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REGRESSIVE EFFECTS OF REGULATION

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Regressive Effects of Regulation

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Abstract

This paper highlights the unacknowledged burden regulation of health and safety has placed on low-income households. Billions of dollars are spent every year to reduce life-threatening risks that arise from auto travel, air travel, air and water pollution, food, drugs, construction, and the list goes on. Today, some form of regulation affects nearly every aspect of our lives (Shleifer 2010). All of it intends (at least nominally) to make consumers better off. The types of risks subject to regulation, however, are often negligible. By focusing on the mitigation of low-probability risks with higher cost, regulation reflects the preferences of high-income households and effectively redistributes wealth from the poor to the middle class and the rich. This suggests that beyond the well-known knowledge and information problems associated with intervention, there is an additional redistributive effect.

JEL codes: H23, H31, H41, I18, L5

1. Introduction

Today, some form of regulation affects nearly every aspect of our lives (Shleifer 2010). We spend billions of dollars every year to reduce life-threatening risks that arise from auto travel, air travel, air and water pollution, food, drugs, construction and many other potential perils of modern life. At least nominally, these expenditures intend to make consumers better off.[1] The types of risks that are regulated, however, are often small, especially compared to the risks we face from various common events and activities that cause illness, injury, and death. In particular, many of the risks we manage privately are significantly larger than those regulatory agencies manage. For example, people make private decisions determining their diets, how safe of a car to buy, whether to install smoke detectors, the type of neighborhood in which to live, and counseling for drug and alcohol problems. As regulatory agencies address smaller and smaller risks—thereby driving up the prices of many consumer goods and lowering wages of workers in regulated industries—they crowd out expenditures people would make in their private lives that address larger risks and perhaps cost less than government risk regulation. This crowding out phenomenon will affect the less well off before it affects the wealthy because lower-income consumers may face higher risks in some areas of their lives and might wish to spend less on risk reduction overall. In this sense, regulation of health and safety risks, particularly regulation of small risks that are expensive to mitigate, can have a regressive effect on household income. By driving up the prices of the goods and services people consume and lowering wages, such regulations force low-income households to contribute financially to the mitigation of risks they

[1] Although the stated justification is typically to improve consumers' lives, much regulation is done at the behest of specialized groups who benefit from regulations. Wildavsky (1981) argues that regulation is an attempt to identify excessive risks that adversely affect specific groups and to buy risk reductions for such groups at the expense of society as a whole.

might not mitigate privately.[2] To illustrate this regressive effect of regulation in more detail, this paper estimates the private cost of mitigating particular risks for low-income households and compares them to the costs of different types of regulation.

Section 2 explains the idea of the regressive effect of regulation in more detail. Section 3 introduces two sample households, one low-income household and one high-income household. Section 4 estimates the cost of private risk-mitigation strategies for low-income households. Section 5 describes the costs of various regulatory risk-mitigation strategies and compares them to the cost of the private risk-mitigation strategy estimated in section 4. Section 6 concludes.

2. The Regressive Effect of Regulation of Risk and Safety

Before we look in more detail at the risks mitigated through regulation, it makes sense to get a better idea of what types of risks the average American is exposed to and what the major causes of death are each year. Table 1 lists the major causes of death from various activities and events and their annual fatality rate per 10,000 people for 2009 (Kochanek et al. 2011). Overall, Americans faced about an 79.4 in 10,000 chance of dying in 2009. [3] The major causes of death were heart disease (19.5 in 10,000), cancer (18.5 in 10,000), lung disease (4.5 in 10,000), stroke (4.2 in 10,000), accidents (3.8 in 10,000), and Alzheimer's (2.6 in 10,000). Among the accidents or unintentional causes of death, motor-vehicle accidents lead (1.2 deaths in 10,000 of population). Following motor-vehicle fatalities are poisoning, at 1 death per 10,000, and falls, at

[2] Baumol and Oats (1975, 191) show theoretically that environmental policy in particular may have redistributive effects of this sort. Such regulations represent the preferences of the wealthy but lower-income households primarily pay for them in the form of higher prices and lower wages.

[3] The mortality rate measures the number of deaths, usually per 1000 of population. It is distinct from the morbidity rate, which measures the number of newly appearing cases of a specific disease.

0.8 deaths per 10,000. Both heart disease and cancer are the result primarily of private choices and expenditures (largely diet).

In comparison, the initial death rates for risks mitigated by regulation are much lower than risks individuals face from activities they personally control. Work-related fatalities, which are often the target of regulation, happen with an annual frequency of only 0.2 in 10,000 people. Some types of occupational health and safety regulation seem to target greater probability risks: regulation of occupational arsenic exposure, for example, mitigates an initial annual risk of death of 18 in 10,000 (Morrall 2003). This risk applies only to the exposed population; the risk to the general population is much lower and is due primarily to arsenic in drinking water. Examples of regulation that target even lower initial annual risks are floor emergency lighting on airplanes and regulations regarding seat-cushion flammability. The initial annual death rate associated with an absence of floor emergency lighting on airplanes was estimated at roughly 2.2 in 100 million or 0.00022 in 10,000 of exposed population (Morrall 2003). Table 2 lists the top and the bottom five types of regulation in order of associated initial annual risk of death from Morrall (2003).[4]

In addition to the generally low levels of risk addressed, the cost effectiveness of these different types of regulation varies greatly. Tengs et al. (1995) estimate the cost per life year saved for 500 live-saving interventions. They find that the median cost of health care regulation is $19,000 per life year saved while the median cost of environmental regulation is $4,200,000

[4] This paper considers only mortality risks addressed by regulation. Reductions in morbidity and secondary effects on mortality are difficult to quantify and therefore not considered here or in most of the existing literature on the relative cost and benefits of regulation. The estimates presented in later sections of the paper may understate the overall benefits of regulation as regulation often results in a reduction in disease morbidity without directly affecting mortality. Similarly, the indirect effects of regulation on health and mortality—for example, the fact that requiring infant seats on airplanes drives up the number of infants injured in car crashes—are ignored. However, the estimates presented for the cost and benefits of private risk-mitigation strategies in section 3 are similarly limited, so a comparison of the two may still be of interest.

per life year saved. These costs of regulation, like the incidence of taxation, are usually borne by both consumers and producers.[5] The share of the burden borne by each group depends importantly on the relative elasticity of demand and supply for the good produced by the industry taxed or regulated. Taxes and costs of regulation imposed on goods that have a particularly inelastic demand curve, like gasoline, will be passed on to consumers almost entirely.[6] Taxes and the cost of regulation imposed on goods that have an elastic demand curve, on the other hand, will be borne mostly by producers. Any costs borne by producers will be shared between the owners of capital (in the form of lower profits) and labor (in the form of lower wages). A number of recent empirical and theoretical studies conclude that labor, not capital, bears the majority of the cost of corporate income taxation (more than 50 percent).[7] If we assume these studies are correct and that regulation can be treated as similar in its effects to taxation, then the majority of any tax or regulatory burden is borne primarily by consumers in the form of higher prices and by workers in the form of lower wages.

Lower wages and regulation-induced expenditures on consumer goods reduce disposable income and, therefore, private expenditures on the reduction of health and safety risks. Such reductions in disposable income affect low-income households most severely because the cost of public risk mitigation crowds out their ability to privately mitigate greater probability health and safety risks privately. Empirical evidence suggests that people spend additional income in ways that lowers their private mortality risk.[8] With increasing income, individuals will spend greater

[5] Economists treat regulation as a cost imposed on producers and consumers, similar to taxation. See any standard microeconomics textbook for more detail.
[6] For a recent empirical study on the incidence of gasoline taxation, see, for example, Alm, Sennoga, and Skidmore (2008). For a recent theoretical study on the same topic, see Marion and Muehlegger (2011).
[7] For a survey of the recent empirical literature on the incidence of corporate taxation, see Gravelle (2011). For a survey of both empirical an theoretical contributions on the topic, see Jensen and Mathur (2011).
[8] See Duleep 1986; Williams 1990; Graham, Hung-Chang, and Evans 1992; Chapman and Hariharan 1994; Wildavsky 1981.

amounts of money to mitigate ever smaller risks. Put differently, economists consider health and safety to be a normal good. Like all normal goods, this implies that wealthier households will spend more money on health and safety, while low-income households spend less. In addition, the marginal benefit of increasing expenditures on health and safety has to be decreasing, as households address high-probability, high-severity risks first (taking costs of risk mitigation into account), before addressing lower-probability and lower-severity risks, for which the benefit of risk reduction to the households is lower.[9] This suggests that low-income households will focus on the mitigation of high-probability, high-severity risks that are lower cost per unit of risk, but they are less willing to pay to reduce small-probability risks with higher costs per unit of risk. At some point, both rich and poor households decide that some low risks are not worth reducing. Higher-income households pursue risk-reduction strategies that address much lower risks and are therefore more expensive. Figure 1 shows this phenomenon.

Figure 1: Private Risk-Reduction Preferences of Low- and High-Income Households

[9] "Diminishing marginal utility" is an economics term that applies to most goods. It means that as people get more of something, they become less enamored with it. For example, one might pay a great deal for the first glass of water in a day or for the first personal computer. But it would be expected that people would be willing to pay a great deal less, because it is not as valuable to them, for the 10th or 20th personal computer.

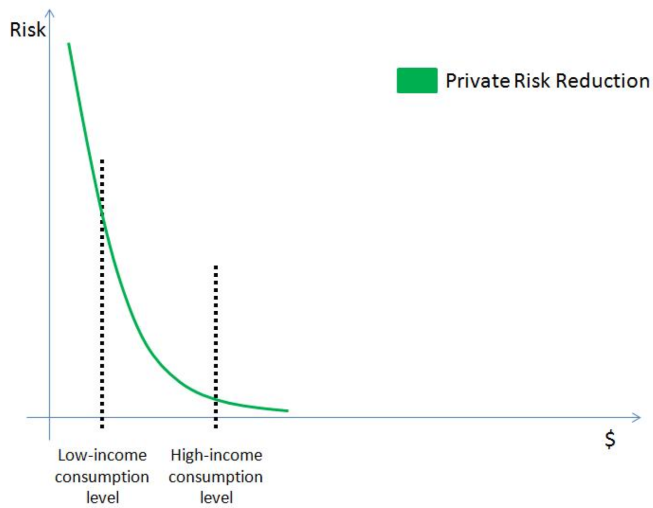
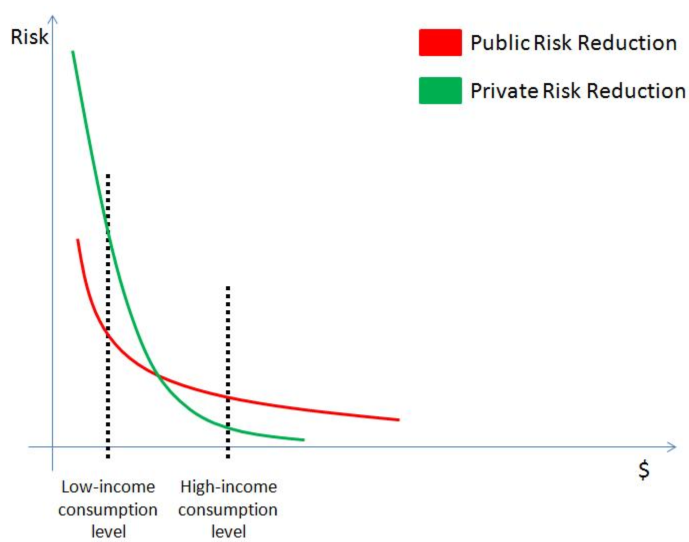


Figure 2 includes possible public risk-reduction strategies and the preferred consumption levels for low- and high-income households for both private and public risk-reduction strategies.

Chart 2: Private and Public Risk Reduction Preferences of Low and High-Income Households



The red line represents a set of opportunities to reduce risk through public measures, the green line opportunities to reduce risk privately. The figure suggests that for higher levels of risk, public risk-reduction strategies are less costly than private risk-reduction strategies, but for lower levels of risk, private risk-reduction strategies are cheaper than their public equivalent. This is plausible as long as the costs of public risk-reduction measures are affected by both economies of scale and knowledge problems.[10] Economies of scale will make some public risk-reduction strategies cheaper than private risk-reduction strategies as long as a large enough subgroup of the population benefits from them. Knowledge problems counteract this beneficial effect of scale economies in risk reduction. Because centrally administered risk-reduction strategies cannot take local knowledge and information into consideration, they will always be less efficient than privately chosen risk-reduction strategies. For example, dietary choices represent large risks but, because of the heterogeneity of choices that need to be made, it is likely that the costs of many kinds of public risk reduction efforts in this area will exceed private risk reduction efforts. In addition, private risk-mitigation strategies can, in some cases, account for both the heterogeneity of individual risk and cost-effective risk-mitigation strategies. Scale economies can outweigh knowledge and heterogeneity issues for large-scale risks (with large benefits of mitigation) that affect a large group of the population. When the group of beneficiaries gets smaller, however, the costs associated with knowledge problems outweigh the benefits of economies of scale.

Figure 2 indicates that at the level of expenditure for risk reduction low-income households are willing to make, public risk-reduction strategies would focus on higher levels of risk. Higher-income households, on the other hand, prefer the elimination of lower-level risks. At the level of risk reduction preferred by high-income households, public

[10] F.A. Hayek (1945) explains that prices solve the problem of knowledge aggregation in the market context. When price signals are absent, as is the case with any publicly provided good, the knowledge problem persists because the institutions that effectively aggregate information are absent and only poorly replaced by alternative institutions for the aggregation of knowledge.

risk-reduction measures seem to be more expensive than similar private measures. At first glance, this might suggest that the current regulatory environment does not actually reflect the preferences of high-income households. However, since the cost of reducing lower-level risks is born by all taxpayers, high-income households will not bear the full burden of the cost as indicated in the figure. Similarly, low-income households are forced to consume a higher level of risk mitigation than they would choose privately and, accordingly, are paying more for risk reduction than they otherwise would, essentially subsidizing the risk-reduction preferences of the wealthy.

As outlined above, public risk reduction through regulation often involves the mitigation of small-probability, high-cost risks, and these cases are more likely to represent the preferences of high-income households. Left to their own devices, low-income households would demand a much lower level of risk reduction than high-income households. Because both low- and high-income households pay for the regulatory mitigation of risks through higher prices, however, public risk-reduction strategies crowd out private risk-mitigation strategies of low-income households. Put differently, regulation has a regressive effect: It redistributes wealth from lower-income households to higher-income households by causing lower-income households to pay for risk reduction worth more to the wealthy. If lower-income households can avoid purchasing higher-priced products regulated to extremely low risk levels, basically expressing their preferences through the market, it mitigates some of the regressive nature of the regulation.

Consider the following example. The National Highway Traffic Safety Administration (NHTSA) recently proposed a mandate requiring all automakers to put rearview cameras in all passenger vehicles by 2014.[11] Currently, such features can be found only in luxury models or are part of upgrade packages, suggesting that the demand for them is limited to higher-income households. The expected benefit of this particular regulation is a reduction in the number of fatalities resulting from drivers backing up and hitting pedestrians. Approximately 228 individuals die annually in such accidents (44 percent are under age five). This particular regulation is expected to reduce the number of fatalities to between 133 and 116 individuals per year (Department of Transportation [DOT] 2010). This is equivalent to a reduction in the risk of being a victim of a backover accident from 1 in every 200,000 children under age five to roughly 1 in every 400,000 children under age five.[12] For the overall number of fatalities without consideration of age, it represents a reduction in the risk of being a victim of a backover accident from currently roughly 1 in every 1.5 million people to 1 in every 3 million people.[13] In comparison, the mortality risk associated with pregnancy is roughly 1 in every 300,000. The risk of being in a backover accident is much smaller.[14]

In the example of rearview cameras, the cost per life saved would be roughly $24 million (this is roughly four times the value that DOT uses to calculate the average benefit on ex ante lives saved, $5.8 million).[15] The NHTSA estimates the total cost of the measure for the auto

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[11] The proposed rule is not yet final. However, the most recent report by the NHTSA (Department of Transportation 2010) suggests that the final rule will mandate rearview cameras for all vehicles. NHTSA delayed the release of a final rule for the second time in February 2012 and is expected to release a final rule in December 2012. The Cameron Gulbransen Kids Transportation Safety Act of 2007 originally required NHTSA to provide a final rule by the end 2011. See *Cameron Gulbransen Kids Transportation Safety Act of 2007*, Public Law 110-189, *U.S. Statutes at Large* 122 (2008): 639, http://www.gpo.gov/fdsys/pkg/PLAW-110publ189/pdf/PLAW-110publ189.pdf.

[12] This calculation uses 2010 Intercensal Estimates of the Resident Population of children under age five from the Census Bureau, which was 20,899,181. See U.S. Census Bureau, "Population Estimates: National Intercensal Estimates (2000–2010)," http://www.census.gov/popest/data/intercensal/national/nat2010.html.

[13] This calculation uses the July 2010 Intercensal Estimates of the Resident Population of the United States, which was 309,349,689. See Ibid.

[14] See Kochanek et al. (2011) for a list of the 2009 death rates for 113 selected causes, which includes the mortality risk associated with pregnancy, reported as 0.3 in 100,000.

[15] Department of Transportation, "Value of Statistical Life and Injuries", March 18, 2009, http://www.dot.gov/regulations/value-statistical-life-and-injuries

industry at roughly $2.7 billion, or roughly $200 per vehicle, which would be passed on to consumers (Department of Transportation 2010). Low-income households have the least resources to absorb and manage those costs. Even if they are initially able to avoid paying the costs of the regulation by purchasing a used car, the greater demand for used cars that results will drive up the price of cars, regardless of whether they have the added security feature. If you further consider an individual's willingness to pay for a specific reduction in the risk of an accident as a function of income, interventions like this are even more difficult to justify. Risk-mitigation strategies like rearview cameras are unlikely to be part of a private risk-mitigation strategy of a low-income household because they offer a very low reduction in risk for a very high cost. Low-income households would be forced to pay for this low-risk, high-cost risk-mitigation strategy once the rule is implemented because it will affect the cost of new and used vehicles.[16] In this sense, such regulations are regressive: They impose the preferences of the rich on lower-income households and force them to share in the cost of risk reduction they are unlikely to pursue privately.[17]

From a societal perspective, the effect of regulation of low-probability risks like this is to redistribute income from poor households to richer households. A low-income household's willingness to pay to reduce low-probability risks is less likely to be great enough to cover the cost of regulation. In those cases where the benefit, based on willingness to pay, is greater for the wealthy than for the poor and the costs are shared equally, regulations are regressive. This would

[16] When the relative price of new cars increases, demand for used cars (a substitute) increases, which drives up the price of used cars. For more information on the effect of a change in the price of a substitute on the market for a particular good, see any introductory microeconomics textbook.

[17] There are potential secondary consequences of this kind of risk-reducing regulation. When low-income households are forced to pay higher prices for new cars as a result of this type of regulation, they may be forced into the market for used cars instead and end up purchasing a car that has neither the newly regulated safety feature, nor other important safety features, thereby leaving them with an overall less safe vehicle. Alternatively, they may forgo the purchase of other safety features that might have offered more benefits to the particular household because of the extra cost of the newly regulated safety feature.

be true of any regulation, but the opportunity costs of regulating extremely small and expensive risks are greater for low-income individuals. To some extent, these regressive effects may be mitigated when low-income individuals can avoid purchasing those kinds of regulated products. Note that this implies also that households may be worse off because they are discouraged from buying a product they may have otherwise wanted to buy.

3. Sample Families

This section introduces a low-income and a high-income household by reviewing some descriptive census statistics for each household. In addition, this section presents the average mortality-risk profile for primarily high- and low-income counties in New York State to offer some insight into the respective risks each of our two households may face.

Both households are family households with two income earners and three children under age 18. The income of the low-income family is $26,023, which is the 2010 Census poverty threshold for a family of five with three children under age 18. The income of the high-income family is $260,230, which is 1000 percent of the 2010 Census poverty threshold for a family of five with three children under age 18.

Table 3 provides some statistical characteristics of U.S. households with income levels similar to the two sample households. The income level of our low-income household (between $25,000 and $29,999) is representative of 5.7 percent of all U.S. households, while the high-income household's level of income (income above $200,000) is representative of 4.0 percent of all U.S. households. Among households with incomes between $25,000 and $29,999, 81 percent live in metropolitan areas, while 94 percent of high-income households live in metro areas. Fifty-nine percent of the lower-income households are family households, and 4.5 percent are five-people households.[18] For the higher-income household category, 89 percent are family households and 11 percent are five-people households. Fifty-three percent of the high-income households have two earners, while only 15 percent of the low-income category households have two income earners. Thirty-four percent of the lower-income households are headed by a person that has completed high school, but only 16 percent hold a bachelor's degree or higher. In contrast, 77 percent of the heads of household of the high-income households have a bachelor's degree or higher.

In addition to differing demographic characteristics for our two sample households, they also face different risk profiles. To illustrate these different risk profiles in more detail, I provide average mortality rates based on county-level data for the 16 counties with the highest incomes and the 16 counties with the lowest incomes in New York, which I obtained from the Center for Disease Control's (CDC) Wonder Online Database. Table 4 reports the annual death rate for various causes of death for the top quartile of counties with the greatest percentage of low-income households and for the top quartile of counties with the greatest percentage of high-income households.[19] As may be expected, the annual death rate for all causes of death is higher in low-income counties than in high-income counties, which supports the idea that low-income households spend less on private mitigation of risk and are therefore exposed to greater levels of risk than high-income households on average. Overall, an individual living in a low-income

[18] The U.S. Census Bureau defines a family household as " a household in which there is at least 1 person present who is related to the householder by birth, marriage or adoption. For further information see U.S.Census Bureau, "About Family and Living Arrangements" last accessed November 14, 2012, http://www.census.gov/hhes/families/about/

[19] The information given in table 4 was obtained from the Census Bureau's American Fact Finder Database (for household income) and from the CDC's Wonder Online Database (for mortality data by county) for 62 New York counties. I divide the counties into quartiles first based on the percentage of households with annual labor and benefits income of less than $35,000. I do the same for the percentage of households with annual income of more than $200,000. Out of 62 New York counties, the 16 with the greatest percentage of low-income households had an average of 41.75 percent low-income households (<$35,000), while the top 16 counties in terms of percentage of high-income households had an average of 7.45 percent high-income households (annual income > $200,000).

county faced a 97 in 10,000 chance of death in 2007, while an individual living in a high-income county faced only a 73 in 10,000 chance of death in the same year.[20]

These results suggest that the low-income family presented in this section is on average subject to much greater private risks than the high-income family to which it is being compared.[21]

4. Private Cost of Risk Reduction

One potential criticism of aggregating mortality risks beyond the individual level is that risks vary greatly from person to person depending on an individual's genetic makeup, risk-taking habits, diet, exercise routine, and so on. The public health literature suggests, however, that neighborhood-level socioeconomic characteristics still matter for individual mortality risk, even after controlling for individual-level characteristics such as income, education, and diet.[22] This section uses existing empirical evidence for neighborhood-level adult-mortality and pediatric-injury risks to estimate the approximate cost and benefits of a potential private risk-mitigation strategy: moving to a higher-income neighborhood. Obviously, moving to a higher-income neighborhood will reduce mortality risk only for risks independent of the individual's private risk-taking behaviors. The empirical results I use to calculate the reduction in mortality

[20] Note, the annual all-cause mortality rate for the United States was roughly 80 in 10,000. Note also that these data are based on the existing regulatory regime; arguably, death rates might otherwise be higher.

[21] There are obvious problems with relying on aggregate data to discuss private risk-mitigation strategies: Most of the mortality risks we face are importantly influenced by individual behaviors such as diet, exercise, and education. However, the next section will make the case that despite the fact that mortality data are difficult to aggregate beyond the level of the individual, neighborhood-level mortality effects persist and have been shown to be empirically relevant.

[22] Bosma et al. (2001) show, for example, that all-cause mortality is significantly influenced by neighborhood-level socioeconomic factors; Dubowitz et al. (2008) show that neighborhood socioeconomic status is significant in explaining individual fruit and vegetable intake; Durkin et al. (1994) estimate the risk of pediatric injury for different census tracts in northern Manhattan using measures of average income in a census tract; and Cubbin, LeClere, and Smith (2000) show that neighborhood socioeconomic determinants affect individual injury mortality rates. For a somewhat dated review of the literature, see Adler and Ostrove (1994).

from moving to a higher-income neighborhood therefore control for individual-level variables such as income, education, employment status, and race. Because I rely on existing empirical data and back of the envelope calculations to arrive at these estimates, the implications of this study are limited. They allow a glimpse, however, at the relative cost and benefit of private risk-mitigation strategies.

Durkin et al. (1994) show that after controlling for individual-level characteristics, neighborhood socioeconomic status still affects pediatric-injury risk ratios. I reproduce the pediatric-injury risk ratios for the different census tracts in Manhattan by quartiles of low-income household concentration from Durkin et al. (1994) in table 5. As can be seen quickly, there is a significant difference in the risk of pediatric injury for census tracts in the lowest quartile of low-income household concentration as compared to census tracts in the highest quartile of low-income household concentration. Overall, children living in census tracts with a greater concentration of low-income households were more than twice as likely to be subjects of a pediatric injury as children living in a census tract with a low concentration of low-income households. Durkin et al. (1994, table 2) report an overall injury incidence of 72 per 10,000 of population and a mortality rate as a result of pediatric injury of 1.8 in 10,000 for the northern Manhattan census tracts in their study.

In table 5, I also report the average of census-tract median contract rent for the four quartiles of census tracts by concentration of low-income households, which I obtained from the 2000 census.[23] The difference in monthly rent between the quartile of census tracts with the highest concentration of low-income households and the quartile of census tracts with the lowest concentration of low-income households is roughly $475. Assuming the differences in risk of

[23] I use 2000 Census data to match more closely the 1983–91 data reported in Durkin et al. (1994).

pediatric injury are attributable to neighborhood-level socioeconomic characteristics and the data used in this study effectively controls for household level characteristics, this estimate suggests that low-income households in northern Manhattan could cut their risk of pediatric injury in half by moving to a census tract with a lower concentration of low-income households. Doing so would involve an increase in their monthly rental rate of $475 on average (increasing monthly expenditures on rent by 22 percent).

Durkin et al. (1994, table 4) report simple linear regression results for the effect of different neighborhood as well as household-level characteristics on the incidence of pediatric injury. They find that for a reduction of 1 percent in the percentage of low-income households in a census tract, the overall risk of pediatric injury would decrease by 16.7 cases in 100,000 population or almost 2 in 10,000. These results suggest that low-income households could obtain significant reductions in the risk of severe pediatric injury by moving to a neighborhood with a slightly lower concentration of low-income households, for a relatively small increase in their rental rate.

What about adult mortality risks? Cubbin, LeClere, and Smith (2000) use data from the National Health Interview Survey (1987–1994) to estimate injury-mortality hazard ratios for different individual- and census tract–level socioeconomic characteristics. Overall, their findings suggest a roughly 25 in 10,000 chance of death. For individuals in their sample, 17.4 percent of all deaths were homicides, 23 percent suicides, 33.8 percent caused by motor-vehicle accidents, and 26 percent were due to other external events.[24] They find that median household income in each census tract has a large effect on injury-mortality ratios even after controlling for individual-level demographics like marital status, income, educational attainment, and

[24] This breakdown of the different causes of death is based on the number of total deaths and the number of observations for each cause of death reported in table 2 of Cubbin, LeClere, and Smith (2000, 519).

employment status. Individuals who live in neighborhoods with a median household income between $0 and $25,953 are 2.7 times as likely to be homicide victims, 1.7 times as likely to be involved in motor-vehicle accidents, and 1.6 times as likely to suffer a fatal injury caused by other external causes as individuals living in neighborhoods with a median family income of $42,933–$150,001 (Cubbin, LeClere, and Smith 2000, table 4).

I combine these results from Cubbin, LeClere, and Smith (2000) with data on median and average rent by income bracket, to estimate the private cost of risk reduction associated with moving to a neighborhood with a lower concentration of low-income households.[25] I obtain this data from the census bureau for all 8,962 New York State census tracts with a median household income of less than $150,000.[26] Note that the data obtained on rent are only for New York State while the data on injury mortality in Cubbin, LeClere, and Smith (2000) are based on a national sample. Despite this difference, the information on rent should help gain a better idea of the approximate private cost of risk reduction in New York State. Table 6 shows that the difference between average/median rent in census tracts with a lower median household income between $0 and $25,953, as compared to census tracts with a higher median household income between $42,933 and $150,001, is roughly $400 a month. This suggests that households could reduce their risk of being the victim of a homicide by 62 percent (from a hazard ratio of 2.66 to a hazard ratio of 1) for a monthly cost of $400. Similarly, by moving, they could reduce their risk of being the victim of a motor-vehicle accident by 42 percent and their risk of being the victim of another external event resulting in death by 37.5 percent. These percentage changes translate roughly

[25] Cubbin, LeClere, and Smith (2000) provides four income brackets $0–$25,953; $25,953–$33,271; $33,271–$42,933; and $42,933–$150,001. I use 2000 Census data (obtained from the American Fact Finder Online Database) on median household income in 1999 and median gross rent by census tract to calculate the average and median rent for all census tracts with a median household income that falls within these four brackets.

[26] The data in Cubbin. LeClere, and Smith (2000) are for the 1987–94 National Health Interview Survey. I use 2000 Census data on median household income and median gross rent by census tract to match the period in Cubbin LeClere, and Smith (2000) as closely as possible.

into a reduction of homicide mortality incidence to 1.7 in 10,000 (for a 2.7 in 10,000 decrease), a reduction in risk of dying in a motor vehicle accident to 4.8 in 10,000 (for a 3.5 in 10,000 decrease), and a reduction of their risk of death from another external cause to 4.2 in 10,000 (for a 2.5 in 10,000 decrease). The only mortality risk that would slightly increase is suicide related risk, which would be 6.2 in 10,000 compared to previously 5.8 in 10,000 (0.4 in 10,000 increase).[27]

Overall, the evidence from Durkin et al. (1994) and Cubbin, LeClere, and Smith (2000), together with the data on average/median household rent, suggests that by spending roughly $500 more on rent a month (for a total annual expenditure increase of $6000), households can reduce their risk of death from different types of events by at least half. Similarly, they can reduce the risk of severe pediatric injury for their children by about 50 percent.

This information is meaningful only when compared to the absolute incidence of such injuries or mortality cases, however. Since data on mortality as well as pediatric injury by income level is not available, a back of the envelope calculation has to suffice. Durkin et al. (1994) report a mean annual injury incidence rate of 72.5 per 10,000, which suggests that the incidence rate for low-income neighborhoods should be slightly above 72.5 per 10,000, and the incidence rate for higher-income neighborhoods should be slightly below it. Using 72.5 per 10,000 population as the injury incidence for low-income neighborhoods and using the risk ratios reported in Durkin et al. (1994) will therefore give us a conservative estimate of the absolute reduction in risk for low-income households that move to higher-income neighborhoods. The authors report that children living in neighborhoods with greater concentrations of low-income

[27] While these private risk reductions are significant (roughly 1/10,000 per year), the cost is also significant ($500 per month). Given that moving could affect multiple children in a single household as well as adults, this type of private expenditure is likely to be a much better deal than many federal risk-reducing measures for these families.

households are 2.2 times more likely to be subject to any type of severe pediatric injury compared to children who live in neighborhoods with lower concentrations of low-income households. This suggests that moving from a largely low-income tract to a moderately low-income tract could potentially reduce these children's risk of pediatric injury by roughly 54 percent—that is, from an incidence of 72.5 per 10,000 with a 1.8 in 10,000 mortality rate to 32.95 cases per 10,000 population with a mortality rate of 0.82 per 10,000 (for a reduction in mortality from severe pediatric injury of 1 in 10,000). This potential private measure for risk reduction is significantly larger than any of the risks health and safety regulation address.[28] Remember from section 1 and table 2 of this paper, for example, that the initial risk addressed by floor emergency lighting in airplanes was as low as 0.00022 per 10,000 population.

We can do a similar back of the envelope calculation for adult injury mortality risk as reported in Cubbin, LeClere, and Smith (2000). The cost of moving from a low-income neighborhood to a high-income neighborhood would lie somewhere between $400 and $500 per month. The mortality risk in the Cubbin, LeClere, and Smith (2000) study is roughly 25 in 10,000 for all deaths, 4.4 in 10,000 for death through homicide, 5.8 in 10,000 for suicide, 8.3 in 10,000 for death through motor vehicle accident, and 6.7 in 10,000 for other external causes of death. As demonstrated, individuals can significantly reduce a number of risks by moving from low-income neighborhoods to higher-income neighborhoods.

The net risk reductions families may obtain simply by moving are significantly larger than any of the initial risks addressed by most federal health and safety regulation. What is the cost per household of different types of regulation and how does it compare to the cost of private

[28] Note that the top five risks addressed by regulation reported in table 2 are larger. However, these numbers reflect the initial annual risk only for the exposed population. If they were adjusted to reflect the initial annual risk for the entire population of the United States, they would in practical terms be zero.

risk reductions described in this section? To allow for at least a tentative comparison of private and public risk-mitigation strategies, the next section estimates the cost and benefit of 36 public risk-mitigation strategies enacted through regulation.

5. The Cost of Regulation

This section provides several examples of the estimated costs of regulation. The premise of this study is that social regulation and health and safety regulation often reflect the preferences of the wealthy and seek to mitigate risks that are small compared to the risks low-income families face on a daily basis. Estimates of the value of better health and greater longevity resulting from the regulation of such negligible risks usually are based on the income of average Americans and therefore ignore specific effects on low-income families (see, for example, Murphy and Topel 2006). However, John Morrall (2003) provides estimates for the cost per life saved for different types of regulation. I use his estimates to construct a measure of the cost of regulation for low- versus high-income households. Morrall finds, for example, that regulation of occupational exposure to asbestos through OSHA (passed in 1986) saves roughly 74 lives each year at a cost of $89 million per life saved. Such stringent occupational asbestos exposure standards drive up the cost of construction, particularly the cost of renovating older buildings. Since low-income households disproportionately occupy older building structures, this regulation affects them directly.

Childcare regulation provides another case in point. Many states require childcare providers to install child-size lavatories and outdoor playground equipment. In addition, strict child-staff ratios limit the size of childcare groups. While such requirements may lead to slight improvements in childcare quality, they do not seem to have a significant effect on long-term childcare outcomes. They do significantly drive up the price of childcare services, however, which has particularly negative consequences for low-income households. For example, for a family with less than $1500 monthly income, the cost of childcare makes up 30 percent of the family budget. The same cost of childcare represents only 7 percent of the budget of a family with a monthly income of $4,500 or more.[29]

To get a better idea of the annual cost of regulation per household, I use Morrall's (2003) estimates of the cost per life saved as well as the number of lives saved per year to calculate the total cost of regulation for each of his 36 examples of implemented regulations. I combine this information with estimates from Keeney (1997) that translate the cost of $1 billion of regulation to the household level.[30] Keeney provides estimates for the cost of regulation by household assuming both that the cost is borne equally by all households and, alternatively, that the cost is borne proportional to income. See table 7 for these results.[31] The 36 regulations together reduce

[29] See Thomas (2011) for more detail on regulation of childcare; see page 30 of the study for the specific source of this information.

[30] For example, Morrall (2003) estimates the cost per life saved for steering column protection at $100,000 (in 1984 dollars). This translates to $166,000 per life saved in 2000 dollars. Morrall also reports that steering-column protection saves roughly 1,300 lives each year. The total cost of saving those 1,300 lives is therefore roughly $215,800,000. Keeney (1997) reports in table 5 of his study that, assuming all households share equally in bearing the cost of regulation, the cost of $1 billion worth of regulation ($1.264 billion in 2000 dollars) translates into a cost of $10.45 per household (or $13.21 in 2000 dollars). I therefore calculate the total cost of steering-column regulation per household as $215,800,000 divided by $1.264 billion multiplied by $13.21 for an annual cost per household of $2.25 for steering-column protection.

[31] The cost of regulation proportional to income for the two types of households is calculated using information from table 5 in Keeney (1997). Keeney reports the cost of $1 billion of regulation per household proportional to income for a number of different income brackets. For the low-income bracket ($25,000–$29,999) I use Keeney's $15,000–$24,999 (in 1991 dollars) income bracket and translate it into 2000 dollars, which corresponds to roughly $18,964–$31,606 (using an inflation factor of roughly 1.26 between 1991 and 2000, obtained from the Bureau of Labor Statistics website [http://www.bls.gov/data/inflation_calculator.htm]) and would therefore contain our sample low-income household. Using this bracket, the year 2000 equivalent of the annual cost of $1 billion of regulation for the low-income household is $6.97. For the high-income household, I use the cost for the highest income bracket recorded in Keeney, which is $75,000 plus (in 1991 dollars). This corresponds to roughly $95,000 in 2000 dollars and is therefore too low to be a good representation of the cost of regulation for the high-income household (income greater than $200,000 per year). Therefore, estimates of the cost of regulation for the high-income household will likely be too low. However, the cost of $1 billion worth of regulation to the high-income household reported in Keeney is $28.76, which translates to $36.36 in 2000 dollars. The cost of $1 billion of regulation to a household when all households share an equal burden is $10.45 in 1991 dollars, which corresponds to $13.21 in 2000 dollars. I

annual mortality risk by roughly 0.18 per 10,000 members of the population. The total cost per household of these 36 regulatory efforts, if all households bear an equal share of the cost of these rules, is roughly $604 dollars per year (in 2000 dollars). If the costs were borne proportional to income, households like our low-income sample household would pay roughly $319 per annum, while high-income households would pay roughly $1,664 (both in 2000 dollars).[32]

Table 8 summarizes the risk reduction and cost for a 1 in 10,000 reduction in mortality from the private risk-reduction strategy of moving to a higher-income neighborhood versus the risk reduction from the 36 regulations in Morrall (2003).[33] As can be seen, the cost of regulation far exceeds the cost of private risk reduction for low-income households. Assuming a proportional distribution of the cost of regulation, the cost of regulation for our low-income households represents roughly between 1 and 1.3 percent of annual income, while the cost of regulation as a percentage of income for high-income households represents roughly 0.83 percent. Assuming equal distribution of the cost of regulation, our low-income household would spend 2–2.4 percent of income on regulation, while the high-income household would spend 0.3 percent of income on regulation.

This somewhat rough approach to estimating the cost of regulation for different levels of income indicates that regulation appears to have a strong redistributive effect. More research on

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also adjust the $1billion figure to 2000 dollars, which translates to roughly $1,264,317,181 using the BLS inflation calculator.

[32] I use the cost of $1 billion of regulation per household from Keeney (1997) together with the total cost of regulation reported in Morrall (2003), both adjusted to 2000 dollars, to calculate the annual cost per household of each of the 36 regulatory efforts reported in table 7. The total cost per household of the reduction in mortality risk of 0.18 per 10,000 members of population reported here is the sum of the cost of each of the 36 individual types of regulation.

[33] Notice that neither of the two measures is a very accurate estimate of the actual costs and benefits of private risk reduction or public risk-reduction strategies. The benefits of the private risk-reduction strategy do not incorporate all potential benefits from relocating to a higher-income neighborhood. Further, it is not clear that the quantified risks would actually be reduced by the amount this study suggests, because mortality risks, while certainly influenced by neighborhood effects, are importantly influenced by individual behaviors such as diet and exercise. Similarly, the 36 different regulations taken from Morrall do not come close to approximating the total cost or benefits of public risk-mitigation strategies. However, both measures give a rough idea of the two alternative strategies for risk reduction.

the topic is needed; however, regulators should recognize the strong likelihood that regulation has a redistributive effect from poor households to the richer households whose preferences are represented by regulation.

6. Conclusion

Well-intentioned regulation often represents the preferences of the wealthy by regulating otherwise negligible risks. By driving up prices for all consumers, such regulation is likely to have disproportionately negative or regressive effects on the poor. This study shows that compared to potential private risk-reduction strategies, regulation tends to target low risks that are extremely expensive to mitigate. Such regulations, therefore, represent the preferences of the wealthy and come at the expense of low-income households.

The 36 different regulations included in this rough estimation of the cost and benefits of public risk-mitigation strategies resulted in a total reduction in the risk of a fatality of 0.18 in 10,000 of population and cost approximately $604 per household, which translates to $3,359 for a 1 in 10,000 reduction in mortality. In contrast, the private risk-reduction strategy of moving to a high-income neighborhood would reduce mortality risk by roughly 8.3 in 10,000 people for adult mortality risks and by 1 in 10,000 for pediatric injury risk. Such private risk-reduction costs a total of $6,000 per household, which translates into a cost of $645.16 for a mortality risk reduction of 1 in 10,000 people. In consequence, having to pay for small risk reductions through regulation may prevent low-income households from taking more beneficial private risk reduction strategies that would result in a greater reduction in mortality.

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Table 1: Annual Death Rate per 10,000 Population,
Top 10 Causes and Specific Accidents (2009)

Cause of Death	Rate*
All Causes	79.4
Heart Disease	19.5
Cancer	18.5
Lung Disease (Emphysema, Chronic bronchitis)	4.5
Stroke	4.2
Accidents	3.8
Alzheimer's	2.6
Diabetes	2.2
Influenza and pneumonia	1.8
Nephritis, nephrotic syndrome and nephrosis	1.6
Suicide	1.2
All Accidents	3.8
Motor vehicle accidents	1.2
Poisoning	1.0
Fall	0.8
Drowning	0.1
Fire	0.1
Accidental Discharge of Firearm	0.02

Source: Kochanek et al. (2011), Deaths: Final Data for 2009, National Vital Statistical Reports, vol. 60, no. 3, Table 11, pp. 93-97.
Note: *Rate is number of people per 10,000 members of the population.

Table 2: Annual Death Rate per 10,000 of Exposed Population for Regulated Risks

Cause of Death	Rate*
TOP 5	
Arsenic (OSHA)	18
Crane Suspended Personnel Platform (OSHA)	18
Underground Construction (OSHA)	16
Oil and Gas Well Service (OSHA)	11
Acrylonitrile	9.4
BOTTOM 5	
DES Cattlefeed	0.0031
Seat Cushion Flammability	0.0016
Cabin Fire Protection	0.00065

Land Disposal Restrictions	0.00023
Floor Emergency Lighting	0.00022

Source: Morrall (2003), Table 1.
Note: *Rate is number of people per 10,000 members of the population.

Table 3: Selected Characteristics of Households, by Total Money Income in 2010

	Low Income ($25,000–$29,999)	High Income (>$200,000)
Total number of households of this size in the United States	6730	4627
Percentage of all U.S. households	5.67%	3.9%
Percentage in Metro Statistical Area	80.52%	94.19%
Percentage Outside Metro Statistical Area	19.48%	5.81%
Percentage in Northeast	16.92%	24.98%
Percentage in Midwest	22.66%	16.34%
Percentage in South	39.87%	32.05%
Percentage in West	20.55%	26.63%
Family Households	58.74%	88.70%
Married-couple families	36.09%	82.73%
Female householder	17.53%	3.09%
Five-people household	4.53%	11.32%
Mean size of household	2.31	3.3
Two earners	15.1%	53.10%
Mean number of earners	0.88	2.06
High school graduate (includes equivalency)	34.46%	7.82%
Bachelor's degree or higher	15.93%	76.72%
Percentage owner occupied	55.85%	90.62%
Percent renter occupied	42.54%	9.03%

Source: The information contained in this table is based on, U.S. Census Bureau and Bureau of Labor Statistics, *Current Population Survey*, 2010, http://www.census.gov/cps.

Table 4: Annual Death Rate by County for Low- and High-Income Counties

per 1000 of population (2008)

Cause	Low-Income Counties	High-Income Counties
Heart Disease	2.987	2.387
Accidents	0.35	0.267
Diabetes	0.271	0.155
Cancer	2.18	1.793
Stroke	0.254	0.156
Suicide	0.1191	0.0863
Homicide	0.0942	0.0418
All Causes	9.68	7.31

Note: The rates reported are average death rates for the 16 New York counties with the highest concentration of households with an annual income of less than $35,000/more than $200,000.
Source: Data for household income obtained from U.S. Census Bureau, American Fact Finder Database 2010 Census, http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml. Data for death rates by county (Underlying Causes of Death - Detailed Mortality) for 2008 obtained from CDC, Wonder Online Database, http://wonder.cdc.gov.

Table 5: Pediatric Injury by Percentage of Low-Income Households in Neighborhood and Average Neighborhood Rent

Concentration of low-income households in census tract	Average % of low-income households	Average of census tract median contract rent (in 2000 dollars)	Pediatric Injury Risk Ration (RRs) for Different Census Tracts: All injuries	Unintentional injuries	Assault injuries	Self-inflicted injuries	Injuries of undetermined cause	Motor-vehicle injuries	Pedestrian injuries	Fall injuries	Gunshot injuries	Burn injuries
lower 25 percentile	17.86	$878.75	1	1	1	1	1	1	1	1	1	1
50 percentile	31.73	$538.00	1.7	1.6	2.6	2.3	1.6	1.9	2	1.5	2.4	1.4
75 percentile	37.67	$490.00	1.7	1.6	2.6	2.3	1.6	1.9	2	1.5	2.4	1.4
top 25 percentile	47.03	$403.48	2.2	2	4.5	1.9	1.8	2.5	3.1	1.9	3.4	1.6

Source: Durkin et al. (1994) and U.S. Census Bureau, 2000 Census.

Table 6: Rate Ratios for Adult Injury Mortality by Cause of Death for Respondents to National Health Interview Survey and Average Rent by Income Bracket for 8,962 New York Census Tracts

Income brackets from Cubbin, LeClere, and Smith (2000), median income for all households in Census Block Group	Average and Median Rent[1]		Hazard Ratios for Injury Mortality by Cause of Death[2]			
	Average Rent	Median Rent	Homicide	Suicide	Motor Vehicle	Other External
$0–$25,953	$532.69	$571.00	2.66	0.95	1.73	1.60
$25,953–$33,271	$680.62	$692.00	1.64	1.46	1.89	1.24
$33,271–$92,933	$751.89	$749.50	2.67	1.01	1.38	1.28
$42,933–$150,001	$960.01	$923.00	1.00	1.00	1.00	1.00

[1] By income group calculated using 2000 Census data for all New York County, New York Block Groups

[2]For persons aged 18–64 who responded to the National Health Interview Survey 1987–94 with follow up until 1995 and linked to the 1990 U.S. Census (n= 472,364) from Cubbin, LeClere, and Smith (2000), full model results reported, which adjust for demographic characteristics, marital status, income to needs, educational attainment, and employment/occupational status.

Table 7: Cost of Specific Types of Regulation for a Low- and a High-Income Household

Regulation[1]	Year[1]	Agency[1]	Annual Lives Saved[1]	Lives saved per 100,000 residents[2]	Total Cost (2000$)[3]	Cost to a low-income household per year (2000$)[4]	Cost to a high-income household per year (2000$)[4]	Cost per household for equal cost distribution (2000$)[4]
Acrylonitrile	1978	OSHA-H	6.9	0.00230	$430,670,400.00	2.37	12.39	$4.50
Alcohol & Drug Control	1985	FRA	4.2	0.00140	$3,486,000.00	0.02	0.10	$0.04
Arsenic	1978	OSHA-H	11.7	0.00390	$1,796,535,000.00	9.90	51.67	$18.77
Arsenic/Copper Smelter	1986	EPA	0.06	0.00002	$2,639,400.00	0.01	0.08	$0.03
Arsenic/Glass Paint	1986	EPA	0.11	0.00004	$3,505,920.00	0.02	0.10	$0.04
Asbestos	1972	OSHA-H	396	0.13200	$4,864,464,000.00	26.82	139.90	$50.83
Asbestos	1986	OSHA-H	74.7	0.02490	$11,073,378,600.00	61.05	318.45	$115.70
Asbestos	1986	EPA	10	0.00333	$1,729,720,000.00	9.54	49.74	$18.07
Benzene	1985	OSHA-H	3.8	0.00127	$107,866,800.00	0.59	3.10	$1.13
Benzene/Fugitive Emissions	1984	EPA	0.31	0.00010	$1,440,880.00	0.01	0.04	$0.02
Cabin Fire Protection	1985	FAA	15	0.00500	$4,980,000.00	0.03	0.14	$0.05
Children's Sleepware Flammability	1973	CPSC	106	0.03533	$228,748,000.00	1.26	6.58	$2.39
Coke Ovens	1976	OSHA-H	31	0.01033	$3,180,228,000.00	17.53	91.46	$33.23
Concrete & Masonry Construction	1985	OSHA-S	6.5	0.00217	$15,106,000.00	0.08	0.43	$0.16
Crane Suspended Personnel Platform	1984	OSHA-S	5	0.00167	$7,470,000.00	0.04	0.21	$0.08
DES (Cattlefeed)	1979	FDA	68	0.02267	$14,900,160,000.00	82.14	428.51	$155.68
EDB	1983	OSHA-H	0.002	0.00000	$51,792,000.00	0.29	1.49	$0.54
Ethylene Oxide	1984	OSHA-H	2.8	0.00093	$118,988,800.00	0.66	3.42	$1.24
Floor Emergency Lighting	1984	FAA	5	0.00167	$5,810,000.00	0.03	0.17	$0.06
Formaldehyde	1985	OSHA-H	0.01	0.00000	$1,195,200,000.00	6.59	34.37	$12.49
Fuel System Integrity	1975	NHTSA	400	0.13333	$199,200,000.00	1.10	5.73	$2.08
Grain Dust	1984	OSHA-S	4	0.00133	$18,592,000.00	0.10	0.53	$0.19
Hazard Communication	1983	OSHA-S	200	0.06667	$597,600,000.00	3.29	17.19	$6.24
Land Disposal	1986	EPA	2.52	0.00084	$14,641,200,000.00	80.71	421.06	$152.98
Oil & Gas Well Service	1983	OSHA-S	50	0.01667	$8,300,000.00	0.05	0.24	$0.09
Passive Restraints	1984	NHTSA	1,850.00	0.61667	$921,300,000.00	5.08	26.50	$9.63
Radionuclides/Uranium Mines	1984	EPA	1.1	0.00037	$12,599,400.00	0.07	0.36	$0.13
Seat Cushion Flammability	1984	FAA	37	0.01233	$36,852,000.00	0.20	1.06	$0.39
Servicing Wheel Rims	1984	OSHA-S	2.3	0.00077	$1,909,000.00	0.01	0.05	$0.02
Side Doors	1970	NHTSA	480	0.16000	$1,035,840,000.00	5.71	29.79	$10.82
Steering Column Protectin	1967	NHTSA	1,300.00	0.43333	$215,800,000.00	1.19	6.21	$2.25
Trihalomethanes	1979	EPA	322	0.10733	$160,356,000.00	0.88	4.61	$1.68
Underground Construction	1983	OSHA-S	8.1	0.00270	$4,033,800.00	0.02	0.12	$0.04
Unvented Space Heaters	1980	CPSC	63	0.02100	$10,458,000.00	0.06	0.30	$0.11

Uranium Mill Trailings/Active	1983	EPA	2.1	0.00070	$184,758,000.00	1.02	5.31	$1.93
Uranium Mill Trailings/Inactive	1983	EPA	2.1	0.00070	$96,213,600.00	0.53	2.77	$1.01
All Regulation Combined			5,471.31	1.82377		319.01	1,664.18	$604.62

[1]The information for regulation, year, agency, and annual lives saved are taken from Morrall (2003, table 1).

[2] Lives saved per 100,000 residents are calculated using Morrall's (2003) total lives saved and dividing by 3000 to get a number for lives saved per 100,000 residents assuming a U.S. population of 300,000,000 residents.

[3] The information for total cost is taken from Morrall (2003) and adjusted to 2000 dollars. Morrall reports his estimates in 1984 dollars. The inflation factor from 1984–2000 of 1.66 was obtained from the Bureau of Labor Statistics (BLS) website (http://www.bls.gov/data/inflation_calculator.htm).

[4] The cost of regulation proportional to income for the two types of households is calculated using information from Keeney (1997, table 5). Keeney reports the cost of $1 billion of regulation per household proportional to income for a number of different income brackets. For the low-income bracket ($25,000–$29,999) I use Keeney's $15,000–$24,999 (in 1991 dollars) income bracket, which corresponds to roughly $18,964–$31,606 in 2000 dollars (using an inflation factor of roughly 1.26 between 1991 and 2000 obtained from the BLS website (http://www.bls.gov/data/inflation_calculator.htm) and would therefore contain our sample low-income household. Using this bracket, the year 2000 equivalent of the annual cost of $1 billion of regulation for the low-income household is therefore $6.97. For the high-income household, I use the cost for the highest income bracket recorded in Keeney, which is $75,000 plus (in 1991 dollars). This corresponds to roughly $95,000 in 2000 dollars and is therefore too low to be a good representation of the cost of regulation for the high-income household (income greater than $200,000 per year). The estimates of the cost of regulation for the high-income household will likely be too low. However, the cost of $1 billion worth of regulation to the high-income household reported in Keeney is $28.76, which translates to $36.36 in 2000 dollars. The cost of $1 billion of regulation to a household when all households share an equal burden is $10.45 in 1991 dollars, which corresponds to $13.21 in 2000 dollars. I also adjust the $ 1billion figure to 2000 dollars, which translates to roughly $1,264,317,181 using the BLS inflation calculator.

Table 8: Cost and Benefits of Regulation vs. Private Risk Reduction

		Risk Reduction (per 10,000 population)	Cost per household per year	Cost for a 1 in 10,000 reduction in mortality risk
Private Risk Reduction	Moving from a largely low-income neighborhood to a neighborhood with fewer low-income households	1 from severe pediatric injury; 8.3 for adult mortality	$6,000.00	$645.16

Regulation (36 measures reported in Morrall [2003])	Low-income household if cost borne is proportional to income	0.18 for exposed population	$319.01	$1,772.28
	High-income household if cost borne is proportional to income	0.18 for exposed population	$1,664.18	$9,245.44
	If cost is distributed equally among all households	0.18 for exposed population	$604.62	$3,359.00

Note: The cost for a 1 in 10,000 reduction in mortality risk is calculated as cost per household per year divided by the risk reduction per 10,000 people. For example, for the private risk-reduction strategy, I divide $6,000 by 9.3 (reduction in pediatric injury plus reduction in adult mortality).
Source: Author's calculations and Morall (2003) , Keeney (1997), Durkin et al. (1994), and Cubbin, LeClere, and Smith (2000)