REGULATING DRINKING WATER QUALITY INCREMENTALLY: BETTER THAN BENEFIT-COST ANALYSIS?

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ABSTRACT

The use of benefit-cost analysis has expanded over the last twenty five years and now plays a key role in the formulation of new regulations, even regulations for the protection of human health. Regulatory decision making is, of necessity, based on pre-regulatory paper studies of costs and benefits. There has been relatively little post-regulatory validation of these benefit-cost estimates, but what little information is available indicates that they are most often inaccurate. Roughly half of such estimates have been found to over-estimate costs by failing to anticipate technological change driven by the regulation. Roughly a quarter of studies underestimated costs by failing to anticipate unintended consequences of the regulation. Estimates of benefits are often impossible to verify even after the regulation is imposed as they involve small changes in cancer rates that are not distinguishable from random fluctuations in epidemiological data.

Basing decisions on a tool that is so often in error would appear to be ill advised. Unfortunately the alternatives are not very attractive. Basing decisions on absolute standards of health protection does not allow for the prioritization of limited resources. In practice it can result either in overly strict regulation, in the hopes of completely eliminating risk, or in inaction, as regulators wait for absolute scientific certainty before imposing stringent and costly regulations.

An alternate regulatory procedure based on incremental regulatory changes is described and statutory changes proposed to give EPA discretionary authority to adopt such a strategy for setting drinking water standards. This strategy will aim to avoid large, irreversible investments with uncertain benefits. This strategy will shift the emphasis from the largely inaccurate pre-regulatory benefit-cost assessments towards ongoing studies of regulatory impacts that will provide feedback to governmental agencies.

KEYWORDS

Drinking water, regulatory policy, benefit-cost analysis, adaptive regulation
INTRODUCTION

As a result of the passage of the Safe Drinking Water Act in 1974, the federal government assumed responsibility for setting legally enforceable drinking water standards, known as Maximum Contaminant Levels (MCLs). In doing so, the federal government took upon itself a complicated task for which the appropriate methodologies and criteria are still being worked out. Any attempt to set drinking water standards must somehow balance human life and health with the monetary costs of achieving the standards. The 1986 Amendments to the Safe Drinking Water Act provided that MCLs should be as close to absolutely protective of human health as technically and economically feasible. This standard setting process is attractive in that it clearly and explicitly places a priority on protecting human health. However, this approach does not allow for prioritization of different health risks and the investment of limited resources in areas where they will have the greatest benefits.

In the decades following the passage of the Safer Drinking Water Act, EPA established an increasing number of drinking water standards and made existing standards more stringent (Cotruvo and Vogt 1990). Some of these standards, particularly the Surface Water Treatment Rule and the Lead and Copper Rule (Auerbach 1994) imposed significant financial burdens on those water systems affected by the rule. In the mid-1990’s standards for a number of contaminants including arsenic, radionuclides, disinfection byproducts, and sulfate were under consideration (EPA 1994, EPA 1998a-c, EPA 2000, EPA 2001). These include wide-spread, naturally occurring contaminants (e.g., arsenic, sulfate, and some radionuclides) to which humans have long been exposed. While feasible technologies exist to address these contaminants, implementing lower standards on a national scale has promised to be very expensive and to offer uncertain health benefits.

BENEFIT-COST ANALYSIS

In response to this situation, the 1996 Amendments to the Safe Drinking Water Act changed the standard setting process. While EPA was still required to identify the most protective level that would be feasible to achieve, the EPA administrator was given discretionary authority to set an MCL less protective of human health than feasible, if justified by a benefit-cost analysis. Benefit-cost analysis is an economic tool that involves monetizing the cost and benefits of alternative options and comparing the aggregate costs with the aggregate benefits. While benefit-cost analyses had been required for all regulatory actions since 1981 under Executive Order 12291, the results of these analyses did not have the legal ability to influence the standard setting process until 1996. The use of benefit-cost analysis in setting environmental and health standards has been controversial. Executive Order 12291 was perceived by environmentalists as a barrier placed by the Reagan Administration to hinder environmental protection (Eads and Lave 1999). In addition, performing benefit-cost analyses on regulatory standards relating to human health and safety inevitable involves assigning a monetary value to human life, a difficult task and one opposed in principle by some people.
Perhaps the most significant concern with benefit-cost analysis is that accurate estimates of both the costs and benefits of a regulation are difficult to anticipate. A recent study (Harrington et al. 2000) compared cost estimates made by the appropriate regulatory agency before the regulation was implemented with cost estimates made after the rule was implemented for 25 different regulations. For 18 of the 25 rules the pre-regulation estimates of unit pollution control costs were inaccurate. Inaccuracy was defined as the post-regulation cost estimate being outside of the error bounds of the pre-regulation estimate, or for point estimates, a difference of greater than 25% between the pre-rule and post-rule regulatory cost estimates. Of these eighteen, in twelve cases costs were overestimated and in six cases costs were underestimated.

The lack of accuracy of pre-regulatory cost estimates raises questions as to whether benefit-cost analysis is a reliable tool for regulatory decision making. However, restoring the pre-1996 criterion of technical and economic feasibility would not necessarily improve the situation. Instead it would remove the one tool that EPA has to avoid highly cost-ineffective standards.

REGULATING INCREMENTALLY

An alternative approach would be to view drinking water standards, not as fixed values informed by certain knowledge, but as perpetually interim values that reflect scientific knowledge and technological capabilities at a given point in time. This would reduce the burden on pre-regulatory estimates of costs and benefits. The task of such an assessment would not be to see into the future and discern the precise value for the standard but to identify the most promising direction for altering the standard and to make an educated guess as to how far one might reasonable move in the desired direction. Too small an incremental change would risk the need for further adjustments in the same direction, while too large a change would risk overshooting the mark.

To some extent standards are already viewed in this way. The most notable example is the regulation of disinfection byproducts and microbial pathogens. The 1996 amendments set up a two-stage process in which interim rules were promulgated followed by long term rules several years later (EPA 2003). In addition, EPA is required to review all standards on a seven year basis and revise them as appropriate given the state of scientific and technical knowledge. In general, however, EPA is not given explicit authority to take incremental action that is likely to improve public health, in preference to risky attempts to guess the optimal value of a regulatory standard in the face of large uncertainties. It might be possible to justify such incremental actions using the benefit-cost provision of the 1996 Amendments to the Safe Drinking Water Act. EPA could estimate the benefits of a two-stage process in which an incremental change is made to the MCL and then, based on new information acquired about the actual impact of the standard, the MCL is further adjusted or left as is at the end of seven years. However, EPA has shown no inclination to pursue this type of analysis, with considerable justification. The inputs for such an analysis would be highly complex and uncertain,
particularly estimates of the extent to which the initial rule would improve the accuracy of the costs estimates used for subsequent rule making efforts. In addition, EPA would have little flexibility in how to incrementally adjust regulations. This lack of flexibility could lead to inefficient implementation of regulatory changes. Currently MCLs apply to all sizes and classes of water suppliers. Rather than simply regulating in temporal increments, it might be more efficient to promulgate regulations that apply to incrementally broader classes of water supplies over time. This would avoid presenting individual utilities with a moving regulatory target. Incremental regulation is likely to be highly inefficient if utilities make capital investments to achieve one standard, and then must make additional capital investments to achieve an incrementally more stringent standard several years later. Instead regulations could be phased in by targeting the largest utilities first, or the ones with the most serious problems. For example, the arsenic standard could have been set at 10 µg/l but initially applied only to supplies with arsenic levels greater than 20 µg/l. This would focus attention and resources on utilities where the greatest problem exists. By setting a target of 10 µg/l, the regulators would make clear to potential vendors the eventual size of the market and thereby encourage research and development expenditures. Similarly, utilities would be able to plan to meet the eventual target of 10 µg/l, rather than first adopting one treatment process to meet an initial standard, and then re-investing in a different process to achieve the next standard.

In order to design innovative regulatory approaches, EPA will need statutory authority that provides it with more flexibility in designing regulations. It is proposed here to amend the Safe Drinking Water Act to provide for a three-stage regulatory standard setting process. The first two stages would be identical to the existing process. The feasible level would be determined in the first step, and any adjusts based on benefit-cost considerations made in the second step, at the discretion of the EPA administrator. The third step proposed here would apply to cases where the costs and benefits were uncertain, such that the costs of the standard might well exceed the benefits. In these situations, the EPA administrator would be given discretionary authority to implement a less stringent, interim rule where the benefits are more likely to exceed the costs. Whenever possible, EPA should designate a target level and time frame. The interim rule should be compatible with subsequent regulatory action designed to achieve levels more protective of human health. This might involve selective application of the interim standard to protect highly exposed populations or application to those areas most able to comply with the rule without suffering excessive costs or other undesired impacts of the regulation.

An incremental action with clearly positive net benefits should be less controversial than a definitive rule with an uncertain net impact. This may help EPA to avoid becoming entangled in lengthy and expensive disputes that involve seemingly endless studies and re-evaluations of proposed regulatory actions. By pursuing a larger number of rules with clear benefits, the EPA may in the long run be able to be more effective at protecting health and the environment. It took 27 years from the passage of the Safe Drinking Water Act and multiple lawsuits before EPA revised the arsenic drinking water standard. Perhaps the great effort and expense involved in determining this single standard could
have been better spent identifying a larger number of less controversial steps to protect human health and the environment.

CONCLUSIONS

The modifications to the Safe Drinking Water Act proposed here would provide EPA with the ability to pursue incrementally beneficial regulatory changes without the need to see into the future and precisely predict the optimal value of a standard based on a benefit-cost analysis. The ability to take action would allow for improved knowledge of the true costs of the regulation and provide incentives for the development of new technologies to comply with the rule. Incremental approaches are not always appropriate, as they may diminish possible economies of scale, or delay needed health and environmental benefits. However, they do offer an opportunity to take limited beneficial action when the benefits of more stringent action are uncertain and likely to be disputed.

REFERENCES