Factor Fiction?



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Cost-effectiveness of Life-saving Interventions

he cost-effectiveness of ways of saving lives is of interest, because it allows for the reduction of mortality risks at reasonable costs to the public. Unfortunately, people who study this kind of thing have noted that the costeffectiveness of risk reduction opportunities varies enormously, often over several orders of magnitude. This large variation leads to a serious problem in promoting survival, particularly if you are interested in getting the most bang for your bucks. In other words, trying to use public and private funds in the most economic fashion. An interesting paper by Tengs and co-authors conducted at the Harvard Center for Risk Analysis helps put some of this in perspective.1 They present published data of dollar costs of life years saved with and without regulatory measures, including 587 interventions, ranging from those that saved more resources than they cost, to those costing more than 10 billion dollars per year of life saved. Most analyses were scientific journal articles or government regulatory impact analyses, but some were internal government memos, reports issued by research organizations, or unpublished manuscripts. Tengs et al. identified approximately 1200 documents, of which 229 met their selection criteria.1

Before reporting on their results, let's define some terms:

- Life-saving interventions are any behavioral and/or technological strategies that reduce the probability of premature death among a specified target population.
- · Cost-effectiveness are the net resource costs of an intervention per year of life saved.

Their key findings are summarized in Tables 1 and 2. Table 1 shows that median of cost/ life-year saved ranged from a low of \$19,000 for health care to a whopping \$2,800,000 for environmental.

Some of the measures cost less than \$1 per life-year saved; the 1988 vs. 1971 standard

for concrete construction; flammability standard for children's sleepware; measles, mumps and rubella vaccination; and reduction of lead content of gasoline from 1.1 to 0.1 g/gal.^{1,2}

Some of the life-saving interventions that help provide the large number for environmental regulations include: Arsenic emission control at low-melting copper range/white pine copper smelter, \$890,000,000; benzene emission control at rubber tire manufacturing plants, \$20,000,000; chloroform private well emission standard at 48 pulp mills, \$99,000,000,000; and radionuclide emission control at uranium fuel cycle facilities, \$34,000,000,000.

If you think these are large numbers, note that regulations that cost more than

\$100 million

per statisti-

cal life

Table 1 Median of Cost/Life-year Saved Estimates As a Function of Sector of Society & Type of Intervention*

Sector of Society	Intervention Costs
Health Care	\$19,000
Residential	\$36,000
Transportation	\$56,000
Occupational	\$350,000
Environmental	\$2,800,000
*From Tengs et al., ref. 1.	

every 5,000 citizens.³ Unfortunately, this approach to toxic control ends up killing more people than it protects. As Justice Stephen Breyer observed, there is an income effect from spending money on nonproductive activities like cleaning dirt .4

When the money remains in the economy, there are more jobs and less stress. Howard discloses: "Every onepercent increase in unemployment over time is correlated with 19,000 more deaths by heart attack and 1,100 more suicides. That works out to about four unnecessary deaths for the \$30 million spent on a typical cleanup and 14 deaths on a \$100 million regulation that saves one life."3

The median cost effectiveness of proposed government regulations for

Table 2	
Median Cost-effectiveness	
Of Proposed Government Regulations*	

saved imply	
Agency Median Cost/Li	fe-Yr
that we Federal Aviation Admin. \$23,000	
dedicate the Consumer Product Safety Comm. \$68,000	
antira GNP National Highway Traffic Safety Admin. \$78,000	
to prolong Occupational Safety & Health Admin. \$88,000	
ing the lives Environmental Protection Agency \$7,600,000	
*From Tengs et al., ref. 1.	

which Tengs *et al.* reported also varies considerably. Medians for each agency, listed in Table 2, show that the average EPA regulation is 86 times higher than the cost-per-life saved of the average Occupational Safety and Health Administration regulation, 97 times greater than the Highway Safety Administration's cost effectiveness, 112 times that of the Consumer Product Safety Commission and 330 times greater than Federal Aviation Administration's.¹

In a follow-on paper, Tengs and Graham⁵ addressed the issue of how many lives we could save if we were to spend the same amount of money but invest it in those interventions that, taken together, would save the greatest number of lives possible. Using the database from their earlier paper,¹ they found that over 60,000 lives are lost (*i.e.*, not saved) every year in the U.S. due to a "wasteful" allocation of resources.

Ramsberg and Sjoberg⁶ performed an analysis in Sweden similar to the one that Tengs et al. did in the U.S. The Swedish study covered 165 interventions, and the figure provides comparison data for both countries. This shows that Swedish and U.S. cost-per-life-saved are, on the whole, comparable-with the major exception being in area of toxic control, where the median cost is much higher in the U.S. Yet, Sweden has stringent environmental laws and is recognized as one of the most health and safety conscious countries in the world.⁷ As Fumento⁷ notes, "When the EPA says the value of extending a person's lifespan is equivalent to the cost of Arnold Schwarzenegger's home, and Sweden says it is equivalent to a 1981 Volvo, there is something wrong with this picture."

Now let's look at another study. In this one, the authors, Guenther and Thein⁸ estimated the value of a year of human life in the U.S. by the cost people are willing to pay for it in nine different circumstances: jury wrongful death awards, medical expenditures, life insurance coverage, lifetime wages and investments, life-saving interventions, willingness to pay, human capital analysis, values used by government and law enforcement costs. Assuming a 75-year life span, these nine methods gave values from \$600,000 to \$4,200,000 per human life with a mean of about \$3,000,000.

The authors choose \$4,000,000 as their final estimate.

Now let's do some math with Table 1 from the Tengs report. If you multiply the figures by 75, you obtain a value for a given life. For example, health care intervention costs in Table 1 averaged \$19,000/year. This value times



Comparison of Swedish (light blocks) and American data(dark blocks) for costs per life-year saved in 1993 dollars for three categories of lifesaving. Adapted from Ramsberg and Sjoberg, reference 6.

75 years gives \$1,425,000. Using this analysis, values for the other interventions give \$2,700,000 for residential, \$4,200,000 for transportation, \$26,250,000 for occupational and \$210,000,000 for environmental. Clearly, except for occupational and environmental, these values are not far from the \$3-4 million value that Guenther and Thien placed on a societal life. By way of comparison, Viscusi reports that labor unions, when free to bargain about safety rules, will insist upon rules that value statistical lives saved at around \$5-6 million.9 P&SF

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