Daylight Saving Time

Executive Summary

Daylight Saving Time (DST), which is the practice of adjusting clock times forwards or back at certain points in the year to change clock time alignment with sunrise and sunset, is observed in approximately 70 countries, including the U.S. DST was first established in the U.S. in 1918 by the Standard Time Act, and has been modified several times since then, most recently in 2005 by the Energy Policy Act. While federal statute establishes nationwide DST observance, states may take legislative or executive action to opt out. Several studies find various effects of shifting clocks ahead on health, energy use, and commerce, but there is less evidence for significant effects due to shifting back to standard time, or having differential light levels between DST and standard time. House Bills 1735, 1761, filed during the 2022 regular legislative session, would make DST permanent in Missouri pending similar action by bordering states. Conversely, HB 1889 would make Standard Time permanent (i.e., eliminate MO's adherence to DST).

Highlights

- As of 2021, 19 states have taken action to make DST permanent (subject to federal statutory changes). Arizona and Hawaii and several U.S. territories have opted out of DST observance, and adhere to standard time year-round.
- Studies find that the risk of heart attack is approximately 5% higher in the first week after entering DST, and that the risk of ischemic stroke has also been found to be elevated by about 8% for the first two days after entering DST.
- Keeping DST in place year-round has been estimated to reduce pedestrian fatalities by about 170/year and motor vehicle fatalities by 195/year.
- Studies have found that DST switches are typically associated with decreases in stock market returns and worker productivity immediately after switches.

Limitations

- Individuals with circadian rhythm disorders, neurological disorders, or children/adolescents whose brains are still developing may be more susceptible to the negative health effects related to the DST transition, but more evidence is needed.
- Overall, there is little evidence as to whether DST decreases or increases energy use, and no evidence that DST poses increased safety risks to school-aged children or decreases their academic performance.
- Research on the broad economic effects of DST is not conclusive.

MOST Policy Initiative, Inc. is a nonprofit organization that provides nonpartisan information to Missouri's decisionmakers. All legislative Science Notes are written only upon request by members of the General Assembly. ***This Science Note was published on 1/26/22 by Dr. Alan Moss, Education & Workforce Development Policy Fellow and Dr. Joshua Mueller, Deputy Director – alan@mostpolicyinitiative.org and josh@mostpolicyinitiative.org. .***

Research Background

Recent History of Daylight Saving Time in the U.S.

Daylight Saving Time (DST) is the period of the calendar year between the second Sunday in March and the first Sunday in November when clocks in most parts of the United States are set one hour ahead of standard time. These transition dates (when clocks are set forward an hour, and then set back one hour) are set in federal statute.[1]

The Uniform Time Act, passed by the U.S. Congress in 1966, established the time zones currently in use (Eastern, Central, Mountain, Pacific), and allowed states (or parts of states) to exempt themselves from DST adherence. Additionally, it authorized the U.S. Department of Transportation to set standard time zone boundaries and DST. Under the Uniform Time Act, changing to permanent DST would require an act of Congress allowing states to adopt the time of their choice.

In response to the oil shock in 1973, Congress passed the Emergency Daylight Saving Time Energy Conservation Act, which enacted year-round DST on a temporary basis as a proposed-energy-saving measure; this period lasted from January 1974 to April 27 1975. Most recently, the Energy Policy Act of 2005 modified the Uniform Time Act to extend the DST period to the period that is used today.[1]

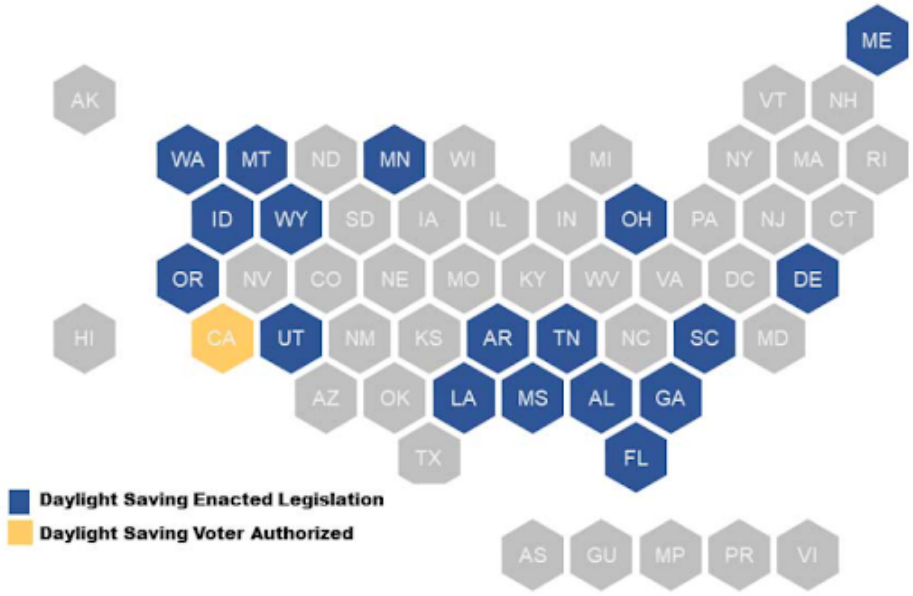

Figure 1. States that have currently enacted bills or passed resolutions to make Daylight Savings Time permanent. This change cannot occur without federal action authorizing the change. In addition, Arizona and Hawaii have opted out of DST observance.
Source: NCSL

Legislative Overview

Three bills introduced during the 2022 legislative session would potentially change the time used in Missouri. House Bills 1735 and 1761 would enter Missouri into a "Daylight Saving as New Standard Time Pact" with other states, enacting DST as the permanent time for those states. This pact would go into effect if two (HB 1735) or three (HB 1761) neighboring states also entered into the pact to adopt the change. Permanent DST would correspond to sunrise

occurring later in the day during the winter months, and sunset occurring later in the day during summer months.

In contrast, HB 1889 would have Missouri adopt Standard Time permanently, regardless of the actions of neighboring states. Under current federal law, Missouri could adopt Standard Time on a permanent basis, but switching to permanent DST would require an act of Congress due to provisions of the Uniform Time Act.

Of the states that border Missouri, two (AR and TN) have adopted bills or resolutions to make DST permanent. Four other states that border Missouri (IL, KY, NE, & OK) currently have introduced legislation for the 2022 session. Since 2018, 19 states have enacted legislation or passed resolutions making DST permanent, contingent upon federal action allowing the change (**Figure 1**).[2]

Legislation to make DST permanent following an act of Congress, sometimes conditional on neighboring states also passing such legislation, is the most common type of legislation to end the biannual switching for DST. However, legislation has also been introduced in some states, including Missouri, that would make Standard Time the permanent time throughout the year. Some states (HI & AZ) and U.S. territories have already made Standard Time permanent. U.S. areas with permanent Standard Time tend to be closer to the equator where day length varies less over the year.

Impacts of Daylight Saving Time Transitions

A wide body of research analyzes the effects of 1) shifting clocks ahead one hour in the spring upon entering DST, 2) shifting clocks back one hour in the fall upon re-entering standard time, and 3) differential morning/night light levels during DST and standard time. Several studies find various effects of shifting clocks ahead on health, vehicle accidents, energy use, and commerce, but there is less evidence for significant effects due to shifting back to standard time, or having differential light levels between permanent DST and standard time. These results are discussed below.

Health

Light levels are a major regulator of "biological clocks;" the body produces different proteins and hormones in response to light/darkness entering the eye, which then regulate behaviors ranging from alertness/sleep, appetite/digestion, and body temperature. The 24-hour biological cycle is known as a circadian rhythm. Disruption of circadian rhythms due to factors such as substance abuse, jet lag, or other disorders/behaviors is a risk factor for obesity, depression, changes in heart rate and blood pressure, and even some forms of cancer.[3,4]

These known negative effects of circadian rhythm disruption have led researchers to investigate the potential health effects of shifting clocks ahead upon entering DST, which in effect simulates jet lag. Large surveys have found that this transition into DST may result in disrupted sleep behavior, including in school-aged children.[5]

Several studies find that the risk of heart attack is approximately 5% higher in the week following entering DST; the researchers conducting the study hypothesize that this effect is due to sleep deprivation that results in increased heart rate, blood pressure, and inflammatory proteins.[6] The risk of ischemic stroke has also been found to be elevated by about 8% for the first two days after entering DST, and was even higher for women and older adults.[7] These effects were not found for the transition out of DST back to standard time, potentially due to the less disruptive direction of the clock shift. Researchers also note that individuals with circadian rhythm disorders, neurological disorders, or children/adolescents whose brains are still developing may be more susceptible to the negative health effects related to the DST transition, since they are more sensitive to sleep disruptions, but studies of these sort have not yet been conducted.[5]

Vehicle Accidents

A study of fatal vehicle accidents from 1996–2017 found that the spring DST transition was associated with a 6% increase in fatal crashes for the week after the transition. This risk was increased in the morning, and in western areas of time zones (where sunrise/light level increases happen later relative to eastern areas of the same time zone). There was no observed increase in vehicle fatalities upon returning to standard time in the fall.[8]

Finally, a study of the relationship between light levels and pedestrian/motorist safety finds that an additional hour of daylight in the evening (corresponding to keeping DST in place year-round) would reduce pedestrian fatalities by about 170/year, equivalent to 13% of all such fatalities that occur between 5–10 a.m. and 4–9 p.m. in a year. It also estimates that motor vehicle fatalities would be reduced by 195/year (3%) in this scenario.[9] This analysis finds no increased safety risk to school children from permanent DST.

Energy

Early use of DST by the U.S. and other nations during World War I was accompanied by appeals to potential energy-saving mechanisms. The Energy Policy Act of 2005 commissioned the Department of Energy to conduct a study on the energy-related effects of extending DST. Overall, there is little evidence as to whether DST decreases or increases energy use.

The 2008 report from the U.S. Department of Energy found that the 2005 extension of DST is associated with a 0.03% decrease in electricity consumption annually, with larger savings in the northern parts of the country. This report did not find evidence as to whether the DST extension changed vehicle gasoline consumption or traffic patterns.[1] Another study from Indiana (where some counties observe DST but others do not) found that DST causes a 1% increase in residential electricity use, with the greatest increase occurring later in the year.[10]

Commerce

Research has not been conclusive on the broad economic effects of DST or the effects of switching. One study found that credit card purchases increased following DST starting in the spring and found a drop in purchases after DST ended in the fall.[11] Other studies have found

decreases in stock market returns and worker productivity immediately following the transition to DST.[12,13] Massachusetts commissioned a comprehensive report in 2017 on the effects of adopting a permanent DST. The report concluded that year-round DST would have a positive effect on commerce in their state. However, due to varying economic conditions between Massachusetts and Missouri, findings in Massachusetts might not be applicable to Missouri.

Changing the time observances between states currently in the same time zone may also impact broadcasters and commuters that work in cities near the borders of states. This is especially relevant for Missouri since its two largest metropolitan areas, Kansas City and St. Louis, are on the borders with other states. Finally, crime has been shown to decrease following switches to DST which has been attributed to daylight making crime more difficult in evening hours when crime tends to be more common.[14]

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