

Heat or eat? How one energy conservation strategy may hurt vulnerable populations

December 16 2019



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Any economic and conservation benefits associated with time-of-use electricity billing could be achieved at the expense of some of the most vulnerable citizens in our society: people with disabilities and the elderly,

new research suggests.

Under a time-of-use system, energy prices are higher during high-demand "on-peak" times, a practice intended in part to create incentive for people to reduce their electricity use when it's more expensive.

The study showed that two vulnerable populations, people with disabilities who may be using life-saving equipment and [elderly people](#) more sensitive to temperature changes, saw the largest increases in their bills on the time-of-use rates.

Time-of-use rates also were linked to [worse health outcomes](#) in households occupied by ethnic minorities and people with disabilities compared to their non-vulnerable counterparts.

"For people with disabilities in particular, there may be a forced choice. Either you're using your medically necessary equipment, which can obviously be critical for maintaining health, or you're saving money. You don't get to do both," said Nicole Sintov, senior author of the study and an assistant professor of behavior, decision making and sustainability at The Ohio State University. "It's a bad choice for people to have to make."

The findings suggest that time-of-use electricity rates should be adopted on a large scale only after they're tested and designed to ensure they don't increase hardship for the most vulnerable energy users, Sintov said.

The study is published today in the journal *Nature Energy*.

Time-of-use billing rates are becoming more and more common as utilities try to shift residential energy use to times of day when demand on the power grid is lower or when the utilities can incorporate renewable sources, such as solar or wind, into the power supply—or

both.

The policies themselves, as potential mitigators of climate change, have merit, said Sintov, a faculty member in Ohio State's School of Environment and Natural Resources. But she said this research suggests time-of-use rates come with consequences for people already more likely to experience injustices identified in previous research: people with disabilities and the elderly, who tend to be disregarded by decision-makers, and residents in [low-income households](#) who may experience energy poverty.

"Households suffering from energy poverty are forced to make trade-offs between paying for electricity bills versus other necessities, such as food and medicine," Sintov and first author Lee White, a former postdoctoral researcher at Ohio State now with Australian National University, wrote in the paper. "Time-of-use and other forms of demand-side response measures may worsen this trade-off pressure, often termed 'the heat or eat dilemma.'"

Sintov and White obtained data from a utility that was surveying participants in a time-of-use rate pilot program implemented during the summer in a hot climate in the southwestern United States. Participants were randomly assigned to either one of two time-of-use rate plans with different peak times and varying on-peak rates or to remain on the existing flat rate.

Based on demographic data the utility collected, the Ohio State researchers created six vulnerability indicators to which participants were assigned as appropriate: low-income, elderly, young children, people with disabilities, and residents identifying as Hispanic or African American. The final sample for the analysis comprised 7,487 respondents.

Sintov and White then applied statistical and mathematical modeling to the data to determine whether and how the time-of-use rates affected costs and health outcomes for residents from vulnerable and non-vulnerable populations.

Both time-of-use rates resulted in bill increases for all participants. But the bill increases from baseline to pilot year were higher for people with disabilities and the elderly than for their non-vulnerable counterparts.

In effect, these groups were penalized for a lack of flexibility in electricity use that is beyond their control, Sintov said, noting the affected households were less likely than others to reduce on-peak energy use and curtail use of air conditioning.

The analysis also showed that Hispanic households and people with disabilities experienced worse health outcomes on time-of-use rates, a finding based on these groups' more frequent reports that they sought medical attention for heat-related conditions.

In some cases, specific vulnerable populations on the time-of-use rates fared better than non-vulnerable participants: Low-income and Hispanic households had lower bill increases compared to non-vulnerable counterparts, and households with young children experienced better health outcomes.

These effects on [vulnerable populations](#) aren't just theoretical. A 2015 California Public Utilities Commission ruling ordered the state's investor-owned utilities to establish default time-of-use rates for residential customers beginning earlier this year. All affected residential customers are expected to default to time-of-use rates by October 2020.

"There are also utilities that already have time-of-use rates as a default. It's possible to opt out, but people tend to stick with the default," Sintov

said. "If you do an overall evaluation of the effects of these changes, which many utilities are doing, you will get a general answer. But when you start slicing it up and looking at subpopulations, and particularly populations that are vulnerable to energy injustices and already experiencing them, we see very different results.

"One-size-fits-all is not going to work."

More information: Health and financial impacts of demand-side response measures differ across sociodemographic groups, *Nature Energy* (2019). DOI: [10.1038/s41560-019-0507-y](https://doi.org/10.1038/s41560-019-0507-y) , www.nature.com/articles/s41560-019-0507-y

Provided by The Ohio State University

Citation: Heat or eat? How one energy conservation strategy may hurt vulnerable populations (2019, December 16) retrieved 11 May 2024 from <https://techxplore.com/news/2019-12-energy-strategy-vulnerable-populations.html>

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