119, 1142 (2002) (reviewing \textit{Paul Slovic, The Perception of Risk} (Ragnar E. Løfstedt ed., 2000)) (reporting that subjects did not adjust their WTP for a tenfold change in the probability of getting cancer when that cancer would be accompanied by “gruesome” and “painful” symptoms, while subjects were sensitive to a ten-fold change in the probability of getting cancer when it was not described in such affect-rich terms).
\bibitem{216} Yuval Rottenstreich \& Christopher K. Hsee, \textit{Money, Kisses, and Electric Shocks}, 12 PSYCHOL. SCI. 185, 188 (2001).
\bibitem{217} \textit{See id.}
\bibitem{218} \textit{See id.}
\end{thebibliography}
Legal literature has increasingly explored the implications of the psychology of happiness. This research has yielded two major findings. First, people have psychological immune systems that prevent major life traumas from having lasting effects on their happiness. This tendency to adapt is referred to as hedonic adaptation. Second, people do not understand that they have these immune systems and thus do not predict that they would adapt to major life events. People erroneously predict that negative life events such as kidney disease, colostomy, and breast cancer will drastically lower their quality of life. This is referred to as an affective forecasting error.

These phenomena might inflate the child premium. If parents predict that the death of their child will cause them serious life-long suffering, and if that prediction is erroneous, then parents might overvalue childhood risk reductions. It is unclear, however, that parents are making any predictive errors. Hedonic adaptation is common but not universal; people rarely adapt to chronic pain. Living with the death of a child may be akin to living with a chronic condition. More importantly, under a preference-based account of welfare,

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221. See, e.g., Jason Riis et al., Ignorance of Hedonic Adaptation to Hemodialysis: A Study Using Ecological Momentary Assessment, 134 J. EXPERIMENTAL PSYCHOL. 3, 7 (2005) (finding that hemodialysis patients hedonically adapt to their condition).

222. Id. at 3.


227. See Peter A. Ubel et al., Mismaging the Unimaginable: The Disability Paradox and Health Care Decision Making, 24 HEALTH PSYCHOL. S57, S57 (2005) (noting that people may “mispredict the impact that circumstances will have on their well-being and quality of life”).


230. There is some evidence that parents adapt to the death of their children, but the authors note that their evidence is only preliminary. Andrew J. Oswald & Nattavudh Powdthavee, Death, Happiness, and the Calculation of Compensatory Damages, 37 J. LEGAL STUDIES S217, S229 (2008) (finding evidence that parents experience a long-term boost in happiness subsequent to the death of a
the hedonic impacts of an event do not exhaust its welfare effects. Most parents have extraordinarily strong preferences that their children flourish. Thus, even if parents fully adapt hedonically to the death of a child, it is unclear how much impact this should have on an assessment of its overall welfare effects.

vi. Deciding for Others

There is a growing body of evidence that people systematically alter the way they make decisions when they are making a decision for others. When deciding for others, people focus only on the most salient variables and downplay the importance of other considerations. This heuristic applies to a host of decisions and deciders. It affects doctors’ recommendations, parents’ decisions to vaccinate their child, people’s investment decisions for others, and even simple choices like deciding what snacks to purchase for another person.

These heuristics might bias a parent’s WTP to protect her child. Two relevant studies addressed self-other decision-making dynamics in the context of health care. Each presented subjects with a tradeoff between a mortality risk and a morbidity risk. For example, subjects in one study had to choose between a medical treatment with a 20% mortality rate and a medical treatment with a 16% mortality rate but a 4% chance of causing non-fatal side effects such as “intermittent bowel obstruction.” When deciding for others (as compared to themselves), more subjects choose the treatment with a lower mortality risk. This might suggest that when parents make risk-wealth tradeoffs for their children, they focus disproportionately on the most salient

child); id. at S244 (noting the novelty of their methodology and concluding that “we believe these ideas should, for the time being, be treated cautiously”).
232. Peter A. Ubel et al., Physicians Recommend Different Treatments for Patients than They Would Choose for Themselves, 171 ARCHIVES INTERNAL MED. 630, 630-32 (2011).
234. Jeremy Shapiro, Discounting for You Me and We 2, 4 (Oct. 2010) (unpublished manuscript), available at http://econ-www.mit.edu/grad/jplaces/papers (finding that women in India were less impatient when making investment decisions for others than for themselves).
236. Ubel et al., supra note 232, at 631; Zikmund-Fisher et al., supra note 233, at 621.
237. Id. As long as intermittent bowel obstructions are not worse than death, then the first treatment dominates the second. This study, along with several others, suggests that people make better decisions for others than for themselves. Shapiro, supra note 234, at 4-5 (finding that women in India were less impatient when making investment decisions for others than for themselves); Ubel et al., supra note 232, at 631-32 (finding that doctors tended to choose a 1% risk of death over a 1% risk of “intermittent bowel obstruction” for themselves but not for others); Zikmund-Fisher, supra note 233, at 619-20 (finding that more people chose a vaccination for others than for themselves when it eliminated a 10% chance of death but added a 5% chance of death).
risks—here, fatality risks—and less on other risks or opportunity costs that should also be relevant to the tradeoff.\textsuperscript{239}

2. Biases and the Child Premium

The above biases are sometimes difficult to disaggregate in practice. For example, if people appear to overreact to a particular risk, any or all of these biases could be at work. These people might be overestimating the risk due to the availability heuristic or the affect heuristic. Alternatively, they might be accurately judging the relevant probabilities, but ignoring them. Therefore, this section discusses these biases together. It will differentiate between the various biases when the evidence makes this possible, but such evidence is not always available. Ultimately, these biases do not undermine the child premium.

There is anecdotal evidence of parental paranoia—that is, parents either overestimate some risks to their children or act as if they do. In the early 1970s and 80s parents feared that people might poison or insert razor blades into Halloween candy.\textsuperscript{240} Many children were told not to take any candy or food that was not in its original factory-sealed packaging. Ironically, in the two documented instances when children ate poisoned Halloween candy, it was the child’s parent who poisoned it.\textsuperscript{241} But even if candy is safe, the people handing it out may not be. Above all else, parents appear to fear child abduction.\textsuperscript{242} Yet the odds of abduction are very low. About 115 children are abducted by strangers each year, compared to about 2,600 children who die annually in car accidents.\textsuperscript{243} Even if parents know on some level that the likelihood of a stranger abduction is low, they may not be able to fully excise their fear from their decision-making processes: “In conversations, most parents are prepared to concede the fact that the likelihood of their child being abducted is minimal . . . . However, such good common sense does not prevent the very same

\textsuperscript{239.} Note that, in the studies of the child premium, the relevant costs are measured in money rather than in side effects, and are paid for by the parent/decider, not the child. It is not clear whether or how the use of a monetary metric might disrupt the patterns found in studies of self-other decisionmaking, or how the fact that the parent (rather than the child) will pay the relevant costs would affect these patterns.

\textsuperscript{240.} BARRY GLASSNER, THE CULTURE OF FEAR 30-31 (2009).

\textsuperscript{241.} Id. at 30-31.

\textsuperscript{242.} JOEL BEST, THREATENED CHILDREN 125 (1990); Angela Mickalide, Creating Safer Environments for Children, 70 CHILDHOOD EDUC. 263, 263 (1994) (reporting that kidnapping topped the list of common parental fears).

parents from feeling burdened by a general sense of external danger . . . . \textsuperscript{244} Today, vaccines appear to be a focus of parental fears.\textsuperscript{245}

This parental probability neglect is unlikely to have influenced existing estimates of the child premium. Two of the published stated-preference studies discussed in Section I.A asked questions about parents' WTP for a treatment that would prevent cold or bronchitis symptoms.\textsuperscript{246} As overprotective as parents might be, it is doubtful that they fear cold symptoms so much that they cannot adequately assess the relevant probabilities. Kids get colds. Kids run fevers. These common and passing harms are a far cry from child abduction and poisoned candy. Similarly, there is a large difference between these sensational risks and the more mundane (even if potentially fatal) risks of everyday life. The studies exploring child premiums in the context of fatal risks focused on everyday decisions in the face of mundane risks like purchasing a safer car, choosing medication, and deciding whether to buy pesticide-free food.\textsuperscript{247} Because parents navigate these risks every day, it is unlikely that parents have never learned to assess the relevant probabilities and integrate them into their decision making. Similarly, parents probably learn how to accurately predict the hedonic effects of these everyday events on both their children and themselves.

Just as probability neglect and hedonic adaptation do not appear to explain the child premium, nor can the potential that parents systematically overestimate the risks that their children face (due perhaps to the availability or affect heuristic) or systematically underestimate their own risks (due to overoptimism). The two studies that asked parents about their WTP to reduce cold and bronchitis symptoms did not rely on probability judgments at all. They asked questions about parents' WTP for a treatment that would prevent, with certainty, inevitable cold or bronchitis symptoms.\textsuperscript{248} Each of these studies presented parents with a riskless choice, and each found a 100% child premium. Because these surveys did not include any risk assessments they cannot be explained by biases related to the misestimation of risks. One

\textsuperscript{244} FRANK FUREDI, PARANOID PARENTING 110 (2001).

\textsuperscript{245} As of January 2011, 18% of Americans were convinced that autism was caused by vaccines; another 30% were unsure. Amanda Gardner, Slightly More Than Half of Americans Say Vaccines Don't Cause Autism: Poll, U.S. NEWS \& WORLD REP., Jan. 20, 2011, http://health.usnews.com/health-news/family-health/brain-and-behavior/articles/2011/01/20/slightly-more-than-half-of-americans-say-vaccines-dont-cause-autism-poll. This fear is particularly resilient because it combines parents' general fears about child safety with betrayal aversion and act/omission biases in attribution. For a discussion of these biases, see Andrew D. Gershoff \& Jonathan J. Koehler, Safety First? The Role of Emotion in Safety Product Betrayal Aversion, 38 J. CONSUMER RES. 140 (2011).

\textsuperscript{246} Dickie \& Messman, supra note 96, at 1153; Liu et al., supra note 97, at 320.

\textsuperscript{247} See supra Section I.A.

\textsuperscript{248} Dickie \& Messman, supra note 96, at 1153; Liu et al., supra note 97, at 319. Of course, subjects might not have believed that the cold or bronchitis symptoms were inevitable. This seems particularly unlikely for something as common as a cold, but more likely in the case of bronchitis. If parents thought that their children were more likely to get bronchitis than they were, and parents were not able to put this belief aside, then the resulting child premium would be biased upward.
additional published stated-preference study asked parents whether they thought their and their children's actual risk were higher or lower than the risk presented in the survey. Even after controlling for these subjective risk assessments, the researchers found an 80% child premium.

Finally, it is unlikely that self-other decision-making dynamics explain the child premium. In one of the studies described in the previous paragraph, subjects reported their WTP to reduce a risk faced by one of their children and another adult in the household. This study found a 15% "other-person premium." It also found an 80% child premium. To tease out the effect of the other-person premium from the child premium, the authors calculated an alternate child premium using the ratio of the child VSL to the other-person VSL and found a 60% child premium. Even if the entire other-person premium is the result of biases that appear when deciding for others (which is far from clear), and these same errors infect subject's choices for their children, a large child premium remains.

3. Laundering Unbiased Preferences

Matthew Adler and Eric Posner have recently suggested that some preferences should be excluded from CBA even if they are well-informed. Their argument relies on intuitions about what events do and do not affect someone’s welfare. In their view, only the satisfaction of self-interested preferences affects one’s welfare. Adler and Posner did not offer a sustained typography of which preferences are adequately self-interested, but they suggested a few touchstones. The first touchstone is remoteness. Suppose I meet a stranger on a train who has a terminal illness. When I leave the train I may have a preference that the stranger recover. But it is unclear whether the satisfaction of that preference increases my welfare. Similarly, my preference that the universe is expanding rather than contracting seems to be one that is irrelevant to my welfare. These preferences "might have nothing to

249. Hammitt & Haninger, supra note 73, at 73.
250. See id. at 81.
251. Id.
252. Id.
253. Id.
254. Id.
255. ADLER & POSNER, supra note 15, at 36.
256. Id. at 36.
257. Id. at 39, 135-36.
258. Id. at 39 ("[P]references that are morally motivated, and do not concern the subject's mind or body, or entail her existence, are pretty clearly disinterested.").
259. Id. at 34-35.
260. Id. at 34 (borrowing this example from DEREK PARFIT, REASONS AND PERSONS 494 (1984)).
261. Id.
do with [my] own life."  

By contrast, if my preferred state of the world affects my mind or body, then it is probably welfare-relevant.  

Their second touchstone is whether a preference is morally motivated.  

Suppose I have a preference to save a rare squirrel in Sri Lanka from extinction.  

If I value the option of benefitting from the squirrel’s existence in the future by, for example, seeing the squirrel frolic, then my preference affects my mind or body and is probably welfare-relevant.  

But if my preference is instead rooted in a perceived moral duty to save the squirrel, then Adler and Posner argue that it is likely to be irrelevant to my welfare.  

They offer one suggestive caveat to this touchstone. They imply that a preference to save the Sri Lankan squirrel could be welfare-relevant even if morally motivated and remote, as long as saving the squirrel was an important part of my life project.  

Regardless of whether they would explicitly endorse this caveat, it has intuitive appeal. It seems odd to claim that people who dedicate themselves to causes are unaffected by the success or failure of their own life projects. Ultimately, Adler and Posner recommend that agencies exclude from CBA those preferences that are both remote and predominantly morally motivated.

Adler and Posner’s arguments are somewhat tailored to their discussion of existence values in environmental CBA.  

An existence value is the value that someone ascribes to the existence of something, regardless of whether they can directly enjoy that thing.  

They argue that environmental existence values are remote and morally motivated.  

Accordingly, they argue that such values are not welfare-relevant.

Parental preferences regarding their children’s safety are potentially suspect under Adler and Posner’s vision of welfare-relevant preferences. It seems likely that parents feel a moral obligation to protect their children. Such familial obligation shares many of the same features as existence values in the

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262. Id. at 36.
263. See id. at 39.
264. Id. at 34.
265. Id.
266. See id. at 34, 39.
267. Id. at 34.
268. See id. (noting that Sheila—the squirrel lover in their hypothetical—“has never traveled to Sri Lanka, and never intends to, nor is she an environmentalist who’s made species preservation her life’s work . . .” (emphasis added)).
269. Id. at 39. Later in their book they cease talking about remoteness and only mention “morally motivated” preferences as suspect. Id. at 133-36. However, this is within their discussion on existence values in environmental law, which they already argued were remote. Id. at 126.
270. See id. at 34, 126.
271. Id. at 126.
272. Id. at 126, 133-36.
273. Id. at 34, 127.
Parents value children in part because of the joy that parents get from directly interacting with their children, but this does not exhaust the value that parents place on their children. In fact, it may only be a very small part of that value. Parents want their children to do well. This idea that a parent would have or care for a child predominantly because of that child's direct use value is antithetical to common ideas about parenting. Such a parent would be treating her child like a pet or an object, and not as a soon-to-be autonomous being deserving of respect.

Although the preferences that underlie the child premium are partially morally motivated, they are clearly not remote. Neither the fate of the stranger on the train nor the fate of the Sri Lankan squirrel has a causal impact on my body or mind, and therefore we might guess that their fates cannot impact my welfare. But for the vast majority of parents, the fate of their child is not remote in this way. It is in fact at the far other extreme.

Even if Adler and Posner were to focus solely on moral obligations rather than on the confluence of remoteness and moral obligations, it is far from clear that all morally motivated preferences are welfare-irrelevant. They seem to suggest this when they imply that saving the Sri Lankan squirrel is welfare-relevant to someone who has a strong enduring commitment to do so. While it is plausible to argue that someone who reluctantly or reflexively complies with a moral obligation is not necessarily improving her welfare, it is implausible to argue that acting on a moral obligation wholeheartedly, joyously, and with a great sense of meaning and pride is welfare-irrelevant. The latter description, although a little melodramatic, is the better description of parenthood.

4. Making Sense of the Child Premium

So far, this section has defended the child premium against the claim that it reflects ill-informed preferences. It has also defended the child premium against the claim that it is rooted in welfare-irrelevant preferences. The remainder of this section constructs an affirmative case and argues that the child premium reflects preferences that are readily cognizable as sensible and reasonable.
The child premium reflects the idea that parents are willing to increase their own risk to lower the risk to their children. Consider the most extreme versions of this: when parents or relatives put themselves at extreme immediate risk in order to save a child. In 2001, second-grader Jessie Arbogast was attacked by a seven-foot shark in shallow waters off the coast of Florida. His uncle not only dove in to save the boy but also dragged the thrashing shark to shore to retrieve his nephew’s severed arm from its mouth. Recall also Melanie and Aaron Richman, who risked their lives to prevent a car thief from taking their child. Most people would not react to these stories by lamenting the irrationality of the adults involved. Instead, the motivations of these adults are likely to be viewed not only as understandable but also admirable. This is not to say that these adults acted on the basis of calm, calculated cost-benefit analysis. Far from it. But the clearly emotional motivation of these adults is one that people are likely to accept as stable and well-informed rather than the result of some form of error: “[P]arents are not rational actors in the commonly accepted meaning of the term. Yet their seemingly irrational acts make perfect sense in the context of the human experience of parenthood.” This is perhaps because the concepts of self and other blur between parents and their children.

If it is true that the concepts of self and other blur for parents and their children, one might wonder why parents value their child’s safety more highly than they value their own. There are plausible reasons supporting the rationality of the child premium for both non-fatal and fatal risks, although the underlying reasons supporting a child premium in each case are somewhat different.

In the context of non-fatal risk reductions, the child premium emerges from two simple and plausible assumptions. First, parents seek to maximize the joint welfare of themselves and their children. Second, parents feel their children’s pain, while children do not necessarily feel their parents’ pain. Suppose that adults are willing to pay $100 to reduce a risk that they themselves will develop bronchitis. This figure is the result of a combination of the economic and non-economic costs of bronchitis. Perhaps $50 is attributable to the adult’s WTP to avoid medical costs, and another $50 is attributable to

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278. Id.
279. See supra note 1 and accompanying text.
281. See MILTON C. REGAN, JR., FAMILY LAW AND THE PURSUIT OF INTIMACY 112-14 (1993); Woodhouse, supra note 280, at 2498 (“Parenthood in action requires suspending objectivity and adopting an inherently other-centered subjectivity made possible by the blurring of emotional boundaries between self and other.”).
282. This is a common assumption within economic analyses of the family. Pollack, supra note 40, at 117. This assumption could be weakened, such that the parent maximizes a household utility function that includes both her own and her child’s utility, but gives greater weight to her own utility, as long as it still gives sufficient weight to the child’s utility.
their WTP to avoid the pain and suffering associated with bronchitis. Now suppose that a parent is considering how much to spend to reduce the probability that her child will develop bronchitis that will create the same medical costs and the same amount of suffering for the child. So far, it appears that the parent would be willing to pay $100. But if parents feel their children's pain, then the non-economic costs of child bronchitis must be inflated to take account of its welfare effects on both parent and child. A simple model might suppose that the parent suffers an equal amount as the child. If this is correct, then the parent would be willing to pay $150 to reduce the child's risk: $50 to reduce the risk of incurring the medical cost, $50 to avoid the risk that her child will suffer, and another $50 to reduce the risk that she will suffer from seeing her child suffer. This simple model is consistent with a child premium. To clarify, this model presumes an asymmetry: parents feel their children's pain, but children don't feel their parents' pain. The basic contours of this model, and the asymmetry built into it, are also supported by parents who say: "I could not live with myself if something happened to my child." Guilt and regret are powerful emotions that create serious welfare losses.

It is not clear that the same asymmetry exists in the context of fatal risks. Losing a child is one of the most painful human experiences, and one of the most enduring. But losing a parent while you are still a child is also likely to create immense suffering that reverberates over the child's lifetime. While a child may not notice her parent's illness, she is sure to notice her parent's death. Accordingly, it is not clear that parents should prefer a risk of parental-death and child-suffering over a risk of child-death and parental-suffering.

The child premium makes sense even for fatal risks as long as the parent is attempting to maximize the joint welfare of the parent and the child. If, for example, welfare is a function of life-years, then risk-wealth tradeoffs should favor the young over the old. The few studies that have asked people to explain

283. FUREDI, supra note 244, at 111.
286. Linda J. Luecken, Long-Term Consequences of Parental Death in Childhood, in HANDBOOK OF BEREAVEMENT RESEARCH, supra note 285, at 397, 397-98.
287. The concept of a parent maximizing a joint parent/child utility function is a rather technical way to express common themes of parenthood. "The human heart was not designed to beat outside the human body and yet, each child represented just that—a parent's heart bared, beating forever outside its chest." DEBRA GINSBERG, RAISING BLAZE 188 (2002). "Sometimes when you pick up your child you can feel the map of your own bones beneath your hands. . . . This is the most extraordinary thing about motherhood—finding a piece of yourself separate and apart that all the same you could not live without." JODI PICOULT, PERFECT MATCH 151 (2002).
why they prefer to allocate scarce health resources to children support the idea that life-years matter, at least in a rough way. Therefore, at least part of the child premium is rooted in the sensible notion that children have more years ahead of them. Although the relationship between welfare and life-years is not linear, it need not be to produce the child premium.

“Fair innings” arguments can support a preference for child safety while denying that the normative justification for doing so is rooted in claims that each life year is equally valuable.

The fair innings argument takes the view that there is some span of years that we consider a reasonable life. Let’s say that a fair share of life is the traditional three score and ten, seventy years. Anyone who does not reach 70 suffers, on this view, the injustice of being cut off in their prime. They have missed out on a reasonable share of life; they have been shortchanged. Those, however, who do make 70 suffer no such injustice, they have not lost out but rather must consider any additional years a sort of bonus . . . . The fair innings argument requires that everyone be given an equal chance to have a fair innings . . . but, having reached it, they have received their entitlement.

Originally, the fair innings argument split people into two groups: those who had surpassed the average life expectancy, and those who had not. The latter group had a stronger moral claim to recourses than the former. But the fair innings argument is compatible with a number of different groupings. For example, people might deserve a chance to accomplish certain major life milestones, each of which could be a relevant threshold for purposes of a fair innings argument. Different people might use different milestones, but there is likely to be widespread agreement that children deserve a chance to develop into adults, or perhaps to have children of their own. Life-years prior to having the opportunity to reach these or other milestones would be more valuable than those that occur later.

C. Other Normative Objections

This section focuses on two additional critiques. First, the child premium discriminates against adults. Second, the child premium is less attractive than using a uniform VSL for all people. Neither of these critiques is convincing.

288. See, e.g., Tsuchiya et al., supra note 112, at 694 tbl.6.
291. Id.
292. This presumes that the child has a good chance of achieving the relevant milestone. People give children less priority for medical interventions that would add five years and only five years to the patient’s life span. Such interventions may not allow children to achieve the relevant milestone and hence might not be worth much under a normative view that prioritized such milestones. Tsuchiya et al., supra note 112, at 692, 693 (finding that 76% of subjects gave a five-year-old patient first priority for a life saving treatment, but only 39% did so when the benefit was only a five year extension of life followed by death).
1. Fairness to Adults

One might object to the child premium by arguing that it discriminates against adults. However, this would be a very weak objection. The child premium does not treat people differently, let alone do so in a way that is unjust. Of course, the child premium does favor child safety over adult safety. But all adults were once children. The child premium affects the distribution of safety across one's life, but does not affect the overall amount of safety provided to particular people. Adults cannot complain about a child premium if they benefitted from that premium when they were children. But this leads to a modified objection. People who were adults at the time of the adoption of a child premium would incur the costs of the child premium (in the form of higher taxes or higher product prices) without receiving the benefits. This group can plausibly claim that they are being treated unfairly. Nonetheless, this modified objection is also weak. The concerns raised by transitioning to a system that relies on a child premium should not infinitely delay a program that better reflects the preferences of millions of current and future people. Subjects in the studies from Part I appear to agree. Far from objecting to the child premium, these adults (both parents and non-parents) give priority to children. This suggests that these adults do not find the modified objection convincing.

2. The Child Premium vs. A Uniform VSL

Agencies currently ignore heterogeneity and use a uniform VSL. They do so despite a great deal of evidence that WTP figures vary across persons and context. Wealthy people have higher WTP, as do more educated people even after controlling for income. There are also gender and racial effects on WTP. If there are plausible normative reasons for ignoring differences between these groups, then we might ask: why treat childhood differently than gender, race, income, or education?

There are two normative arguments in favor of using a uniform VSL. Both arguments deny that increasing overall welfare is the only goal of regulation. The first argument draws on distributional justice, and the second

294. Robinson et al., supra note 130, at 6.
296. Id. at 7; Robinson et al., supra note 130, at 10.
297. Hammitt & Haninger, supra note 73, at 73-75.
draws on the concept of expressive harm. Neither is inconsistent with a child premium.

First, the use of a uniform VSL might prevent objectionable distributional consequences. Those who favor a uniform VSL on distributive grounds compare the uniform VSL to one that is customized based on an individual’s WTP. This system would assign a relatively low VSL to poor people and a relatively high VSL to rich people. This, in turn, could lead to objectionable outcomes. For example, if the government had to choose where to put a hazardous waste site, a CBA would favor placing it in a poor neighborhood where lives are less valuable. A VSL that does not vary with wealth helps prevent this result. But the question of whether to adopt a child premium is orthogonal to the question of whether to customize VSLs based on an individual’s WTP. The child premium affects the poor and the rich in the same way: increasing the estimate of monetized benefits when regulations protect their children.


300. ACKERMAN & HEINZERLING, supra note 17, at 73-74, 149-50.
302. ACKERMAN & HEINZERLING, supra note 17, at 149-50.
303. Note that this is not really an argument for a uniform VSL. It is an argument against assigning a lower VSL to poorer people; it is not an argument against using higher values for poorer people or against adjusting the VSL based on personal characteristics that do not trigger distributional concerns. For example, distributional justice does not require assigning the same VSL to those who choose to skydive and those who do not.
304. Of course, the child premium hinders distributive justice in at least a trivial way. Any time policymakers invest limited resources into any goal other than furthering distributive justice, they are compromising their distributive justice goals.
305. The child premium could be seen as creating a distributional benefit if children are viewed as worse off than adults. Alternatively, if worse-off adults have more children, then benefiting all children will disproportionately benefit households that are worse off. See Greg Bognar, Age-Weighting, 24 ECON. & PHIL. 167, 182-83 (2008) (noting that children might be seen as worse off than adults because they “have had fewer goods in their” lives so far).
The second defense of a uniform VSL is that it symbolizes equal respect for all persons. Using different VSLs for different racial groups, or for men and women, could be seen as encouraging people to think that these groups are fundamentally different and worth more or less than one another.

A child premium would not send a message of unjust inequality. Everyone passes through childhood prior to reaching adulthood. Because everyone was a child once, treating children differently than adults affects all people equally. Further, treating children differently than adults is considered appropriate in a wide range of contexts. For example, children are compelled to attend school, they cannot purchase or consume alcohol, and have restricted driving privileges. Given this background of child exceptionalism, it is unlikely that people would interpret the child premium as an affront to equality or equal human dignity. In fact, the studies from Section I.B suggest that people not only think governments are permitted to give children priority, they think that governments should do so.

III. The Alternate-Models Approach

At this point, many readers may be sympathetic to the idea that agencies should incorporate a child premium into their analyses in some fashion. The most straightforward way to do so would be for each agency to update its standard VSL model. This is precisely what the EPA is currently seeking to do with the cancer premium. In part because the child premium will only affect a subset of regulations, and in part because of the advantages of the alternate-models approach, the child premium can be most usefully deployed as an inaugural candidate for the alternate-models approach.

A. Updating the Standard VSL Model

Adopting the child premium is likely to have an impact—albeit a modest one—on the quantified benefits within CBA. It will be useful to start with some examples of where the child premium will have the least effect. A child premium would have increased the benefits of fatality reductions under the

306. ACKERMAN & HEINZERLING, supra note 17, at 72 (noting that the use of different VSL numbers is “difficult to reconcile with ideals of democracy and equal treatment under the law, let alone the sacredness of every human being”).

307. See sources cited supra note 293.


309. WHITE PAPER, supra note 151, at 60.

310. It will have a much smaller effect on the overall complexity of CBA. CBA is long past the point where it can claim to be a simple parsimonious decision procedure; it is already steeped in complexity. See McGarity, supra note 6, at 2343, 2355 (discussing the data requirements for CBA, and its many mathematical machinations). Adding the child premium or the cancer premium will only minimally increase CBA’s complexity. In many cases, agencies already have data on the age of persons who suffer morbidity and mortality and data on whether morbidity or mortality was caused by cancer. See EPA CLEAR SKIES, supra note 16, at 18 tbl.3, 35 tbl.8, 68 tbl.19.
Clear Skies Initiative by about $135 million per year.\textsuperscript{311} Although an extra $135 million in benefits every year is a hefty amount, it is small compared to the overall predicted benefits of the Clear Skies Initiative of over $50 billion per year.\textsuperscript{312} The child premium will normally have only a small impact on environmental regulations simply because many of the harms that the EPA seeks to prevent result from cumulative exposures, which does not result in harm for many years. For example, the Clear Skies Initiative’s reduction in particulate matter was expected to save 30 children, 1,900 people aged 18 to 64, and 6,000 people aged 65 and up.\textsuperscript{313} The child premium would have a larger effect on the quantified benefits of non-fatal illnesses because children are disproportionately affected by the non-fatal illnesses that air pollution causes.\textsuperscript{314} But the overall effect would still be modest.\textsuperscript{315}

The child premium can have a larger effect on regulations that derive much of their benefit from preventing sudden deaths, rather than from preventing deaths with long latency periods. Department of Transportation (DOT) regulations provide a potential area where the child premium can have a larger impact. For example, an upcoming DOT regulation seeks to prevent back-over deaths.\textsuperscript{316} Every year in the United States, about 100 children are killed and another 2,300 are injured in their own driveways when they wander or hide behind the family car as it backs out of the driveway.\textsuperscript{317} Regulations like this one—that specifically target children—are more likely to be affected by a child premium.\textsuperscript{318} Consider also child restraints in cars. In 2003, OMB examined and adjusted the DOT’s quantified benefits for child restraint

\begin{itemize}
\item \textsuperscript{311} See EPA CLEAR SKIES, supra note 16, at 5 tbl.1b. Although the Clear Skies Initiative was never passed, its thorough CBA serves as a useful example.
\item \textsuperscript{312} Id.
\item \textsuperscript{313} Id. at 64 tbl.16.
\item \textsuperscript{314} See id. (reporting 271,000 instances of quantifiable non-fatal health effects in children and 9,900 such effects in adults). The child premium affects the monetized benefits of any risk reduction (fatal or not) measured by WTP.
\item \textsuperscript{315} If these most recent WTP estimates to avoid a day of coughing, chest pain, shortness of breath, and fever were applied to the EPA’s retrospective study of the Clean Air Act from 1970 to 1990, and a child premium were applied, then the benefits would increase by $465 billion over that twenty year period, and the share of benefits attributable to reducing respiratory illnesses would rise from 1.5% to 8.6%. Dickie & Messman, supra note 96, at 1171.
\item \textsuperscript{318} The child premium could also affect food safety regulations, which tend to disproportionately benefit children and the elderly. See Prevention of Salmonella Enteritidis in Shell Eggs During Production, Storage, and Transportation, 74 Fed. Reg. 33,030, 33,053 (July 9, 2009) (to be codified at 21 C.F.R. pts. 16 and 118). The Food and Drug Administration (FDA) normally uses a uniform VSL to monetize fatal risks, and a child premium would increase the benefits of reducing those risks. See, e.g., id. at 33,056. The FDA monetizes the benefits of preventing non-fatal illnesses by calculating the quality adjusted life years (QALYs) that preventing those illnesses would yield and then monetizing those QALYs. See, e.g., id. at 33,054-56. The child premium suggests that the FDA should use a higher monetary equivalent for childhood QALYs. Section IV.B will discuss the impact of the child premium on other QALY-based decision procedures.
\end{itemize}
The DOT estimated that the child restraints would save 36-50 children per year. OMB discounted these benefits to a present-equivalent of 25-35 children per year, and then discounted the remaining life-years of these three-year olds such that saving each child was the equivalent of saving only fourteen current life-years. As Frank Ackerman and Lisa Heinzerling noted: “The combined effect of OMB’s ‘double discounting’ was to slash the estimated benefits of tighter restrictions on child restraints by over 85 percent. In a cost-benefit world, cutting benefits by such a large amount drastically weakens the case for government intervention.” A child premium would have partially offset this reduction in quantified benefits, and strengthened the case for government intervention. The child premium will also have a greater impact when agencies seek to achieve a particular ratio between costs and benefits (in the simplest case, equalizing them) and increases in safety investment tend to lead to continuous increases in safety. For example, when the DOT set standards for roof crush resistance it sought to come as close to equalizing the costs and benefits as possible within the constraint that rules generally have to have a positive impact to pass OMB scrutiny. In the context of car roofs, there were no large discontinuities in the relationship between safety investments and safety. Each additional dollar of quantified benefits allowed the DOT to increase roof strength. In these situations, the child premium could affect the content of the ultimate rule.

The importance of the child premium does not lie primarily in its capacity to influence a broad swath of regulations, but rather in its ability to serve as the thin edge of the wedge to open up a space for agencies to experiment with other premiums, such as cancer premiums and perhaps the incorporation of a broader set of altruistic values. It can do this in two ways. First, the defense of the child premium serves as a proof of concept that CBA can accommodate risk.

320. Id.
321. Id.
322. ACKERMAN & HEINZERLING, supra note 17, at 197.
323. In this instance, OMB was conducting cost-effectiveness analysis, rather than cost-benefit analysis. See Section IV.B for further discussions of cost-effectiveness analysis.
324. Personal communication from Christopher Wiacek, NHTSA Office of Crashworthiness Standards to author (May 11, 2012) (commenting on Roof Crush Resistance, 74 Fed. Reg. 22,348 (May 12, 2009) (to be codified at 49 C.F.R. pts. 571 and 585)); see also REVESZ & LIVERMORE, supra note 11, at 11 (“Under rules that have been in place since the early days of the Reagan administration, most major new environmental, health and safety regulations must pass a cost-benefit test before they can be adopted.”).
325. Id.
326. See ACKERMAN & HEINZERLING, supra note 17, at 70 (“We are not aware of any attempts to quantify the existence value of another person’s life; but we are sure that, if the value of life is a number in the first place, then there is a substantial existence value to the life of a stranger, let alone a relative or friend.”); see also Brady, supra note 157, at 542 (arguing that the VSL should include altruism toward other citizens).
attitudes that do not fit neatly into actuarial models. Thus, it should help promote social science research into other premiums. Section IV.A revisits the cancer premium and briefly sketches a social science research strategy that has the potential to clarify whether the cancer premium reflects well-informed welfare-relevant preferences. Second, the child premium can further promote experimentation with other VSL models, and any other model within CBA, by helping establish and entrench the alternate-models approach. Although Part II argued that the child premium should be uncontroversial, valuing different lives differently implicates deeply held values and hence it is the type of judgment that agencies should make only if they communicate the nature of their decision to more democratically accountable bodies. This makes the child premium a good inaugural candidate for the alternate-models approach.

B. The Advantages of the Alternate-Models Approach

Under the alternate-models approach, agencies would report the benefits of a regulation under both their current uniform VSL model and an alternate VSL model that incorporates the child premium. Although agencies would report the results of multiple VSL models, they would have discretion over which model to rely on to set final rules.

The alternate-models approach has substantial advantages over simply updating the standard VSL model. More specifically, it can mitigate two well-documented problems in administrative rulemaking. First, judicial review and political oversight create incentives for agencies to spend years gathering and weighing data so that they can make a final, complete, and confident determination about the appropriate rule. This front-loaded defensive decision-making process causes substantial delay in response to innovation. Second, agencies also have incentives to downplay a particular kind of uncertainty—model uncertainty—which encompasses various policy decisions embedded within CBA. Roughly speaking, the first problem concerns technocratic issues regarding how agencies incorporate new scientific knowledge, and the second addresses institutional and normative issues concerning the value judgments inherent in CBA. Reporting a child premium (or any other premium) as an alternate model sends a signal to stakeholders and scientists that these premiums could have real-world effects on regulation. This will help spur research into those models and allow agencies to drive innovation rather than following it slowly. In addition to spurring technocratic research, the alternate-models approach can also help spur normative debate about the value judgments embedded within CBA.

The same incentives that cause agencies to engage in defensive decision-making and to downplay the value judgments within CBA are also likely to make agencies reluctant to embrace the alternate-models approach. In these situations, either Congress or the OMB can provide a useful corrective by requiring reluctant agencies to report alternate models. For example, Congress
might enact a statute that lists specific alternate models that agencies should report, or require agencies to report any model that passes a certain threshold of credibility; the judiciary would then enforce these requirements. Alternatively, the OMB might issue guidelines that require agencies to report alternate models. This would mirror existing ways that the OMB guides agencies. For example, the OMB encourages agencies to use a VSL between $1 million and $10 million but allows them discretion within that range, and encourages agencies to use both a 3% and a 7% discount rate, yet leaves it to agencies to decide which to rely on if they conflict. The alternate-models approach is an extension of this existing pattern of OMB oversight. A precise balancing of the potential roles of Congress, the OMB, and the judiciary in enforcing an alternate-models approach is beyond the scope of this Article.

I. Front-Loaded Decision-making and the Alternate-Models Approach

Administrative law favors a great deal of pre-rulemaking assessment. Executive Order 12,291 and its progeny require agencies to conduct CBA for certain rules, the OMB enforces these requirements and can prevent rules from going forward if agencies have not sufficiently justified them. Courts conduct “hard look” review to ensure that agencies engage in reasoned decision-making. The combination of these forces has led to an excess of caution: “[A]gencies systematically engage in excess data gathering, protracted analysis of the data and associated public comments, and extraordinarily detailed explanation of the bases and purposes of their final rules in an attempt to insulate their policies from judicial reversal” and OMB interference.

Many scholars have embraced adaptive management theory as a response to the above dynamics. The alternate-models approach, however, is better

327. See, e.g., Wagner, supra note 22, at 1711 (advocating an amendment to the Administrative Procedure Act requiring agencies to disclose trans-scientific assumptions and allowing judges to enforce that requirement).

328. See OMB CIRCULAR A-4, supra note 23, at 30-31 (providing this range and asking agencies to “explain any significant deviations from the prevailing state of knowledge”).

329. Id. at 33-34.

330. Under the George W. Bush administration, for example, John Graham encouraged agencies to report CBA results using both the VSL and the value of a statistical life year. See OMB CIRCULAR A-4, supra note 23, at 30.


332. Livermore & Revesz, supra note 2, at 4.


335. REVESZ & LIVERMORE, supra note 11, at 49-50 (arguing that the EPA developed expertise in CBA in order to combat interference by OMB, specifically, OIRA).
suited than adaptive management as a tool to confront defensive decision-making in the context of innovating the VSL.

Adaptive management theory was designed to overcome the shortcomings of front-loaded models of regulation in situations where the regulator's knowledge was rapidly developing. The core idea of adaptive management is "learning by doing," as opposed to the traditional agency management style which might be called "learning before doing." Adaptive management shifts the regulator's focus away from determining a single best rule, and toward setting up an iterative system of incremental experimentation, monitoring, and reassessment. Under this approach agencies would implement rules provisionally, monitor the results, and adjust those rules to account for new information. Instead of rulemaking being akin to flipping a single switch once and for all, it should work at least partially like a dial, allowing agencies to adjust the rule (perhaps within limits) after it is implemented. This core idea has strong intuitive appeal.

Although adaptive management is attractive in theory, it has been disappointing in practice. At best, agencies have instituted adaptive management "lite." The ideal adaptive management plan outlines specific experiments and monitoring techniques that ensure that agencies learn. For example, a forest management plan might separate areas into different zones, allow differing logging techniques in each, and monitor the effects of those logging techniques on waterways. In reality, agencies don't design such experiments and often don't even have the funds to monitor the results of their rulemaking. These funding constraints create substantial slippage between adaptive management theory and practice.

The alternate-models approach avoids these problems. Unlike in traditional adaptive management contexts, agencies need not design


340. Id. (offering the switch and dial analogy).

341. R. Gregory et al., Deconstructing Adaptive Management: Criteria for Applications to Environmental Management, 16 ECOLOGICAL APPLICATIONS 2411, 2411 (2006) ("The central premise of learning by doing is so attractive and universally intuitive that one is hard pressed to find an environmental resource management plan... that does not make at least some form of commitment to the use of [adaptive management]."); Ruhl & Fischman, supra note 337, at 424 ("Adaptive management... has become infused into the natural resources policy world to the point of ubiquity.").

342. Doremus, supra note 336, at 1457-58.

343. Ruhl & Fischman, supra note 337, at 435, 441.

344. Id. at 449-51 (describing the Northwest Forest Plan as an example of well-executed adaptive management).

345. See, e.g., id. at 441, 481-82.
experiments or monitor results in order to fill their knowledge gaps. When agencies report alternate VSL models, they signal to stakeholders that they may someday come to rely on one of those alternate models for purposes of its rulemaking. This will likely incentivize stakeholders to invest in examining these alternate models. If agencies reported a child premium, some industries would respond by sponsoring studies that critiqued it. Other industries (perhaps those whose products are already exceedingly safe for children) would invest in promoting the premium. This will produce information that is relevant to updating and improving the VSL model. This dynamic eliminates the major impediment to implementing adaptive management—resource constraints—and suggests that the alternate-models approach can play an important role in spurring technocratic research and driving innovation.

2. Model Uncertainty and the Alternate-Models Approach

In the process of estimating costs and benefits, agencies must confront a great deal of uncertainty. In order to deal with some of these uncertainties, agencies turn to models. A classic example is the EPA’s efforts to model how widely and quickly pollutants spread through the air.346 These models attempt to generate a set of parameters that influence the relevant outcome (here the spread of a pollutant) and then to determine the mathematical relationship among those parameters.

Model predictions are subject to two main sources of uncertainty: parameter uncertainty and model uncertainty.347 Parameter uncertainty is the uncertainty involved in assigning a specific value to any particular parameter in the model.348 For example, if the model includes humidity as a parameter, there may be uncertainty about what point estimate to use. Model uncertainty is the uncertainty involved in deciding which parameters to include in the model and determining their relationship to one another.349 Compared to parameter uncertainty, model uncertainty is often more important yet harder to address.350

Model uncertainty is closely intertwined with “trans-scientific” or “science policy” questions that agencies must answer.351 These questions

347. NAT’L RESEARCH COUNCIL, COMM. ON MODELS IN THE REGULATORY DECISION PROCESS, MODELS IN ENVIRONMENTAL REGULATORY DECISION MAKING 134 (2007) [hereinafter NRC MODELS].
348. Id.
349. Id. at 131.
350. Id. at 134.
351. Wagner, supra note 22, at 1619-20.
353. Model uncertainty encompasses both these trans-scientific questions and questions that are clearly normative.
look like scientific questions but cannot be answered by science. To regulate carcinogens based on animal studies, agencies must develop mouse-to-man models that extrapolate from the high doses present in animal studies to the low doses that humans are likely to encounter. Science cannot currently determine whether the dose-response curve for low doses of carcinogens is linear, sublinear, or supralinear. The only way to make this determination is to invoke a default rule. One such default rule might be to choose the model that offers more protection from cancer; another might be to choose the model that offers more protection from government regulation. This is a policy choice.

The distinction between science and trans-science is fuzzy but useful. The terms track the following distinction: Some seemingly-scientific questions are best answered by expert scientists, and others are best answered by the public or publically accountable officials. "Trans-scientific" is the label attached to questions of the second sort. Because the choice between different mouse-to-man models implicates deep philosophical commitments to welfare and autonomy, it is better made by a publically accountable official rather than an expert in toxicology.

The current administrative law system is flawed because agencies make these trans-scientific policy choices without sufficient oversight. Agencies lack expertise in value judgments. They also lack proper incentives to seek input about those values. Agencies have powerful incentives to hide model uncertainty and trans-scientific assumptions and pretend that they merely follow the dictates of science. Agencies do not like to lose court cases. To avoid being accused of resorting to mere "guesswork" when they adopt particular rules, agencies often produce long, complex records that bury and downplay the uncertainty. The more an agency highlights model uncertainty, the more it opens itself up to attack from courts, stakeholders, and politicians.

354. McGarity, supra note 352, at 732; Wagner, supra note 22, at 1619.
355. See McGarity, supra note 39, at 125.
356. In the face of this uncertainty, the prevailing assumption for carcinogens is that there is a linear relationship between dose and response, and that no exposure level is completely safe. Nicholas Bagley & Richard Revesz, Centralized Oversight of the Regulatory State, 106 COLUM. L. REV. 1260, 1321-22 (2006).
357. For a discussion of dose-response curves, see Wagner, supra note 22, at 1625.
358. Id. at 1623; McGarity, supra note 39, at 125-26.
360. Leather Indus. of Am., Inc. v. EPA, 40 F.3d 392, 408 (D.C. Cir. 1994) ("While the EPA 'may err' on the side of overprotection, 'it may not engage in sheer guesswork.'").
for merely guessing or, perhaps worse, for imposing its own contestable values on regulated industries.

The existing literature about model uncertainty and trans-scientific assumptions can inform debates about VSL innovations. The VSL embeds trans-scientific assumptions. It is a prediction of the welfare effects of risk reductions. To model this effect on welfare, the VSL makes various assumptions. For example, the standard VSL model presumes that a single uniform VSL should apply to every person and every risk. This presumption is a policy decision.

The NRC's recent discussion of model uncertainty provides a useful starting point for discussing model uncertainty in the VSL context. The NRC stressed the importance of augmenting and improving the ways that agencies communicate model uncertainty. It suggested that agencies report the results of their CBA using alternate models and used alternate VSL estimates of $1 million and $10 million as an illustration. It argued that using alternate models is more faithful to the limitations of technocratic analysis:

Although it is hard to argue with the principle that regulations should do more good than harm, there are substantial problems in reducing the results of a large-scale study with many sources of uncertainty to a single number . . . . We contend that such an approach draws the line between the role of analysts and the role of policy makers in decisionmaking at the wrong place . . . . The notion [of] reducing the results of a large-scale modeling analysis to a single number . . . is at odds with one of the main themes that began this Chapter, that models are tools for helping make decisions and are not meant as vehicles for producing decisions.

The NRC's suggestion, however, is not as useful as it could be. It does not sufficiently distinguish between model and parameter uncertainty. A policymaker might look at the two VSL estimates and conclude that there is merely parameter uncertainty regarding the VSL, which should be resolved by the relevant expert, not by the policymaker.

A proposal by Wendy Wagner does a better job of communicating model uncertainty. She proposed an Executive Order requiring agencies to report CBA using two different sets of assumptions. Under the first, the agency would answer all trans-scientific questions by using risk-averse assumptions when they calculate regulatory benefits of, for example, reducing cancer

363. Similarly, the VSL model assumes (based on policy, not science) that welfare is best measured by preference satisfaction, and that preferences are best measured using WTP data. ADLER & POSNER, supra note 15, at 1106.
364. NRC MODELS, supra note 347, at 15-16 ("EPA should place a high priority on ensuring that stakeholders and others have access to models for regulatory decisionmaking. . . . It is most important to highlight the critical model assumptions." (emphasis added)). The OMB agrees. OFFICE OF MGMT. & BUDGET & OFFICES OF SCI. & TECH. POL'Y, EXEC. OFFICE OF THE PRESIDENT, OMB BULLETIN NO. M-07-24, UPDATED PRINCIPLES FOR RISK ANALYSIS 7 (2007) ("[A] discussion of model uncertainty can greatly inform risk management decisions.").
365. NRC MODELS, supra note 347, at 136.
366. Wagner, supra note 22, at 1707.
Statistical Children

rates. Under the second, the agency would use risk-tolerant assumptions. This proposal does a good job of communicating the trans-scientific question to policymakers. Policymakers are likely to understand that choosing a level of risk tolerance is a value judgment that toxicologists are not specially qualified to make. Instead, this is a question that must be answered by the policymakers themselves. But notice that policymakers are likely to think that the midpoint between a risk-averse benefits estimate and a risk-tolerant benefits estimate approximates the risk-neutral estimate. They are also likely to think that a risk-neutral choice is the easiest one to justify, because it is the one that deviates least form the dictates of “sound science.” Of course, given the uncertainty of risk assessment there simply is no estimate within this range that hews closer to “sound science” or that is demonstrably risk-neutral. But this point may be lost on policymakers. This suggests that Wagner’s proposal might not motivate decision-makers to sufficiently engage with the relevant value judgment.

Wagner also proposed an amendment to the Administrative Procedures Act that would require agencies to separate scientific questions from trans-scientific ones and to provide reasons for answering those trans-scientific questions in the way that they did. Cary Coglianese, Gary Marchant, and Thomas McGarity have made roughly similar suggestions. This requirement would improve transparency, but may not promote participation. Requiring agencies to identify and explicitly answer trans-scientific questions does not yet clarify the importance of those policy choices. The alternate-models approach, however, can simultaneously highlight the existence of trans-scientific questions, and clarify how important those questions are to the ultimate cost-benefit calculations. If part of the goal of communicating model uncertainty is to spur input or debate on trans-scientific assumptions, then quantifying the impact of those assumptions is likely to be important.

Reporting both a standard VSL model and one that incorporated a child-premium would not suffer from the problems outlined above. First, policymakers are likely to understand that the choice between a uniform VSL and a child-premium VSL requires a value judgment rather than simply reflecting parameter uncertainty. Policymakers are much more likely to believe that they have a role to play in deciding whether to value children more than adults than whether to use $1 million or $10 million as the monetized value of a statistical life. Second, policymakers are unlikely to unthinkingly adopt the midpoint between the benefits estimate derived from the standard VSL and the

367. *Id.*
368. *Id.*
369. *Id.* at 1707-12. Her proposal could better highlight the value judgments that the policymaker is supposed to make if the two sets of assumptions were re-characterized as “risk averse regarding risks to human life” and “risk averse regarding risks of government intrusion.”
370. *Id.* at 1711.
child-premium VSL. Every compromise between the uniform VSL and the child-premium VSL embraces a child premium and an affirmative value judgment to invest more in protecting children compared to adults. If policymakers already agree that child safety should be valued more than adult safety, why would they second-guess the single best estimate the agency provided for that child premium? Of course, they might debate the magnitude of the child premium, and perhaps come to a political compromise, but selecting the midpoint of the two benefits estimates does not have the intuitive appeal that it does when policymakers are presented with a risk-averse and risk-tolerant estimate. Finally, using alternate VSL models quantifies the effects of the relevant value judgments. Therefore, conducting alternative analyses both with and without the child premium (or other VSL models, or any other alternate model) has significant advantages over existing proposals for communicating model uncertainty.

Communicating model uncertainty is the first step toward resolving it.\textsuperscript{372} To the extent that alternate models contain contested normative assumptions, reporting them in CBA results can spur political input about those normative assumptions. The EPA’s experience with the “senior death discount”\textsuperscript{373} lends support to this prediction. In 2002 the OMB asked the EPA to re-run its CBA for the Clear Skies Initiative.\textsuperscript{374} In response to that request, the EPA estimated the benefits of the initiative using both its standard VSL estimate and a modified VSL estimate that explicitly lowered the VSL for people sixty-five and older by about one third.\textsuperscript{375} The EPA essentially used two different VSL models: a standard model and a model that was partially adjusted for life-years. This senior death discount was salient enough to generate a great deal of publicity. The controversy erupted during a series of town hall meetings by EPA Administrator Christine Todd Whitman.\textsuperscript{376} At one meeting, a flyer read: “Seniors are Worth \(\frac{3}{5}\) of a Person.”\textsuperscript{377} This public debate—which was made possible precisely because the EPA published CBA results using an explicit alternate model rather than merely a range of potential estimates—essentially transferred the decision about which model to follow from the agency to the political arena. In that arena, the normative assumptions underlying the models took center stage. Politicians and the public had to grapple with the potential justifications for providing less safety for the elderly than for others. The public ultimately rejected any such justifications and in doing so gave the EPA

\textsuperscript{372} Such uncertainty is “resolved” in a practical sense, in that policymakers decide how to regulate in the face of such uncertainty. This does not mean that the uncertainty disappears.
\textsuperscript{375} Viscusi, supra note 50, at 111.
\textsuperscript{376} Skrzycki, supra note 373.
\textsuperscript{377} Id.
painfully clear guidance on which model contained the stronger normative assumptions. To be sure, this political debate contained its own pathologies and overtones of interest group influence. Despite these imperfections, however, this kind of political input seems especially important given agencies’ limited democratic pedigree.\(^\text{378}\)

IV. Extensions

\textit{A. Beyond Children: The Cancer Premium Revisited}

This Article’s examination of the child premium provides a reason to be optimistic that future social science research will be able to determine the extent to which the cancer premium reflects well-informed welfare-relevant preferences.

A strong case can be made that the cancer premium is rooted in biases. Consider the U.K.’s 100% cancer premium.\(^\text{379}\) Regulations that use this premium presume that people will pay double to eliminate a cancer risk compared to a non-cancer risk. This would mean that people are indifferent between a risk of a non-cancer death and a risk of experiencing cancer symptoms but surviving, because they value avoiding each at the same amount. This seems surprising and is plausibly the result of a cognitive or affective error.\(^\text{380}\) Some conditions may be worse than death or as bad as death, but it would be surprising if the average symptoms of the average cancer were as bad as death. More than likely, evidence of the cancer premium is at least partially skewed by biases. People systematically fear cancer more than most other diseases.\(^\text{381}\) The dreaded nature of cancer suggests that people may be making cancer decisions with their (fearful) heart rather than their (rational) head.

\(^{378}\) Of course, not all of the uncertainty revealed by the alternate-models approach will be resolvable. Two models may yield drastically different results, and the choice between those two models may be a question of policy—albeit one that people do not have strong feelings about. Even in these cases, the alternate-models approach is useful. Reporting multiple models, and publicizing the pivotal importance of an unanswerable policy question, could go a long way toward mitigating the common view of CBA as an answer machine. See Wagner, \textit{supra} note 22, at 1706-08 (making similar arguments about the benefits of reporting CBA with a set of risk tolerant and risk averse models).

\(^{379}\) \textit{The Green Book}, \textit{supra} note 161, at 62 n.33.

\(^{380}\) See Sunstein, \textit{supra} note 43, at 441.

Indeed, several scholars have argued peoples' strong reaction to cancer is driven by unjustified fears.\textsuperscript{382}

Despite these concerns, there are two ways to defend a cancer premium of even 100 percent. First, people may fear cancer more than other harms, and this fear is itself a cost that people could rationally seek to avoid or mitigate. Second, people's responses to cancer may be rooted in a "rival rationality"\textsuperscript{383} that is sensitive to the social meaning of certain risks.\textsuperscript{384} These two theories make empirical claims about why people exhibit cancer premiums. These empirical claims can be tested.

A fear-based account of the cancer premium is plausible, even though it has weaknesses. Even if people fear cancer for erroneous reasons, this fear is a real cost. Because the fear of cancer is a real cost, reducing this fear is a real benefit that could justify a cancer premium.\textsuperscript{385} There are two weaknesses with this defense. First, if actuarially unjustified fear is the problem, then agencies cannot presume that reducing actuarial cancer rates will decrease or eliminate this fear. Second, even if reducing cancer rates reduces the fear of cancer, there may be more cost-effective ways of reducing that fear, perhaps through public information campaigns aimed at increasing trust in regulatory agencies or providing people with additional process rights to share their concerns with regulators.\textsuperscript{386} Although this fear-based defense of the cancer premium has weaknesses, those weaknesses could be addressed empirically. For example, it may be the case that reducing cancer rates is the most cost-effective way of reducing cancer-inspired fear, and it may be that a few large cancer-reducing regulations would go a long way toward mitigating this fear. Again, these are empirical questions that agencies could begin to explore through surveys of the general population.

The rival rationality thesis is more promising, but it too contains weaknesses. Lay people assess risk differently than experts.\textsuperscript{387} More specifically, lay people consider a host of qualitative factors that experts ignore.\textsuperscript{388} These factors include whether the risk is involuntary vs. voluntary, and man-made vs. natural.\textsuperscript{389} In the regulatory context, cancer risks are often the result of man-made pollution that people are exposed to involuntarily. These risks may be socially meaningful because allowing some people to impose risks on others without their consent may threaten values such as individual autonomy.\textsuperscript{390} It is possible that people are willing to pay more to

\textsuperscript{382} Peters et al., supra note 190, at S145-46 (2006); Sunstein, supra note 215, at 1139, 1145.
\textsuperscript{384} Id. at 1764, 1777.
\textsuperscript{385} Sunstein, supra note 210, at 121.
\textsuperscript{386} Kysar, supra note 383, at 1765.
\textsuperscript{387} Sunstein, supra note 215, at 1120-22.
\textsuperscript{388} SLOVIC, supra note 195, at 297.
\textsuperscript{389} Id.
\textsuperscript{390} Kysar, supra note 383, at 1777-78.
reduce cancer risks because of these social meanings. Although promising, the rival rationality thesis faces one major obstacle. It is not clear as an empirical matter that people actually adopt the view that cancer risks carry special social meanings. But again, social science can fill this gap. Recall that several studies of the child premium included qualitative follow-up questions where subjects could indicate why they prioritized children. Similar studies could help determine the veracity of the rival rationality thesis and help disentangle the part of the cancer premium rooted in it from the part that might be rooted in erroneous factual predictions about the probability or severity of cancer.

Although there are significant barriers to justifying a cancer premium, there are reasons to be optimistic that further research can answer the question of whether, and to what extent, the cancer premium reflects well-informed preferences. The alternate-models approach can play a facilitative role in motivating this research. Therefore, rather than pursuing the possibility of incorporating the cancer premium into their standard VSL model, the EPA should, for now, merely report it as an alternate model.

B. Beyond Cost-Benefit Analysis: Cost-Effectiveness Analysis

In addition to having implications for CBA, the research outlined in Part I has implications for cost-effectiveness analysis (CEA). CEA compares different programs based on how much each program costs to produce an equivalent outcome as measured in, for example, lives-saved or life-years saved. Unlike CBA, CEA does not place a single monetary value on a health outcome, but rather compares different programs by the monetized cost of achieving those health outcomes. For example, a CEA might conclude that Program A costs $100,000 per life-year saved, while Program B costs $200,000 per life-year saved. CEA does not comment on whether the proper value of a life year is higher than $200,000 or lower than $100,000; thus, it cannot tell us whether both programs are too expensive, or whether both programs are worth funding. Instead, it is often used with the assumption of a fixed budget, in which case it can suggest reallocating funds to make better use of them.

391. Id. at 1764, 1777.
392. See supra notes 115-122 and accompanying text.
393. ALASTAIR M. GRAY ET AL., APPLIED METHODS OF COST-EFFECTIVENESS ANALYSIS IN HEALTH CARE 9 (2010).
394. See id. at 14.
395. Id. at 9, 11. Note that researchers sometimes apply a cost-per-quality-adjusted-life-year (QALY) threshold to the results of CEA to determine which programs are worth pursuing, but monetizing QALYs is controversial. Id. at 22-26; WILHELMINE MILLER ET AL., VALUING HEALTH FOR REGULATORY COST-EFFECTIVENESS ANALYSIS 181 (2006).
396. See MILLER ET AL., supra note 395, at 31-38; see also OMB, Analytical Perspectives, Budget of the United States Government, Fiscal Year 2003, 420 (2002) [hereinafter OMB, Analytical Perspectives] (noting that, with CEA, "decision makers can consider reallocating resources to those
CEA has been used in the regulatory field to help decision makers compare the relative value of multiple regulations. For example, the OMB has used CEA to compare various regulations based on their costs per life saved, and their costs per life-year saved.397

The studies in Section I.A suggest that these regulatory CEAs are not as illuminating as they might initially appear.398 Many scholars have argued that the proper goal of decision makers in the regulatory context is to maximize welfare.399 The studies in Section I.A suggest that the welfare effect of protecting children is greater than the welfare effect of protecting adults. This suggests that outcomes like lives saved and life-years saved are poor proxies for the relative welfare impacts of various regulations. Focusing on lives saved ignores the greater welfare effects of saving children rather than adults. Although focusing on life-years saved incorporates an implicit child premium, it is not large enough to reflect the greater welfare effects of saving children compared to adults.400

Although the OMB has used CEA, CBA remains the dominant decision-making tool in regulatory analyses. By contrast, CEA is favored in the health care field.401

In the health care field, the standard form of CEA analyzes a program’s effect on health, and measures health through quality-adjusted life years (QALYs).402 To calculate QALYs, researchers assign a score of zero to one to various health states, where one is equivalent to perfect health and zero is equivalent to death.403 This health-related quality of life score is then multiplied by the duration of the health state to provide a measure of health that is

rulemaking opportunities that rank the highest in cost-effectiveness†). CEA can also be used to identify programs that are clearly dominated by others. GRAY, supra note 393, at 16.

397. OMB, Analytical Perspectives, supra note 420, at 419 (using costs per life-years saved to compare regulations); OMB, Budget of the United States, Fiscal Year 1992, Part II-370 (1991) (reprinting CEA using lives-saved). The OMB has also given a qualified endorsement of conducting CEA using QALYs. OMB CIRCULAR A-4, supra note 23, at 12-13. I will discuss QALY-based CEA below.

398. For further critiques of similar CEAs, see ACKERMAN & HEINZERLING, supra note 17, at 44-50.


400. Adjusting life-years to account for quality of life—hence creating QALYs—does not resolve either problem. See infra notes 412-417 and accompanying text.


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sensitive to both the duration of the illness and its severity.\textsuperscript{404} QALY-based CEA indicates how to maximize QALYs with a given investment.\textsuperscript{405}

The studies in Section I.A do not have clear implications for QALY-based CEA. Those studies measured the welfare impacts of childhood mortality or morbidity on parents, rather than the health impacts of these potential events. Quantifying welfare benefits through WTP studies is likely to yield different results than quantifying health benefits through QALYs.\textsuperscript{406} Although parents no doubt consider health-related spillover effects when answering WTP questions about child risk reductions, their WTP figures are likely to be influenced by much more than just the mental anguish that they would feel if their child died. Parents want their children to flourish, and not merely because of the effects that this might have on the parents' health. This disparity reflects the disparity between an event's health effects and its potentially much broader welfare effects.\textsuperscript{407}

Although the studies in Section I.A do not have clear implications for QALY-based CEA, the studies in Section I.B do. People routinely reject health maximization as the appropriate social goal. For example, several studies suggest that people give greater weight to saving the lives of patients who are severely ill.\textsuperscript{408} That is, people prefer allocations of resources that favor these patients over allocations that maximize the overall number of QALYs gained. People also prefer non-QALY-maximizing allocations in order to rescue patients in imminent danger of dying and to ensure that every patient has some

\begin{itemize}
\item \textsuperscript{404} Id.
\item \textsuperscript{405} Dolan, \textit{QALY Maximisation}, supra note 114, at 197.
\item \textsuperscript{406} Brouwer, supra note 402, at 332-34; see, e.g., Henrik Andersson et al., Willingness to Pay and QALYS: What Can We Learn About Valuing Food-Borne Risk? 1 (Nov. 9, 2011) (unpublished manuscript) (on file with author).
\item \textsuperscript{407} Within the narrow goal of maximizing QALYs, it is not clear that a child premium could be justified. Such a premium would be justified if a child's death or illness normally has a larger health-related spillover effects on other people—most notably her family—than the health-related spillover effects that would accompany the death of her parent. But it is not clear that this is the case. It is possible that parental death has larger health spillover effects, thus counseling for a parental premium rather than a child premium. The empirical research has not developed sufficiently to help fill this theoretical gap. Of course, childhood death causes many health-related spillover effects, but so too does adult death. See, e.g., Paul Boyle et al., \textit{Does Widowhood Increase Mortality Risk?: Testing for Selection Effects by Comparing Causes of Spousal Death}, 22 EPIDEMIOLOGY 1, 1 (2011) (implying the existence of a spousal premium by finding increased risk of mortality, even ten years after the death of a spouse); Jiong Li et al., \textit{Hospitalization for Mental Illness Among Parents After the Death of a Child}, 352 NEW ENG. J. MED. 1190, 1190 (2005); Jiong Li et al., \textit{Mortality in Parents After Death of a Child}, 361 THE LANCET 363, 363 (2003). Further, more research needs to be done to convert these spillover effects to QALYs. See Anirban Basu et al., \textit{A Time Tradeoff Method for Eliciting Partner's Quality of Life Due to Patient's Health States in Prostate Cancer}, 30 MED. DECISION MAKING 355, 355-56 (2010) (noting that CEA has not adequately incorporated intrafamilial spillover effects); Martin Knapp & Roshni Mangalore, \textit{"The Trouble with QALYs . . ."}, 16 EPIDEMIOLOGIA E PSICHIATRIA SOCIALE 289, 289 (2007) (arguing that existing health-status instruments that measure QALYs are insufficient to measure many mental health effects).
\item \textsuperscript{408} Peter Ubel et al., \textit{Improving Value Measurement in Cost-Effectiveness Analysis}, 38 MED. CARE 892, 894 (2000).
\end{itemize}
hope of obtaining care. Similarly, people favor saving a single child over saving about 1.5 middle-aged adults and between 3 and 10 elderly people. If CEA gave more weight to programs that protected children, as opposed to treating all QALYs as equivalent, then it would expand beyond a narrow focus on maximizing QALYs and do a better job of tracking societal preferences for allocating scarce health care resources.

Although QALYs provide an implicit child premium in some circumstances, it is too small. In the context of fatal illnesses, it is not large enough to mirror the child premium evinced by the studies in Section I.B. In the context of nonfatal illnesses, QALYs do not provide any implicit child premium.

Much like life-years, QALYs contain an implicit child premium for fatal risks. But again, this implicit child premium appears to be too low. CEA normally discounts future costs and benefits, including future QALY gains, using a discount rate of 3%. Applying this discount rate to average life-expectancy and quality-of-life data, and comparing a risk reduction that benefits a ten-year-old and a thirty-year-old, CEA would yield an implicit child premium of about 19%. This is significantly lower than the estimate derived from the study that quantified the comparative social value of saving a 5- to 15-year-old vs. a 25- to 35-year-old, which found a child premium of about 50%. Similarly, QALYs produce a 97% child premium when comparing a ten-year-old and a sixty-year-old, while data from the U.S. suggests that it should be closer to 900%. A third study yielded a smaller disparity. This study compared 5- to 15-year olds with 35- to 45-year-olds and found a 40% child premium. The child premium implied by the use of QALYs for these age groups is slightly lower: 34%. Taken together, these three studies suggest that the implicit child premium embedded within QALYs is too low, although the precise magnitude of the discrepancy is difficult to estimate with

410. See supra notes 105-111.
412. Arias, supra note 137, at 2.
415. Eisenberg et al., supra note 110, at 153.
416. Carlsson et al., supra note 109, at 1814.
417. See Eric Nord, An Alternative to QALY: The Saved Young Life Equivalent (SAVE), 305 BRIT. MED. J. 875, 876 (1992) (outlining person tradeoff questions as a way of incorporating distributional and ethical considerations into CEA).
so little data.\textsuperscript{418} Again, this discrepancy makes sense. People care about the fact that children have more years ahead of them, but this is not necessarily all that people care about. For example, they may care that children have not had their fair innings yet.\textsuperscript{419} QALYs do not account for fair innings arguments, and thus it is reasonable to suspect that the social value of protecting children vs. adults will be higher than indicated just by their relative remaining QALYs. This suggests that some form of age-weighting\textsuperscript{420} could better align CEA with societal values regarding childhood risk reductions.

The need for age-weighting is even more pronounced in the context of non-fatal illnesses. It seems likely that, from a societal vantage point, people would exhibit a child premium for both fatal and non-fatal risks.\textsuperscript{421} Yet QALYs do not offer any implicit child premium for preventing such illnesses. Consider an illness that causes the patient to be hospitalized for one month, and requires an additional eleven months for full recovery. A CEA using unweighted QALYs would not distinguish between programs that prevented 100 of these illnesses in children rather than adults,\textsuperscript{422} even though one 2011 study asked subjects about this illness and found a 1,900% child premium.\textsuperscript{423} This again suggests that some form of age-weighting could better align CEA with societal preferences.

V. Conclusion

The child premium and the alternate-models approach represent two simple innovations to administrative practice. The child premium illustrates the potential to rigorously incorporate commonly held values within the VSL. The existing evidence suggests that the child premium is not merely an artifact of biases. Instead, the child premium reflects welfare-relevant preferences that are readily cognizable as reasonable responses to the blurring of self and other that parents experience. This Article’s defense of the child premium should leave

\textsuperscript{418} The magnitude of the discrepancy may also be affected by the particular methodology used to elicit societal preferences. R. Baker et al., \textit{Weighting and Valuing Quality-Adjusted Life-Years Using Stated Preference Methods}, 14 \textit{HEALTH TECH. ASSESSMENT} ix-x (2010).

\textsuperscript{419} Aki Tsuchiya, \textit{Age-Related Preferences and Age Weighting Health Benefits}, 48 \textit{SOC. SCI. & MED.} 267, 273-74 (1999).

\textsuperscript{420} Aki Tsuchiya, \textit{QALYs and Ageism: Philosophical Theories and Age Weighting}, 9 \textit{HEALTH ECON.} 57, 57-58, 61 (2000) (discussing age weights within CEA); Ubel et al., supra note 408, at 893 (same). A close cousin of QALYs—disability-adjusted life years (DALYs)—already incorporates age weights. Miller et al., supra note 395, at 89-90. However, DALYs use age weights to reflect social productivity rather than WTP, and hence place greater weight on protecting the most productive age groups: younger adults. \textit{Id.}

\textsuperscript{421} The studies in Section I.A showed that parents exhibit a child premium for both fatal and non-fatal risks.

\textsuperscript{422} Tsuchiya et al., supra note 112, at 691 ("The standard assumption in the literature on QALYs is that the decrement in quality of life due to a given health problem is independent of the person's age.").

\textsuperscript{423} Eisenberg et al., supra note 110, at 151 (finding that most people chose to prevent the illness in 100 children rather than preventing it in 2,000 sixty-year-olds).
readers optimistic about the possibility that social science research can uncover and defend other, even more impactful, VSL premiums and CBA innovations. In order to help motivate this research, and to provide a framework within which agencies can experiment with these innovations, this Article outlined the alternate-models approach. This approach represents an improvement over existing agency practice because it helps agencies drive innovation rather than follow it, helps them communicate model uncertainty to more democratically accountable institutions, and makes it harder to view CBA as an answer machine. More concretely, the alternate-models approach offers a useful middle path for the EPA’s cancer premium and a useful way to begin exploring other CBA innovations. The implications of the child premium are not, moreover, limited to CBA. The studies described in this Article strongly suggest that CEA would better reflect societal preferences for allocating scarce health care resources if it incorporated age-weights that favored children.