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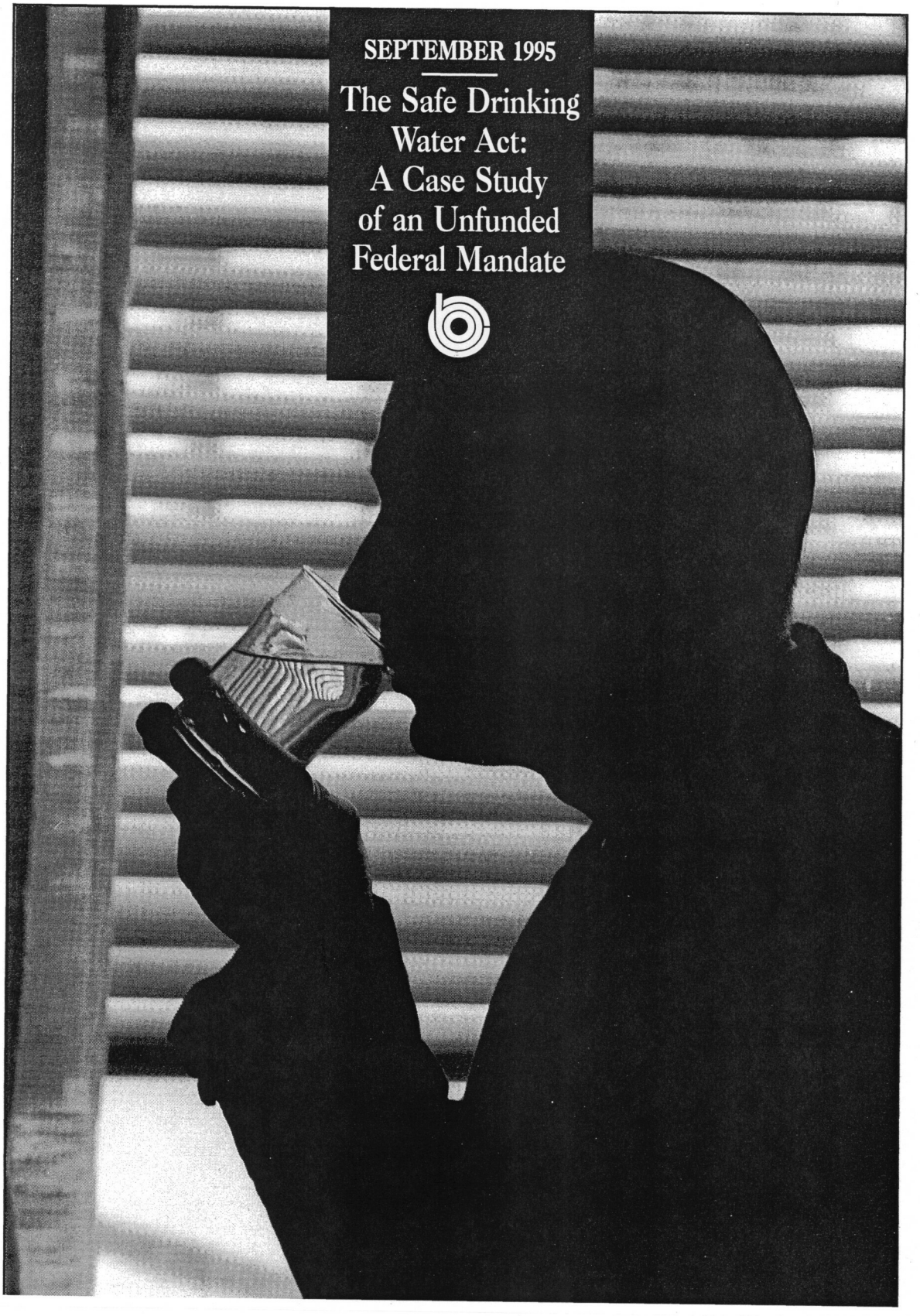
The Safe Drinking Water Act: A Case Study of an Unfunded Federal Mandate



THE SAFE DRINKING WATER ACT: A CASE STUDY OF AN UNFUNDED FEDERAL MANDATE

The Congress of the United States
Congressional Budget Office

NOTES

Numbers in the text and tables of this study may not add to totals because of rounding.

All data on local expenditures are in the fiscal years used by local governments, which end on June 30. All references to legislation are in calendar years.

Preface

The Congressional Budget Office (CBO) prepared this report at the request of the then Chairman of the Senate Committee on Governmental Affairs. The report uses data provided by the Environmental Protection Agency (EPA), the American Water Works Association, and local communities to examine the cost of treating drinking water according to the standards set under the Safe Drinking Water Act (SDWA). It also discusses available data on the benefits that result from treating drinking water and examines the actual use of legislative provisions that are meant to provide the EPA and the states with flexibility in enforcing the requirements of the SDWA.

Terry Dinan of CBO's Natural Resources and Commerce Division wrote the study under the supervision of Jan Paul Acton and Roger Hitchner. CBO analysts Kim Cawley, Teri Gullo, and Matthew Eyles made valuable comments, and Aaron Zeisler and Kim Wegbreit provided assistance with data analysis. Outside CBO, James McFarland, John Cromwell, Robert Raucher, and Robert Stavins provided valuable assistance and reviews. In addition, several staff members of the EPA's Office of Drinking Water and the Bureau of the Census provided useful information.

Paul L. Houts edited the report, and Leah Mazade provided editorial assistance. Angela McCollough typed the drafts. Kathryn Quattrone, Christian Spoor, and John McCarty prepared the study for publication.

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Summary

State and local officials have voiced strong opposition in recent years to the growing number of federal requirements. At the local level, environmental requirements are perceived to be particularly onerous. Critics of those so-called "unfunded mandates" argue that they place a large burden on local governments, the federal government frequently underestimates local costs, the costs of such mandates sometimes outweigh their benefits, and often the mandates lack the flexibility to accommodate important differences in local conditions. The Congressional Budget Office (CBO) examined available data to determine the validity of those criticisms with respect to the Safe Drinking Water Act (SDWA). The SDWA was enacted in 1974 and requires all public water systems to meet drinking water standards and monitoring requirements that the Environmental Protection Agency (EPA) has developed.

CBO chose to use the SDWA as a case study of the unfunded mandates issue because the SDWA has been identified as one of the more burdensome federal mandates. In addition, examining its local cost impact is relatively easy because only a limited amount of federal aid is provided to drinking water systems. Consequently, one does not need to try and separate federally funded costs from locally funded costs for most systems. Even with that simplifying feature, this case study highlights many of the difficulties in measuring the costs and benefits of federal mandates. Data on costs and benefits are limited. In addition, no reliable method exists to estimate the incremental cost of the SDWA--that is, the additional expenditures that federal standards require water systems to make above and beyond the expenditures that they would have made to ensure safe drinking water without such standards. Despite those difficulties, this study reaches several conclusions.

To Date, the SDWA Has Resulted in Fairly Modest Costs for Most Households

Although the SDWA has been cited as a particularly burdensome mandate, available data do not indicate that it has imposed high costs on most households. Cost estimates from the EPA and available data on actual experiences with costs at the local level both indicate that most households--approximately 80 percent--are expected to incur costs of less than $20 per year to treat their drinking water to meet the standards specified by the existing rules of the SDWA. Moreover, comparing EPA data with available local estimates does not reveal that the EPA has underestimated local compliance costs.

The limited available data indicate that the Safe Drinking Water Act currently places a small fiscal burden on most municipalities, accounting for less than 0.1 percent of median household income or average residential property values. Although those results are important, this study did not examine the cumulative effect that multiple federal mandates have on municipalities.

Average household costs are modest for most communities, but some could face very high household costs--in excess of $100 per year--under existing drinking water standards. Households served by small water systems are particularly likely to face high costs. Furthermore, compliance costs could increase significantly over time. In fact, four rules that are currently proposed under the SDWA could more than triple compliance costs.

Benefit-to-Cost Ratios Vary Widely by Categories for Contaminants and System Sizes

For both existing and proposed regulations for carcinogens in drinking water, CBO examined available data on the cost per cancer case avoided--that is, the cost to prevent a single case of cancer. Those data indicate that the cost per cancer case avoided varies greatly among contaminants. For example, the average cost per cancer case avoided (averaged for all system sizes) is estimated at $500,000 for regulating the pesticide ethylene dibromide and its co-contaminants compared with more than $4 billion for regulating the pesticides atrazine and alachlor. In addition, the cost per cancer case avoided tends to increase sharply as the size of the system decreases. For example, in the category for the largest-sized systems, the expected cost per cancer case avoided because of the proposed regulation of adjusted gross alpha emitters (which primarily reduces exposure to the radionuclide polonium) is $600,000 compared with more than $1 billion for the category for the smallest-sized systems.

Conclusions about the merits of drinking water standards are limited by a great deal of uncertainty underlying estimates of both costs and benefits. However, in some cases the cost per cancer case avoided would need to be decreased by a factor of 10 or more to fall within the range that is generally considered reasonable.

The most costly rule currently proposed is the Disinfectants/Disinfection By-Product (D/DBP) Rule. The degree to which that rule would reduce the risk of cancer is extremely uncertain. The EPA estimates that the average cost per cancer case avoided ranges between $867,000 and $8.7 billion in the initial stage of the rule and between $840,000 and $19 billion in the extended stage.

The second most costly rule currently proposed is the Enhanced Surface Water Treatment (ESWT) Rule, which is designed to prevent the outbreak of waterborne gastrointestinal diseases. Using an estimate of medical costs and lost wages as a measure of benefit, the benefits are expected to exceed the average cost per case of waterborne disease avoided as a result of complying with the proposed initial phase of the ESWT rule (averaged for all systems). That assessment, however, is based on limited data on the potential risk of waterborne diseases.

The EPA's and States' Use of Legislative Tools to Provide Flexibility to Water Systems Has Been Limited

One benefit of federal drinking water standards is the assurance that all water systems meet minimum health standards. A potential disadvantage of federal requirements, however, is that uniform requirements may cause some localities to take actions that do not make sense for their specific community--such as testing for chemicals that are not used in their area or undertaking treatment measures for which the costs far outweigh the benefits. An important question, therefore, is whether the SDWA provides sufficient flexibility to adjust requirements in those cases.

The SDWA provides the EPA and the states with several tools that are designed to allow them to provide flexibility to water systems. Those measures of flexibility, however, have not been widely used. Furthermore, numerous barriers prevent more wide-

spread use of those measures. Such barriers include constraints on resources, concerns about public perception, and the effect that those measures might have on protecting public health.

The SDWA Case Study Highlights Challenges That CBO Faces in Providing State and Local Cost Estimates

The Unfunded Mandates Reform Act of 1995 requires CBO to estimate the costs that proposed legislation will impose on state and local governments as well as the private sector. The SDWA case study highlights some of the challenges involved in fulfilling that responsibility. Because mandates are often designed to achieve goals that state and local governments share, a particularly difficult issue is how to estimate the additional, or incremental, costs that a mandate imposes--above and beyond the expenditures that state and local governments would have made in its absence.

Estimating state and local costs at the legislative stage is more difficult than estimating the cost of current and proposed standards under the SDWA for at least three reasons. First, legislation is often broad and lacks the specifics, which are developed through the regulatory process, to project costs. Second, many of the sources of data used in this study are not available at the legislative stage. Third, often only a very limited amount of time is available to collect information on projected state and local costs. As a result of those complicating factors, cost estimates constructed at the legislative stage will be much less precise than examinations conducted after the law or regulation has taken effect.

Chapter One

Introduction

In the past several years, a growing movement has attempted to draw attention to the costs that state and local governments bear in complying with federal requirements. At the local level, environmental laws are regarded as particularly burdensome. For example, in two surveys that were designed to draw attention to the cost that federal mandates impose on local governments, over half of the mandates on which localities provided information were environmental ones.[1] The Congressional Budget Office (CBO) examined the Safe Drinking Water Act (SDWA) as a case study of federal mandates. The SDWA requires all public water systems to comply with drinking water standards and monitoring requirements developed by the Environmental Protection Agency (EPA).

CBO chose to use the SDWA as a case study of federal mandates for two reasons. First, it has often been cited as a particularly onerous mandate.[2] Second, examining the local cost impact is relatively easy because only limited offsetting federal funds have been provided to localities; hence, separating local from federal cost shares is unnecessary.

The increasing concern about the costs that federal mandates impose on state and local governments has led the Congress to pass legislation--the Unfunded Mandates Reform Act of 1995--that would make it harder to enact additional unfunded mandates. That legislation allows Members of Congress to raise a point of order against intergovernmental mandates that exceed a $50 million threshold unless funding is provided to pay fully for the mandate. The legislation also requires CBO to estimate the cost of federal mandates to state and local governments.

The analysis of the SDWA conducted in this study does not represent the types of cost estimates that CBO will make under the Unfunded Mandates Reform Act. Rather, this study is a much more complete analysis that examines both costs and benefits using data that are typically not available at the legislative stage. (See Chapter 6 for a more complete discussion of the requirements of the Unfunded Mandates Reform Act of 1995 and the challenges that CBO faces in providing state and local cost estimates.)

Study Objectives

Critics of unfunded mandates argue that the number of mandates that the federal government has imposed on state and local governments has increased while the amount of federal aid has declined and that those

1. See the U.S. Conference of Mayors, *Impact of Unfunded Federal Mandates on U.S. Cities* (Washington, D.C.: U.S. Conference of Mayors, October 1993); and National Association of Counties, *The Burden of Unfunded Mandates: A Survey of the Impact of Unfunded Mandates on American Counties* (Washington, D.C.: National Association of Counties, October 1993).

2. For example, see "Costly Federal Mandates Spur Protest," *Washington Post*, October 27, 1993, p. A3.

mandates displace local priorities. Furthermore, they argue that the federal government has often underestimated the cost of complying with those mandates; the costs of the mandates sometimes outweigh the benefits; the mandates have placed a large burden on local governments; and the federal mandates are inflexible, requiring localities to do things that do not make sense for their particular communities.

Conversely, proponents of federal mandates argue that they prevent states and localities from imposing costs on citizens or businesses outside their boundaries and that they ensure that citizens are guaranteed a minimum level of safety (such as clean drinking water) or rights (such as access to public facilities for handicapped people) regardless of where they live or travel. In addition, uniform national standards may be more efficient than multiple state or local standards in some cases, such as for companies that have plants in different locations. Finally, uniform standards may prevent local governments from setting lower safety or environmental standards in order to attract businesses to their area.

In this study, CBO examines whether some of the criticisms that have been made of federal mandates are valid for the SDWA. Specifically, it examines whether the SDWA:

- Has imposed large costs on households,
- Has costs that exceed benefits,
- Has imposed a large fiscal burden on municipalities, and
- Lacks flexibility to allow regulators to adjust the act's requirements based on the specific circumstances of individual communities.

In addition, CBO examines whether the available data on the SDWA show that the federal government has underestimated the actual costs of compliance. Finally, CBO uses the SDWA to draw conclusions about the challenges that it faces in providing state and local cost estimates.

Measuring the Incremental Cost of Unfunded Federal Mandates

Many federal mandates are designed to achieve a goal that state and local governments share. Consequently, many state and local governments would take actions toward achieving that goal without a federal mandate. The true cost of the mandate, therefore, is the incremental cost that the mandate imposes on state and local governments. For example, most communities strive to provide their residents with safe drinking water. They would undertake some testing and treatment of their drinking water even without federal requirements. Calculating the incremental cost of the SDWA requires subtracting the cost of treatment and testing that communities would have undertaken without the mandate from the total treatment and testing costs that they incur once the mandate is in place. Unfortunately, no accurate method is available to determine what communities would have done if no federal requirements had been in force.

Because the actions that communities would have taken without a mandate are unknown, cost estimates of mandates typically reflect total, not incremental, costs. Those cost estimates, therefore, generally overstate the cost of the mandate. For example, when the EPA estimates the cost of the SDWA, it typically does not attempt to exclude the costs of testing and treatment that communities would have undertaken without federal drinking water standards.

Data on the Costs and Benefits of the Safe Drinking Water Act

Three primary sources provide information about the cost of the SDWA:

- Census data indicate actual expenditures for drinking water by local governments in the United States. Although those data reflect actual costs at the national level, they do not provide a breakdown of what share of the costs are the result of drinking water treatment, as opposed to delivery.

- Engineering models are used to construct cost estimates based on assumptions about treatment design characteristics and cost components. An advantage of those estimates is that they may be designed to represent costs at the national level. However, they have two major limitations. The costs generated by those models depend on numerous assumptions and may not accurately reflect actual costs. In addition, those estimates do not account for the actions that communities would have undertaken in the absence of drinking water standards--that is, they reflect total, not incremental, costs.

- Data on actual costs at the local level are available in the form of case studies and surveys. The most comprehensive source of data on actual local costs (and the one used in this study) is a municipal expenditure survey that was conducted by Price Waterhouse for the United States Conference of Mayors and the National Association of Counties. That survey, however, was not designed to be representative at the national level, has numerous quality control limitations, and also reflects total--not incremental--costs.

Data on benefits are even more limited than those on costs. Estimates of benefits do not accompany local estimates of actual costs for particular communities in the municipal expenditure survey. The EPA is the primary source of information on benefits. In some cases, the EPA provides information on the number of health effects (such as cases of cancer or gastroenteritis) that may be avoided as a result of the regulation. In other cases, it is only able to estimate the number of people who will avoid exposure to a contaminant.

Although the data on both costs and benefits are limited, careful examination and comparison of the available data reveal important insights into the magnitude of the burden that the SDWA places on local communities and the potential sources of local discontent.

Background on Drinking Water Regulations and Trends in Cost

Local governments treated their drinking water to ensure acceptable taste and odor and to prevent the outbreak of acute waterborne disease long before the Environmental Protection Agency was established and the SDWA was enacted. The initial federal action concerning drinking water was the establishment of the Public Health Service (PHS) Hygienic Laboratory in 1901.[3] That laboratory investigated infectious diseases. In 1914, the PHS established criteria to test drinking water that interstate carriers used. Over time, those standards began to be applied to water that was distributed by municipalities, and such standards were revised in 1925, 1946, and 1962. By 1971, a large number of states had officially adopted or were using the PHS drinking water standards. However, the federal enforcement authority was limited to prohibiting interstate carriers from using water from a system that failed to comply with standards.

Several events led to the passage of the SDWA in 1974, which considerably expanded the federal role in protecting drinking water. First, although waterborne diseases had been virtually eliminated since the 1930s, they began to reemerge during the 1960s. One explanation for that reemergence was that states switched often limited resources away from drinking water safety programs to deal with water pollution following the inception of the federal water pollution program in 1948. In response to the reemergence of waterborne disease, the Bureau of Water Hygiene of

3. The discussion on drinking water treatment before the passage of the SDWA and the factors that led to its passage is drawn from Thomas J. Douglas, "Safe Drinking Water Act of 1974--History and Critique," *Environmental Affairs*, vol. 5 (Summer 1976); statement of Robert W. Fri, Deputy Administrator, Environmental Protection Agency, before the Subcommittee on Public Health and Environment of the House Committee on Interstate and Foreign Commerce, March 8, 1973; and Congressional Quarterly, *Almanac: 93rd Congress, 2nd Session--1974*, vol. 30 (1974), pp. 423-426.

Box 1.
Existing and Proposed Rules Under the Safe Drinking Water Act as of September 1994

Following the 1986 amendments to the Safe Drinking Water Act, the Environmental Protection Agency (EPA) issued seven major rules (referred to as "existing rules" in this study). In addition, EPA has proposed four more rules.

Existing Rules

The EPA has issued rules for both individual contaminants, such as fluorides, and groups of contaminants, such as inorganic compounds. Each of the final rules is listed below. The Phase II rule is broken down into synthetic organic compounds and inorganic compounds. The date in parentheses indicates when the rule was published in the *Federal Register*. Rules generally become effective 18 months after they are published.

Fluoride (April 2, 1986). Fluorides occur naturally and are added during the treatment process in many water systems. Amounts greater than two parts per million can have harmful effects, ranging from discoloration and pitting of teeth to bone and skeletal damage. Systems must test for fluoride. If it is found to be above allowable levels, they must change their operations or take other actions to lower the level.

Phase I Volatile Organic Compounds (July 8, 1987). Volatile synthetic organic chemicals (VOCs) are man-made compounds used for a variety of industrial and manufacturing purposes in the form of products such as solvents, degreasers, and dry cleaning chemicals. VOCs have adverse effects on the liver, kidneys, and nervous system, and they may cause cancer in humans. Water systems must sample for VOCs. When the compounds are found, the source of the VOCs must be removed or treatment must be undertaken.

Surface Water Treatment Rule (June 29, 1989). The rule for treating surface water requires treatment to control bacteria and other microbes that are difficult to detect and pose immediate health risks. This rule covers all surface water systems and groundwater systems that are under the direct influence of surface water. The rule requires affected systems to disinfect and install a subset of systems to filter their water.

Total Coliform Monitoring (June 29, 1989). Total coliform monitoring requirements affect all community water systems. Systems are required to conduct monthly tests for coliform bacteria, which indicate whether potentially harmful bacteria may be in the water. Over the years, bacteria from sewage and animal wastes have presented the most frequent and immediate health risks to community water supplies.

Phase II Synthetic Organic Compounds (January 30, 1990, for 14 Contaminants; July 1, 1991, for One Contaminant). This rule covers Phase II synthetic organic compounds (SOCs) and nonvolatile man-made compounds, primarily pesticides and polychlorinated biphenyls. Adverse health effects from exposure to SOCs include damage to the nervous system and kidneys and risk of cancer. Vulnerable water systems must test for SOCs. If the contaminants are found, the source of the SOCs must be removed or the water supply must be treated to remove them.

Phase II Inorganic Compounds (January 30, 1990, for 19 Contaminants; July 1, 1991, for Four Contaminants). Phase II inorganic compounds (IOCs) may be naturally occurring in geological structures or they may be caused by mining, industrial, or agricultural activities. In large amounts, these chemicals can damage the liver, kidney, nervous system, circulatory system, blood, gastrointestinal system, bones, or skin.

the PHS undertook a study of 969 public water systems in 1969. That study played an important role in generating Congressional interest in legislation on drinking water and the ultimate passage of the SDWA. It indicated deficiencies in the quality of drinking water, the capacities of purifying and distribution systems, and the surveillance of water systems by state and local officials. Furthermore, the study noted that many of the Public Health Service's drinking water standards had been based on insufficient data and that they did not cover many contaminants found in drinking water.

All community water systems must monitor for regulated IOCs. If IOCs are found, their level must be adequately reduced or treatment must be undertaken.

Lead and Copper (June 7, 1991). Lead and copper contamination generally occurs after water has left the public water system. Therefore, testing for it should be done at household faucets. Water systems must target homes with a high risk of lead and copper contamination and conduct tests in those locations. If contamination is found, water systems must reduce the corrosiveness of the water or replace materials containing lead under the control of the water system. Water systems are not required to replace customers' pipes containing lead.

Phase V SOCs and IOCs (July 25, 1992). See the description above of Phase II SOCs and IOCs.

Proposed Rules

The EPA has proposed four rules that are not yet final. The Radionuclides Rule and the Sulfate Rule cover compounds that the EPA was specifically required to regulate under the 1986 amendments. The Disinfectants/Disinfection By-Product Rule is one of the first group of 25 substances for which EPA is required to set standards.

Radionuclides Rule. The Radionuclides Rule sets standards for radon-222, radium-226, radium-228, uranium, and adjusted gross alpha emitters. Those radionuclides are classified as Group A human carcinogens; in addition, uranium is toxic to kidneys. People can be exposed to radionuclides by drinking tap water that contains them or by inhaling radionuclides released into indoor air from tap water. The proposed rule on radionuclides primarily affects groundwater systems.

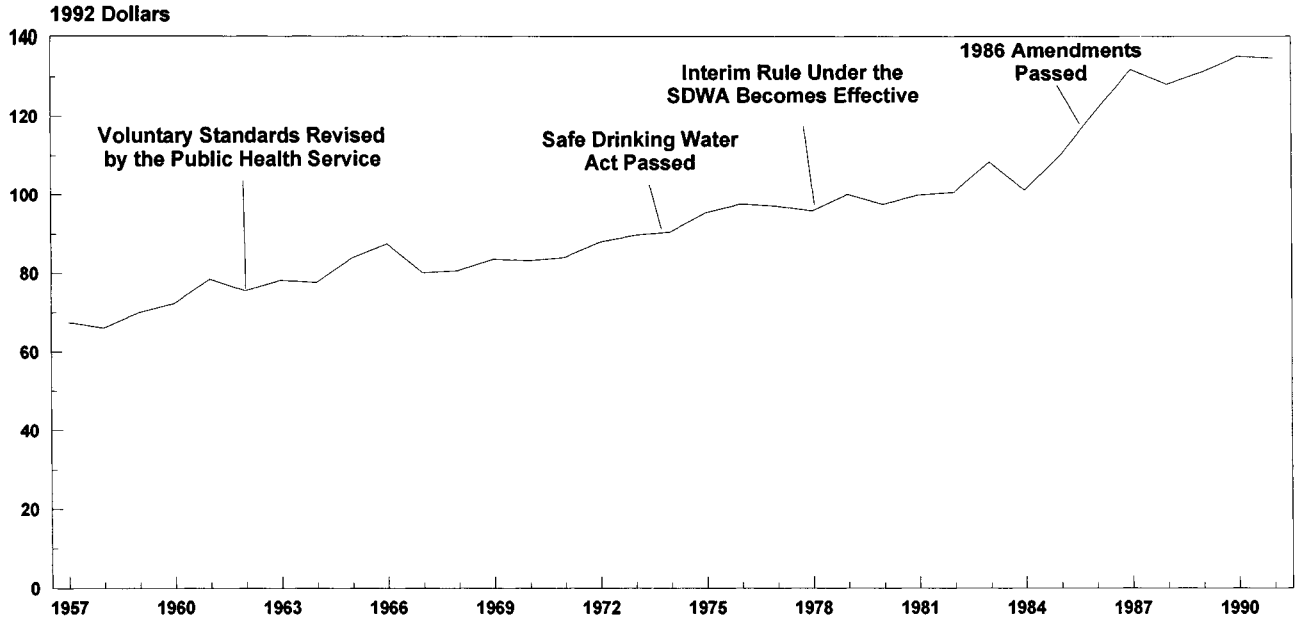
Disinfectants and Disinfection By-Products. Disinfectants (such as chlorine) are used by over 90 percent of surface water systems and less than one-half of groundwater systems to prevent diseases caused by microbiological contaminants. Although disinfection provides important benefits, the disinfectants themselves can react with organic materials in water supplies to form disinfection by-products. Such by-products may ultimately increase the risk of cancer. Stage I of the proposed rule would require systems to use existing treatment processes to remove precursors (for example, total organic carbon) of disinfection by-products. Stage II would require systems serving more than 10,000 people to undertake testing and treatment for disinfection by-products. An extended Stage II would expand those requirements to all systems.

Enhanced Surface Water Treatment Rule. The rule on enhanced surface water treatment (ESWT) would expand the controls established under the Surface Water Treatment Rule. Additional controls are proposed because of new evidence that exposure to microbial contaminants in surface waters may be significantly greater than previously believed. In addition, requirements under the proposed rule for disinfectants and disinfection by-products may result in greater risk from microbial contaminants. Under the proposed rule, an "interim" ESWT rule would require additional controls for systems serving more than 10,000 people. A "long-term" ESWT rule would extend those requirements to all systems.

Sulfate Rule. The primary adverse health effect of ingested sulfate is diarrhea in unacclimated individuals, who include infants and new residents and visitors to high-sulfate areas. The Environmental Protection Agency is proposing four options for regulating sulfate. The preferred option, Option 1, is an alternative to central treatment. Under that option, a system may comply by providing the exposed population with alternative water supplies, establishing and maintaining a public education program, and carrying out a public notice program. Under that option, systems may still opt for central treatment, and almost all large systems are expected to do so.

In addition to the reemergence of waterborne diseases, the passage of the SDWA stemmed from a concern about introducing many new chemical pollutants into water supplies following World War II and the belief that treatment technology for drinking water was not advancing rapidly enough to address those types of pollutants. Two reports--one by the Environmental Defense Fund and the other by the EPA--linked certain pollutants found in drinking water with cancer. Those reports provided the final impetus needed to pass the SDWA.

Figure 1.
Annual Local Expenditures for Water Supply Measured on a Per Capita Basis, 1957-1991



SOURCE: Congressional Budget Office calculations based on data from the Environmental Protection Agency and the Bureau of the Census.

NOTES: Local expenditures were divided by estimates of the population served by publicly owned community water systems.

SDWA = Safe Drinking Water Act.

In 1974, the Congress passed the SDWA and directed the EPA to define national interim regulations for primary drinking water while final regulations were being developed. The interim regulations codified existing health standards; they were promulgated in December 1976 and became effective in mid-1978. Another rule--the total trihalomethane regulation--was issued in 1979 and became effective 18 months later. Trihalomethanes are cancer-causing by-products that may form when drinking water is treated with chlorine. The interim regulations and the total trihalomethane rule were the only national regulations covering drinking water in effect before the 1986 amendments to the Safe Drinking Water Act were passed.

The 1986 amendments directed the EPA to develop regulations for 83 specific contaminants as well as regulations mandating filtration (for those water systems supplied by surface water sources) and disinfection (for all water from public water supplies).[4] In addition, the law required the EPA to regulate 25 additional contaminants every three years. Since 1986, the EPA has issued seven major regulations that establish standards for either a specific contaminant or groups of contaminants. Under those rules, the EPA sets standards--called maximum contaminant levels--for each contaminant. All of the seven rules are now in effect. Moreover, four regulations are currently in the proposal stage. Two of the proposed rules would be phased in, either having less rigorous requirements or only covering large systems in the initial phase. (See Box 1 on pages 4 and 5 for a listing of the existing and proposed rules.)[5]

4. Environmental Protection Agency, *Estimates of the Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act* (March 1990).

5. Rules that are now in their final form are referred to as "existing rules" in this report. The EPA refers to those rules as "final rules."

To date, no federal aid has been provided to drinking water systems for the explicit purpose of helping them to comply with the SDWA requirements. Since 1940, however, the Department of Agriculture's Rural Development Administration has provided loans to drinking water systems in rural areas or in cities or towns having populations of 10,000 or less. A grant program was added in 1966. Although most of those funds have been used to build infrastructure for water delivery, the program does not preclude recipients from using the funds to build drinking water treatment facilities.

Average per capita local water expenditures by publicly owned water systems (net of federal funds and adjusted for inflation) have increased significantly, rising from $67 in 1957 to $132 in 1991 (see Figure 1).[6] Using the average household size in those years would bring those costs to $223 per household in 1957 and $343 in 1991.

Increased treatment of drinking water is a factor that could explain at least part of the increase over the 1957-1991 period. However, numerous other factors could contribute to the increase as well. In addition to the need to treat their drinking water, water systems face rising costs for replacing and upgrading their aging infrastructure for water delivery and may be forced to use higher-cost water supplies as populations grow and low-cost supplies are depleted. In addition, increases in household income affect the demand for water.[7]

6. Note that in some years, real (inflation-adjusted) per capita expenditures decreased because nominal per capita expenditures increased less than the inflation rate.

To figure per capita costs, CBO divided local expenditures for water supply in each year by an estimate of the population served by locally owned public water systems. That estimate was based on Bureau of the Census data on the percentage of households served by public and private community water systems and on information about the percentage of community water systems that are publicly, rather than privately, owned (see the appendix for details on how per capita costs were constructed). CBO obtained the latter information from the EPA's Federal Reporting Data System.

7. Models of residential demand for water have generally found income to have a small but statistically significant effect. The magnitude of that effect varies with the model, the region of the country, and the price rate structure. However, most estimates indicate that a 10 percent increase in income would result in an increase in water consumption of between 1 percent and 2 percent. For example, see Michael Niegwiadomy and David Molina, "Comparing Residential Water Demand Estimates Under Decreasing and Increasing Block Rates Using Household Data," *Land Economics*, vol. 65, no. 3 (August 1989); and Michael Niegwiadomy and David Molina, "A Note on Price Perception in Water Demand Models," *Land Economics*, vol. 67, no. 3 (August 1991).

Chapter Two

Total National Estimates of SDWA Costs

Two organizations provide engineering-based estimates of the total cost of meeting federal requirements for safe drinking water: the Environmental Protection Agency and the American Water Works Association (AWWA), a group of major suppliers of drinking water. The EPA estimates that water systems will spend $1.4 billion a year to comply with existing Safe Drinking Water Act rules that go beyond preexisting voluntary guidelines. The AWWA estimates that same cost to be $2.3 billion per year. If proposed rules are passed in their current form, those costs could increase substantially. In fact, the total cost of treating water according to SDWA standards would eventually triple based on the EPA's cost estimates and more than quadruple based on the AWWA's estimates.

Limitations on Data

A primary limitation of the engineering-based estimates of costs provided by the EPA and the AWWA is that they generally reflect total--not incremental--costs. That is, some water systems that do not currently meet a standard would choose to treat their water even without the regulation, and the EPA and AWWA data do not reflect that outcome. Similarly, they do not deduct monitoring costs for communities that would have chosen to test for regulated contaminants without federal requirements.

The second major drawback to engineering-based models is that they are founded on numerous assumptions. The accuracy of the estimates depends on the realism of the modeling and the validity of those assumptions, which include the following:

- The occurrence of contaminants and the type of water system in which they exist (surface water or groundwater, large or small).

- The actual number of treatment units. Information is available on the number of water systems in the United States. However, some systems have multiple treatment units, and estimates of the total number of treatment units differ.

- The treatment technologies that water systems would choose. The type of treatment that a community ultimately chooses will depend on numerous factors, including the characteristics of its source water, the treatment equipment that is currently in place, and the availability of land.

- The cost of purchasing and operating given technologies. Large variations in cost may occur as a result of many factors, including operator capability, availability of financing, and the cost of labor and land.

- The cost of monitoring water quality. Actual monitoring costs will vary based on the number

of waivers granted, local laboratory costs, and the analytic methods used.

Engineering-based cost estimates may ultimately prove to be quite different from the costs that specific water systems incur to treat their drinking water according to the level of federal standards. Nevertheless, by making assumptions about how communities will respond to a regulation, engineering analyses can provide some understanding of the cost of a regulation as it is being developed.

Total Cost Estimates for Existing and Proposed Rules

Both the EPA and the AWWA have recently published engineering-based estimates of the total annual cost of treating drinking water according to federal standards specified by the Safe Drinking Water Act. The EPA estimates that water systems will spend $1.4 billion per year to comply with existing standards, and the AWWA estimates that water systems will spend $4.1 billion (see Table 1). The AWWA's estimate is built on EPA data on the occurrence of contaminants, choice of technology, and unit treatment costs. Its estimate is higher than the EPA's for two main reasons. First, the AWWA uses different assumptions about the number of treatment units. Second, its estimate includes the cost of complying with some standards that the EPA excludes--specifically some of the Phase II standards.

The EPA issued the Phase II Rule after the Congress passed the 1986 amendments to the SDWA. Many of the standards set under that rule merely formalized (or sometimes strengthened) standards that existed earlier--first under the standards established by the Public Health Service in 1962 and then under the interim rules issued by the EPA in 1976. Because those standards had been in effect for a long time, the EPA assumed that most water systems were already complying with them before the Phase II Rule was promulgated.[1] Therefore, in estimating the cost of the rule, the agency included only the additional cost that the rule imposed--that is, the cost resulting from standards that were strengthened. The AWWA, however, included the full cost of meeting all of the Phase II standards. If the AWWA's estimate of the total cost of all existing rules was adjusted to include only the additional cost of the Phase II regulations, it would drop to $2.3 billion--approximately 60 percent more than the EPA's total cost estimate.

The primary reason for the difference between those two estimates is alternative assumptions about the number of treatment units. If the AWWA had developed its own assumptions about the technologies that would be chosen and the cost of purchasing and operating those technologies, then the divergence between the two estimates could be much greater.

If the EPA's assumption that systems were complying with voluntary rules (or would have eventually done so on their own) is correct, the practice of excluding the relevant portion of the costs of the Phase II Rule from the estimate of the cost of the SDWA is consistent with the notion of identifying an incremental cost. Consequently, the Congressional Budget Office attaches more significance to the AWWA's $2.3 billion per year estimate than to its $4.1 billion per year estimate. Except for the portion of the Phase II regulations, the EPA's cost estimates do not deduct the cost of actions that water systems might undertake on their own. As a result, $1.4 billion to $2.3 billion per year should be viewed as a range of estimates of the total cost that water systems will bear to comply with SDWA regulations that went beyond pre-SDWA standards. The incremental cost of those regulations could be substantially less, but it cannot be estimated.

In addition to estimating the cost of treating water to the standards required by the existing rules discussed above, the EPA has also published estimates of the total cost of four proposed rules. The proposed rules are for radionuclides, disinfectants and disinfection by-products, enhanced surface water treatment, and sulfate. Adopting those rules in their current form could more than double or triple the esti-

1. However, the belief that many water systems were not meeting those standards was one of the factors that led to the passage of the SDWA in 1974 (see the statement of Robert W. Fri, Deputy Administrator, Environmental Protection Agency, before the Subcommittee on Public Health and Environment of the House Committee on Interstate and Foreign Commerce, March 8, 1973).

Table 1.
Annual Cost of Treatment According to Standards Specified by the Safe Drinking Water Act
(In millions of 1992 dollars)

	EPA	AWWA
Existing Rules		
Fluoride	7.5	8.7
Phase I (VOCs)	63.4	98.9
Surface Water Treatment Rule	549.1	918.0
Total Chloriform Monitoring	139.5	142.5
Phase II SOCs	106.4	a
Phase II IOCs	15.2	2,081.3[a]
Lead and Copper	503.9	780.2
Phase V SOCs and IOCs	46.1	69.4
All Existing Rules	1,431.1	4,099.0[b]
Proposed Rules		
Radionuclides		
Radon	280	1,917
Radium-226	48.6	n.a.
Radium-228	8.7	n.a.
Adjusted gross alpha emitters	53.4	n.a.
Uranium	80.7	n.a.
Disinfectants/Disinfection By-Product (D/DBP) Rule		
Stage I	1,064	n.a.[c]
Stage II (Large systems only)[d]	1,820	n.a.[c]
Stage II (All systems)[e]	2,631	n.a.[c]
Enhanced Surface Water Treatment Rule		
Interim rule (Large systems only)[f]		
Based on Stage I D/DBP	402	n.a.[c]
Based on Stage II D/DBP	746	n.a.[c]
Long-term rule (All systems)		
Based on Stage I D/DBP	519	n.a.[c]
Based on Stage II D/DBP (All systems)	927	n.a.[c]
Sulfate	80	n.a.

SOURCE: Congressional Budget Office based on data from the Environmental Protection Agency and American Water Works Association.

NOTES: Costs listed are the estimated compliance cost when rules are in effect. All the existing rules are expected to be in effect in 1995. EPA = Environmental Protection Agency; AWWA = American Water Works Association; VOCs = volatile organic compounds; SOCs = synthetic organic compounds; IOCs = inorganic compounds; n.a. = not available.

a. The AWWA does not provide individual estimates of the Phase II SOCs and IOCs. Those two costs are combined. Furthermore, the AWWA estimate includes the total cost of complying with Phase II requirements, and the EPA estimate includes only the additional cost (because of increased stringency over interim rules). The AWWA estimate of the additional cost of the Phase II requirements is $255.9 million.

b. If only the additional cost of the Phase II requirements is included, the AWWA total estimate is reduced to $2,273.6 million.

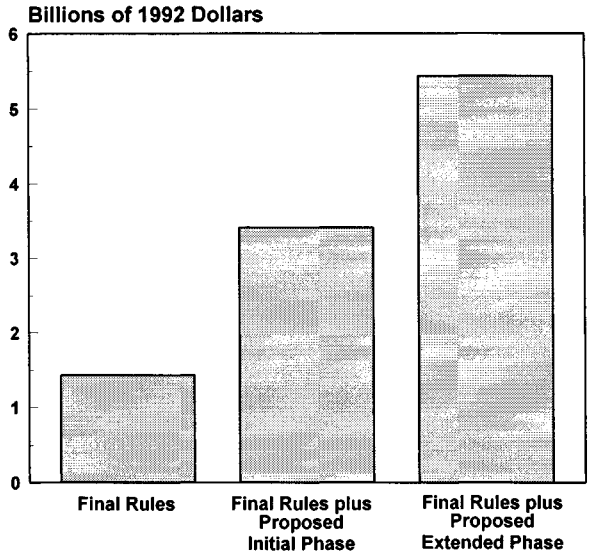
c. The D/DBP rule and the Enhanced Surface Water Treatment Rule were proposed under a negotiated rule-making process. The EPA cost estimates, therefore, represent consensus numbers, and industry has not published independent estimates.

d. Proposed Stage II covers systems serving more than 10,000 people. Costs listed include Stage I costs.

e. Extended Stage II covers all systems. Costs listed include Stage I costs.

f. The proposed interim rule covers systems serving more than 10,000 people.

Figure 2.
EPA's Estimate of the Annual Costs of Complying with Final and Proposed Rules Under the Safe Drinking Water Act



SOURCE: Congressional Budget Office calculations based on data from the Environmental Protection Agency.

NOTE: The proposed initial phase comprises the cost of the proposed rules in their initial stage. It takes in the radon rule, Stage I of the rule for disinfectants and disinfection by-products (D/DBP), and the rule for enhanced surface water treatment (ESWT) for large systems only. The proposed extended phase comprises the cost of the proposed rules once they are extended. It takes in the radon rule, Stage II of the D/DBP rule for all systems, and the ESWT rule for all systems.

mated cost of treating drinking water according to the SDWA-specified standards (see Figure 2). Note, however, that those rules could change significantly before they are completed. In addition, the SDWA requires the EPA to regulate 25 additional contaminants every three years.

The AWWA projects substantially higher costs for one of the proposed radionuclides--radon--than the EPA does. The AWWA has estimated that the proposed standard for radon will cost $1.9 billion in 1992 dollars.[2] EPA has estimated the annual cost to be $280 million in 1992 dollars. Differences in assumptions about unit treatment costs are the primary source of the difference in cost estimates.[3] If the AWWA's cost estimates for radon are used, the proposed rules would increase the cost of treating drinking water more than threefold in the proposed initial stage and nearly fivefold in the proposed extended stage.[4]

2. RCG/Hagler Bailly, *Estimating the National Costs of Compliance with Drinking Water Regulations: A Users Guide and Research Protocol*, prepared for the American Water Works Association (Boulder, Colo.: RCG/Hagler Bailly, February 1995), p. 10.

3. RCG/Hagler Bailly, *The Cost of Compliance with the Proposed Federal Drinking Water Standards for Radionuclides*, prepared for the American Water Works Association (Boulder, Colo.: RCG/Hagler Bailly, October 1991), p. 6-2.

4. This estimate is based on a comparison with the EPA's estimate of the cost of the existing rules.

Chapter Three

Household Costs of Drinking Water Treatment

Estimates of total national costs of treating drinking water are useful, but it is also important to understand how those costs affect individual households. Using available data from the Environmental Protection Agency, the Congressional Budget Office estimated the percentage of households that are expected to fall into different categories of average annual costs. In addition, CBO analyzed available survey data on expenditures that municipalities made to comply with the Safe Drinking Water Act.

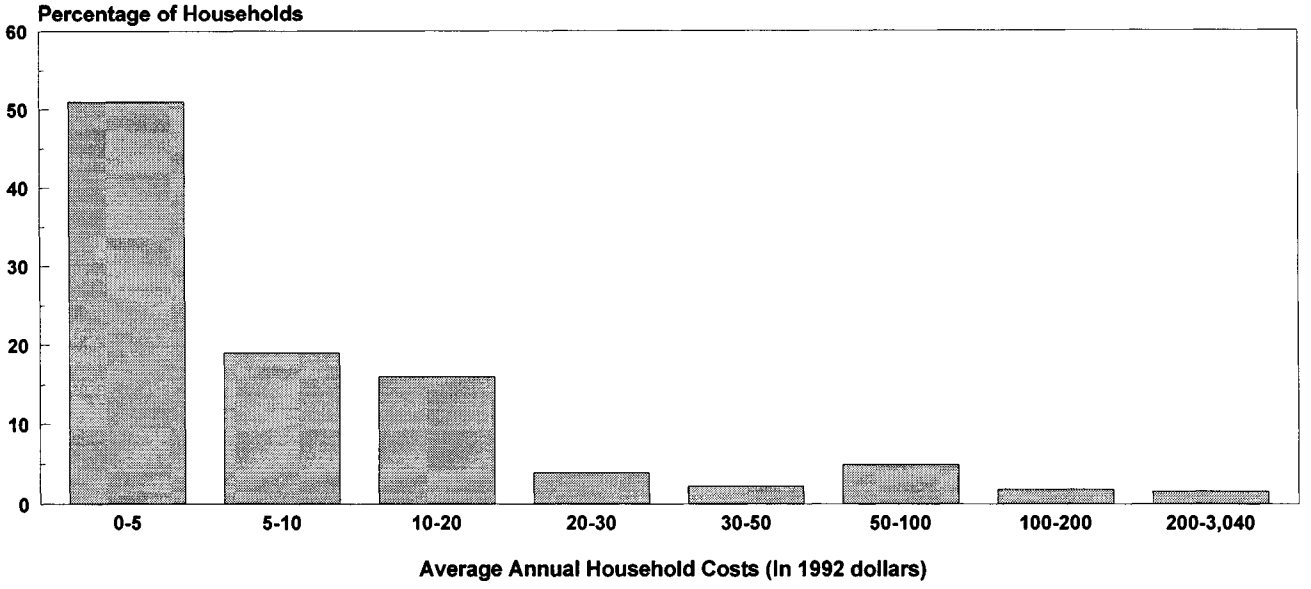
Both the EPA data and the municipal expenditure data revealed similar results. Over 80 percent of households are expected to incur relatively modest costs--less than $20 per year--to treat drinking water according to the existing standards specified by the SDWA. Furthermore, a comparison of actual expenditures of municipalities with the EPA's estimates for systems serving more than 10,000 people did not reveal evidence that the EPA has greatly underestimated the actual cost of treatment. That comparison, however, is limited, since the survey on municipal expenditures was not designed to be representative at the national level.

Although most households are expected to have modest costs, some households could have much greater costs--some in excess of $100 per year. The households most likely to face such high costs are ones that are served by small systems in need of treatment. Finally, though per-household costs are currently modest, they could rise significantly under the proposed rules. Like the existing rules, the proposed rules are most likely to impose high average household costs on small systems.

EPA Data on Costs at the Household Level

Understanding the costs of mandates at the national level, though important, provides little insight into how households in communities of different sizes and with different types of water systems might be affected. Using data provided by the EPA, CBO grouped households according to categories of potential annual drinking water treatment and monitoring costs (see Figure 3). Although those data reflect the EPA's expectations about the variation and range of potential costs, the data are highly speculative. They are based on numerous assumptions (described in Chapter 2) and may ultimately prove to be quite different from actual costs. In addition, those costs reflect the total cost of treating drinking water according to the standards specified by the SDWA and do not reflect the incremental cost of the SDWA. In other words, the costs are not net of the cost of treatment measures that communities would have chosen to undertake in the absence of federal standards. Finally, they are based on the assumption that all existing systems comply with the regulations. In reality, some small systems may choose to merge with larger

Figure 3.
Distribution of Households by EPA Estimates of the Cost of Monitoring and Treating Drinking Water According to Existing SDWA Standards



SOURCE: Congressional Budget Office calculations based on data from the Environmental Protection Agency.

NOTE: EPA = Environmental Protection Agency; SDWA = Safe Drinking Water Act.

systems rather than undertake costly treatment (see the discussion of restructuring in Chapter 5).

Nearly 70 percent of households would be expected to have a cost of less than $10 per year as a result of monitoring and treating drinking water according to the standards specified by the existing rules of the SDWA; 86 percent would be expected to incur a cost of less than $20 per year. Less than 4 percent of the households would be expected to incur a cost of more than $100 per year, and less than 1 percent could have costs greater than $300 per year.[1] Those costs can be compared with an average expenditure for drinking water of $352 per household in 1991.[2] Therefore, treatment is a relatively small component of total expenditures for drinking water for most households.

Although the EPA data suggest that the great majority of households would have a cost of less than $20 dollars a year, they also show that some water systems could incur substantial costs to meet the standards specified in the SDWA. Households with the highest compliance costs tend to be those served by small water systems that need one or more types of treatment. As indicated in Table 2 on pages 16 and 17, the compliance cost for the average household generally decreases significantly as the size of the system increases for a given number of treatments and type of system (surface or ground). For example, groundwater systems that serve from 25 to 100 people and require two types of treatment are predicted to have an average household cost of $984. That average cost falls to $337 for groundwater sys-

1. In calculating these costs, capital equipment was annualized over a 20-year period at a 7 percent interest rate. Monitoring costs were averaged over an 18-year period. Actual monitoring costs will be much higher in initial years than in later years. As discussed above, the cost of meeting only a subset of the Phase II standards is included. The EPA assumes that most water systems were already complying with the voluntary public health guidelines that preceded passage of the SDWA. The costs therefore do not include the cost of meeting the share of the Phase II standards that merely codified those guidelines.

2. This average expenditure is based on Bureau of the Census data. See the discussion in Chapter 1.

tems that serve from 100 to 500 people and also require two treatments.

In addition, per-household costs tend to be higher for surface water systems than for groundwater systems. For instance, a groundwater system in the smallest-sized category that needs one type of treatment is expected to have an average cost of $338. A surface water system in the same size category that also needs one treatment is expected to have an average cost of $577.

As Table 2 also reveals, a very small percentage of the population is expected to fall into the highest categories for average household costs. For instance, 0.01 percent of the population is served by a surface water system that requires two types of treatment and is expected to incur an average household cost of $1,087.

Nevertheless, household costs, as shown in Figure 3 and Table 2, could increase significantly if the proposed regulations were to go into effect. CBO used information available from EPA documents to develop estimates of the average per-household costs for affected systems under three of the proposed rules for categories of different system sizes (see Table 3 on pages 18 and 19). All three of the proposed rules tend to impose higher average per-household costs on small communities than on large communities. In general, the percentage of the population that falls into categories for very high compliance costs is fairly small for each rule but not insignificant. Of the population served by community water systems, 3 percent are expected to require treatment under the Disinfectants/Disinfection By-Product (D/DBP) Rule and are served by systems in which the average cost of treatment per household for that rule exceeds $100. Note that the full range of actual costs associated with the proposed rules will be greater than the range of average costs for affected systems in each size category.[3] In addition, actual costs may differ from the EPA's estimates.

Preferably, the cumulative cost of the existing and proposed rules for individual systems should be examined. For example, are the specific systems that are expected to incur high average per-household costs under the existing rules also expected to incur high costs under the proposed rules, or are those that are likely to have high costs under the D/DBP rule also likely to have high costs under the Enhanced Surface Water Treatment (ESWT) Rule or the radon rule? If systems are likely to incur high costs under multiple rules, would one type of treatment technology be able to address both problems? EPA does not currently have that type of information. Therefore, the cumulative cost of existing and proposed rules cannot be examined, and the full financial impact of existing and proposed rules on individual systems is unknown.

Survey Data on Local Costs

In an attempt to draw attention to the cost of unfunded federal mandates, the U.S. Conference of Mayors and the National Association of Counties each commissioned Price Waterhouse to survey their members about their total costs for complying with such requirements. Most of the mandates that cities and counties were asked about were environmental ones. (See Figure 4 on page 20 for a list of the mandates that the surveys covered.) CBO obtained those survey results (referred to here as the municipal expenditure survey) and analyzed the expenditures that cities and counties reported for 1993 and 1997 as necessary to meet the standards specified by the SDWA.

The Data: Quality Control and Limitations

The municipal expenditure survey asked cities and counties to report the expenditures they had made in fiscal year 1993 to comply with each of the existing rules (listed in Box 1) and an "other" mandate category. (Some cities and counties listed their costs for proposed rules or for testing or research in the "other" category.) In addition, the survey asked both cities and counties to report the total expenditures that they expected to make to comply with each existing rule for five additional years--1994 through

3. EPA documents do not provide sufficient data to indicate the full range of costs estimated for the proposed rules (analogous to the full range of costs for existing rules shown in Figure 5 on page 23).

Table 2.
Average Household Cost for Monitoring and Compliance, by Size of System and Number of Treatments (In 1992 dollars)

	Groundwater				Surface Water			
	No Treatment[a]	1 Treatment	2 Treatments	3 Treatments	No Treatment[a]	1 Treatment	2 Treatments	3 Treatments
25 to 100 People								
Compliance Cost	171	338	984	1,194	171	577	1,087	2,402
Percentage of Systems[b]	18.47	21.22	2.43	0.02	0.15	0.64	0.64	0.03
Percentage of Population[c]	0.37	0.42	0.05	d	d	0.01	0.01	d
100 to 500 People								
Compliance Cost	45	91	337	437	45	291	467	1,009
Percentage of Systems[b]	10.26	14.62	1.51	0.01	0.26	0.61	0.36	0.01
Percentage of Population[c]	0.86	1.22	0.13	d	0.03	0.06	0.04	d
500 to 1,000 People								
Compliance Cost	18	39	144	189	18	340	225	458
Percentage of Systems[b]	3.10	4.85	0.50	d	0.02	0.42	0.59	0.01
Percentage of Population[c]	0.78	1.22	0.12	d	d	0.11	0.15	d
1,000 to 3,300 People								
Compliance Cost	8	21	84	n.a.	9	22	130	306
Percentage of Systems[b]	3.13	3.90	0.36	n.a.	0.03	0.62	0.67	0.02
Percentage of Population[c]	1.98	2.47	0.23	n.a.	0.02	0.42	0.45	0.01
3,300 to 10,000 People								
Compliance Cost	4	16	50	n.a.	4	33	90	188
Percentage of Systems[b]	1.48	1.62	0.14	n.a.	0.17	0.74	0.66	0.02
Percentage of Population[c]	2.93	3.22	0.28	n.a.	0.36	1.52	1.36	0.05
10,000 to 25,000 People								
Compliance Cost	2	13	38	n.a.	2	30	42	143
Percentage of Systems[b]	0.75	0.35	0.03	n.a.	0.20	0.39	0.17	0.01
Percentage of Population[c]	4.08	1.89	0.15	n.a.	1.09	2.14	0.96	0.04
25,000 to 50,000 People								
Compliance Cost	1	8	n.a.	n.a.	1	19	31	50
Percentage of Systems[b]	0.28	0.11	n.a.	n.a.	0.12	0.23	0.10	d
Percentage of Population[c]	3.46	1.34	n.a.	n.a.	1.41	2.80	1.24	0.03

(Continued)

Table 2.
Continued

	Groundwater				Surface Water			
	No Treatment[a]	1 Treatment	2 Treatments	3 Treatments	No Treatment[a]	1 Treatment	2 Treatments	3 Treatments
50,000 to 75,000 People								
Compliance Cost	1	5	n.a.	n.a.	1	5	21	84
Percentage of Systems[b]	0.02	0.05	n.a.	n.a.	d	0.10	0.11	d
Percentage of Population[c]	0.49	1.09	n.a.	n.a.	0.09	2.02	2.31	0.09
75,000 to 100,000 People								
Compliance Cost	1	4	n.a.	n.a.	1	13	24	n.a.
Percentage of Systems[b]	0	0.02	n.a.	n.a.	d	0.07	0.03	n.a.
Percentage of Population[c]	0.12	0.65	n.a.	n.a.	1.11	2.01	0.90	n.a.
100,000 to 500,000 People								
Compliance Cost	e	4	n.a.	n.a.	e	12	27	154
Percentage of Systems[b]	0.03	0.03	n.a.	n.a.	0	0.12	0.06	d
Percentage of Population[c]	1.80	2.26	n.a.	n.a.	4.22	8.54	3.93	0.20
500,000 to 1 Million People								
Compliance Cost	e	3	n.a.	n.a.	e	5	10	n.a.
Percentage of Systems[b]	d	d	n.a.	n.a.	d	0.03	0.01	n.a.
Percentage of Population[c]	d	0.69	n.a.	n.a.	3.89	6.15	2.27	n.a.
More than 1 Million People								
Compliance Cost	n.a.	n.a.	n.a.	n.a.	e	4	9	n.a.
Percentage of Systems[b]	n.a.	n.a.	n.a.	n.a.	d	0.01	d	n.a.
Percentage of Population[c]	n.a.	n.a.	n.a.	n.a.	4.00	7.00	2.00	n.a.

SOURCE: Congressional Budget Office based on data from the Environmental Protection Agency.

NOTE: n.a. = not applicable (no systems fell into this category).

a. Costs in the no-treatment category represent monitoring costs only.

b. Indicates the percentage of community water systems and nontransient, noncommunity water systems that are expected to fall into this category for average household compliance cost.

c. Indicates the percentage of the population served by community water systems or nontransient, noncommunity water systems that are expected to fall into this category for average household compliance cost.

d. Less than 0.005 percent of the systems or population was expected to fall into these cost categories.

e. Estimated costs for this category were less than $1.

Table 3.
Average Household Cost Under the Proposed Rules by Size of Affected System (In 1992 dollars)

	System Size (People served)					
	25 to 100	100 to 500	500 to 1,000	1,000 to 3,300	3,300 to 10,000	10,000 to 25,000
Disinfectants/Disinfection By-Product Rule						
Average Cost per Household[a]	223	204	199	164	186	57
Percentage of Population[b]	0.02	0.07	0.21	0.69	2.10	2.81
Cumulative Percentage of Population[c]	0.02	0.09	0.30	0.99	3.09	5.91
Enhanced Surface Water Treatment Rule						
Average Cost per Household[a]	445	250	212	72	45	29
Percentage of Population[b]	0.01	0.04	0.16	0.62	2.15	2.91
Cumulative Percentage of Population[c]	0.01	0.05	0.21	0.83	2.98	5.89
Radon Rule						
Average Cost per Household[d]	260	99	47	26	17	15
Percentage of Population[b]	0.30	1.00	0.51	1.15	1.12	1.15
Cumulative Percentage of Population[c]	0.30	1.30	1.81	2.96	4.08	5.24

(Continued)

Table 3.
Continued

	System Size (People served)					
	25,000 to 50,000	50,000 to 75,000	75,000 to 100,000	100,000 to 500,000	500,000 to 1 Million	More than 1 Million
Disinfectants/Disinfection By-Product Rule						
Average Cost per Household[a]	44	40	36	31	27	26
Percentage of Population[b]	3.79	3.11	3.14	10.10	10.30	7.72
Cumulative Percentage of Population[c]	9.70	12.81	15.96	26.06	36.36	44.08
Enhanced Surface Water Treatment Rule						
Average Cost per Household[a]	23	20	17	18	16	15
Percentage of Population[b]	4.07	3.26	3.44	11.11	11.51	7.08
Cumulative Percentage of Population[c]	9.96	13.22	16.66	27.78	39.29	46.37
Radon Rule						
Average Cost per Household[d]	10	9	8	7	87	5
Percentage of Population[b]	0.84	0.38	0.21	0.87	0.30	0.14
Cumulative Percentage of Population[c]	6.08	6.46	6.67	7.54	7.83	7.97

SOURCE: Congressional Budget Office based on data from the Environmental Protection Agency.

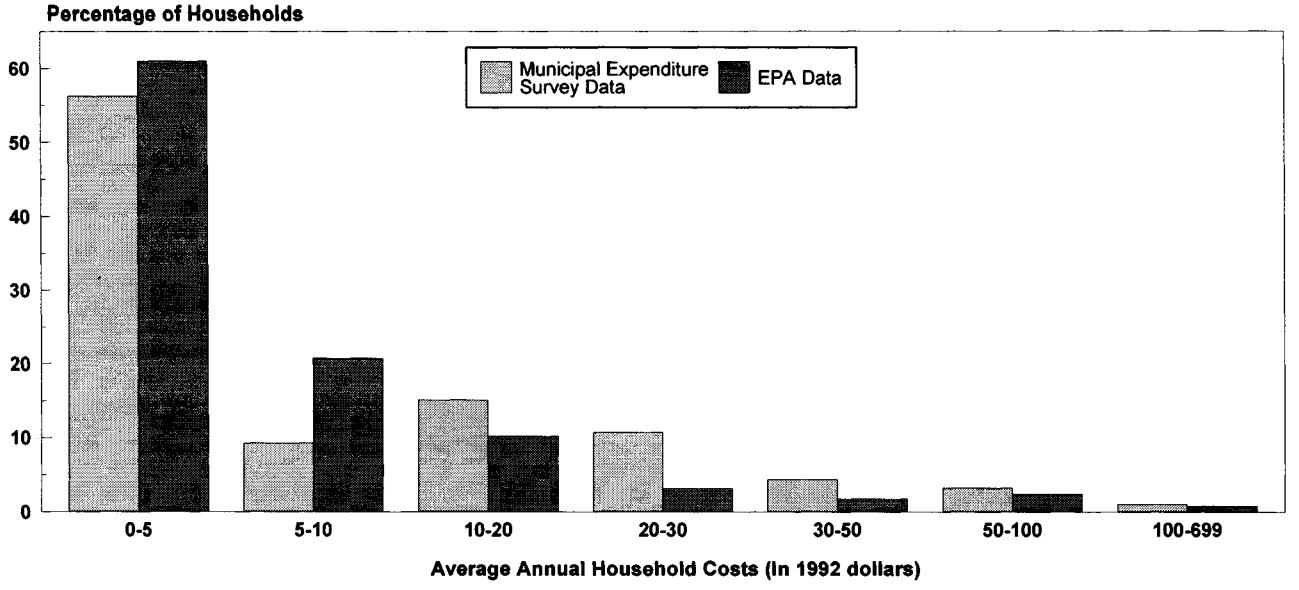
a. Calculated as the total cost for that size category divided by the number of affected systems in the size category divided by the median population in the category multiplied by the average household size (2.6 people). All capital costs were annualized over 20 years using a 7 percent interest rate.

b. Percentage of population that is served by affected systems in that size category.

c. Cumulative percentage of population served by affected systems in the stated size category or smaller-sized categories.

d. Calculated by the EPA based on the average flow per system size category and an assumption of 100,000 gallons used per household per year.

Figure 6.
Distribution of Households by Average Per-Household Cost of Treating Drinking Water According to Existing SDWA Standards: 1997 Municipal Expenditure Survey Data Versus EPA Data



SOURCE: Congressional Budget Office based on data from the Environmental Protection Agency and the municipal expenditure survey commissioned by the U.S. Conference of Mayors and the National Association of Counties.

NOTES: SDWA = Safe Drinking Water Act.

The figure compares EPA data with 1997 data from the municipal expenditure survey for the subset of systems serving more than 10,000 people.

The Results

The 1997 costs reported in the municipal expenditure survey for systems serving more than 10,000 people appear somewhat higher, but not radically different from, the costs indicated by EPA data for like-sized systems (see Figure 6). Based on the municipal expenditure survey, 91 percent of households are expected to incur an average annual cost of less than $30 in 1997, whereas the EPA estimates that 95 percent of households will have costs of less than $30. Moreover, 66 percent of households would incur annual costs of less than $10 based on municipal expenditure data as opposed to 82 percent based on EPA data.

The available data do not provide evidence of any extreme differences in local and national estimates of the total cost of treating drinking water. That observation, however, must be balanced by a recognition of the considerable limitations of the municipal expenditure data, particularly that the survey was not designed to be representative at the national level.

Chapter Four

Placing SDWA Cost Estimates in Context

Examining the magnitude of the cost of treating drinking water is useful, but it is important to place those costs in an appropriate context as well. In the following discussion, the Congressional Budget Office compares the cost estimates for drinking water treatment with available data on benefits. That comparison reveals that costs relative to benefits vary widely among contaminants and system sizes and in some cases appear extremely large--for example, more than $4 billion per cancer case avoided. In addition, CBO considers treatment costs relative to other costs facing drinking water systems. Finally, CBO compares local estimates of the cost of complying with the Safe Drinking Water Act with local measures of fiscal capacity. That comparison reveals that the cost of treating drinking water according to the standards specified under the existing rules of the SDWA is expected to impose a modest fiscal burden on most municipalities.

Costs Relative to Benefits

Whether costs of a regulation are "too large" or not depend, of course, on the benefits that result from the regulation. Regulations are generally thought to be too costly when the cost of complying with them exceeds the value of the benefits received. However, measuring costs and benefits can be very difficult.

Information on the benefits associated with the SDWA is limited. CBO used information available in Environmental Protection Agency documents and applied a consistent method to calculate the cost per cancer case avoided from several carcinogens that are regulated, or proposed to be regulated, under the SDWA (see Table 4). The cost per cancer case avoided varies enormously among contaminants. For example, the cost per cancer case avoided averaged for all water systems varies from $0.5 million under the standard for the pesticide ethylene dibromide and co-contaminants to $4.3 billion for regulating the pesticides atrazine and alachlor under the Synthetic Organic Compounds (SOCs) Rule.

In addition, the cost per cancer case avoided generally declines (sometimes drastically) as the size of the system increases. For example, the cost per cancer case avoided as a result of regulating 1,2 dichloropropane falls from $135 million for the category for the smallest-sized systems to $13.2 million for systems serving between 10,000 and 25,000 people. That decline primarily takes place because unit treatment costs decrease as system size increases.

Two of the proposed regulations are expected to reduce the risk of cancer: the Disinfectants/Disinfection By-Products Rule and the Radionuclides Rule. However, the EPA is uncertain about how much the risk of cancer would be reduced by the proposed D/DBP rule. Based on differing estimates about the baseline cancer risk associated with disinfection by-products, the EPA estimates that the average cost per cancer case avoided ranges between $867,000 and $8.67 billion in the initial stage of the

Table 4.
Cost per Health Effect Avoided for Selected Rules and Contaminants (In millions of 1992 dollars)

Rule/Contaminant	System Size (People served) 25 to 100	100 to 500	500 to 1,000	1,000 to 3,300	3,300 to 10,000	10,000 to 25,000
Carcinogens						
Radionuclides (Proposed)						
Radon: MCL = 300 pCi/L						
Cases avoided (Per year)	8.41	25.74	6.26	13.01	6.6	6.23
Cost per case avoided	8.9	4.0	5.5	2.7	1.9	1.5
Radium-226: MCL = 20 pCi/L						
Cases avoided (Per year)	0.000485	0.001306	0.001047	0.001458	0.37	0.87
Cost per case avoided	663.1	255.4	80.8	170.8	22.1	12.0
Radium-228: MCL = 20 pCi/L						
Cases avoided (Per year)	0.00016	0.000492	0.010422	0.019338	0.05	0.05
Cost per case avoided	754.2	245.7	91.4	62.8	40.9	36.8
Adjusted gross alpha emitters: MCL = 15 pCi/L						
Cases avoided (Per year)	0.001253	0.01	0.02	0.05	0.04	0.19
Cost per case avoided	1,047.8	173.3	191.6	145.4	115.5	63.7
Volatile Organic Compounds (All combined)						
Cases avoided (Per year)	0.21	0.55	0.62	1.45	2.83	3.66
Cost per case avoided	59.0	18.3	10.0	5.3	2.6	1.5
Synthetic Organic Compounds						
EDB and co-contaminants						
Cases avoided (Per year)	2.223	7.108	7.314	15.369	20.167	19,652
Cost per case avoided[a]	2.2	0.8	0.5	0.4	0.4	0.3
1,2 dichloropropane						
Cases avoided (Per year)	0.0054	0.0166	0.017	0.0358	0.047	0.0458
Cost per case avoided[a]	135.5	47.6	25.7	19.7	18.1	13.2
Atrazine and alachlor						
Cases avoided (Per year)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cost per case avoided	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Noncarcinogens (Acute effects)						
Surface Water Treatment Rule						
Cases avoided (Per year)	222	925	1,972	5,423	11,882	12,517
Cost per case avoided (In thousands of dollars)	161.1	32.3	12.2	7.5	6.8	3.9

(Continued)

Table 4.
Continued

Rule/Contaminant	System Size (People served) 25,000 to 50,000	50,000 to 75,000	75,000 to 100,000	100,000 to 500,000	500,000 to 1 Million	More than 1 Million	Average for All Systems
Carcinogens							
Radionuclides (Proposed)							
Radon: MCL = 300 pCi/L							
Cases avoided (Per year)	4.64	2.44	0.73	4.11	1.3	0	79.46
Cost per case avoided	1.4	1.3	1.4	1.2	1.4	a	3.6
Radium-226: MCL = 20 pCi/L							
Cases avoided (Per year)	0.65	0.34	0.1	0.58	0.18	0	3.1
Cost per case avoided	13.4	12.3	13.5	12.5	16.6	a	14.2
Radium-228: MCL = 20 pCi/L							
Cases avoided (Per year)	0.03	0.01	0.004399	0.029058	0.00706	0	0.210914
Cost per case avoided	41.5	46.2	16.5	35.1	75.7	0	45.5
Adjusted gross alpha emitters: MCL = 15 pCi/L							
Cases avoided (Per year)	0.19	0.11	0.08	0.32	0.18	0.22	1.4
Cost per case avoided	56.8	62.3	12.4	13.2	8.7	0.6	39.5
Volatile Organic Compounds (All combined)							
Cases avoided (Per year)	3.24	1.63	0.79	6.12	3.04	3.85	27.99
Cost per case avoided	1.1	1.1	1.1	0.8	0.8	1.0	2.4
Synthetic Organic Compounds							
EDB and co-contaminants							
Cases avoided (Per year)	0	0	0	0	0	0	71.833
Cost per case avoided[a]	b	b	b	b	b	b	0.5
1,2 dichloropropane							
Cases avoided (Per year)	0	0	0	0	0	0	0.1676
Cost per case avoided[a]	b	b	b	b	b	b	24.6
Atrazine and alachlor							
Cases avoided (Per year)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.0024
Cost per case avoided	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4,258.0
Noncarcinogens (Acute effects)							
Surface Water Treatment Rule							
Cases avoided (Per year)	12,236	9,819	10,669	7,970	5,296	4,263	83,194
Cost per case avoided (In thousands of dollars)	2.8	2.7	3.3	10.7	10.0	22.8	7.1

SOURCE: Congressional Budget Office based on data from the Environmental Protection Agency.

NOTES: All capital costs were annualized over a 20-year period using a 7 percent interest rate.

MCL = maximum contaminant level; pCi/L = picocuries per liter; EDB = ethylene dibromide; n.a. = not available.

a. Monitoring costs were not included in these calculations.

b. Not applicable.

rule. In the extended stage, the incremental cost per cancer case avoided is expected to be between $840,000 and $19 billion.[1]

In some cases, the proposed standards for radionuclides may result in extremely high costs per cancer case avoided. For example, the standard proposed for adjusted gross alpha emitters (which is primarily designed to reduce the risk of exposure to the radionuclide polonium-210) would cost more than $1 billion per cancer case avoided for systems in the smallest-sized category.

Although considering the costs per cancer case avoided is useful, it is important to realize that those estimates are highly uncertain. They are based on the best available data, but those data are limited. For example, the occurrence data used in estimating the cost per cancer case avoided for the SOCs are not based on a nationwide survey. Those data indicate where and at what levels a contaminant is expected to be found. A nationwide estimate of occurrence was obtained by piecing together many sources of information (none of which was designed to be representative at the national level) and by using considerable judgment.[2] Given that uncertainty, the actual costs per cancer case avoided could either exceed or fall below the estimates provided.

Unfortunately, CBO does not have sufficient information to provide ranges--which would account for the uncertainty--around most of the estimates of costs per cancer case avoided.[3] However, unless the uncertainty is great enough to reduce the cost per cancer case avoided by a factor of 10 or more, the cost per cancer case avoided for some contaminants--or for some categories of system sizes--will be greater than the amount that is generally thought of as reasonable. For example, two reviews of studies that measure the value that individuals place on an avoided statistical death found that the values ranged between $0.6 million and $10.9 million in 1992 dollars.[4]

Extremely large costs per cancer case avoided, however, would not necessarily result in extremely large cost savings if the standard was eliminated. For example, although the cost per cancer case avoided for the standard for atrazine and alachlor is estimated at more than $4 billion, the total cost of meeting that standard (for all systems) is estimated at $10.2 million. The high cost per cancer case avoided in this case is the result of the extremely small number of cases avoided (0.0024 per year) rather than a very high level of expenditures.

Noncarcinogens can be grouped into two types of health effects--acute and chronic sublethal. Acute adverse health effects addressed by drinking water regulations fall into two major categories: those from exposure to microbial contaminants, such as giardia and cryptosporidium, and those from exposure to chemical substances.[5] One of the main acute health effects of concern from exposure to microbial contaminants is gastrointestinal disorders, such as gastroenteritis.[6] The symptoms may range from mild

1. Environmental Protection Agency, *Regulatory Impact Analysis of Proposed National Primary Drinking Water Regulations: Disinfectants/Disinfection By-Products Rule* (May 1994), p. 5-7.

2. Environmental Protection Agency, *Regulatory Impact Analysis of Proposed National Primary Drinking Water Regulations for Synthetic Organic Compounds* (April 1989), p. 1-2.

3. The one exception to this situation is radon. Based on EPA data, the number of cancer cases avoided because of the proposed standard for radon could range from 37 to 243. See Environmental Protection Agency, *Report to the United States Congress on Radon in Drinking Water* (February 1994), p. 7-14. That range of cancer cases avoided results in costs per cancer case avoided (averaged for all systems) that range from $7.6 million to $1.1 million. If the American Water Works Association's estimate of the annual cost of meeting the radon standard is used, then the cost per cancer case avoided would lie between $52 million and $7.9 million.

4. See Ann Fisher, Loraine G. Chestnut, and Daniel M. Violette, "The Value of Reducing Risks of Death: A Note on New Evidence," *Journal of Policy Analysis and Management*, vol. 8, no. 1 (Winter 1989), pp. 88-100; and W. Kip Viscusi, "Mortality Effects of Regulatory Costs and Policy Evaluation Criteria," *Rand Journal of Economics*, vol. 25, no. 1 (Spring 1994), pp. 94-109.

   In addition, recent research has examined whether regulations that reduce risks directly (for example, by decreasing the level of contaminants in drinking water) can cause offsetting increases in risk by lowering the income that individuals have to spend on health. This research indicates that regulation that costs more than $50 million per life saved can have an adverse effect on mortality because of the offsetting effect. See Viscusi, "Mortality Effects of Regulatory Costs and Policy Evaluation Criteria."

5. Environmental Protection Agency, *Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act* (March 1990), p. 2-8.

6. Gastroenteritis is an inflammation of the stomach and intestine. It can result in loss of appetite, nausea, vomiting, cramps, and diarrhea.

to severe and incapacitating and generally last from one to four weeks. In some cases, gastrointestinal disorders caused by microbial exposure may result in death, particularly for individuals with weakened immune systems. The Surface Water Treatment Rule is aimed at avoiding exposure to microbial contaminants in surface water systems.

As is the case with carcinogens, the cost per avoided acute health effect varies by system size under the Surface Water Treatment Rule (SWTR), with the largest costs incurred by the smallest systems (see Table 4). Unlike the carcinogens that were examined, the lowest cost per case avoided occurs in medium-sized systems. In the original analysis of the SWTR, the estimated economic cost associated with waterborne giardiasis was based on a study of costs incurred during an outbreak of waterborne giardiasis in 1983 that occurred in Scranton, Pennsylvania. That study estimated that the medical cost and the cost of time lost from work were in the range of $1,678 to $2,532 per case (measured in 1992 dollars).[7] If those medical costs and lost wages are used as a measure of the benefits of avoided incidences of gastroenteritis obtained by waterborne giardia, the cost per case avoided exceeds the benefits in all categories of system sizes.

The proposed Enhanced Surface Water Treatment Rule is designed to provide increased protection from infection resulting from microbial contaminants. The general public's concern about the risk from microbial contaminants increased significantly following an outbreak of waterborne disease in Milwaukee, Wisconsin, in 1993. That outbreak was caused by the presence of cryptosporidium. As a result of the outbreak, 400,000 people suffered stomach upsets and diarrhea and 104 people died. Although the Milwaukee incident drew public attention to the threat posed by cryptosporidium, the EPA's analysis of the costs and benefits of the proposed ESWT rule is based on the extent to which it will result in the control of giardia, not cryptosporidium.

The EPA has focused on giardia because severe deficiencies in data (resulting, in part, from analytic problems in measuring the presence of cryptosporidium) limit the EPA's ability to evaluate treatment techniques that might control cryptosporidium or to predict the extent to which the proposed ESWT rule would decrease the presence of cryptosporidium. The EPA is currently working on an analytic method that will allow water systems to detect the presence of cryptosporidium. In addition, it has proposed a rule on collecting information (the Information Collection Rule) that will provide much better data on the presence of microbial contaminants and hence the ultimate costs and benefits of the ESWT rule.

Based on the limited data that are currently available, the EPA estimates that the initial phase of the rule (which will apply only to systems serving more than 10,000 people) will cost $391 million per year and reduce the number of cases of giardia infection by 400,000 to 500,000.[8] That range in the number of cases of giardia infections avoided results in an average cost of between $978 and $782 per case avoided. Based on that information, the average cost per case avoided by the proposed rule would be less than the measures of benefits described above.

The proposed ESWT rule (in the initial phase) is expected to result in a more favorable benefit-to-cost ratio than the SWTR for two reasons. First, given current information, the SWTR appears to have been based on an underestimate of the extent of microbial risk. That underestimate would, therefore, result in an overestimate of the cost per case of waterborne disease avoided. Second, microbial risks may increase from treatment modifications undertaken to comply with tighter standards for disinfection by-products.[9] It is important to understand that the measures of cost per case avoided in both the SWTR and the ESWT rule are based on limited data on the actual incidence of waterborne diseases. In both cases, incidence is predicted using samples that were not designed to represent the nation as a whole.

7. Environmental Protection Agency, *Regulatory Impact Analysis for the National Primary Drinking Water Regulations: Interim Enhanced Surface Water Treatment Rule* (May 25, 1994), p. 1-7.

8. Ibid., pp. 1-3 to 1-7.

9. Ibid.

Only a few chemical contaminants are regulated based primarily on their acute effects--for example, nitrate, nitrite, copper, and sulfate. Only sulfate, however, is estimated to be present at levels for which establishing a maximum contaminant level (MCL) will result in avoiding cases of acute adverse effects. The primary adverse effect associated with sulfate is diarrhea. That effect appears to be transient: exposed individuals become acclimated to high sulfate levels over time.[10] The EPA does not report the cost per avoided acute health effect expected under the proposed regulation for sulfate because of inadequate data on the relationship between exposure and incidence of diarrhea.[11]

The EPA has been unable to develop estimates of "cases avoided" for contaminants regulated on the basis of chronic sublethal health effects. The primary reason cited for the lack of such estimates is the "absence of accepted dose-response relationships to allow for the determination of the number of cases of a particular adverse health effect caused by different exposure levels."[12] As an alternative, the EPA has examined the number of people whose exposure will be reduced from a level above an MCL to a level in compliance with an MCL as a result of a regulation. The EPA has examined the cost per reduction in exposure to three contaminants--cadmium, fluoride, and lead.[13] That examination revealed large differences in the cost of reductions in exposure among contaminants and among different-sized systems.

Evaluating the cost of reduced exposure and comparing such costs among contaminants is difficult, however, for two reasons. First, the reduction in adverse health effects that will result from decreased exposure is unknown. Second, the types of adverse health effects from different contaminants vary widely. For example, the major chronic health effect from exposure to cadmium involves the kidney, whereas exposure to lead is particularly problematic for children and can result in numerous effects, including delayed neurological and physical development, impaired cognitive development, adverse reproductive effects, and interference with vitamin D metabolism.[14] Because of the inability to attach meaningful evaluations to costs per reduction in exposure, those data are not presented.

Ideally one should compare the incremental benefits of a federal mandate with the incremental costs. In other words, the costs associated with each treatment that communities would not have undertaken in the absence of federal drinking water standards would be compared with the benefits of that treatment. Unfortunately, available data do not permit CBO to make such a comparison. Given the extremely high cost per cancer case avoided for some contaminant and size categories, however, some of those treatments would probably never have been undertaken without federal requirements.

The large variation in costs relative to benefits among different-sized systems and contaminants is not surprising given the process by which the EPA sets drinking water standards. First, the EPA establishes maximum contaminant level goals (MCLGs). "MCLGs are nonenforceable health-based goals which are set at the level at which no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety."[15] Next the SDWA directs the EPA to set the enforceable MCL as close to the MCLG as is feasible, "taking costs into consideration." The legislative history of the SDWA, however, directs the EPA to base feasibility on what is affordable to large systems.[16] Given that large systems generally have lower unit treatment costs than small systems, that process will inevitably result in smaller systems' having higher costs per health effect avoided than larger systems do. In addition, although the SDWA directs the EPA to take costs into account in determining the feasibil-

10. Environmental Protection Agency, *Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act*, p. 2-8.

11. Environmental Protection Agency, *Regulatory Impact Analysis for the National Primary Drinking Water Regulations: Sulfate* (August 31, 1994).

12. Environmental Protection Agency, *Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act*, p. 2-5.

13. Ibid., p. 5-3.

14. Ibid., p. 2-6.

15. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations* (September 1993), p. 22.

16. Ibid.

ity of meeting a standard, it does not direct the EPA to weigh the cost of meeting a standard against the anticipated benefits.

Treatment Costs Relative to Other Cost Factors

As discussed above, meeting drinking water standards may impose a large per-household cost on some systems, particularly small systems. But treatment is only one of the multiple costs that water systems bear. According to the National Regulatory Research Institute, the need to replace and upgrade an aging water delivery system and the need to meet growing water demand associated with population growth and economic development are expected to be the primary factors increasing the cost of water in the foreseeable future.[17] Based on trends established during the 1971-1991 period, CBO projected that capital expenditures by drinking water systems over the 1992-2012 period would total $220 billion in 1992 dollars.[18] In comparison, the EPA estimates that $8.8 billion in 1992 dollars in capital expenditures will be necessary to meet the standards set by the existing SDWA requirements. However, the cost of proposed rules could add more than $17 billion in additional capital requirements based on the EPA's estimates and $24.3 billion based on the American Water Works Association's estimates.[19]

As discussed above, the EPA estimates that the annual cost (for both capital and operations and maintenance) of meeting the standards set by the existing SDWA regulations will be $1.4 billion. The AWWA projects that cost to be $2.3 billion (or $4.1 billion, if the costs of meeting all the Phase II standards are included). Those costs can be compared with total national expenditures of $28.6 billion in 1991 (measured in 1992 dollars) for providing community drinking water--that is, they represent 5 percent to 8 percent of total expenditures on drinking water. The EPA's estimate of the total annual cost of meeting existing and proposed standards (in their extended form) is $5.4 billion, or 19 percent of total community drinking water expenditures in 1991.

The AWWA's estimate of the cost of meeting existing and proposed standards is $8 billion, or 28 percent of total drinking water expenditures in 1991.[20] Because the cost of providing drinking water is moving upward over time, the actual percentage of total expenditures required to treat drinking water according to SDWA standards should be less than indicated here. For example, based on current trends, total expenditures on drinking water would be $34 billion in 2001.[21] Based on that estimate, the cost of treating drinking water according to the levels specified by existing and proposed standards (in their extended form) would be 16 percent of total drinking water expenditures based on EPA data and 23 percent based on AWWA data.

17. National Regulatory Research Institute, *Meeting Water Utility Revenue Requirements: Financing and Ratemaking Alternatives* (November 1993), p. 13.

18. Projections were made based on Bureau of the Census data on capital expenditures by publicly owned community water systems. CBO increased the data by 19 percent to account for the expenditures of privately owned community water systems. That adjustment was based on information from the EPA's Federal Reporting Data System and is consistent with the approach used by the Environmental Protection Agency.

19. The EPA estimates that the proposed radon rule will result in $1.6 billion in additional capital requirements. In addition, it estimates the capital requirements associated with the D/DBP rule and the ESWT rule to be $11.2 billion and $4.5 billion, respectively. The AWWA estimates that the radon rule will result in $8.6 billion in additional capital expenditures. The D/DBP rule and the ESWT rule were developed using a negotiated rule-making process in which the AWWA and EPA worked together. Consequently, the AWWA did not develop independent estimates.

20. That figure includes the AWWA's estimate of complying with all of the new standards established following the 1986 amendments ($2.3 billion), the AWWA's estimate of the cost of the proposed radon rule ($1.9 billion), the joint EPA and AWWA estimate of the ultimate annual cost of the D/DBP rule ($2.6 billion) and the ESWT rule ($0.9 billion), the EPA's estimate of the annual cost of the proposed Sulfate Rule ($80 million), and the EPA's estimates of the cost of the proposed Radionuclides Rule other than for radon ($191 million).

21. The $34 billion estimate was obtained by assuming that total expenditures continue to rise at the rate established over the 1957-1991 period.

Local Cost Estimates of the Safe Drinking Water Act Compared with Fiscal Capacity

Identifying costs on a per-household basis is one step toward understanding the magnitude of the burden that SDWA regulations place on local governments and their residents. An additional step is to place those costs in the context of the fiscal burden that it places on the community.

Critics of unfunded mandates argue that they impose too large a fiscal burden on local communities. The measure of fiscal burden that has been frequently used to make this argument, however, is misleading. Many case studies of unfunded mandates compare the cost of complying with environmental requirements to the municipality's budget, either total budget or locally raised revenues.

Yet both of those measures can be deceptive. The types of services that municipalities provide vary greatly and, therefore, so do the sizes of their budgets and the amount of revenue that they collect. For example, some cities fund elementary and secondary schools, and others do not. Some operate hospitals, and others do not. The share of a budget (or of local revenues) that complying with a mandate requires may say more about the type of services that a municipality provides than about the cost of compliance. Municipalities that spend a higher share of their budget to comply with a mandate do not necessarily have a larger burden than those that spend a smaller share of their budget. They may just provide fewer other services.

Comparing cost estimates with a municipality's "fiscal capacity" rather than its spending or revenues is a better indicator of burden. Measures of fiscal capacity should ideally reflect the municipality's potential to raise revenue, rather than the amount of revenue that it actually raises. Municipalities have the potential to raise revenue from both residents and nonresidents. The potential to raise revenue from residents is based on the residents' income or assessable wealth. The potential to raise revenue from nonresidents depends on the municipalities' ability to tax nonresidents through such mechanisms as business property taxes, local sales taxes, and earnings taxes.[22]

Over 95 percent of all public water systems finance their system by user fees, or direct charges to their customers, and nearly all systems with more than 10,000 customers do so.[23] Although nearly all systems rely on user fees as a source of revenue, some systems may supplement that revenue by general tax revenue. Unfortunately, data on how much supplementing occurs are not available.

Because systems may use a combination of user fees and property taxes to finance SDWA expenses, CBO examined two alternative measures of fiscal burden as a means of placing the costs reported by the municipal expenditure survey in context. The first measure looks at the per-household cost of treating drinking water according to SDWA standards relative to median household income. That measure reflects the municipality's ability to raise revenue through user fees. The second measure of fiscal burden looks at the per-household cost of treating drinking water according to SDWA standards relative to the average residential property values in the municipality. That measure may reflect not only residents' wealth but also the municipality's potential to tax nonresidents.[24]

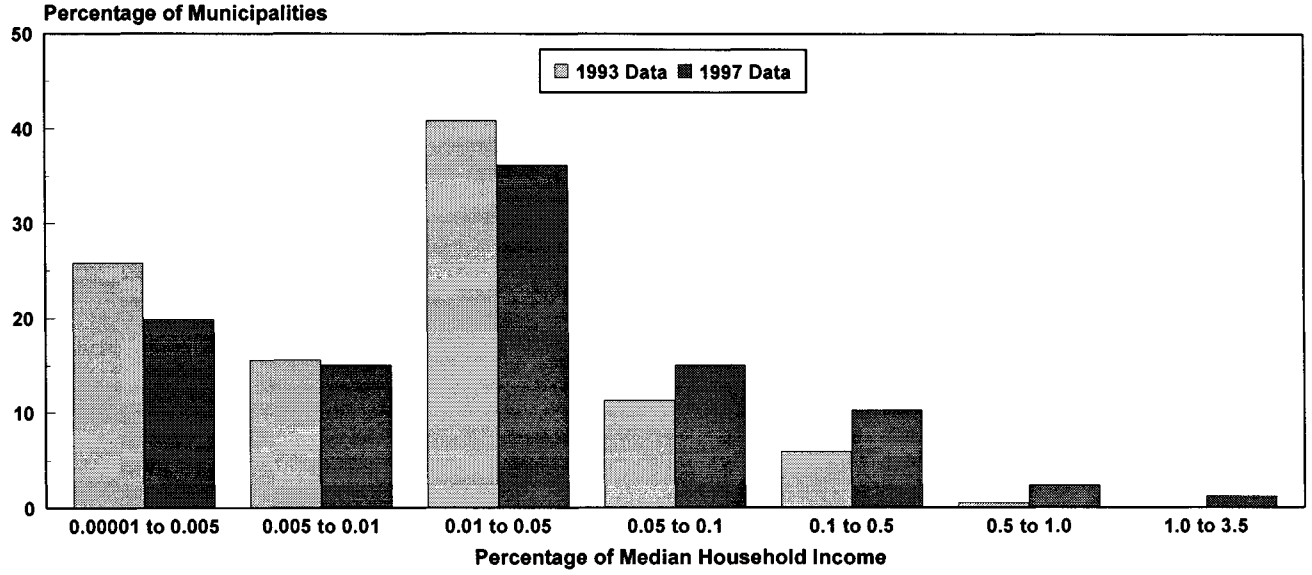
For 1993, none of the municipalities included in the subset of municipal expenditure survey respondents used by CBO reported per-household SDWA compliance costs for the existing rules that exceeded 1 percent of median household income. Over 93 per-

22. Helen Ladd and John Yinger, *America's Ailing Cities: Fiscal Health and the Design of Urban Policy* (Baltimore: Johns Hopkins University Press, 1991).

23. Environmental Protection Agency, *Final Descriptive Summary: 1986 Survey of Community Water Systems* (October 1987), p. 33, and American Water Works Association, *Water Industry Data Base* (Washington, D.C.: AWWA, 1992), p. 65, indicate that all systems that serve more than 10,000 customers charge user fees. However, neither survey covers all systems in that size category.

24. See Helen Ladd, Andrew Reschovsky, and John Yinger, "City Fiscal Condition and State Equalizing Aid: The Case of Minnesota," in National Tax Association/Tax Institute of America, *Proceedings of the Eighty-Fourth Annual Conference on Taxation, 1991* (Columbus, Ohio: NTA-TIA, 1992), pp. 42-49.

Figure 7.
Distribution of Municipalities by Average Per-Household Cost of Treating Drinking Water According to Existing SDWA Standards as a Share of Median Household Income



SOURCE: Congressional Budget Office calculations based on data from the Environmental Protection Agency, the Bureau of the Census, and the municipal expenditure survey commissioned by the U.S. Conference of Mayors and the National Association of Counties.

NOTES: SDWA = Safe Drinking Water Act.

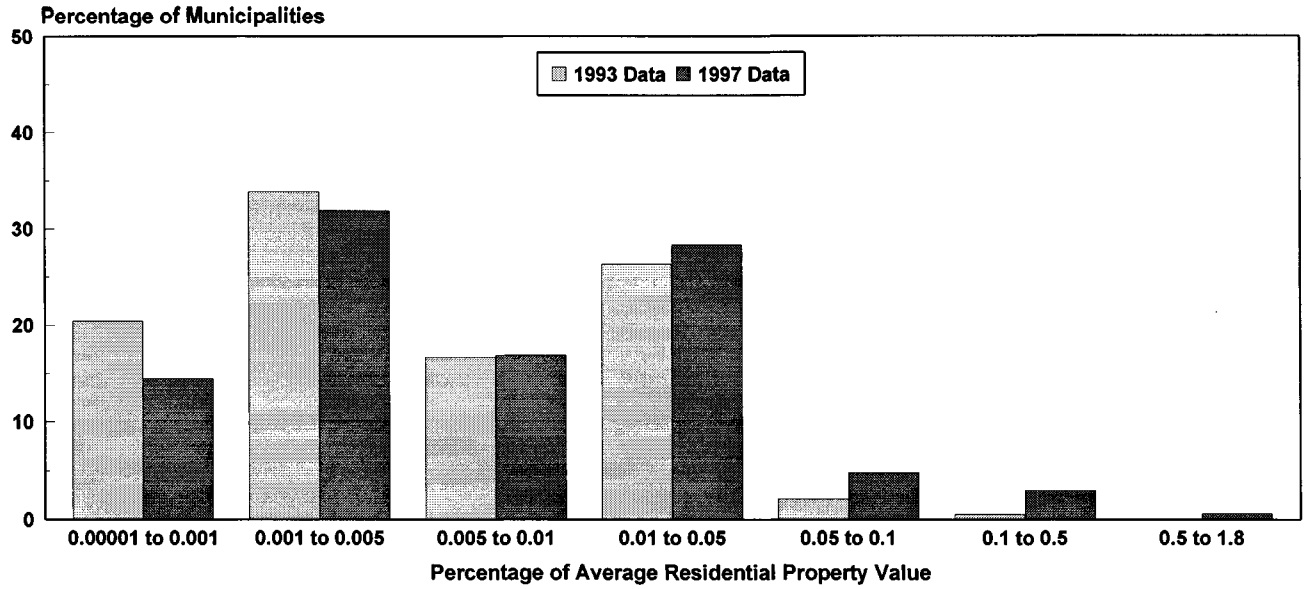
The figure compares 1993 and 1997 expenditure data from the municipal expenditure survey with 1990 data on median household income from the Bureau of the Census.

cent of municipalities had per-household costs that were less than 0.1 percent of median household income (see Figure 7). For 1997, two municipalities--or 1.2 percent of the 166 municipalities for which data were available--projected per-household costs of complying with existing rules that exceeded 1 percent of median household income. The remaining communities reported per-household costs that were less than 1 percent of median household income. Furthermore, over 87 percent of communities reported costs that were less than 0.1 percent of their median household income.

For 1993, over 99 percent of the municipalities reported per-household SDWA compliance costs for the existing rules that were less than 0.1 percent of their average residential property value (see Figure 8). For 1997, the number of municipalities projecting a cost that was less than 0.1 of their average residential property value fell to 96 percent. One municipality (0.6 percent of the 166 municipalities for which data were available) projected a cost that was 1.8 percent of its average residential property value.

The cost of meeting SDWA standards relative to median household income is a useful summary measure of fiscal burden for a municipality. It does not depict, however, the full distribution of burden experienced by individual households. Because some households may have income levels that are well below the median, increases in user fees will place a larger burden on them than the summary statistic indicated. Similarly, households with incomes that are above the median value will experience a fiscal impact that is less than that indicated by the summary statistic. Costs that are passed on to households in the form of property taxes do not share that characteristic because property taxes are levied as a percentage; in short, households with lower property values will pay a smaller amount. Because of that difference, the share of drinking water treatment costs that are passed on to households in the form of

Figure 8.
Distribution of Municipalities by Average Per-Household Cost of Treating Drinking Water According to Existing SDWA Standards as a Share of Average Residential Property Value



SOURCE: Congressional Budget Office calculations based on data from the Environmental Protection Agency, the Bureau of the Census, and the municipal expenditure survey commissioned by the U.S. Conference of Mayors and the National Association of Counties.

NOTES: SDWA = Safe Drinking Water Act.

The figure compares 1993 and 1997 expenditure data from the municipal expenditure survey with 1990 data on average residential property values from the Bureau of the Census.

user fees will be more regressive--that is, they will affect low-income households proportionately more than high-income households--than costs that are passed on to households through residential property taxes.

Chapter Five

Flexibility Under the Safe Drinking Water Act

A factor that led to the passage of the Safe Drinking Water Act in 1974 was a desire to have all public water systems meet certain health standards. A downside of imposing uniform requirements on drinking water systems, however, is that uniform requirements may cause some localities to take actions that do not make sense for their particular communities--such as testing for chemicals that have not been used in their area or undertaking treatment measures for which the costs far outweigh the benefits.

An important question is whether the SDWA provides sufficient flexibility to adjust requirements in those cases and therefore minimize unjustified costs. Current provisions in the law and the regulations are meant to provide the Environmental Protection Agency and the states with the ability to be flexible with the requirements that they place on communities. In reality, however, many of those provisions are rarely used. Nevertheless, in some cases, the EPA and the states may use the enforcement process to achieve flexibility in dealing with communities.

Provisions in the Law

The federal government and the states share responsibility for enforcing the SDWA. The federal government, through the EPA, has the authority to enforce drinking water standards in states that do not have "primacy." States with primacy take on enforcement responsibility, and the EPA may step in only under special circumstances. To gain primacy, states must obtain approval from the EPA. That approval is granted when states meet certain criteria. States with primacy receive funds to aid them in their oversight capacity. In 1995, $70 million was provided to states for that purpose.

Several provisions in the law are meant to provide the EPA and the states with the ability to be flexible with the requirements that they impose on communities.

- *Variances* are meant to provide some flexibility for dealing with water systems that have exceptionally dirty source water. Variances may be granted to systems that have used the "best technology, treatment techniques, or other means, which the Administrator finds are generally available (taking costs into consideration)" and are still unable to meet the maximum contaminant level defined by the EPA.[1] Before a state may grant a variance, it must find that the variance will not result in "an unreasonable risk to health."[2]

1. Memorandum from Joan Z. Bernstein, General Counsel, Environmental Protection Agency, to Victor J. Kimm, Deputy Assistant Administrator, Office of Drinking Water, May 21, 1979, p. 1.

2. Ibid.

- *Exemptions* may be granted to systems that are unable to meet a maximum contaminant level "due to compelling factors." Those compelling factors may include economic difficulty. Systems may be granted an exemption only if they were already in operation on the effective date of the MCL and if the state determines that the exemption will not result in an "unreasonable risk to health."[3] In addition, states must issue a compliance schedule when they grant an exemption.[4]

- *Waivers* for sampling requirements for specific contaminants may be granted to systems that are deemed to be unlikely to have that contaminant in their source water. States may issue areawide waivers that cover several systems or even all systems in the state. Use waivers may be granted when it is determined that a contaminant was not used, manufactured, or stored in the area. Susceptibility waivers may be granted when the geological conditions, the use of the land, and previous test results indicate that an area is not susceptible to a particular contaminant.

- *Grandfathering* may be used to allow systems to use data that was collected before the time monitoring requirements were in effect to satisfy their initial sampling requirements for a contaminant. Systems that are allowed to use grandfathered data to meet their initial sampling requirements may then begin their sampling requirements with the repeat sampling schedule.[5] Repeat sampling requirements are generally less frequent, and therefore less costly, than initial sampling requirements.

- *Composite sampling* offers a way for small systems (those serving less that 3,300 people) to reduce their monitoring costs by pooling their samples with other systems. States may allow composite sampling for no more than five sampling points. Larger systems may also use composite sampling to pool samples taken from different points in the system.[6]

Actual Use of Provisions for Flexibility

Although variances and exemptions give states the option to offer flexibility to systems in theory, in reality they are not frequently used. No variances and only 15 exemptions were issued between January 1990 and March 1994.[7] Given that approximately 200,000 public water systems are subject to federal regulations, that is a strikingly small number.

Variances and exemptions can be difficult to grant for several reasons.[8] First, it can be costly for a state to set up a program to carry them out. Second, it can be difficult to determine that granting them will not create an "unreasonable risk." Third, variances may be granted only after a technology is already in place. Systems are reluctant to install a technology unless they are sure that it will allow them to meet the required maximum contaminant level. Fourth, economic infeasibility is a criterion under which exemptions may be granted. However, there is no clear agreement on what is considered "affordable." The EPA offers that, "as a rule of thumb, a total annual household water bill becomes unaffordable when it is greater than 2 percent of median household income."[9] It does not indicate, however, what level of median household income should be considered--national, state, county, or other. Finally, states may be reluctant to grant exemptions even when they think they are warranted because they are concerned about the public perception of such an action.

3. Ibid., p. 2.

4. Memorandum from Michael B. Cook, Director, Office of Drinking Water, Environmental Protection Agency, to Regional Water Supply Branch Chiefs, February 20, 1987.

5. Environmental Protection Agency, "Consolidated Rule Summary for the Chemical Phases" (draft, October 1992).

6. Ibid.

7. Information contained in the Environmental Protection Agency's Federal Reporting Data System, August 1994.

8. The reasons discussed in this chapter are based on discussions with EPA staff, representatives of the Association of State Drinking Water Administrators, and state officials.

9. "National Primary Drinking Water Regulations; Final Rule," *Federal Register*, vol. 56, no. 20 (January 30, 1991), pp. 3570-3571.

Although only a small number of exemptions are granted, the EPA and the states often use the enforcement process to accomplish the goals that exemptions were to achieve. As part of the enforcement process, the EPA or a state may set up a compliance agreement with a system that allows it a period of time to comply.

Seven states have approved waiver programs, and 14 states have informal, in-place programs. In addition, 26 states are developing wavier programs but cannot yet grant waivers. Some states expect to reduce testing costs substantially through the use of waivers. For example, Minnesota expects to reduce its monitoring costs by $18 million during the 1993-1995 compliance period--56 percent of what it would expect to spend on the sampling in the absence of a waiver program. It spent $240,000 developing a waiver program and expects to spend approximately $23,000 to operate it each year. Since the state assumes the laboratory costs for water systems, the waiver program will result in significant savings to the state.[10]

Other states that have approved monitoring programs foresee problems in using them effectively. For example, New York State had a monitoring program approved by the EPA in the summer of 1994. Michael Burke, the director of the Bureau of Public Water Supply Protection in New York State, cites a lack of resources as a major impediment in granting waivers. He says that the state has difficulty affording the manpower that an intensive process of collecting data (such as those on chemical use, source protection, soil, and hydrological conditions) requires in order to grant waivers. He also indicates that the systems that are most in need of waivers, primarily small systems, are least likely to be able to undertake that effort themselves.

Although waiver programs are expected to result in significant savings in some states, not all states have them and some important barriers limit their use. Developing the waiver programs takes up limited state resources. Determining what contaminants have been used in an area and examining the susceptibility of water sources can be a very expensive process. States that conduct monitoring tests for water systems are the ones that are most able to benefit from the waiver process. In those cases, the upfront costs that the state incurs to establish a waiver program will result in lower testing costs for the state. If states require the systems themselves to gather the data to justify a waiver, some systems may find it less expensive to conduct the monitoring than to qualify for a waiver.

The EPA believes that most states allow grandfathered data but that such data are successful in lowering systems' costs for only some groups of contaminants. Grandfathered data are available because the EPA either required or encouraged the monitoring of unregulated contaminants in order to obtain occurrence data to be used when those contaminants were regulated. For some groups of contaminants, such as volatile organic compounds, the availability of grandfathered data can greatly reduce the amount of initial sampling that is required. For other groups of contaminants, such as inorganic compounds (IOCs) and synthetic organic compounds, availability of grandfathered data does not generally reduce sampling costs. In the case of IOCs, that failure is because the frequency of initial and repeat sampling requirements is the same.

In the case of SOCs, it is because early monitoring was not required for some of the contaminants that were ultimately regulated. Given the analytic methods for testing, having to test for the subset of contaminants for which grandfathered data are unavailable is not substantially less expensive than testing for the entire group.[11]

Although no data are available on the number of states that allow systems to undertake composite samples, the EPA believes that a significant number of states do not allow it. Some states may be reluctant to allow composite sampling for two reasons. First, they require additional resources to determine when composite sampling has occurred and to ensure that it was done properly. Second, since composite sampling leads to the dilution of samples, it may result in cases in which systems are not required to engage in more frequent monitoring when they have

10. Environmental Protection Agency, *Summaries of Selected State Waiver Programs* (April 1994).

11. Environmental Protection Agency, "Consolidated Rule Summary for the Chemical Phases."

contaminant levels at which such monitoring would otherwise be required.

Restructuring as Another Option to Reduce Costs

In addition to the high average household cost of treating drinking water, some small systems face other problems, including deteriorated physical infrastructure, lack of access to capital, limited customer and rate bases, and limited technical and management capabilities. The combination of those factors creates viability problems for small systems. "Restructuring" is one option that the EPA has advocated for dealing with small systems that cannot afford to comply with SDWA requirements. The EPA uses the term "restructuring" to refer to a variety of operations and ownership changes that systems can adopt to improve their viability. Those options include informal purchasing cooperatives among systems, mutual aid networks, contract operations and maintenance, and wholesale purchase of water, as well as actual consolidation of ownership.[12]

Although the EPA estimates that 50 percent of small systems could benefit from restructuring, numerous barriers can prevent restructuring from taking place. Those barriers include lack of incentives for viable systems to acquire troubled systems, local concerns about loss of control, and in some cases loss of water rights when consolidation occurs.[13] The EPA is urging states to develop viability programs. It would like those programs to contain approaches to prevent new nonviable systems from forming; systematically assess the viability of existing systems; promote restructuring or otherwise provide for improving the effectiveness of systems needing such improvement; and compel restructuring of nonviable, seriously noncompliant systems that are unwilling to take the steps necessary to achieve compliance.[14]

12. Peter E. Shanaghan, "Small Systems and the SDWA Reauthorization," *Journal of the American Water Works Association* (May 1974), p. 56.

13. Ibid.

14. Ibid., p. 57.

Chapter Six

Implications for Providing Cost Estimates Under the Unfunded Mandates Reform Act of 1995

The increasing concern in recent years about the costs that federal requirements impose on state and local governments has led the Congress to pass legislation that will make it harder to enact new unfunded mandates (see Box 3). The Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires the Congressional Budget Office to estimate the cost of intergovernmental mandates on state and local governments. The Safe Drinking Water Act case study highlights some of the challenges that CBO will face in providing those estimates:

- The law requires CBO to estimate the incremental cost of a mandate--that is, the additional cost that the mandate imposes above and beyond the cost of actions that states and localities are already taking or would undertake on their own before the requirements take effect. It is often difficult, or impossible, to isolate the incremental component of cost.

- The ultimate cost of a mandate is often a function of the specific requirements of the implementing regulations. Those details are not available when CBO is preparing cost estimates, which is the time the legislation is proposed.

- The data available at the time legislation is proposed are often extremely limited. The accuracy of CBO's estimate, therefore, will be limited by the lack of data.

- CBO often has limited time to prepare cost estimates--particularly for amendments and marked-up versions of bills.

As a result of those challenges, CBO's cost estimates will inevitably be imprecise. For example, although CBO's estimate of the cost of the 1986 amendments to the SDWA was based on the best information available from the Environmental Protection Agency and local communities at that time, it is considerably lower than the ultimate cost that current information indicates. CBO estimated that water systems would be required to make between a total of $3.3 billion and $4.6 billion (in 1992 dollars) in capital investments to comply with the amendments' requirements. Based on more recent data, the EPA now estimates that water systems will spend $8.8 billion on capital investments to meet the existing requirements that resulted from the 1986 amendments. Furthermore, an additional $13.8 billion to $20.8 billion could be necessary to meet proposed regulations (in their extended form) that are directly required by the 1986 amendments.[1]

1. This estimate includes a range of $1.6 billion (estimate of the Environmental Protection Agency) to $8.6 billion (estimate of the American Water Works Association) in capital to comply with the radon rule, $1 billion to meet the capital requirements imposed by other radionuclides, and $11.2 billion to meet capital requirements associated with the Disinfectants/Disinfection By-Products Rule. Radionuclides were one of the 83 contaminants that the EPA was specifically required to set standards for under the 1986 amendments. In addition to naming 83 specific contaminants, those amendments directed the EPA to issue regulations for 25 additional contaminants every three years. The Disinfectants/Disinfection By-Products Rule is one of the first group of 25 contaminants that the EPA chose to regulate.

Box 3.
Definitions and Requirements Regarding Intergovernmental Mandates Under the Unfunded Mandates Reform Act of 1995

Definition of an Intergovernmental Mandate

A definition of an intergovernmental mandate may be found in Title I of the Unfunded Mandates Reform Act of 1995. The Congress has not yet provided greater interpretation. The Congressional Budget Office (CBO) has paraphrased the definition below.

An intergovernmental mandate is defined as any provision in legislation, statute, or regulation that (1) would impose an enforceable duty upon state, local, or tribal governments, except when it is a condition of federal assistance or a duty arising from participation in a voluntary federal program; or (2) would reduce or eliminate the amount of authorization of appropriations for federal financial assistance for the purpose of complying with previously imposed duties. Legislation, statutes, or regulations that relate to duties arising from participation in voluntary programs may be considered intergovernmental mandates under a number of circumstances if those provisions were to increase the stringency of conditions of assistance or place caps on or decrease federal funding and if the state, local, or tribal governments lacked authority under the program to amend their financial or programmatic responsibilities to continue providing required services, and if the program is one under which more than $500 million is given to state and local governments under permanent authority.

Legislative Accountability and Reform[1]

Exemptions. The act exempts from the procedural point of order mandates that enforce the constitutional rights of individuals; prohibit discrimination on the basis of race, color, religion, sex, national origin, age, handicap, or disability; require compliance with federal grant-related accounting or auditing procedures; provide for disaster assistance; are necessary for national security or the implementation of treaties; are designated by the President as emergency legislation; or are related to various Social Security programs.

Committee Reports. The act requires any authorizing committee that approves a bill or joint resolution containing a federal mandate to draw attention to the mandate in its report. The report must describe the costs and benefits of the mandate, including direct costs to state, local, and tribal governments, and identify any newly created or existing sources of federal funding that will help pay for the mandate. If the committee intends for an intergovernmental mandate to be partly or entirely unfunded, it must explain why it is appropriate for any of the costs to be borne at the state or local level.

Cost Estimates. The act requires the authorizing committee to submit the bill to CBO for an estimate of a mandate's costs. That estimate must either be included in the committee's report or the committee should insert it into the *Congressional Record.* The CBO cost estimate must be provided for any intergovernmental mandate that would cost $50 million or more in the fiscal year in which it takes effect, or in any of the subsequent four fiscal years. The CBO report must include an estimate of any increased authorization levels in the bill that would help pay for the mandate. If there are such authorizations, CBO must estimate the new budget authority required to comply with the mandate for up to the first 10 years that the mandate is in existence. CBO must submit an explanation if it is unable to estimate the cost. To the

1. The description of the requirements under the Unfunded Mandates Reform Act of 1995 were drawn from the *Congressional Quarterly* (April 15, 1995), pp. 1087-1089.

extent practicable, CBO must also submit cost estimates of mandates in amended legislation.

Requests to CBO. The act requires CBO, at the request of a committee, to study proposed mandates with a significant budgetary impact on state and local governments. The committees can also ask CBO to estimate costs beyond a five-year period and to look at the disproportionate effect a mandate may have on particular regions.

Point of Order. The act allows any member of the House or Senate to raise a point of order against a bill or joint resolution that contains an intergovernmental mandate without a CBO cost estimate, unless that estimate cannot be made. Members can also raise a point of order in either chamber against a bill, joint resolution, amendment, motion, or conference report in which the costs of the intergovernmental mandate are to exceed the $50 million threshold, unless funding was provided to pay fully for the mandate.

Appropriations. The act allows any Member of the House or Senate to raise a point of order against any provision in an appropriation bill, resolution, amendment, or conference report containing an unfunded intergovernmental mandate. Such a point of order would affect only a single provision rather than the entire legislation.

Underfunded Mandates. The act requires federal agencies to determine whether there are sufficient funds to carry out mandates under their jurisdictions. If the funds are insufficient, they must notify the appropriate Congressional authorizing committees within 30 days of the beginning of the fiscal year. The agency can then submit a reestimate, based on consultations with state, local and tribal governments, that the amount appropriated is sufficient to pay for the mandate. Alternatively, it must submit recommendations for implementing a less costly mandate or making the mandate ineffective for the fiscal year. The Congress then has 30 days to consider the recommendations under expedited procedures. If the Congress takes no action within 60 days, the mandate will be abolished. State, local, and tribal governments may continue to comply, voluntarily, with a mandate that has been terminated by the federal government for lack of funds.

Review of Federal Mandates

The act authorizes funds for the Advisory Commission on Intergovernmental Relations to issue various reports on mandates on state and local governments and private business. First, the commission must issue a preliminary report within nine months on the role of federal mandates and the effect on state, local, and tribal governments. The report must make recommendations to the President and the Congress on easing mandates--including terminating impractical, obsolete, or redundant ones--simplifying them, making them more flexible, and temporarily suspending mandates that are not vital but that create fiscal difficulties for state, local, or tribal governments. Second, the commission must complete a study on intergovernmental mandates within 18 months. The study will have to consider the feasibility of measuring both the direct and the indirect costs and benefits of mandates. It will also consider the feasibility of measuring the direct and indirect benefits of federal assistance and tax benefits to state, local, and tribal governments. Finally, the commission must report to the Congress and the President on federal court cases involving intergovernmental mandates. The commission is to submit its first report within four months of the bill's enactment and a subsequent report by March 15 every year.

Measuring the Incremental Cost of a Federal Mandate

As discussed in Chapter 1, measuring the true cost of a federal mandate involves measuring the incremental cost that the mandate imposes on state and local governments. Because many federal mandates are designed to achieve a goal that state and local governments share, many state and local governments would take certain actions toward achieving that goal even without a federal mandate. The incremental cost of the mandate, therefore, is the additional cost that it imposes on state and local governments--above and beyond the expenditures that they would have made in its absence.

In some cases, incremental aspects of cost might be readily identified. For example, if a state or locality already has a requirement in place that is as stringent (or more so) than the proposed federal requirement, then the incremental cost of the federal requirement on that state or locality will frequently be negligible.

Calculating the incremental cost may be considerably more complicated if a state or locality has a requirement that is less stringent than the federal requirement. For example, if a federal mandate specifies a more stringent standard for drinking water than an existing state standard, then calculating the incremental cost will require an understanding of the available technologies for treatment as well as the nature of equipment currently installed in systems. Meeting a more stringent standard could either involve modifying or completely replacing a treatment facility. If a treatment facility is completely replaced, then the incremental cost that it imposes on the community will depend on the remaining life of the facility that it replaces. If the replaced facility is at the end of its useful life, then the incremental cost of the mandate would be the cost of building a new facility that meets the federal standard minus the cost of building a new facility that meets the less stringent state standard. Conversely, if the treatment facility that is replaced is a new one, then the incremental cost of the mandate is the entire cost of building the new facility. Calculating the incremental cost of mandates in that case requires knowledge about the age of the existing stock of treatment systems. That information, however, is often not available.

Finally, calculating the incremental cost ideally entails not only netting out the costs of actions that state and localities are currently undertaking, but also the future actions that they would chose to undertake on their own. For example, as information about the potential risks from drinking water contaminants becomes available through the research that is conducted as part of the process of developing both drinking water legislation and implementing regulations, communities might decide to undertake additional treatment on their own, regardless of federal requirements. Theoretically, CBO would like to deduct the cost of future actions that communities would choose to undertake on their own from the cost of the federal mandate. Predicting those costs, however, is an intractable problem.

Determining the incremental cost of a mandate is extremely difficult. It involves making assumptions about the technological choices that governments will make, the cost of implementing those choices, and possibly the age of the existing stock of equipment. Estimating incremental costs also requires making assumptions about the future actions that states and local governments would have undertaken without federal requirements. Such assumptions will inevitably be arbitrary.

Uncertainty About the Regulations That Will Result from Legislation

CBO cost estimates are made at the time legislation is proposed for enactment. However, legislative language is often broad and lacks the specifics needed to project future costs. Executive branch agencies usually develop those specifics through the regulatory process. For example, when the SDWA was passed in 1974, it did not specify what contaminants to regulate or at what level standards should be set, although it did direct the Administration to do so. The ultimate cost of the SDWA, of course, has hinged on those details. Because of the uncertainty about the

specific regulations that will result from legislation, cost estimates that are made at the legislative stage will be speculative and will usually have to encompass a wide range of possible regulatory alternatives.

In addition to the uncertainty about the specifics of the implementing regulations, both legislation and regulations may be challenged in court. In those cases, important details may not be clarified for a long period of time, making it even more difficult to predict costs.

Limited Data Sources

This study has examined available data on the cost that localities incur to comply with the current final and proposed standards under the SDWA. As is emphasized throughout the study, the data available to calculate that cost are limited. The engineering-based estimates of cost provided by the Environmental Protection Agency and the American Water Works Association rest on numerous assumptions that may ultimately prove to be incorrect. The locally provided cost estimates are based on surveys that are not designed to be representative at the national level, have poor quality control, and in which the respondents may have an incentive to make worst-case assumptions about future costs. Those limitations exist even though the SDWA has been in place for over two decades, many of the regulations have been finalized, the EPA and industry have devoted a great deal of effort and funding to generating cost estimates, and some localities have actually undertaken some of the necessary investments.

When cost estimates are generated at the legislative stage, the limitations on data are much greater. The sources of information used in this study are typically not available: engineering analyses are usually developed only as the specific regulations are formed, and little--if any--information on the costs that municipalities would actually experience may be available from census data or case studies.

The primary source of information for cost estimates developed at the legislative stage is often the views and judgments of federal, state, and local officials or others in the regulated community. Often, a different set of individuals must be contacted for each legislative proposal. In addition, the most informed people in the regulated community may have an interest in the outcome of the legislative debate and may therefore have an incentive to either over- or underestimate costs.

Limited Time

CBO devoted a considerable amount of time and resources to the task of assessing the costs and benefits of the Safe Drinking Water Act in this study. Gathering the appropriate data from a variety of sources, taking steps to assess and improve the quality of the data, and normalizing data obtained from different sources so that estimates may be compared appropriately are very time-consuming tasks.

An additional factor complicates the process of constructing the state and local cost estimates that CBO is required to make under P.L. 104-4: in some cases, the estimates will need to be provided in a very short time period. CBO will try to identify issues early on in the legislative process and in that way maximize the amount of time and effort that it can devote to constructing cost estimates. In spite of those efforts, however, major amendments can be adopted in the final stages of the process, leaving little time to conduct a thorough analysis of their implications.

Although state and local cost estimates can be an important ingredient in a legislative debate, the methodological challenges in estimating the incremental component of state and local costs, the uncertainty about the details of the implementing regulations, the lack of data at the legislative stage, and the short time frame under which those estimates must be produced will limit CBO's ability to provide accurate estimates. As a result of such complicating factors, cost estimates constructed at the legislative stage will be less precise than examinations conducted after the law or regulation is in effect.

Appendix

Method Used to Construct Estimates of Per Capita Local Expenditures on Drinking Water

The Congressional Budget Office calculated average per capita local expenditures on drinking water by dividing Bureau of the Census data on total expenditures by local drinking water systems by an estimate of the population served by municipally owned water systems. The estimate of the population served was based on Census Bureau data on the percentage of households served by public and private community water systems and on information about the percentage of community water systems that are publicly, rather than privately, owned. (The latter information was obtained from the Environmental Protection Agency's Federal Reporting Data Systems.)

Since 1940, the Department of Agriculture's Rural Development Administration (RDA) has provided loans to drinking water systems in rural areas or in cities or towns having populations of 10,000 or less. The department added a grant program in 1966. To reflect only local expenditures, CBO subtracted the value of the subsidies provided through the RDA program from the total expenditures that are reported by the Census Bureau. To calculate the grant equivalent of federal loans, CBO subtracted the net present value of payments that communities were required to make on loans provided by the RDA from the net present value of alternative loan payments that they would have had to make if they had not received RDA loans.

Since 1982, the RDA has provided loans at three different interest rates, depending on the median household income of the community. The highest interest rate is a "market rate" that corresponds to the Bond Buyer's 11-Bond Index. The 11-Bond Index is based on a set of 11 general obligation bonds maturing in 20 years and having a Moody's Investor Service rating of Aa. An "intermediate rate" and a "poverty rate" lie below the market rate. Before 1982, loans were offered at either 4.5 percent or 5 percent, depending on the year. The communities that receive RDA loans will generally not have a sufficient credit rating to receive the market rate indicated by the 11-Bond Index. In addition, RDA loans are generally for 40 years, a longer time period than communities can obtain elsewhere.

The Bond Buyer's Revenue Bond Index was used as an estimate of the alternative rate that communities might have obtained without RDA loans. That index uses 25 bonds maturing in 30 years with Moody's ratings ranging from Baa1 to Aa1. The Revenue Bond Index was thought to represent a conservative assumption about the alternative market rate that communities might expect. That index began in 1979; thus, earlier rates were estimated based on the relationship between the 11-Bond Index and the Revenue Bond Index over the 1979-1993 period. Because the alternative loan would probably be for a shorter period than the RDA loan, it was necessary to make an assumption about the rate at which the borrowing communities discounted future loan payments. For simplicity, CBO assumed that the communities' discount rate was equal to the rate indicated by the Revenue Bond Index. CBO then calculated the grant equivalent of each loan as the net present value of the payments under the alternative loan mi-

nus the net present value of payments under the RDA loan. During the 1957-1968 period, the interest rate charged on loans offered under the RDA exceeded the alternative market interest rate. In those cases, the method described above resulted in a negative grant equivalent. Communities would obviously not accept the RDA loan unless it presented a positive benefit relative to their alternative. Hence, in those cases the grant equivalent was constrained to zero.