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Water Costs and Affordability in the United States: 1990 to 2015

NEARLY 25 YEARS AFTER THE D/DBP NEGOTIATIONS FOCUSED ATTENTION ON AFFORDABILITY, IT IS NOW A GOOD TIME TO EXAMINE HOW THE COST AND AFFORDABILITY OF WATER SERVICE IN THE UNITED STATES HAVE CHANGED.

Twenty-five years ago, the US Environmental Protection Agency (USEPA) conducted a negotiated rulemaking on disinfectants and disinfection byproducts (D/DBP) in drinking water. One important issue that arose during these negotiations was how to determine whether new regulations would be affordable. Up until that time, no one had conducted any rigorous analysis of water affordability, though one early paper had highlighted a growing concern with low-income households that were unable to afford water service in some communities (Saunders 1992). So, late one night during the negotiations, a few people huddled around a laptop computer in a hotel room and started looking at income distribution curves and other data that might help inform decisions about the affordability of water service in the United States. These efforts resulted in several informative presentations and one of the first papers focused on water affordability (Rubin 1994).

A few years later, the National Research Council issued a report on safe drinking water that included a discussion of affordability (National Research Council 1997). At around this same time, the Safe Drinking Water Act Amendments of 1996 included both specific affordability provisions and the state revolving fund program to help provide lower-cost capital to utilities. Since then, the water and wastewater industries' thinking about affordability has been shaped by a comprehensive study of water affordability programs (Saunders et al. 1998), the inclusion of a chapter on affordability in the fifth edition of the AWWA Manual M1. *Principles of Water Rates, Fees and Charges* (AWWA 2000), a report on affordability from the National Drinking Water Advisory Council (NDWAC 2003), and the publication of affordability guides by AWWA (2005) and the Water

Water supply by State/territory, county/parish and Basin/Province

Environment Federation (WEF 2007), as well as numerous papers, conference presentations, and reports.

While surveys of water rates have been conducted biennially for nearly 30 years (AWWA 2016, Duke & Montoya 1993), comprehensive studies examining the actual cost of water to consumers (that is, water bills) are much less frequent (Rubin 2005, 1998). The distinction is important, because as Chesnutt and Beecher (1998) noted, conservation programs can be expected to increase water rates (that is, the price per unit of water), but often result in lower bills for water service (that is, the total cost to the consumer). Indeed, this distinction has become even more critical in light of the significant decline in average household water consumption that has been observed for the past decade and longer (DeOreo & Mayer 2012, Coomes et al. 2010).

As we approach the 25th anniversary of the D/DBP negotiations that focused attention on affordability, it is an appropriate time to examine how the cost and affordability of

water service in the United States have changed over the past 25 years.

CHANGES IN WATER PRICES

Water prices—the cost per unit of water—have tripled since 1990. According to data collected through biennial surveys, first by Ernst & Young and now by Raftelis Financial Consultants and AWWA, the typical cost in the United States for a residential customer to purchase 1,000 ft³ of water increased from \$11.16/month in 1990 to \$34.61/month in 2016 (AWWA 2016, Duke & Montoya 1993). In contrast, overall consumer prices, as measured by the consumer price index and typical incomes as measured by median household income, have approximately doubled during the same period, as shown in Figure 1.

CHANGES IN WATER BILLS

As mentioned, there is an important difference between the per-unit price of water and the actual water bills customers receive. Over the past 25 years, two significant trends have affected customers' water bills. First,

the typical household uses less water now than it did in the past; for example, Coomes et al. (2010) estimated that between 1978 and 2008, typical household water consumption declined by approximately 13%. While the exact sources of the decline are not known with certainty, the Coomes study suggested that multiple factors may have been at play, including the introduction of appliance and plumbing fixture efficiency standards, a reduction in the average number of people living in a household, drought conditions in some parts of the country, and increasing water prices.

In addition, data collected by the US Census Bureau show a dramatic increase in the percentage of customers in multi-family housing units (e.g., apartment buildings, condominiums) that receive a bill for water or wastewater service. Figure 2 provides an analysis of US census microdata from 1990 to 2015 using data compiled by the University of Minnesota (Ruggles et al. 2017). Figure 2 shows that during this 25-year period, there has been little change in the percentage of

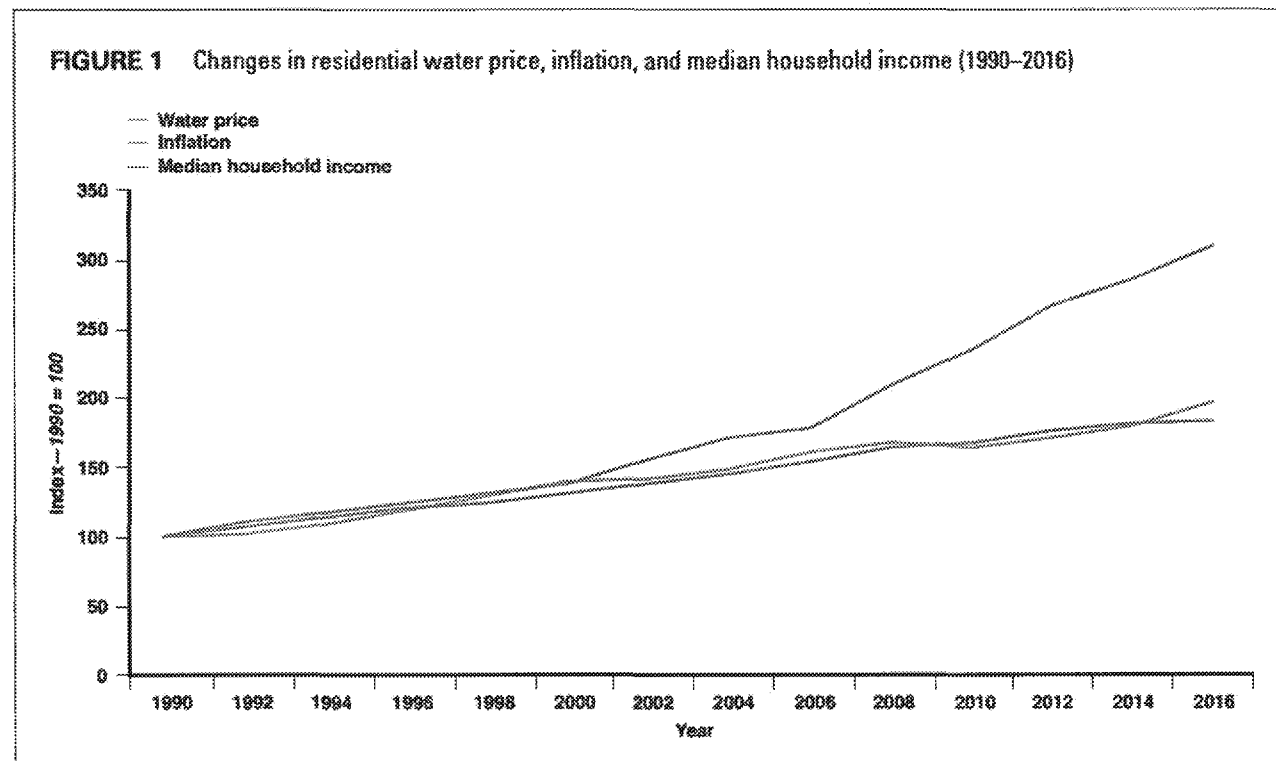
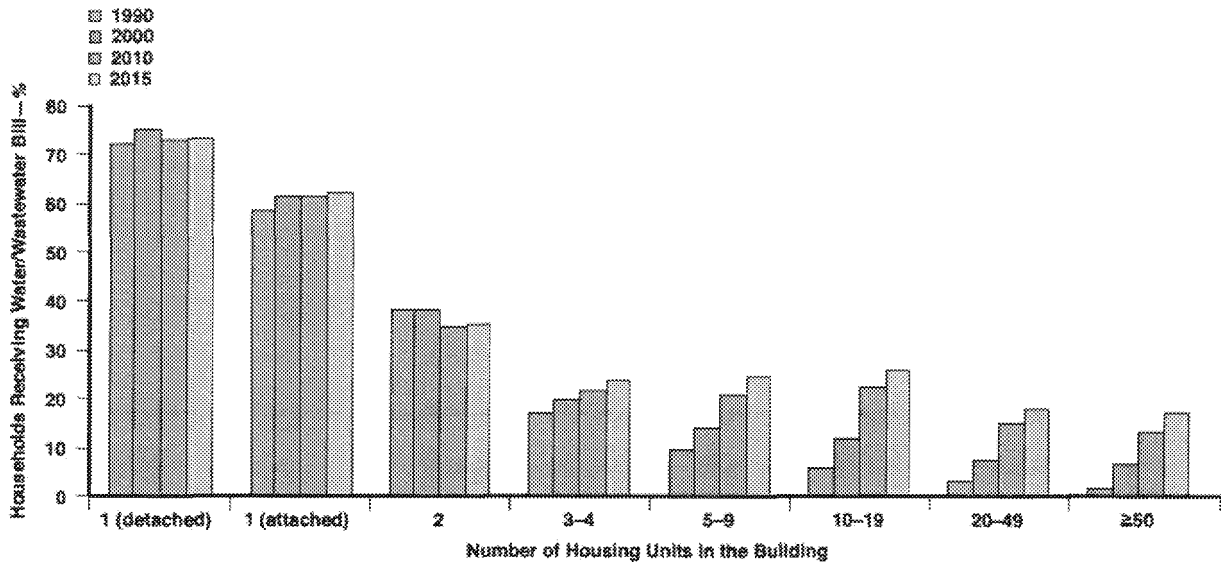


FIGURE 2 Percentage of households receiving water or wastewater bill by number of units in building (1990–2015)



single-family households that receive a water/wastewater bill, with the percentage remaining at about 70% for customers in detached houses and 60% for customers in single-family attached houses. In contrast, there has been a dramatic increase in the percentage of households in multi-unit buildings that receive a water/wastewater bill. Taking buildings with 50

or more units as an example, in 1990 only 2% of households said they received a water or wastewater bill; by 2015 that percentage had increased eight-fold, to 17%. Similar significant increases occurred between 1990 and 2015 for all households in buildings with five or more units.

Many households in multi-unit buildings do not receive water bills

directly from the water utility providing service. Instead, their share of the building's water bill is determined through submetering or the use of ratio billing methods by building owners and operators. In a comprehensive study sponsored by USEPA and others, Mayer et al. (2004) estimated that increased submetering or other methods of billing consumers in multi-unit

FIGURE 3 Changes in residential water and wastewater bill, water price, inflation, and income (1990–2015)

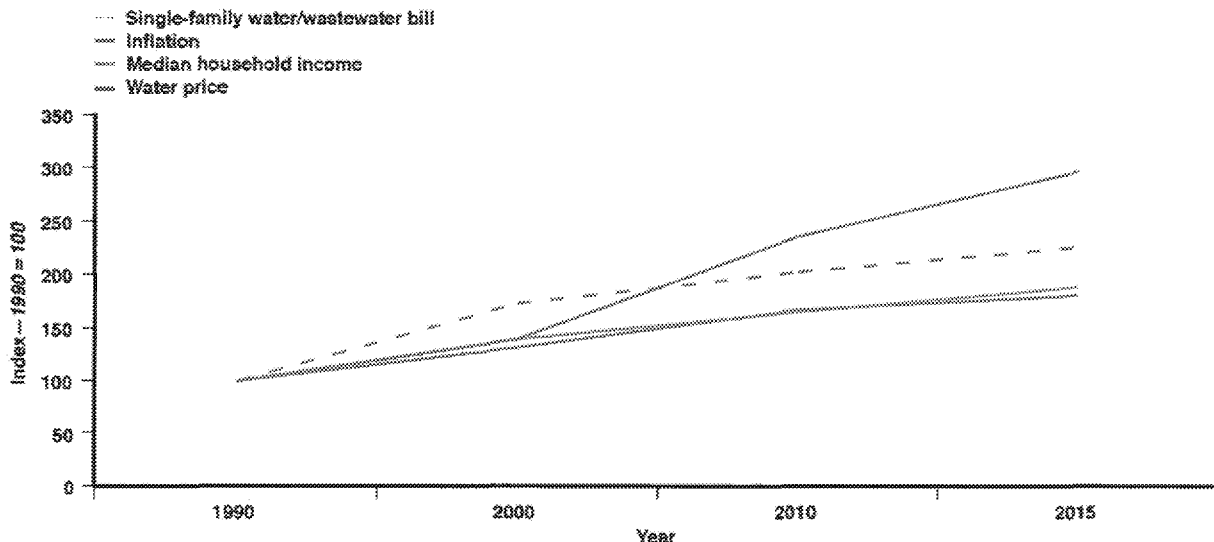
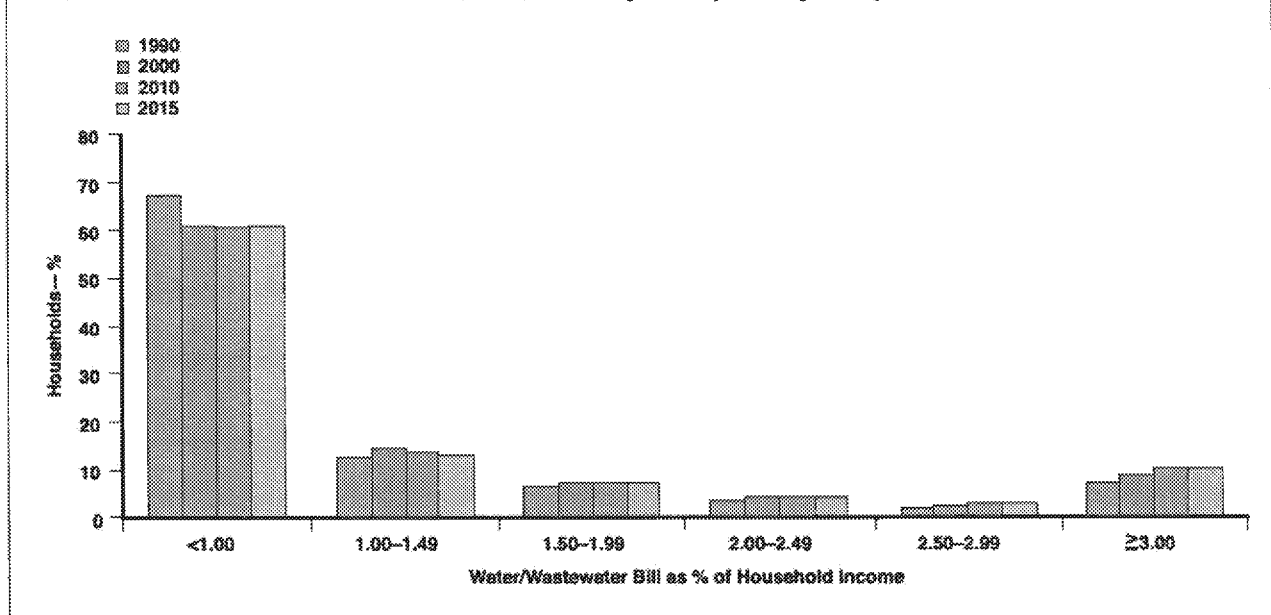


FIGURE 4 Water/wastewater bill for households in single-family buildings as a percent of income (1990–2015)



buildings could reduce water consumption by between 11 and 26%. This study was part of an effort by USEPA to promote submetering and other billing methods as a way to encourage water conservation in multi-unit buildings, and from the census data, it appears that these efforts have achieved some level of success.

The combination of declining consumption in single-family housing and the increased prevalence of direct billing in multi-unit buildings has contributed to declining per-household water usage. This affects utilities significantly, because even though water prices are increasing much faster than the rate of inflation, it does not necessarily follow that water bills (the product of the water price and water consumption) will exhibit the same trend.

An analysis of US census data provides a 25-year history of actual water bills that households reported receiving. Figure 3 reproduces the data from Figure 1 but adds a dashed line showing the increase in water/wastewater bills from 1990 to 2015 for households in single-family buildings. These are the households that are most likely to receive their water or wastewater bills directly from the utility rather than from a third party.

That is, between 1990 and 2015, while the price of water tripled (a compound annual increase of 4.5%), the average water/wastewater bill received by residential customers of water utilities increased by a more modest (but still substantial) 2.25 times (an annual increase of 3.3%). When compared with the rate of increase in general prices

median incomes over this period, it does not necessarily follow that the same effect would occur for households with incomes higher or lower than the median. An analysis of US census data for households in single-family buildings shows that water costs as a percentage of income have been fairly stable, except for households with the lowest incomes.

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(1.8 times or 2.4% per year) and incomes (1.9 times or 2.6% annually), water bills increased by between 0.7 and 0.9% per year in excess of the increase in inflation and incomes, respectively.

CHANGES IN THE AFFORDABILITY OF WATER SERVICE

While water/wastewater bills increased faster than the increase in

Figure 4 shows that in 1990, 67% of households in single-family buildings had bills for water and wastewater that were less than 1% of their income. By 2000, that percentage had dropped to 61%, and it has remained at that level through 2015. At the opposite end of the figure, in 1990, 7% of households in single-family buildings had water/wastewater bills that totaled 3% or more of

their income; that percentage increased to 9% in 2000 and was more than 10% in 2015.

CONCLUSIONS

The water industry has seen many changes in the past 25 years, but some things have remained fairly constant. In the United States, most water consumers in single-family buildings continue to pay less than 1% of their income for water and wastewater service. At lower income levels, however, water and wastewater bills are increasingly burdensome as costs increase faster than incomes. Indeed, between 1990 and 2015, the percentage of households in single-family buildings that paid 3% or more of their income for water and wastewater increased by 40%, from 7.4% of households in 1990 to 10.5% of households in 2015.

The percentage increase, however, tells only part of the story. The number of households in single-family buildings that pay for water or wastewater increased dramatically during the 25-year period, from 47 million to 66 million households. Thus, in 1990 about 3.3 million households paid 3% or more of their income for water and wastewater. By 2015 the number of households devoting 3% or more of their income to water and wastewater had more than doubled to 6.8 million households.

Those in the water industry have greatly increased their understanding of the affordability of water services to lower-income customers. Those efforts, however, have not stopped the costs of water services from continuing to increase faster than incomes. If that trend continues, it can be expected that lower-income households will have even more difficulty paying their water and wastewater bills in full and on time. Consequently, water and wastewater utilities will need to remain vigilant in controlling costs, continue to evaluate the need for (and effectiveness of) affordability programs, and assess the adequacy of their customer service operations.

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Scott J. Rubin is a consultant and attorney working exclusively on issues affecting the public utility industries. He was a member of the Disinfectants and Disinfection Byproducts Rule negotiated rule-making in 1992 and 1993 when he was serving as chair of the Water Committee of the National Association of State Utility Consumer Advocates. He left government service in 1994 to open his own practice. During the past 25 years, he has conducted research and provided guidance on affordability and customer service issues for AWWA, the National Rural Water Association, the Water Research Foundation, and several utilities. Rubin can be reached at scott.j.rubin@gmail.com.

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