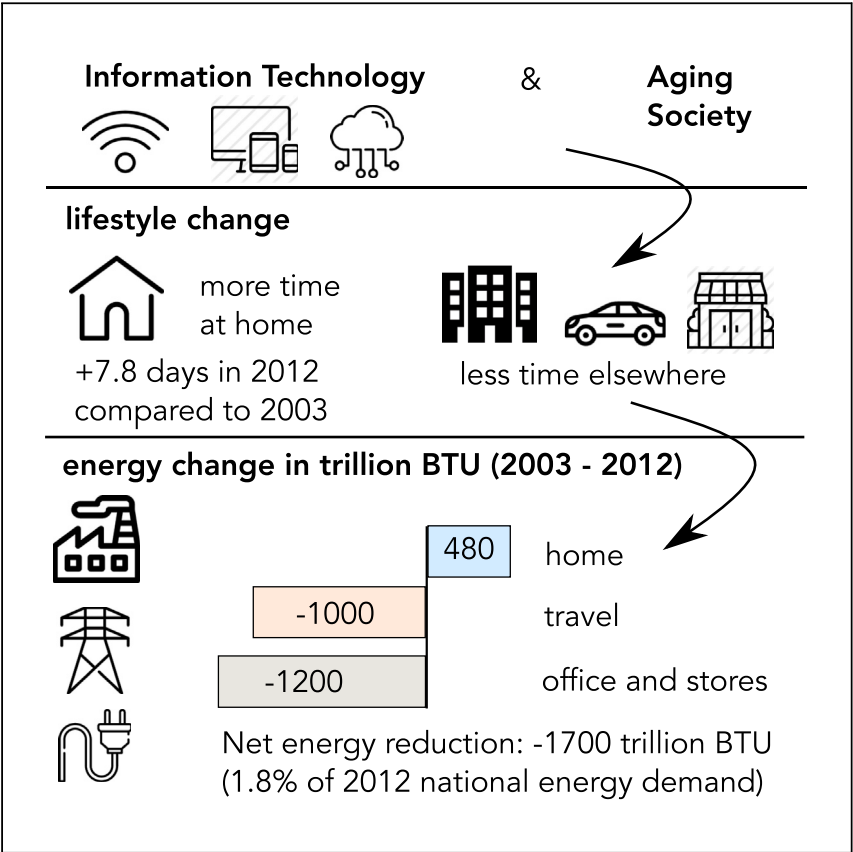


Article

# Changes in Time Use and Their Effect on Energy Consumption in the United States



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HIGHLIGHTS

Technology is enabling lifestyle shifts and influences energy use across sectors

Americans are spending more time at home: 8 more days in 2012 versus 2003

Additional time at home came from less time traveling and in offices/retail stores

1.8% of 2012 national energy demand was reduced due to activity tradeoffs

This research aims to better understand lifestyle changes and the associated energy effects in the United States over the past decade. We find that Americans are increasingly spending more time at home and less time elsewhere. The lifestyle shift led to reduced energy consumption of 1,700 trillion BTU, 1.8% of 2012 national demand. This effect is not explicitly captured in current national energy models. The approach used has implications for prioritizing energy policies for governments and utilities.

Article

# Changes in Time Use and Their Effect on Energy Consumption in the United States

Ashok Sekar,<sup>1,3,\*</sup> Eric Williams,<sup>1,2</sup> and Roger Chen<sup>1,2</sup>

## SUMMARY

Lifestyles are changing due to information technology and other socio-technological trends. We study the energy effects induced by lifestyle shifts via trade-offs in time spent in performing activities. We use the American Time Use Survey to find changes in times performing different activities from 2003 to 2012. The results show that Americans are spending considerably more time at home (7.8 days more in 2012 compared with 2003). This increased home time is counterbalanced by decreased time spent traveling (1.2 days less in 2012 versus 2003) and in non-residential buildings (6.7 days less in 2012 versus 2003). Increased residential time is mainly due to increased work at home, video watching, and computer use. Decomposition analysis is then used to estimate effects on energy consumption, indicating that more time at home and less on travel and in non-residential buildings reduced national energy demand by 1,700 trillion BTU in 2012, 1.8% of the national total.

## INTRODUCTION

Despite substantial improvements in energy efficiency, energy demand has increased around the world in the last several decades. In the United States total residential energy use increased 39% from 1975 to 2015, with a per capita decrease of 6%.<sup>1</sup> Over the same period, transportation energy use increased 52%, with a per capita increase of 3%. Mitigating consumption is a critical strategy to manage the societal challenges of energy, and many argue that improving efficiency is more economically effective than changing the energy supply (e.g., Refs.<sup>2,3</sup>)

Mitigating energy use is supported by measuring and understanding it. Lifestyle and energy demand are integrally tied.<sup>4,5</sup> The rapid advancement of technology combined with evolving social, economic, and demographic factors influence lifestyle choices and thereby energy demand.<sup>4,6</sup> Information and communication technology (ICT) is one of the most important drivers of recent changes in lifestyle.

There are two main quantitative lenses for analyzing lifestyle. One lens characterizes spending to purchase goods and services. Which products are bought is important for energy use, e.g., the size of home or efficiency of a vehicle. Many nations conduct expenditure surveys, e.g., the Consumption Expenditure Survey in the United States,<sup>7</sup> which track trends in consumer purchases. From an energy perspective, there is a data infrastructure measuring trends in energy efficiency of vehicles and appliances.<sup>8–10</sup> There is a long history of work combining expenditure data with economic input-output models to characterize environmental implications of consumption patterns.<sup>11–13</sup>

Another lens through which to analyze lifestyle is time use, i.e., the activities people perform, for how long, and where. Many nations conduct regular surveys of time

## Context & Scale

Technological advancements and socio-economic trends are enabling rapid changes in lifestyle that influence energy use. This research tracks lifestyle changes in the United States through changes in times spent on different activities and measures the associated energy effects. We find that Americans are spending more time at home and correspondingly less time traveling and in offices and stores. We find that more time at home implies lower energy consumption due to reduced automobile travel and energy use in non-residential buildings. At the national scale, this research shows that time-based models would improve energy forecasts by capturing behavioral changes that current models fail to capture. Knowledge of such lifestyle trends can help prioritize energy efficiency policies of federal and state governments and utilities. For individuals, the research raises awareness of connections between lifestyle and energy use.

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