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Equitable Risk Tradeoffs**

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ABSTRACT

Promoting Equity through Equitable Risk Tradeoffs

The impact and economic merits of President Biden's Executive Order 13985 on equity depend on how the executive order is implemented. While policy discussion to date has focused on equitable outcomes, we propose framing risk equity policies in terms of equitable risk tradeoff rates based on six policy guidelines. The starting point for ex ante evaluation of equity for mortality risk policies should be the symmetric application of the value of a statistical life (VSL) to all groups. Because of the substantial heterogeneity in VSLs by income and demographic characteristics, symmetric tradeoff rates generate subsidies and deficits relative to private values of risk. Efforts to provide for distributional preferences should be grounded in an understanding of the differentials already provided through application of a uniform VSL. Targeting government programs to specific groups ex ante should be coupled with estimates of the efficiency loss based on symmetric tradeoff rates and the implicit tradeoff rate ratio relative the average VSL needed to support the redistributive policy. Here we propose equity guidance that could be incorporated in a revised version of Office of Management and Budget Circular A-4. We contrast the ex ante equity guidance approach with the ex post risk equity evaluation procedure that is incorporated in the Biden Administration's recently proposed Justice40 plan, where 40 percent of the benefits of existing programs must be targeted to certain minority groups without ex post examination of their cost effectiveness either feasible or currently planned.

JEL Classification: D61, D63, I18

Keywords: value of statistical life, risk equity, Justice40, Circular A-4, benefit-cost analysis, regulatory impact analysis

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1. Introduction

On the first day of his presidency, President Biden issued the “Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government.”¹ The Biden administration has sought to induce government agencies to make the equity implications of their policies a more prominent component of both *ex ante* regulatory impact analyses and *ex post* assessments of the distribution of policy impacts. The details are still emerging regarding how and to what extent the executive order will promote “a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality.” Our goal here is to examine how one should best conceptualize equity issues in the context of mortality risk reductions, which comprise a prominent share of the benefits provided by government policies.

The governmental guidance available to date has focused principally on different measures of whether outcomes are equitable. Although policy impacts are clearly consequential to individual welfare, we propose that concerns for equity should be framed in terms of benefit valuations rather than outcomes. The valuations approach to equity is consistent with the fundamental theory of benefit-cost analysis developed more than a half century ago, the emerging literature on equity considerations in classical benefit-cost analysis (Boardman et al. 2018), social welfare functions for evaluation (Adler and Norheim 2022), and the health economics literature on valuing life extensions fairly (ICER 2018). Equity principles for risk regulation should focus on equitable rates of tradeoff, following the risk equity approach

¹ E.O. 13985, January 20, 2021.

advocated in Viscusi (1992, 2000, 2018). In particular, what is the price that government policies attach to reducing mortality risks for different affected groups, and how should we think about what it means for the values of tradeoff rates to be equitable?

The tradeoff rate between money and small risks of death embodied in the value of a statistical life (VSL) is not uniform across sub-populations. The VSL differs by many characteristics such as income, gender, age, race, ethnicity, and other attributes. Despite VSL heterogeneity, government policies usually adopt an equitable risk tradeoff approach based on a symmetric economy-wide VSL to value mortality reduction benefits. Applying an overall average VSL is often reasonable when policies have broad impacts, but it is less reflective of the affected population's preferences for targeted policies. Application of a uniform VSL in effect provides a VSL subsidy for those with a low VSL and a VSL deficit for those with a high VSL. Before embarking on any effort to add distributional weights to the policy assessment to target policies toward disadvantaged groups, we propose that it is essential to first understand the baseline extent of any tradeoff subsidy or deficit.

After motivating the policy equity concepts in Section 2, in Section 3 we present our six guidelines for incorporating the equitable risk tradeoff approach in government practices for policy analysis, such as Office of Management and Budget (OMB) Circular A-4. Section 4 reports the equity subsidies or deficits for different groups by income, gender, race, and ethnicity. Section 5 fleshes out age-related issues. Section 6 contrasts our approach with the planned implementation of the Justice40 program, which is already becoming a political vehicle to target benefits to particular constituencies. Despite being an outcome-oriented approach, the Justice40 effort also does not appear to have an economic evaluation component that is either planned or feasible. Section 7 concludes.

2. The Equitable Risk Tradeoffs Approach We Advocate

The potential policy role of equity gained prominence in 1994 in President Clinton's Executive Order 12898 on environmental justice. Although it is unclear whether there was any consequential policy impact from the Clinton effort, the order spawned a considerable literature on environmental equity.² Much of the focus in the subsequent academic literature was on risk exposures that are of continued concern in the Biden equity order. Prominent case studies addressed hazardous waste sites, which at the time ranked as the most pressing environmental problem in public opinion polls. In a spatial analysis of over 1,173 Superfund sites using population distribution data at the census block group level, Hamilton and Viscusi (1999) found that there were inequities, but the principal risk inequities were the disproportionate exposures of Hispanics and Asians, not Blacks, which was typically the group that was prominent in claims of environmental racism. Much of the inequity in exposure to hazardous wastes was attributable to government policies and political factors governing agency priorities for cleanup. Their study found that targeting hazardous waste cleanup policies based on their benefit-cost merits would not only be more protective generally but would also increase the benefits to affected disadvantaged groups. The available guidance provided by the Biden executive order also adopts an outcomes-oriented focus. However, it does not cast the distributional concerns within a benefit-cost framework.

Understanding the consequences of policies is valuable, but it also creates the danger of adopting an extremely inefficient policy strategy for promoting equity. A prominent example occurred with respect to the siting of a new landfill in Orange County, NC (Viscusi 2018). The

² See, especially, Been (1993, 1994, 1995), Been and Gupta (1997), and Hird (1993). Hamilton and Viscusi (1999) provide a general review.

existing landfill in a rural area was nearing its capacity so the county sought a new landfill site. Because the current landfill used farmland as the site the proposed landfill site was to be adjacent to the suburbs in the interest of promoting equitable treatment of farmers. The proposal was rescinded after the residential area adjacent to the proposed site was able to demonstrate the substantial loss in property taxes that would result from siting the landfill adjacent to what at that time was the most affluent development in the county. A principal lesson from the North Carolina incident is that the quest for equity should be coupled with an assessment of the efficiency price that is paid for the equity enhancing effort.

How one conceptualizes and addresses risk inequities has potential efficiency implications. Is the measure of equity whether absolute risk levels are equitable such that there are no differences in mortality risk or life expectancy? Or, is the focus on equitable increases in risk from a particular exposure such as whether air pollution has a differential mortality risk impact? If differences are observed, what policies should be used to handle them? Risks of accident and illness vary by gender, race, age, and personal behaviors. There is also considerable heterogeneity in the willingness to bear risks. Workers more tolerant of incurring health risks will be more likely to sort into risky jobs and will be more willing to live in a less expensive, but more dangerous neighborhood. There may also be heterogeneous preferences for activities that happen to be strongly correlated with a risky lifestyle generally, such as smoking cigarettes and climbing mountains. It is often a challenging task to choose which sources of risk inequities should play a role in assessing whether differences in risk should be judged as inequitable. The many differences in equity concepts and contributors to risk heterogeneity also imply that efforts to promote equitable outcomes may reduce the perceived welfare of the intended beneficiaries and impose efficiency losses on society.

While we recognize the importance of understanding distributional impacts of policies, our analysis here is concerned with how equity considerations should be incorporated in valuations. Our primary focus is not on determining which attributes should contribute to whether a risk outcome is assessed to be inequitable but rather what weights should be applied to different policy impacts. The default starting point for a risk equity assessment should be that of risk tradeoffs as a type of sufficient statistic. In the case of policies affecting mortality risks, agencies begin by using the same VSL for all groups. However, adopting benefit assessment uniformity as the reference point may not be consistent with the underlying preferences of those who are affected. The fundamental benefit evaluation principle is that benefit values should be based on beneficiaries' willingness to pay for the benefit. There is substantial empirically documented heterogeneity of the VSL by income, age, race, and other personal characteristics, much of which we explore below. Because many government programs affect a broad cross-section of the population, the dominant governmental valuation approach is to employ the same average VSL across different policies rather than fine tuning it to reflect differences in preferences. Using the average VSL is desirable if the distribution of valuations based on the prominent labor market studies analyzing wage-risk tradeoffs is comparable to that for the affected population.

Targeted policies that have a differential effect across the population usually will generate a subsidy or deficit relative to beneficiaries' VSL. How one wishes to treat the heterogeneity depends in part on who is bearing the financial cost of the policy. If beneficiaries of safety measures are bearing the financial cost through higher prices, as in the case of vehicle safety and airline safety, setting standards based on average values or with an equity subsidy or deficit may be inconsistent with their preferences. Previously, in a report prepared for the Federal

Aviation Administration (FAA), Viscusi (1992, 2010, 2018) advocated that the FAA be permitted to use a higher VSL than the rest of the Department of Transportation because airline passengers are more affluent and, in effect, pay for the greater safety through higher ticket prices. Similarly, the more affluent purchasers of expensive cars may value comprehensive safety features, but purchasers of less expensive cars may place a lower value on such amenities. Lowering the safety standard for motor vehicles purchased by lower income buyers by too great an extent may not be desirable, however, to the extent that consumers have expectations that all used cars meet reasonable safety standards (Viscusi 2018). There are two general lessons from our chosen examples. First, if people are paying for above average levels of safety such as through higher ticket prices or vehicle costs, then regulations that provide for high levels of safety consistent with consumer preferences are desirable. Second, when policy costs are borne privately, requiring levels of safety that are reflective of a VSL that is greater than that of affected groups will reduce their expected welfare levels. Permitting downside heterogeneity in the VSL should be done with caution to the extent that these lower levels of safety are inconsistent with societal perceptions of the regulated levels of riskiness.

The policy application of different VSL levels to different population groups also raises fundamental behavioral economics concerns amplified by possible loss aversion. Groups who are assigned a VSL that is less than the average VSL or less than that of reference groups accorded a higher VSL will experience a perceived loss. In effect, from their vantage point, their lives have been devalued.

Past experience with devaluation of the lives of older people affected by a policy indicates the potency of resistance to downward adjustments in the VSL for age.³ In its 2003

³ For documentation of this incident and the EPA Air Office's reduction in the VSL see Viscusi (2018)

analysis of the Clear Skies initiative, the Environmental Protection Agency (EPA) analyzed the age distribution of the air pollution regulation, which would principally have mortality impacts on the tails of the population distribution. In recognition of the age-related difference in life expectancy, EPA adopted a 37% discount to be applied to the mortality effects among those 65 and older. There was a widespread outcry against the effort to discount for life expectancy, which became known as the “senior discount” or the “senior death discount,” and gave rise to headlines, such as “What’s a Granny Worth?” and “Seniors on Sale, 37% Off” (Viscusi 2008). After a public outcry from groups such as AARP, EPA subsequently abandoned the age variations.⁴

In a different policy context, the EPA Air Office subsequently sought to make a reduction in the overall VSL used by that agency branch in its 2008 analysis of air pollution regulations. Observers were taken aback by the concept that now their lives were worth less than they were before. In effect, the government was taking something away from people—the value attached to their lives.

Using a uniform VSL establishes an equitable price for risk. The application of a uniform VSL is not entirely neutral as it involves implicit distributional assumptions, which we document below. We will also delve into some prominent, but not widespread, situations in which there may be exceptions to using a uniform VSL. Making the applicable VSL the focus of the analysis facilitates generating a measure of the efficiency loss associated with the equity policy. Suppose that the choice is between two general policy options, one of which is a standard efficiency-

⁴ Interestingly, until the 1980s in the U.S. retired women received lower annual private defined contribution pension payments than otherwise identical retired men. The logic was that because women lived longer on average than men, lower annual payments equalized the average present values of pension payments for men and women. The law was changed so that men and women now receive equal annual payments under the logic that no individual woman is guaranteed to live longer than the average man. The EPA seems not to have embraced the ruling, which logically extends to the situation where no individual elderly person is guaranteed to live fewer years than the average younger person.

oriented policy and the other is the equitable regulatory policy that targets benefits to a particular group, as elaborated on in Kaplow and Shavell (1994). What implicit VSL or relative VSL subsidy for the targeted group is a potentially more desirable policy on a benefit-cost basis? As we will soon flesh out, the ratio of the critical VSL to the average VSL provides a quantitative index of the extent to which policymakers need to place a greater distributional weight on the beneficiary group for it to be the preferred policy. Unfortunately, one must rely on other assessments of the efficiency loss when there is a myriad of attributes that qualify for a distributional subsidy.

Our discussion of equity is broader than the Biden executive order in that we consider inequitable treatment by age and other demographic characteristics in addition to inequitable treatment of populations that are well-known to be marginalized or underserved. Inequities may arise because of misguided or nonexistent analysis, such as removing COVID-19 victims from ventilators based on age considerations. Equity is not just a matter of race and income. Attributes such as gender, age, immigrant status, and other characteristics also come into play. Despite the multiplicity of attributes that may contribute to disadvantaged status, a distributional policy based on a plethora of criteria may not be operational. Inequitable treatment and attempts to address inequities through differential policy preferences may generate legitimate controversies, which we discuss and clarify below.

3. Incorporating Equity in Regulatory Impact Analysis Guidance

President Biden's E.O. 13985 mandates incorporating equity in government policies, which involves framing the equity considerations of interest in terms of assisting the disadvantaged. Even after espousing an equity policy objective and advocating a preference for assisting those designated as disadvantaged, there are many approaches one could take to

operationalize an equity concept for risk policies. The approach we favor has the six guidelines listed in Table 1.

Table 1
Equitable Risk Tradeoffs Guidelines

1. The pertinent measure of whether policies are equitable is with respect to establishing equitable risk-money tradeoff rates. The pricing of the outcomes rather than the level of the outcomes should be the mechanism for promoting equity.
2. The starting point for equitable policies is to apply a uniform VSL when valuing the benefit of all mortality risk reductions.
3. After recognizing any baseline subsidies or deficits, application of a different VSL to certain groups based on demographic characteristics should be standardized across all government agencies, not done on an ad hoc basis. Policies justified based on differential equity weights should be accompanied by an assessment of the efficiency cost of equity calculated based on symmetric valuations.
4. Equity distinctions should be framed in terms of a parsimonious set of equity criteria such as income rather than in terms of political voting groups, such as Blacks and Hispanics. If age is an equity consideration, such heterogeneity should reflect private willingness to pay for the risk reduction benefits rather than less pertinent quantitative measures such as years of life expectancy.
5. When the beneficiary of the government policy is, in effect, paying for the policy benefit, then policies should reflect private values rather than imposing the average valuation. Suppressing such heterogeneity imposes an efficiency loss.
6. Analyzing distributional inequities in outcomes can be helpful in identifying gaps in policy design and implementation, both *ex ante* and *ex post*.

The equitable risk tradeoffs guidelines begin with application of a symmetric VSL in guideline 2 but can incorporate a tradeoff rate subsidy through guideline 3 if there is a societal preference for providing benefits to the disadvantaged population. The approach we advocate implements an outcome valuation-based equity framework in guideline 1 that provides for a potentially different social value of the welfare effects of risk reductions for the disadvantaged. Our approach is consistent with the usual social welfare function analysis in which expenditures across groups yield the same marginal benefits after appropriate weighting to reflect differences in society's valuation of different groups' well-being.

Incorporating equity as described in Table 1 avoids the danger of efficiency criteria for policy being undermined by the introduction of equity concerns. Implementing the equity policy through a VSL subsidy retains the use of benefit-cost tests as the policy evaluation metric and is a straightforward generalization of the welfare economics theory underlying benefit-cost models. Applying a higher VSL to the disadvantaged enables policies to be designed in an efficient manner conditional on the relative social value of risk reductions for the disadvantaged.

A strength of the equitable tradeoffs approach is that under guideline 3 the tradeoff rate subsidy would be the same across agencies, promoting consistency in any differential treatments and averting the abandonment of benefit-cost tests by policies aimed at directing benefits to politically influential groups. The subsidy would be an established policy evaluation number. The subsidy amount is also bounded, which reduces the likelihood of ad hoc efforts to promote equity that embody far different subsidy levels across policies and across agencies. Guideline 4 indicates that the dimensions on which there are equity-based differentials should be limited and rely on traditional equity criteria such as income levels rather than racial or ethnic groups.

As indicated in Guideline 4, when policies are justified based on an equity subsidy for specific groups, there should also be an assessment of the efficiency loss resulting from this targeting, calculated based on symmetric equity valuations. In effect, what is the price being paid to promote equity in this particular context? Given this efficiency cost and the extent of the equity objective that is being promoted through this policy, is the level of the equity subsidy being applied to justify the policy reasonable? Application of symmetric equity weights across agencies should result in most such judgments being favorable if our set of guidelines is applied. But if there is abandonment of benefit-cost tests after adopting an equity dominant approach, understanding the magnitude of the efficiency loss will make clear the price that is being paid for the redistribution effort.

For most government policies, benefits and costs are broadly based. However, some more narrowly tailored efforts have impacts on particular groups. Guideline 5 makes provision for the policy relevant heterogeneity in valuations in situations in which the beneficiaries of the policies in effect are paying for the benefits, as in the aforementioned examples of airline safety and automobile safety.

Notwithstanding the focus on equitable pricing of policy impacts rather than the equitable distribution of policy effects, it is often instructive to determine policy effects. Doing so may assist in identifying gaps in policy *ex ante* (Rascon 2022), as in the evaluations undertaken using OMB Circular A-4, which is undergoing revision. Such evaluations are also instructive *ex post* in the search for more efficient government policies (Greenstone 2019, Sunstein 2022). As discussed above with respect to hazardous waste sites, such analyses may identify inequities that previously were not of primary concern and can assist in determining whether government policies ameliorate or exacerbate inequities.

This recognition of the potential importance of learning about the distribution of policy impacts recognizes that understanding policy impacts can facilitate the development of equity policies but does not represent an abandonment of the equitable tradeoffs approach. One such equity quantity approach is to attempt to equalize the absolute risk levels faced by the disadvantaged, compared to the risk levels of other population groups. What risk equalization will mean varies by context. If the situation pertains to risks of air pollution, the equality objective would be to reduce the air pollution risk for the disadvantaged so that their overall air pollution exposures are at the same absolute level as those who are not disadvantaged. Even if it is inordinately costly to do so without also reducing the risk for those who are not disadvantaged, pursuing a risk equalization goal would require that efforts be focused on promoting the welfare of the disadvantaged rather than the population generally. Targeting policies may be difficult and perhaps infeasible when groups that are not disadvantaged also benefit from reductions in air pollution or if no policies can feasibly reduce the absolute risk levels of the disadvantaged to those of other groups.

A variant on an equitable risk quantity approach would be to advocate policies that achieved the same reductions in risk for the disadvantaged as for other population groups. Even though the disadvantaged may face higher risk levels, so long as the risk policy achieved equal or greater reductions in risk for the disadvantaged that would be acceptable. The Biden administration's Justice40 policy is in the risk reduction vein. As in the case of the absolute risk level approach, there would be the potential for substantial inefficiencies by ignoring the heterogeneity of policy efficacy across different groups as well as the difficulty of excluding from policy impacts possible benefits to groups that are not disadvantaged.

4. Differences by Income, Gender, Race, and Ethnicity

Our approach to equity considers different measures of the baseline distributional weights that are implicit in adopting an average VSL. The VSL measure that we use as the anchor is \$11 million, which is the value in 2021 dollars of the labor market estimates of the VSL using the Census of Fatal Occupational Injuries data after correcting for publication selection effects (Viscusi 2018).⁵ Without adjustments for publication selection effects, the estimate is \$13 million. The VSL amounts used by government agencies are in a similar range, with a value of \$9.6 million in 2015 USD for the U.S. Department of Transportation (2016), \$7.4 million in 2006 USD for the EPA (2021), and \$9.6 million in 2014 USD for the U.S. Department of Health and Human Services (2016). The particular VSL used is not our pivotal concern, but rather the ratio of the average VSL to the population-specific VSL in the measure of the effective VSL distributional weight in the discussion below. The extrapolations of the VSL to different income groups use an income elasticity of 1.0 as well as a set of representative results of the implications of using a lower income elasticity of 0.6.⁶

4.1 Income

The standard economic benefits measure is the individual willingness to pay (WTP) for the benefits, which in the case of small changes in mortality risk is the VSL. The WTP value is inextricably tied to the person's available resources. The preference structure may or may not

⁵ More specifically, the VSL in December 2021 dollars is \$11.3 million, but for purposes of the discussion we use \$11 million. Note that the VSL level does not affect the calculated VSL ratios for different groups, which are presented below.

⁶ Income levels used in the calculations here are from the U.S. Bureau of Labor Statistics (2022). The estimate of an income elasticity of 1.0 is from the meta-regression analysis of U.S. data by Viscusi and Masterman (2017). Many studies have found income elasticities at or not greatly above 0.6 (Viscusi and Aldy 2003). At a higher end is the income elasticity for the median worker in the Panel Study of Income Dynamics sample of 1.8 in Kniesner, Viscusi, and Ziliak (2010).

differ across income groups, but available financial resources will be consequential in governing preferences. Critics sometimes object to the use of WTP, noting that some people would have a high willingness to pay, but they lack the ability to pay. As Ferranna et al. (2021) observe, “Wealthy individuals are likely to offer more to reduce the risk of COVID-19 infection and death than their less-wealthy counterparts not because they value life more, but because they have more resources and are thereby more inclined to trade wealth for a given change in health.” Such statements seek to set aside the role of a person’s income, which is usually the principal variable used to indicate differences across people in their utility functions. Although we might all have different preferences if we had the financial resources of Jeff Bezos, the world in which people currently live is based on their available resources. Asking whether a person would willingly incur a particular risk if they had greatly enhanced financial resources is not more meaningful than inquiring whether they should be allocating more of their funds to space travel based on what they would do if they had Jeff Bezos’s wealth. The benefit value and the expressed preferences of the citizenry are derived from the current society’s WTP, not the thought experiment of what preferences would look like if existing budgetary limits were relaxed.

One approach to assessing the relationship of income to the VSL is to estimate how the VSL varies across the earnings distribution for a large sample of workers. The results by Kniesner et al. (2010) in Table 2 report the estimates of the VSL for different percentiles of the wage distribution. To make the results comparable across the tables, all VSL estimates are in December 2021 dollars. The first column of statistics listing the VSL indicates that the VSL ranges from \$5.5 million at the 10th percentile of the distribution to \$34.8 million at the 90th percentile, with a median value of \$12.0 million. The VSL distribution is highly skewed, with

VSL estimates at the high end exhibiting a much greater absolute difference and percentage difference from the median VSL than the estimates at the low end.

Table 2
VSL Weights for a Worker Sample*

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 5.5 | 2.0 |
| 0.25 | 7.7 | 1.4 |
| 0.5 | 12.0 | 0.9 |
| 0.75 | 23.1 | 0.5 |
| 0.9 | 34.8 | 0.3 |

*Estimates of the VSL are from Kniesner, Viscusi, and Ziliak (2010), converted to December 2021 dollars.

If all people are assigned an average economy-wide VSL of \$11 million, what is the distributional weight that is being applied to the person’s own WTP in the first column of Table 2? We define the term, “effective VSL weight,” as the ratio of the policy-relevant VSL to the person’s own VSL. The final column of Table 2 reports effective VSL weights. Mortality risks to workers who have below the median earnings have a weight that gives them a VSL exceeding their private valuations. The effective weight doubles the VSL at the 10th percentile. At the upper end of the wage distribution, the application of the average VSL undervalues mortality risks to the more affluent, as only 30% of their private valuation is reflected in the average value.

An alternative approach to analyze the effect of income differences is to couple the average VSL with an estimate of the income elasticity of VSL with respect to annual worker earnings and information on worker earnings for different percentiles of the earnings distribution (Bureau of Labor Statistics 2022). Table 3 presents projected VSL estimates using an income elasticity of 1.0. The effective VSL weight in the final column is unaffected by the choice of the baseline VSL.⁷ The projected median labor market VSL figure of \$11.1 million is slightly above

⁷ In particular, for percentile p , $VSL(p) = VSL(p = 0.5) [(income(p))/(income(p = 0.5))] (income\ elasticity\ of\ VSL)$.

the \$11.0 million figure since median worker earnings are slightly higher than the mean worker earnings used in the labor market studies of the VSL. The distribution of the VSL estimates by percentile reflects a rising, skewed distribution, but the spread is less pronounced than in Table 2 because the income elasticity is below that reflected in the Kniesner et al. (2010).⁸

Table 3
Projected VSL by Income Using Elasticity = 1.0

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 5.7 | 1.9 |
| 0.25 | 7.7 | 1.4 |
| 0.5 | 11.1 | 1.0 |
| 0.75 | 17.4 | 0.6 |
| 0.9 | 26.9 | 0.4 |

The effective VSL weights shown in the final column of Table 3 indicate that the median worker is not affected by income level adjustments. However, valuing mortality risks of workers at the 10th percentile by an average VSL yields a VSL that is 1.9 times their personal value. Those at the 90th percentile incur a greater relative discrepancy, as their effective VSL is only 0.4 times the level of their personal VSL. Even without undertaking any explicit distributional weighting the application of an equitable VSL approach provides for considerable distributional weighting.

If instead the calculations in Table 3 are repeated using an income elasticity of 0.6, the projected VSL estimates are more compressed. This distribution shown in Table 4 indicates a VSL range, whereby the VSL increase from the 10th percentile to the 90th percentile is substantial, but less stark than earlier. The effective VSL weight at the 10th percentile is 1.4 so that even for these conservative income adjustments this group receives a 40% subsidy. Those at

⁸ Their estimates found an income elasticity as high as 2.2 for at the 10th percentile and 1.8 at the median, but an income elasticity of 1.2 for the 75th percentile and the 90th percentile.

the 90th percentile receive an effective VSL that is only half of their personal value. All subsequent tables use an elasticity of 1.0.

Table 4
Projected VSL by Income Using Elasticity = 0.6

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 7.8 | 1.4 |
| 0.25 | 9.0 | 1.2 |
| 0.5 | 11.1 | 1.0 |
| 0.75 | 14.8 | 0.7 |
| 0.9 | 20.5 | 0.5 |

4.2 Gender

The VSL might differ by gender for multiple reasons. Women have longer life expectancies, have lower own earnings, and may have different risk-related preferences. Income-related differences can arise because the VSL formula for a semi-log wage equation sets the VSL as a linear function of the wage rate, multiplied by the gender-specific estimate of the fatality rate coefficient. To the extent that there is a gender gap in wages that gives rise to differences in VSL, it is also important to inquire whether the persistent gender earnings gap reflects labor market discrimination. Despite the earnings inequality, some direct estimates of the gender-specific VSL for female workers find that the VSL may be higher for women than for men.⁹ However, because most labor market VSL studies either are for male samples or do not distinguish VSL levels by gender, we report results below based on the income differences in the distribution of male and female workers.

⁹ The estimates in Viscusi (2004) in \$1997 were that blue-collar men have a VSL of \$7.0 million and blue-collar women have a VSL of \$8.5 million.

Table 5
Projected VSL for Male Workers

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 6.2 | 1.8 |
| 0.25 | 8.1 | 1.4 |
| 0.5 | 12.1 | 0.9 |
| 0.75 | 19.3 | 0.6 |
| 0.9 | 29.9 | 0.4 |

Tables 5 and 6 use income elasticity adjustments to project the VSL distributions for male and female workers. The distributions by gender are similar, but with slightly higher VSL levels for men. The median male worker has an effective VSL weight of 0.9, and the median female worker has an effective VSL weight of 1.1. Those who are at the 10th percentile are accorded a VSL that roughly doubles their personal VSL, while those at the 90th percentile have an effective VSL that is about half their private value. The effective VSL ratio is greater for women than for men, with women at the bottom income range receiving a greater subsidy and those at the top of the income range incurring a smaller deficit.

Table 6
Projected VSL for Female Workers

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 5.4 | 2.0 |
| 0.25 | 7.6 | 1.4 |
| 0.5 | 10.2 | 1.1 |
| 0.75 | 15.7 | 0.7 |
| 0.9 | 23.3 | 0.5 |

4.3 Differences by Race and Ethnicity

Following the same approach as above, it is feasible to project VSL estimates for different racial and ethnic groups. In each instance, the pertinent VSL estimate is based on the average society-wide VSL, which is then adjusted using differences in income level across the pertinent percentile of the income distribution, coupled with an income elasticity of 1.0. The alternative is to use VSL estimates that have been estimated for the particular group. However, this approach is sometimes problematic. In particular, for some disadvantaged groups there is evidence of market segmentation in which more advantaged labor market group faces a more favorable labor market offer curve.¹⁰ The disadvantaged group incurs greater fatality risks but receives less wage compensation for these risks. The market opportunities locus for the disadvantaged workers is lower and not as steep with respect to changes in the fatality rate. Because of the market locus disparity, the labor market VSL estimates for Blacks are considerably below those of whites. Similarly, the VSL estimates for immigrants from Mexico are lower than those for native workers and are sometimes zero, especially for workers with weak English language skills. The income-elasticity adjustment procedure results in higher VSL estimates than the direct VSL estimates for such groups.

4.3.1 Whites

The projected VSL estimates for Whites shown in Table 7 are similar to those for workers overall. The median VSL is only slightly higher than the economy-wide average VSL. The effective VSL weights at the extremes of the distribution indicate that using the average

¹⁰Studies of labor market segmentation of job risk compensation differences by smoking status, race, and immigrant status are reviewed in Viscusi (2018).

VSL for those at the 10th percentile involves an effective VSL of 1.9. A somewhat greater relative disparity is observed at the 90th percentile, where the effective weight is 0.4.

Table 7
Projected VSL for Whites

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 5.9 | 1.9 |
| 0.25 | 7.8 | 1.4 |
| 0.5 | 11.3 | 1.0 |
| 0.75 | 17.6 | 0.6 |
| 0.9 | 27.4 | 0.4 |

4.3.2 Blacks

The earnings of Black workers are below those of Whites, and the VSL levels in Table 8 are somewhat lower as well. However, the effective VSL weights shown in the final column of Table 8 are very similar to those for Whites. These weights range from 1.9 at the 10th percentile to 1.2 at the median and 0.5 at the 90th percentile. At least for workers who are employed, the principal differences are less affected by race than by income. The application of an equitable VSL provides a bonus subsidy to Blacks relative to whites of about 20% for the median worker.

Table 8
Projected VSL for Blacks

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 5.2 | 1.9 |
| 0.25 | 6.7 | 1.6 |
| 0.5 | 8.9 | 1.2 |
| 0.75 | 13.6 | 0.8 |
| 0.9 | 20.2 | 0.5 |

4.3.3 Hispanics/Latinos

The estimates for Hispanic and Latino workers in Table 9 provide evidence of stronger disparities in financial well-being, which in turn results in lower group-specific VSLs. The effective VSL weight more than doubles the equitable VSL at the 10th percentile, and even at the median there is a 30% subsidy that results from using the equitable VSL. The effective VSL weights for the 75th percentile and the 90th percentile are the same as for Blacks. Of the groups considered thus far, it is the lower income Hispanics and Latinos who would benefit most from an equitable tradeoffs policy.

Table 9
Projected VSL for Hispanics/Latinos

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 5.1 | 2.2 |
| 0.25 | 6.5 | 1.7 |
| 0.5 | 8.8 | 1.3 |
| 0.75 | 13.1 | 0.8 |
| 0.9 | 20.5 | 0.5 |

4.3.4 Asians

The demographic group that would be systematically disadvantaged by an equitable risk tradeoffs policy rather than a group-specific policy is that of Asians. The data in Table 10 indicate that throughout the distribution Asians have a higher VSL than that of whites. At the median, the Asian VSL is \$15.2 million, and at the 90th percentile the VSL reaches \$36.0 million. The effective VSL weights indicate the substantial penalties that Asians incur by application of equitable tradeoffs. At the 90th percentile, Asians recoup only 30% of their VSL, and even at the median the effective weight is only 0.7.

Table 10
Projected VSL for Asians

| Percentile | VSL | Effective VSL Weight |
|------------|------|----------------------|
| 0.1 | 6.5 | 1.7 |
| 0.25 | 9.1 | 1.2 |
| 0.5 | 15.2 | 0.7 |
| 0.75 | 23.3 | 0.5 |
| 0.9 | 36.0 | 0.3 |

The disparity evidenced for Asians is somewhat reminiscent, but more pronounced, than the racial differences that have spurred the recent affirmative action litigation against Harvard University and the University of North Carolina. Even applying neutral equitable risk tradeoffs, the risks facing Asians are undervalued relative to their private valuations. If Biden’s equity executive order is implemented in a manner that provides additional preference for Blacks, as is reflected in the Justice40 policy discussed below, then there may be legal challenges. The issue would then be whether agency actions incorporating an additional distributional weight for Blacks and imposing a relative deficit for Asians are consistent with the agency’s statutory mandate.

5. Differences by Age

One of the most pressing distributional issues is whether government agencies should assign a lower VSL to the mortality risks faced by older people. Life expectancy declines with age, and financial resources and family obligations also vary with age. Aging does not pose any distinctive challenges, as the economic principles for benefit-cost analysis remain unchanged. The WTP values of those affected by the policy still should govern benefit assessments.

Table 11 follows the same procedure as above and presents VSL estimates for employed persons ages 65 and older using earnings adjustments relative to the average VSL. Note that the

projected VSL levels are very similar to the economy-wide averages. Conditional on focusing on employed workers and using income-elasticity adjusted estimates for VSL, older groups have VSL levels that are not a significant departure from the equitable VSL. Using an equitable VSL overvalues the mortality risks for older female workers and undervalues the mortality risks for older males, but the differences from the average VSL are not great. Valuations for those outside the labor force and with lower income levels may be less.

Table 11
Projected VSL by Age at the Median Value of Worker Groups

| Group | VSL | Effective VSL Weight |
|-------------|------|----------------------|
| All 65+ | 11.1 | 1.0 |
| Males 65+ | 12.8 | 0.9 |
| Females 65+ | 9.5 | 1.2 |

If instead of adjusting average VSL levels with an income elasticity adjustment, consider the age-related variations based on revealed VSL levels in labor market data. The VSL trajectory displays an inverted-U shaped pattern that rises over the life cycle but does eventually diminish. Consistent with economic theory, the rise and fall of the VSL over the life cycle follows the trajectory of the life-cycle pattern of consumption (Kniesner et al. 2006). However, the increase in the VSL during the younger years is steeper than the decline in the VSL for older workers. As a result, there is no statistically significant difference between the estimated VSL for those at the upper end of the age distribution for workers aged 55–62 and for workers aged 18–25 (Aldy and Viscusi 2008). Despite their shorter remaining life expectancy, the greater affluence of older age groups and their general reluctance to incur risks influences their implicit VSL.

For those with extremely short remaining life expectancies, such as advanced cancer patients, some departure from the full VSL may be desirable. Moore and Viscusi (1980)

introduced the concept now known as the value of a statistical life year (VSLY) and first estimated its value. Their estimates considered workers' own subjective rates of time preference for years of remaining life. Current estimates of the VSLY are in the \$500,000 range.¹¹

Application of the VSLY to value the mortality loss of COVID-19 reduces the estimated mortality loss by 45–53% depending on whether there is any discounting used in the construction of the VSLY (Viscusi 2020).

An alternative to the utilitarian approach embodied in the use of VSL in the standard benefit-cost framework is prioritarianism (Adler 2019, Adler and Norheim 2022). Rather than inquire about the revealed preferences of those directly affected by a policy, advocates of prioritarianism judge policies based on their conception of the shape of the social welfare function (SWF). Under the prioritarianism approach, Ferranna, Sevilla, and Bloom (2021) indicate that the following types of policies will emerge: “Because young individuals are among the worse-off in lifetime terms (because they have not yet had the opportunity to live a full life), prioritarian SWFs attach much higher value than utilitarianism to interventions that benefit mostly the young.”

To see how a life expectancy approach would affect valuations, consider a choice between reducing mortality risks for a man aged 60 and another man aged 20. Applying the equitable risk tradeoffs approach would apply the same VSL to each of them. If the VSL accounts for heterogeneity of the VSL based on age, the revealed VSL in labor market decisions is greater at age 60 than at age 20. For the prioritarian approach, the focus is on remaining life

¹¹ Aldy and Viscusi (2008) estimated a VSLY of \$473,000 in the basic regression estimates and \$483,000 in the cohort-adjusted estimates in \$2021. Viscusi and Hersch (2008) use risk-based measures conditional on age, industry, and gender and find an average VSLY for men of \$624,000 and an average VSLY for women of \$526,000 in \$2021.

expectancy, which is 23.5 years for 60-year-old males and 57.2 years for 20-year-old males.¹² Males aged 60 have 41% of the life expectancy of males aged 20. If those aged 20 would receive the full value of the average societal VSL, then males aged 60 would be valued at 0.41 VSL, assuming that there is no discounting of years of life.¹³ Consider a policy choice in which it is possible to reduce the probability of death by 1/100 for a 20-year-old male or for two 60-year-old men. Even though the total mortality risk reduction is double for the two 60-year-olds, under the prioritarian approach the 20-year-old would receive the treatment because that person's life is 2.4 times as valuable based on the remaining life expectancy ratios.

The focus on remaining life expectancy as the guide for treatment is not a viewpoint exclusively held by prioritarrians. During the COVID crisis, a hospital in Italy used a rigid age cutoff of 60 for access to ventilators (Viscusi 2021). Some medical ethicists have likewise advocated preferences based on age. For example, Vanderbilt medical ethicist Larry R. Churchill (2020) espouses what he calls a "fair innings" approach, arguing that older people have already had their "turn at bat." Weill Cornell Medical College ethicist Franklin G. Miller (2020) similarly advocates a bias against older patients because they have already had the "opportunity to live a complete life." Even if the focus is on life expectancy, not willingness to pay, the emphasis should be on the marginal changes in life expectancy that will be derived from treatment or a government policy, not the total remaining life expectancy.

Focusing on life expectancy impacts rather than WTP is not a new concept, but it is not grounded in individual preferences. Policies that seek to maximize discounted life years saved

¹² See Elizabeth Arias and Jiaquan Xu, "United States Life Tables," National Vital Statistics Reports, Vol. 70, No. 19, March 22, 2022. Hyattsville, MD: National Center for Health Statistics.

¹³ Although there is usually discounting of life years in construction of the VSLY, Ferranna, Sevilla, and Bloom (2021) focus on years of life not discounted life years. They note: "We assume that lifetime utility is additive in period (e.g., annual) utility, there is no time discounting, and the marginal utility of income (or consumption) is diminishing so that a dollar raises the utility of the poor more than it does that of the rich."

would result in a dramatic shift in government policies by boosting the cost per normalized life saved for illnesses (Viscusi et al. 1997). Agencies currently use very similar VSL estimates for a broad range of mortality risks despite differences in the life expectancy at stake. The lost life expectancy is greatest for accidental deaths and traumatic injuries, and deaths affecting children. The lost life expectancy is 43 years for drowning, 34 years for poisoning, 37 years for motor-vehicle accidents, and 29 years for all accidents combined. Diseases have an average life expectancy loss of 13 years, and cancer has a life expectancy loss of 14 years. The cost per life saved for regulations such as transportation safety standards and occupational safety regulations are not much affected by accounting for the length of life saved. But for most health-related regulations such as EPA standards, making the appropriate duration adjustment will roughly triple the cost per normalized life saved for agency regulations if one uses the life expectancy loss from traumatic accidents as the numeraire. Moreover, while traumatic events typically have immediate effects, there is often a latency period of a decade or more for health impacts such as cancer, further reducing the discounted value of the impacts of health-related policies. Many policies that formerly passed a benefit-cost test will no longer do so. Under the quantity-of-life approach, there would be a dramatic shift of regulatory policies toward transportation safety and regulations of other imminent hazards, and diminished emphasis on health-related regulations, including most EPA policies. The perennial governmental war on cancer known currently as the “Cancer Moonshot” would go to the back burner.¹⁴

¹⁴ See “Fact Sheet: President Biden Reignites Cancer Moonshot to End Cancer as We Know It.” White House Briefing Room, February 2, 2022.

6. Justice40: Implementing E.O. 13985

The Biden administration’s equity concept for implementing E.O. 13985 is the policy known as Justice40. The Justice40 approach to equity is closest to the equitable risk reduction quantity approach. Justice40 incorporates a specified percentage amount of the benefits that must be received by the disadvantaged. Justice40 establishes a policy goal for federal investments that “40 percent of the overall benefits of such investments flow to disadvantaged communities” (Young et al. 2021). There is no consideration of risk tradeoff rates or other price effects, and there is no concern with whether ultimate outcomes are equitable. However, there is a quantity-related requirement that the disadvantaged must receive 40 percent of the benefits. Unlike other regulatory policies subject to OMB review, there is no requirement regarding the cost effectiveness of the expenditures or that the benefits exceed costs even after recalibration using distributional weights.¹⁵ However, if the justifications for regulations stray too far from agencies’ legislative mandates and disregard standard measures of economic benefits, there could be successful challenges to the regulations (Cecot and Viscusi 2015, Lienke et al. 2021).

Who qualifies as being disadvantaged? A related question that underlies the emergence of the Justice40 initiative is what is the relation of the 40 percent figure to the population share of the disadvantaged? Unfortunately, there is no publicly available documentation of how the 40 percent target emerged and how it compares to the population share of the disadvantaged. Which groups are definitely disadvantaged have not been specified other than that all Blacks and Native Americans are included. The interim OMB guidelines include the following variables as among those that may be considered by an agency in deciding who is disadvantaged: “Low income, high

¹⁵ In an unintendedly whimsical piece of guidance on benefit metrics the Department of Energy notes that expenditures are not to be counted as benefits. Outcome benefit metrics are to include things like measures of the “increase in energy democracy for [disadvantaged communities].” (US Department of Energy, 2022b).

and/or persistent poverty; High unemployment and underemployment; Racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities; Linguistic isolation; High housing cost burden and substandard housing; Distressed neighborhoods; High transportation cost burden and/or low transportation access; Disproportional environmental stressor burden and high cumulative impacts; Limited water and sanitation access and affordability; Disproportionate impacts from climate change; High energy cost burden and low energy access; Jobs lost through the energy transition; Access to healthcare” (Young, Mallory, and McCarthy 2021). The extent of the overlap of all the considerations is unclear, but it is likely that they will be positively correlated. Finally, we emphasize that agencies will develop their own Justice40 risk indicators, which also are quite expansive and differ across agencies and cover over 450 programs currently (Young, Mallory, and McCarthy 2021).

How the Justice40 test is applied also will affect the extent of possible inefficiencies. Must every component policy meet the Justice40 requirement, or can the agency include multiple policies in making this assessment? This parallels the EPA bubble policy. Requiring that each emissions source meet a separate emissions requirement imposes more costs on firms than framing the emissions limit in terms of the total emissions from the plant with respect to an artificial bubble over the plant. The firm can choose which sources emit pollution that can be reduced at the least cost to stay within the overall emissions limit for the facility. The bubble policy produced substantial cost savings for firms and fostered efficient pollution reductions. In much the same way, agencies could be given discretion regarding the ability to pool policies so that collectively the group of policies could comply with the Justice40 requirement.

Notwithstanding the clearcut efficiency gains from such an approach, there may be challenges to a Justice40 bubble for much the same reason that there were challenges by the Natural Resources Defense Council to the EPA bubble policy (*Chevron, U.S.A. v. Natural Res. Def. Council*, 467 U.S. 837 (1984)). Stringent adherence to meeting a Justice40 requirement, in the view of redistribution advocates, would lead to more benefits to the disadvantaged. However, such benefits need not accrue if policies are scaled back or if other policies are not pursued because of the inefficiencies.

Would E.O. 13985 supersede all standard tests of policy merits under our six guidelines or under current benefit-cost requirements? Would the preferred policy be the option that has the highest benefit-cost performance subject to meeting the Justice40 requirement? Or, is Justice40 an attempt to supplant benefit-cost tests in regulatory impact analyses with an alternative approach grounded in providing benefits to target groups? To comply with E.O. 13985, funds could be allocated to highly ineffective policies for the disadvantaged in order to meet the 40 percent goal. Recognition of some of the considerations in our discussion below could assist in curbing the potentially wasteful expenditures.

6.1 Justice40 at the Environmental Protection Agency

In the case of EPA, there are 14 measures of social vulnerability including minority status and populations that are age 65 and older, 17 measures of environmental burden such as National Priority List (NPL) sites and high-volume roads, and five measures of health vulnerability such as cancer and high blood pressure. The variables just listed in turn are grounded in different measures of the exposed disadvantaged population. For example, EPA focuses on populations in census tracts living within a one-mile buffer for a series of potentially hazardous and toxic sites, including NPL sites; Toxic Release Inventory sites; treatment, storage, and disposal facilities;

risk management plan sites; coal mine sites; lead mine sites; and lack of recreational parks (U.S. Environmental Protection Agency 2022a, b). The EPA's approach is an improvement over an earlier proposal that a radius of the exposure zone of 3 miles (5 kilometers) be the exposure area of concern but is still not tied explicitly to the risk reduction benefits (U.S. Environmental Protection Agency 2022c).

Consider the risks posed by Superfund sites on the NPL. If the risk is through contaminated groundwater, that is not a concern in urban areas relying on municipal water supplies. The probability of dermal contact with chemicals in soils for those living as residents on the site is 1.0. However, based on EPA estimates, for residents $\frac{1}{4}$ of a mile away, the probability is 0.025. Between $\frac{1}{4}$ and $\frac{3}{4}$ of a mile the probability is 0.0125, and between $\frac{3}{4}$ of a mile and 1 mile the probability is 0.0063 (Hamilton and Viscusi 1999). A more precise approach for assessing the exposure risk that would be reflective of the risks people actually face would be to calculate the expected number of cancer cases associated with a site, which is usually extremely low (Hamilton and Viscusi, 1999). In effect, a benefits-based approach would be preferable to simply observing that there are exposed populations, not all of whom incur significant risks. Departures from benefit-cost analysis leave out essential aspects of policies.

The scope of the Justice40 policy goal is quite broad and is likely to be consequential. EPA has already established a national office of environmental justice with an annual operating budget of \$100 million and oversight responsibilities over \$3 billion in Justice40 block grants and \$60 billion in investments in environmental justice (Davenport 2022). Under Justice40, OMB guidance specifies that agencies must meet the requirement for federal investments that "40 percent of the overall benefits of such investments flow to disadvantaged communities" (Young et al. 2021). The list of covered policies spans a wide variety of areas and programs. In

the case of environmental justice concerns, under Justice40 the policy areas range from climate change to clean transit, and the affected agencies include the Army Corps of Engineers, Department of Agriculture, Department of Energy, Department of Housing and Urban Development, Department of the Interior, Department of Health and Human Services, Department of Labor, Department of Transportation, Environmental Protection Agency, and many more (EPA 2022). If the Justice40 effort were coupled with monitoring the benefit-cost performance of policies, that would make it possible to identify which policies are desirable candidates to include on a list of policies for which Justice40 is applicable.

6.2 Justice40 at the Department of Transportation

To add to our understanding of the complexity of intentions and activities of the Justice40 program as it currently is evolving it is informative to examine the implementation of Justice40 at another agency, the Department of Transportation (DOT). We will examine the agency's plans for implementation and any planned evaluation of how well the objective of Justice40 is met.¹⁶

The DOT has clearly and succinctly explained how it will be involved with Justice40 by listing (1) its covered programs, (2) how it will define in general what is a transportation disadvantaged community, and (3) how it will use data to identify the specific disadvantaged communities. Any programmatic evaluation must begin there.

To fully appreciate the breadth of Justice40 in the transportation sector policy we note that the DOT has a large and heterogenous program portfolio (U.S. Department of Transportation 2022a). There are 39 covered programs in the DOT. The Federal Highway Administration has 17, the Federal Railroad Administration has three, the Federal Transportation Administration has 10, the Maritime Administration has two, and the Office of the Secretary of

¹⁶ The best way for the interested reader to keep abreast of any of the agencies participating in the Biden administration program's current situation is to Google: Justice40 at *agency name*.

Transportation has seven. The 39 programs include such diverse efforts as the Congestion Mitigation and Air Quality Improvement Program, the Tribal Transportation Bridge Program, the Railroad Crossing Elimination Program, the All Stations Accessibility Program, the Port Infrastructure Development Program, and the Nationally Significant Multimodal Freight & Highway Projects – INFRA Grants Program.

The DOT also has a detailed lengthy definition and algorithm for locating a Transportation Disadvantaged Community (DAC). Specifically, a DOT-DAC includes any Tribal land, any territory or possession of the United States, and certain (qualifying) census tracts out of the roughly 80,000 now in existence. To determine which census tracts are disadvantaged, the DOT uses six general criteria that encompass 22 measure of community disadvantagedness. The six general criteria with the number of specific quantitative indicators in parentheses are Transportation Access Disadvantage (4), Health Disadvantage (3), Environmental Disadvantage (6), Economic Disadvantage (7), Resilience Disadvantage (1), and Equity Disadvantage (1). Included in the 22 disadvantaged indicators are measures of walkability, elderly population, homes built before 1960 (a lead paint indicator), GINI index, unemployment, poverty, linguistic isolation, ozone, renters, and Economic Justice (EJ) indicators for air toxics cancer risk, and traffic proximity and volume.

At the risk of explanatory overkill, but one that is necessary to appreciate fully the complexity of the Justice40 initiative as it applies to the DOT, we now explain their five steps in creating the list of the subset of the 80,000 census tracts that are determined to be disadvantaged and therefore part of the Justice40 program treatment.

There are five steps to identifying a transportation disadvantaged census tract. (1) The first step is calculating the percentile value for each of the 22 indicators of disadvantagedness

where a higher percentile value indicates more disadvantagedness. (2) For each of the six categories of disadvantagedness the DOT computes the average of the percentiles of the category for disadvantaged (for example the economic category averages seven category measures while health is the average of three). (3) Ignoring a few complications, if a category has a percentile average of 50 percent or more, the category indicates disadvantagedness. (4) The six binary indicators of disadvantagedness are then totaled yielding a score ranging from zero to six. (5) A census tract is then determined to be transportation disadvantaged if its score is four or more (U.S. Department of Transportation 2022a).

A recent example of distributional impacts along the same lines as the Superfund study discussed above emerges based on the results of the Federal Highway Administration's External Costs of Highway Users Analysis Tool to evaluate social equity.¹⁷ In the case of noise pollution, the tool calculates the percentage of highway noise costs absorbed by each demographic group divided by their percentage of the population. While Blacks have noise equity ratio of about 1.1, Asians, Pacific Islanders, and other races have ratios as high as 1.5. Particular racial and ethnic groups may fare badly, but in ways that are not always consistent with the expectations embedded in population groups singled out in E.O. 13985. There are other dimensions of equity that the tool also addresses, including air pollution, crashes, and congestion. Promoting equity using estimates along these diverse dimensions will become the norm under the Biden administration's Justice40 effort described below. The DOT practices proposed under Justice40 will then assign weights to these various impacts, but these weights are not grounded in standard economic principles for benefit assessment.

¹⁷ Federal Highway Administration, Transportation Policy Studies, ECAT-Overview, 2022.

6.3 Justice40 at the Department of Energy

Of course, each agency has different programs to check for whether 40 percent of the agency's program benefits go to the disadvantaged (census tract) areas. It is instructive to describe, therefore, how another agency (the Department of Energy, DOE) that is farther along in the planning process than others at the moment plans to meter how a so-called Energy Disadvantaged Community (DAC) is faring when they funnel at least 40 percent of the agency's benefits to the energy DACs.

Under its current Justice40 benefit metric example, the DOE lists eight categories of Justice40 benefits to an energy DAC with 20 specific benefit metrics (U.S. Department of Energy 2022b). General categories of energy benefits include (1) Decrease Energy Burden in DACs, (2) Increase Clean Energy Enterprise Creation and Contracting for Minority or Disadvantaged Businesses in DACs, and (3) Increase Energy Democracy in DACs. Examples of specific benefit metrics within the three respective categories just listed include (1) Dollars saved in energy expenditures due to technology adoption in DACs, (2) Number of jobs created for DACs because of DOE program, and (3) Number of stakeholder events, participants, and/or dollars spent to engage with organizations and residents of DACs, including participation and notification of how input was used. Finally, the DOE also notes that in addition to its list of 20 benefit metrics and units across eight policy priorities: "Other examples of positive long-term outcomes in DACs include wealth creation, workforce development, and other long-term economic development" (U.S. Department of Energy 2022b, p. 12).

While we applaud the comprehensiveness of the DOE's benefit metrics as an example of outcomes research possibilities, the list has outcomes described using many different units of measurement that cannot easily aggregate. This complexifies anything as simple as outcomes

research from Justice40. As a possible remedy, the DOE documentation mentions possibly also using case studies “that highlight approaches different jurisdictions have used to ensure benefits from funding opportunities flow to underserved, overburdened, and frontline communities” (U.S. Department of Energy 2022b, p. 14).

In the case of the Department of Energy (2022b), there are 36 indicators at the census tract level that are used to identify disadvantaged communities. These measures include 10 indicators of socio-economic variabilities, 10 indicators of environmental and climate hazards, five indicators of energy burden, and two indicators of fossil dependence. For each indicator, the census tract receives a score ranging from 0 to 36, for which the metric could be qualitative or quantitative. The scores are then aggregated, with each score receiving equal weight even though the metrics being used are not meaningful quantitative measures and the welfare consequences of scores on different dimensions may be quite different. Being designated as a disadvantaged census tract requires that in addition to having a 30% low-income population, the tract must have cumulative burden scores that are among the worst 20% for its state. This criterion creates inequities across states in how burden indicators are weighted in determining disadvantaged status.

6.4 Overriding Concerns with Justice40 Implementation

Agencies have used different sets of possibly questionable measures to identify disadvantaged communities. Concerns about the details regarding the identification and magnitude of the disadvantaged groups obscures the fundamental problems with the Justice40 approach that should be addressed. Agencies are being diligent in trying to implement Justice40. In doing so, they are defining different categories of disadvantaged populations and establishing a weighting system to aggregate the components. The disadvantaged population categories and

the weights differ by agency so it is unlikely that the distributional preferences across agencies will be consistent. While adopting our equitable risk tradeoffs approach would address concerns, even within the Justice40 concept adopting a simpler structure would be helpful. One such possibility is to base qualification for being disadvantaged on the percent of the affected population below some income-based measure. Comparison across agencies would be straightforward, making it possible to ensure that substantially different distributional weights were not being imposed. It would also be feasible to compute the implied distributional weight on policy decisions if agencies adopted such a common and simplified framework.

There are two principal reservations one might have with respect to relying on income alone as under our guideline 4 in Table 1. First, classifications for being disadvantaged could include more than income status, including factors indicated above. Thus, some disadvantaged populations would be excluded. This omission could be regarded as the cost that is incurred in the effort to establish more consistent treatment of disadvantaged groups across policies. Second, the reliance on income alone as the criterion ignores the political underpinnings of the executive order, which was structured to convey preference for particular constituencies. E.O. 13985 lists a substantial roster of affected groups, including, among others: “Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.” Each of these and other groups represents a potential interest group for which there will be rent-seeking incentives so that the group can obtain a substantial weight in the disadvantaged calculus. The political dividends from focusing

on a disadvantaged status measure linked only to income would be far less, but the dangers of undesirable rent-seeking would be lower as well.

Political pressures to use the Justice40 effort to advance a broader political agenda have also emerged. A group of 60 progressive members of Congress has advocated that policies that might generate emissions should not be counted toward the Justice40 requirement (Maloney, et al. 2022). Such policies include: “Technologies or projects that increase pollution, extend the life of polluting industries, or exacerbate pre-existing disproportionate exposure and projects like carbon capture and sequestration hydrogen applications, combustion fuels, and highway expansion are not appropriate to count toward Justice40.” Highway expenditures to provide greater mobility for those living in disadvantaged rural areas such as Appalachia would not count in advancing Justice40 even though the 2021 OMB guidelines regarded low transportation access as an indicator of disadvantaged status (Young, Mallory, and McCarthy 2021).¹⁸ Would such excluded policies nevertheless count against the agency’s denominator of total benefits and expenditures, making the Justice40 requirement greater than 40% for the other policies? Attempts to augment the redistributive aspects of Justice40 with policy intrusions are likely to increase the inefficiencies that will result from Justice40. The principal challenge for those implementing the Justice40 requirement is to not lose sight of the primacy of benefit-cost tests even if equity is a component of these tests.

Whether Justice40 can emerge as a coherent approach is also in question. The Justice40 mandate inconsistently couples a specific numerical requirement that 40% of the benefits from policy investments be received by the disadvantaged with an ill-defined concept of whom is disadvantaged. That the classification of whom is disadvantaged has not yet been indicated calls

¹⁸ Somin (2020) provides a detailed assessment of the role of highways and mobility in promoting income growth.

into question whether there was any meaningful basis for selecting the 40% figure.

Implementation of the Justice40 approach threatens to undermine efforts to bring consistency and benefit-cost balancing to government policies. Distributional preferences under Justice40 can and will vary by agency. Surely agencies' preferences will vary in response to the pressures from rent-seeking behavior. External political influences appear to have already identified Justice40's open-ended policy as an opportunity to advance other items on advocates' political agendas. To limit socially undesirable influences policy mandates such as the ones just described, the equity policy should be rethought so as to incorporate equity preferences within a benefit-cost framework rather than treating the equity measure as an independent, sufficient metric of policy desirability.

6.5 Justice40 Hippocratic Oath Interpretation

In an extreme interpretation of what the Justice40 requirement implies, a group of 60 members of the U.S. Congress made the following recommendation: "Ensure Justice40 Investments Do Not Harm Disadvantaged Communities...Justice40 spending should do no harm to disadvantaged communities" (Mallory, et al., 2022). In effect, such a prescription is a spending-based variant of the Hippocratic Oath. Making every policy subject to the requirement that the disadvantaged can never be worse off would preclude permitting agencies to advance a set of policies that collectively fulfill the Justice40 mandate if any of the component policies makes the disadvantaged worse off. In terms of the Kaldor-Hicks framework, if agency actions are viewed broadly, the gainers not only can compensate the disadvantaged losers but over the entire set of policies the disadvantaged can also never be losers as they will receive at least 40% of the benefits. Imposing the Hippocratic Oath requirement on every policy that the disadvantaged can never be made worse off is a quite different standard. The progressive

congressional group also recommended “that implementation guidance clarify that the Initiative’s 40% target is a funding floor, not a ceiling.” The recognition of the role of equity in our proposed guidelines for incorporating equity in policy analyses may ameliorate progressives’ long-standing reservations about benefit-cost tests.

6.6 Longer-term Concerns with Justice40 as Currently Evolving

So, where are we now in understanding better the Justice40 program overall? Each agency will use aggregate different category measures to define how disadvantaged a census tract is. Moreover, the metaphorical road that winds from a starting point of measuring transportation disadvantage ends where they will “Conduct program evaluation and improve program design.” (U.S. Department of Transportation 2022b) How this evaluation can be accomplished is unclear, as there is no formal role for benefit-cost analysis in this policy framework. Moreover, none of the policy documents distributed to date has recognized that there is an opportunity cost of reallocating funds to these preferred policies. In particular, what are the efficiency losses resulting from the budget reallocations under Justice40?

A final concern with Justice40 as currently envisioned by its proponents is that there is no way to monitor the cost effectiveness of programs involved going forward. As President Obama said in his 2009 Inaugural Address, “The question we ask today is not whether our government is too big or too small, but whether it works. ... Where the answer is yes, we intend to move forward. Where the answer is no, programs will end.”¹⁹ A major problem from our vantage point is that cost effectiveness of Justice40 is of little concern based on the way it is being implemented. There currently is no proposed gathering of data on the costs of 450+ programs

¹⁹ Available at <https://obamawhitehouse.archives.gov/blog/2009/01/21/president-barack-obamas-inaugural-address>.

already involved where many have 10+ goals, each of which may have five subcomponents that differ across agencies and the 80,000 census tracts that are the unit of observation. The lack of planned or infeasible downstream evaluation is contrary to the wise recommendations of well-known Democrats' and scholars' continued support for refinement in the efficiency of government (Greenstone 2009; Livermore and Revesz 2020; Bennear and Wiener 2021; Sunstein 2022, 2023).

7. Concluding Thoughts

More explicit recognition of equity concerns in policy analysis potentially can broaden the pertinent factors that should be considered in making policy judgments. However, straying from more conventional *ex ante* and *ex post* benefit-cost calculations either by design or from not devoting the resources for collecting the required data create the danger of abandoning efficiency concerns and justifying rent-seeking behavior by special interest groups under the guise of aiding the disadvantaged. Moreover, suppose that at least at its beginning Justice40 functions without any additional resources and simply reallocates resources to DACs away from non-DAC's. This reallocation, of course, has an opportunity cost. At the most basic level, Justice40 as currently described has no plan to examine the possibly negative outcomes in the non-disadvantaged communities as the result of Justice40. Our proposed six guidelines for equity incorporate equity considerations within a benefit-cost framework using equitable risk tradeoffs rather than jettisoning economic analysis.

This article has focused on equitable risk tradeoffs as a prominent example of how equity can be incorporated in policy analyses. However, the principles advocated here are quite general. If there is a desire to promote equity by making redistributive distinctions, this should be done by altering the monetary benefit value attached to these impacts rather than by imposing a quantity

constraint on policy outcomes and designating particular groups as meriting a predetermined share of these outcomes. The task is to devise an equitable pricing structure. When analyzing the equity subsidies that policymakers wish to provide to particular groups, it is essential to recognize the baseline subsidies and deficits that are already provided. The effective VSL weight statistics above provided indexes of the relative value of using a uniform VSL compared to the group-specific VSL. These same effective weights also apply to any other benefit categories for which the income elasticity is 1.0. In these situations, application of uniform benefit values already promotes substantial redistribution for disadvantaged groups given by the relative weight ratios. Finally, irrespective of the policy context and whether mortality risks are involved, prospective and retrospective benefit-cost analyses can assist in informing policymakers of the consequences of policies and highlight whether there are policy gaps that are generating unintended inequities.

The famous econometrician Arnold Zellner was known to have remarked that in matters of research and policy recommendations economists should follow his version of the KISS Principle, which is “Keep It Sophisticatedly Simple.” We have tried to accomplish this here when suggesting how to implement risk regulation equity in practice. The Biden administration has announced plans to use regulatory policy which should involve developing regulations that yield not only greater economic efficiency but also greater economic equity. In our view, the equity targets should be more laser-focused than is being done under Justice40. Any differentials to promote equity should be restricted to a very small number of dimensions, such as income.

The simplicity of our approach is that one need not specify a social welfare function for either *ex ante* or *ex post* implementation and evaluation, which we view as likely to be unnecessarily contentious. The sophistication enters through the well-known and highly

researched concept of the VSL for which there is a well-developed literature both with respect to average VSL levels as well as disaggregation by demographic groups. Our approach incorporates equity into benefit-cost analysis in a simple, straightforward manner.

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