Due To The Coronavirus We Will Be Closed Until Further Notice. Thank You.
Water Consumption and Utility Revenues at the Start of a Pandemic: Insights From 11 Utilities

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Key Takeaways

Eleven utilities from across the United States were studied to understand the pandemic’s effects on water consumption and utility revenues.

Most utilities in the study saw an overall increase in water consumption with a rise in residential demand that offset declines in nonresidential demand.

Most utilities in the study experienced increased revenues in 2020 compared with previous years, largely due to rate increases, inclining block rates, and an unusually warm summer.

Water utilities’ ability to adjust to fluctuating demand and changing revenue patterns is a testament to their sound financial practices.
As the first wave of COVID-19 hit the United States in early 2020, utility leaders across the water industry wondered what the pandemic would mean for their worker safety, continuity of operations, and ultimately, their bottom line. An AWWA survey sent to utilities in March 2020 showed utilities were shifting operational and business practices, and 80% expected revenue and cashflow problems (AWWA 2020). In April 2020, a Raftelis report, produced in collaboration with AWWA and the Association of Metropolitan Water Agencies (AMWA), predicted an overall negative impact of US$13.9 billion nationwide on drinking water utility revenues due to changes in consumption patterns, increased delinquencies, the temporary elimination of shutoffs for nonpayment, lower customer growth, and other indirect impacts (Raftelis 2020).

Raftelis teamed with researchers from Duke University to further explore these anticipated trends and study water utility consumption and revenues during the COVID-19 pandemic. The study team recruited 11 water utilities that agreed to provide monthly water consumption updates and billed revenues. Historical data were collected from years not affected by COVID-19 (2017–2019) to compare with 2020.

### 11 Water Utilities Across the United States

The 11 utilities recruited for this study (shown in Table 1) are a diverse group of water providers, varying in size (from 50,000 to more than one million people served) and climate (Trabuco in the dry coastal California climate; Denver in the Rocky Mountain region; West Palm Beach in the subtropical southeast; and Lehigh County Authority in the humid continental northeast). The utilities also have different customer bases—the large metropolitan water providers have a mix of residential, commercial, and industrial customers, while Marana and Trabuco Canyon have primarily residential customers.

Likewise, each water utility has a rate structure unique to its situation, reflecting individual goals and priorities. Steeply inclining block volumetric rates were common in the western and south-western utilities (e.g., Austin, Denver, and Marana), some had differential rates by customer class (DC Water), and others had a uniform volumetric rate for all customers (Lehigh County Authority). All participating utilities had a fixed charge that increased with the size of the customer’s water meter. The differences in customer base, climate, and rate structure would become relevant to the financial impact of COVID-19 for each utility.

### Percentage of Revenues From Residential Customers for the Participating Water Utilities (2017–2019)

| Utility                          | State    | Revenue From Residential Customers % |
|---------------------------------|----------|--------------------------------------|
| City of Arlington               | Texas    | 60                                   |
| City of Austin                  | Texas    | 44                                   |
| Columbus Water Works            | Ga.      | 69                                   |
| DC Water                        | D.C.     | 23                                   |
| City of Denton                  | Texas    | 55                                   |
| Denver Water                    | Colo.    | 58                                   |
| Lehigh County Authority         | Penn.    | 75                                   |
| Marana Water                    | Ariz.    | 77                                   |
| City of Raleigh                 | N.C.     | 54                                   |
| Trabuco Canyon Water District   | Calif.   | 90                                   |
| City of West Palm Beach         | Fla.     | 38                                   |

Table 1
relevant to the financial impact of COVID-19 for each utility.

**Tracking COVID-19 Impacts Using Utility Billing Data**

The utilities in the study provided summarized billing data for analysis, and because they charge for water service in different ways, the data were consolidated to allow for a utility-to-utility comparison. The study team accomplished this by consolidating customer classes into two groups: residential and nonresidential. The residential group included single-family residential customers, while the nonresidential group included multifamily residential, government, commercial, and industrial customer consumption and billing. Irrigation, agricultural, reclaimed water, and wholesale customers were excluded from the analysis because not all utilities had those customer classes.

**Residential Consumption Increased While Nonresidential Consumption Decreased**

Total water consumption increased in 2020 for most of these utilities (Table 2), with residential customers using more water in all utilities except West Palm Beach. In contrast, total nonresidential consumption in 2020 decreased in 80% of the utilities. DC Water saw the largest drop in year-end nonresidential consumption (−9.5%) compared with its average in 2017–2019, followed by Columbus Water Works (−8.0%), Arlington (−7.4%), and Denton (−6.0%). Only in the smaller residential communities of Marana and Trabuco Canyon was 2020 nonresidential consumption greater than the pre-pandemic average, but nonresidential consumption was a much smaller portion of those communities’ overall system consumption. Restrictions on commercial activity due to COVID-19 health orders and individual apprehensions surrounding COVID-19 likely drove nonresidential consumption reductions.

Water consumption varied considerably for this group of utilities in 2020 (Figure 1). Total consumption decreased in the early months of the pandemic but rebounded in July and August 2020, with some utilities, such as the primarily residential communities of Trabuco Canyon and Marana, experiencing very strong increases. The seasonal increase in consumption during the particularly hot and dry summer months was evident in Arlington, Austin, Denton, Denver, and Marana. Residential consumption was likely bolstered by lockdown orders, remote schooling and working, and the hot, dry conditions throughout the United States, which increased residential irrigation and outdoor water recreation.

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**2020 Water Consumption Compared With Average (2017–2019)**

| Utility            | Residential % | Nonresidential % | Total % |
|--------------------|---------------|------------------|---------|
| Arlington          | 4.3           | −7.4             | −0.6    |
| Austin             | 9.1           | −1.5             | 2.5     |
| Columbus           | 2.5           | −8.0             | −2.3    |
| DC Water           | 0.7           | −9.5             | −7.4    |
| Denton             | 8.0           | −6.0             | 1.6     |
| Denver             | 15.7          | −2.7             | 6.3     |
| Lehigh County      | 3.7           | −2.9             | 0.1     |
| Marana             | 18.6          | 5.0              | 16.1    |
| Raleigh            | 7.0           | −1.8             | 2.4     |
| Trabuco Canyon     | 3.8           | 17.9             | 5.5     |
| West Palm Beach    | −0.1          | −0.4             | −0.3    |

Percent values represent difference between 2020 and average of 2017–2019.

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Revenue Trends Reflected Changes in Consumption and the Influence of Inclining Block Rates

Billed user charge revenues are directly related to water consumption, but the relationship between the two may vary with the percentage of revenue recovered from fixed charges and the price per unit of water used. Except for the Lehigh County Authority, which uses a uniform volumetric rate structure, all utilities in the study use an inclining block rate for residential customers.
The utilities included in the study each apply a fixed charge, regardless of the amount of water a customer consumes, and the rate structures incentivize water conservation. For example, Denton, Denver, and Marana have inclining block tiered rates in which the cost of water per unit doubles or triples at certain use thresholds.

Inclining block rates, in addition to the bump in consumption from a dry and hot summer, may explain the large increases in residential billed revenues observed in those communities in Table 3. In addition, each of these utilities has increased its rates since 2017, making comparison of 2020 revenues with historical billed revenues difficult. However, in no case did communities raise rates enough to completely explain the large increases in residential billed revenues.

Nonresidential billed revenues decreased in three communities (Arlington, Austin, and Raleigh) compared with their three-year historical averages. Still, revenues did not decrease as much as consumption did, possibly a result of recent rate increases and stable revenues from fixed charges.

Overall, billed rate revenues were higher than the three-year average in all but one community, exemplifying these water providers’ general financial resilience. Put another way, none of the water utilities experienced a dramatic drop in total billed revenues in 2020. While a positive result, some utilities did not meet planned revenues, which can significantly affect utility finances, even if the difference is only a few percentage points.

Figure 2 shows the monthly patterns of billed revenues for the residential and nonresidential groups in 2020 compared with 2017–2019. The seasonality of revenues is apparent, as was the case for consumption. Although the year-end numbers show relative stability of revenues (except for Denver, Marana, and Raleigh, which experienced considerably increased revenues), the month-to-month picture shows that some utilities experienced significant fluctuations. Denton experienced several months of double-digit decreases in nonresidential revenues from April to June 2020, but then saw double-digit increases in nonresidential revenues from July to September 2020.

Conversely, starting in May 2020, Denton, Denver, and Marana began to see 20%–50% increases in billed revenues from the residential group.

### 2020 Billed Water Revenues Compared With Average (2017–2019)

| Utility       | Residential % | Nonresidential % | Total % |
|---------------|---------------|------------------|---------|
| Arlington     | 7.0           | −0.1             | 4.2     |
| Austin        | 6.7           | −6.8             | −0.9    |
| Columbus      | 12.1          | 13.2             | 12.5    |
| DC Water      | 9.5           | 5.3              | 6.2     |
| Denton        | 32.3          | 3.3              | 19.2    |
| Denver        | 22.7          | 5.3              | 15.4    |
| Lehigh County | 14.6          | 1.5              | 11.3    |
| Marana        | 24.0          | 5.8              | 19.8    |
| Raleigh       | 6.6           | −0.9             | 3.1     |
| Trabuco Canyon| 6.7           | 14.7             | 7.6     |
| West Palm Beach| 4.9           | 2.4              | 3.4     |

Percent values represent difference between 2020 and average of 2017–2019.
compared with the historical average for each month. In December 2020, Denton experienced a 91% increase in residential revenues. Although billed revenues increased for many utilities, this study did not investigate actual collected revenue from customers, which was expected to decrease moderately because of economic hardship affecting customers and collections efforts put on pause.
Evidence of Financial Resilience

This study did not seek to establish direct causation between COVID-19 prevalence in a community and changes in water utility consumption and revenues. Instead, we used water consumption and billed revenues as a proxy for water utility operational and financial performance during this pandemic. Our study shines a light on the high-level trends that affect water utilities’ bottom lines. Of course, these variables do not paint an entire picture of utility financial performance; other variables such as actual recovered revenues (as opposed to billed) would show any increases in pandemic-related delinquency, and utility customer policies such as shutoff moratoriums and customer assistance programs will also affect customer behavior. This study included only a small sample of utilities, but the trends of increased residential and decreased nonresidential consumption and revenues are consistent with other reports (Cooley 2020).

The 2020 water consumption and billed revenues data from these utilities showed that only a few experienced low total consumption in 2020, which was largely driven by decreases in nonresidential demand. In comparison, most of the utilities showed that any decrease in nonresidential consumption was offset by much higher residential demand. Interestingly, a confluence of factors, most notably inclining block volumetric rates for residential customers and a hot, dry summer that drove an increase in residential demand, turned what could have been a low-consumption, low-revenue year into a high-revenue year for many utilities.

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