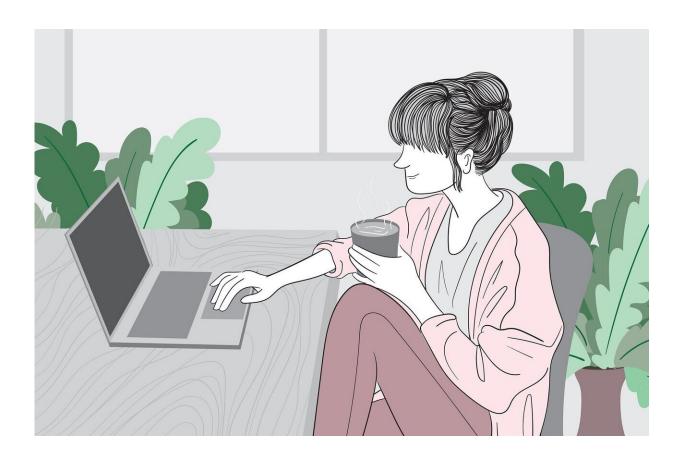# Research reveals household water consumption changes during lockdown

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Cranfield University research using data from smart meters has found that household water consumption changed significantly after the start of the COVID-19 lockdown, shifting from predominantly higher usage

early in the morning to multiple peaks and continued demand throughout the day.

The study used machine learning algorithms to analyze and identify patterns in hourly water [consumption](#) data from 11,528 households in the East of England from January to May 2020.

The research is the first of its kind in the UK to quantify network consumption and segment households into different behavioral clusters according to significant differences in usage patterns.

Key findings were that:

- There was an overall increase in household consumption from March to May 2020 compared to the same period in 2019, with the gap opening as lockdown restrictions deepened;
- A sharp increase (10% on the previous week) in consumption was recorded in the fourth week of March—the week of the COVID-19 lockdown—rising to 46% above the pre-lockdown average in the fourth week of May;
- Four distinct clusters of household water consumers can be characterized by their unique patterns of hourly use: early morning, late morning, evening peak and multiple peak;
- The multiple peak cluster experienced the most significant increase in the number of households during the lockdown period, with a 93% rise between the third and fourth weeks of March;
- The early morning cluster experienced the sharpest decrease in the number of households during the lockdown period, with a significant drop in their share of relative consumption between 07:00-08:00 a.m. from 40% to 20%.

Halidu Abu-Bakar, Ph.D. researcher in the Cranfield Centre for

Competitive Creative Design, Cranfield University, said: "The COVID-19 lockdown has instigated significant changes in household behavior across a variety of categories including water consumption, which in the south and east regions of England is at an all-time high. The impact of the extended time people stayed at home under the lockdown and the ensuing changes in behavior arising from this led to an increase in household water demand, exacerbating existing pressure on network water supply.

"Having knowledge of these patterns provides a solid framework for peak demand management and can help utility companies to forecast consumption, especially at unusual times such as pandemics, droughts and when there are seasonal variations."

Professor Leon Williams, Head of the Cranfield Centre for Competitive Creative Design, said: "Quality data driven research will provide the intelligence needed for water utilities to make strategic decisions."

Professor Stephen Hallett, Centre for Environmental and Agricultural Informatics, Cranfield University, said: "Water utility companies are increasingly searching for ways to understand the full nature of household water use, how to improve network demand forecasting and achieve effective water efficiency interventions. This data-driven characterisation of household clusters and understanding the impact of these unique patterns of behavior on network demand can help in the design of demand forecasting and intervention that targets households on the basis of their shared cluster characteristics."

The research paper, "Quantifying the impact of the COVID-19 lockdown on household water consumption patterns in England," was recently published by *Nature Partner Journals*.

  More information: Halidu Abu-Bakar et al. Quantifying the impact of

the COVID-19 lockdown on household water consumption patterns in England, *npj Clean Water* (2021). DOI: 10.1038/s41545-021-00103-8

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