

Sunrise and sunset guide daily activities of city-dwellers

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Daily rhythm of modern humans pan out under the simultaneous ticking of two different kind of clocks: an internal biological clock adapted to environmental cues, and a social clock, which determines the schedules for daily social activities. Credit: Daniel Monsivais

Despite artificial lightning and social conventions, the dynamics of

daylight still influence the daily activities of people living in modern, urban environments, according to new research published in *PLOS Computational Biology*.

Like many other organisms, humans have an [internal biological clock](#) that helps them adapt to different environmental cues, such as light and darkness. In modern cities, people also must adhere to a social clock of daily activities, such as work, leisure, and schooling.

"How does the daily rhythm of humans pan out under the simultaneous ticking of these two clocks?" asked Daniel Monsivais of Aalto University School of Science, Finland, who led the new study. To find the answer, he and colleagues employed an emerging technique known as "reality mining," in which patterns of human activity are inferred by analyzing use of wireless devices.

The researchers obtained anonymous records of call times over the course of one year for about one million [mobile phone users](#) in a country in southern Europe (use of the data was contingent on keeping the country's identity unknown). A user's sleep/wake cycle was inferred by noting daily periods when their calling activity started and ceased.

Analysis of the call records revealed that, despite a shared time zone, the timing of sunrise and sunset at people's respective longitudes still guided the start and end of their daily activities. Over one year, changes in the timing of [daily activities](#) corresponded to seasonal variations in the timing of sunrise and sunset.

The researchers also found that women tended to sleep more than men (confirming findings from previous studies), and that duration of sleep varied with age. As people approached adulthood, they tended to sleep for longer amounts of time. Sleep duration then decreased slightly for middle-aged people and increased again in the elderly.

These findings could have implications for human health, the economy, power consumption, and public transportation—all of which are influenced by the timing of [human activity](#).

"The next step in our study is to use this type of big data approach to understand the difference in behavior between urban and rural populations, as it pertains to the role of social and biological clocks in their daily routines," Monsivais says.

More information: Monsivais D, Ghosh A, Bhattacharya K, Dunbar RIM, Kaski K (2017) Tracking urban human activity from mobile phone calling patterns. *PLoS Comput Biol* 13(11): e1005824.
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