

SB

6

<TARGET><BILL>SB 6</BILL><SUBJECT>SB
6</SUBJECT><COMM>SSTA29</COMM></TARGET>

SENATE COMMITTEE REPORT First Committee of Referral

DATE: 1/21/15

FURTHER: Finance

Date of 5-Day Notice: 2/5/15
(in accordance with Uniform Rule 23)

DATE TURNED
IN TO OFFICE: _____

State Affairs Committee considered SENATE BILL NO. 6

SB 6 ELIMINATE DAYLIGHT SAVING TIME

"An Act exempting the state from daylight saving time; and providing for an effective date."

and recommends:

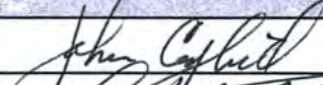

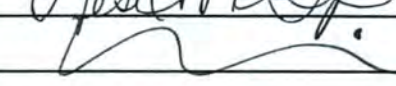

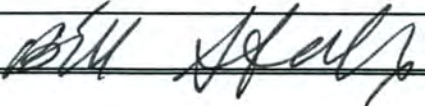
- be replaced with CS _____ (_____) Same Title New Title
- adopt previous CS _____ (_____) Same Title New Title
- attached amendment(s)
- adopt _____ Letter of Intent
- further referral to _____ Committee

Dept Abbr.	
ADM	LWF
CED	LAW
COR	LEG
CRT	MVA
EED	DNR
DEC	DPS
DFG	REV
GOV	DOT
DHS	UA

NEW FISCAL NOTE(S)				
Dept.	Fiscal	Indet.	Zero	FN #
ADM			✓	

PREVIOUS FISCAL NOTE(S)				
Dept.	Fiscal	Indet.	Zero	FN #

APPROPRIATION - no fiscal note

SIGNATURES AND RECOMMENDATIONS:	PRINTED LAST NAME	DO PASS	DO NOT PASS	NO REC	AMEND
	COGHILL	✓			
	HUGGINS	✓			
	MCGUIRE	✓			
	WIELECHOWSKI	✓			
CHAIR: 	STOLTZE	✓			



Alaska State Legislature

Senator Anna MacKinnon — Senate District G

Sponsor Statement

Senate Bill 6

"An Act exempting the state from daylight saving time; and providing for an effective date."

This bill is in direct response to a number of concerns raised by my constituents, fellow Alaskans, and various groups that would like to repeal daylight saving time in Alaska.

The idea for daylight saving time originated in Europe and was introduced to the United States in 1918 when Congress placed the nation on daylight saving time for seven months in order to conserve resources for World War I. Since then the United States has had multiple iterations of federal policy for daylight saving time and we currently operate under the Uniform Time Act of 1966. Later, daylight saving time was extended by the Energy Policy Act of 2005 so we now observe daylight saving time between the second Sunday in March and the first Sunday in November. Under the Uniform Time Act, Alaska has the authority to exempt ourselves from daylight saving time and stay on standard time year-round.

Studies have shown that there are adverse effects on our health, sleep cycles, work productivity, safety, and overall wellbeing during the time that we go on and off daylight saving time. According to a study completed in 2012, daylight saving time led to a decrease in productivity at work. Two different studies conducted in 2012 found the rate of heart attacks increases, and multiple studies completed in the past 20 years have found that the rate of traffic accidents increase during the first days and weeks of daylight saving time in March. However, the effects of daylight saving time have been and currently are extensively studied showing positive, negative and neutral outcomes.

Daylight saving time does not achieve in Alaska what it was intended to do and I urge your support for this piece of legislation.

ALASKA STATE LEGISLATURE

SENATE STATE AFFAIRS COMMITTEE

Senator Bill Stoltze, Chair
State Capitol, Room 125
Juneau, AK 99801-1182
Phone (907) 465-4958
Fax (907) 465-4928



Official Business

Members:
Sen. John Coghill, Vice Chair
Sen. Charlie Huggins
Sen. Lesil McGuire
Sen. Bill Wielechowski

February 10, 2014
Bill Packet Information

SB 6 ELIMINATE DAYLIGHT SAVING TIME

- SB6 ver H
- Sponsor Statement
- Fiscal Note - DOA-FAC-02-06-2015
- Supporting Documents
 - Letters and Email of Support 2-9-2015
 - Journal Articles
 - Daylight Gains by City
 - Alaska Time Zones History

SJR 2 CONST. AM: G.O. BONDS FOR STUDENT LOANS

- SJR 2 ver W
- Sponsor Statement
- Sectional Analysis
- Fiscal Note - [FORTHCOMING]
- Letter of Support
 - University of Alaska

Fiscal Note

State of Alaska
2015 Legislative Session

Bill Version: SB 6
Fiscal Note Number: _____
() Publish Date: _____

Identifier: SB006-DOA-FAC-02-06-15
Title: ELIMINATE DAYLIGHT SAVING TIME
Sponsor: MACKINNON
Requester: Senate State Affairs

Department: Department of Administration
Appropriation: General Services
Allocation: Facilities
OMB Component Number: 2429

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

	FY2016 Appropriation Requested	Included in Governor's FY2016 Request	Out-Year Cost Estimates				
			FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
OPERATING EXPENDITURES	FY 2016	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Personal Services							
Travel							
Services							
Commodities							
Capital Outlay							
Grants & Benefits							
Miscellaneous							
Total Operating	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fund Source (Operating Only)

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Positions

Full-time							
Part-time							
Temporary							

Change in Revenues							
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Estimated SUPPLEMENTAL (FY2015) cost: 0.0 *(separate supplemental appropriation required)*
(discuss reasons and fund source(s) in analysis section)

Estimated CAPITAL (FY2016) cost: 0.0 *(separate capital appropriation required)*
(discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? no
If yes, by what date are the regulations to be adopted, amended or repealed?

Why this fiscal note differs from previous version:

Not applicable, initial version

Prepared By: Tom Mayer, Director
Division: Division of General Services
Approved By: Sheldon Fisher, Commissioner
Agency: Department of Administration

Phone: (907)465-5677
Date: 02/06/2015 05:30 PM
Date: 02/06/15

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2015 LEGISLATIVE SESSION

BILL NO. SB006

Analysis

SB 6 will amend AS 44.12 by adding a new section, 44.12.400, that will exempt the state from observing daylight savings. As a result state would observe standard time throughout the year.

The Division of General Services does not anticipate a fiscal impact and therefore submits a zero fiscal note.



First National Bank
A L A S K A

February 3, 2015

Senator Anna MacKinnon(Fairclough)
State Capitol Room 516
Senate District G
Juneau, AK 99801-1182

RE: Senate Bill 6: Eliminating Daylight Saving Time in Alaska

Dear Senator MacKinnon:

For many reasons, the Daylight Saving Time law should be repealed. Some of the principal reasons are as follows:

- By the first of March 1, I am going to work in the daylight, but when the law mandates that I turn the clocks forward, I am going to work in the dark again. Either way, it is daylight when I drive home at night. There, Daylight Saving Time causes me to *lose* daylight during the business hours.
- I have long believed that Daylight Saving Time wastes energy over the course of a year, and a recent study cited by *Fast Company* magazine has found this to be the case.
- Daylight Saving Time is an anachronism that originated I response to political and climatic factors in World War I England which have no relevance in Alaska in 2015.
- It would be nice to be on the same time schedule as the Pacific Coast at least six months out of the year, but Daylight Saving Time prevents that.
- Daylight Saving Time is just a complete nuisance and inconvenience, twice a year, and it accomplishes nothing in the State of Alaska.

Sincerely,


D. H. Cuddy
Chairman of the Board

DHC:etm

NFIB

The Voice of Small Business.®

ALASKA

January 30, 2015

The Honorable Anna MacKinnon
State Capitol Building
Juneau, Alaska 99801-1182

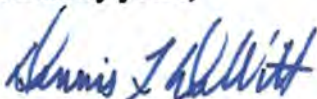
RE: Senate Bill 6

Dear Senator MacKinnon:

On behalf of the National Federation of Independent Business/Alaska, I wish to respectfully share our support for Senate Bill 6 that eliminates daylight savings time in Alaska. The National Federation of Independent Business is the largest small-business advocacy group in Alaska.

In our 2010 member ballot, NFIB/AK members voted overwhelmingly that Daylight savings time should be eliminated in Alaska. The members have not since changed their minds. We believe its original purpose is long past and it has no current value. The change from five to two time zones in Alaska's northern latitude has created a situation where changing time in the spring and fall makes little sense. Thus, while it may be a nice idea elsewhere, it is a cumbersome activity that provides no real value to Alaskans.

Sincerely yours,



Dennis L. DeWitt
Alaska State Director

Cc: Senate State Affairs Committee
NFIB/AK Leadership Council

From: Scott Stewart <sstewart@arcticcontrols.com>
Sent: Tuesday, February 03, 2015 1:29 PM
To: Erin Shine
Subject: Senate Bill 6

Please be advised that Arctic Controls, Inc. supports the proposed Daylight Saving Time Elimination. If you have any questions please feel free to contact us at your convenience.

Thank you.

Best Regards,



Scott A. Stewart

Scott A. Stewart
President
Phone: (907) 277-7555
Fax: (907) 277-9295

URL: www.arcticcontrols.com



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From: M3 Sweatt <msweatt@microsoft.com>
Sent: Wednesday, February 04, 2015 12:04 PM
To: Sen. Anna MacKinnon
Cc: Sen. Bill Stoltze; Sen. John Coghill; Sen. Click Bishop; Sen. Mike Dunleavy; Sen. Cathy Giessel
Subject: On SB 6, exempting Alaska from daylight saving time

Senator Anna MacKinnon

Alaska State Senate

State Capitol Room 516

Juneau AK, 99801

Re: On SB 6, exempting Alaska from daylight saving time

Dear Senator MacKinnon,

I work at Microsoft across our engineering and marketing teams on broad technical issues that impact our customers. I understand you and your colleagues have sponsored and submitted Senate Bill 6, SB 6, exempting Alaska from daylight saving time, and to establish an effective date of the change.

As I am sure you are aware, a change in Alaska's time zone and observance of daylight saving time would have national and worldwide impacts on time references for interstate and international commerce. Each year there are many changes to daylight saving time and shifts in time zones around the world, some of which are late-breaking. When such changes are enacted into law, Microsoft (through regular updates to products and services) and other companies providing broad technical infrastructure to customers around the world issue updates to comply with these laws.

We appreciate that you have thoughtfully called for this Act, if passed, to take effect January 1, 2017. As you know, without adequate time to react, such changes can be challenging for individuals to manage and for companies to support. In order to achieve more seamless transitions to new DST and time zone policies (and allow ample time to implement the changes in product and services), Microsoft crafted a set of guidelines with input from representatives from the U.S. Department of Homeland Security and the Department of Energy. To provide a seamless transition to new time offset rules, we recommend that governments consider providing the following:

1. Ample advance notice (1 year or more) of the planned change, from the time it is enacted into law to the time of the change (as was provided in the Energy Policy Act of 2005)

2. Official, published confirmation of planned changes to DST or time zones on governmental websites and in official publications.
3. Concentrated promotional efforts communicating the change to affected residents and citizens.

Thank you for taking the time to read this mail. We will closely monitor this legislation and the impact it will have on Alaskans, our customers and people who use connected devices around the world. For more information, please visit <http://www.microsoft.com/time>. If you have any questions, please do not hesitate to contact me at your convenience.

Respectfully,

(Mr.) M3 Sweatt

Partner, Program Management & Corporate CPE

Microsoft Corp.

M3 Sweatt --- [Microsoft Product & Services Customer & Partner Satisfaction](#)

Tel: (425) 705-9295 Mob: (425) 442-2803 Fax: (425) 708-2545

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Protect Your PC: <http://www.microsoft.com/protect>

Sent using at least Windows 8.1 and Office 365

February 6, 2015

Testimony regarding Senate Bill (SB) 6 – Repeal of Daylight Saving Time in Alaska

From: Lynn Willis, 10140 Hillcrest Lane, Eagle River, Alaska 99577

To: Senate State Affairs Committee, Alaska State Legislature

Again the topic of ending the use of Daylight Saving Time in Alaska is before us. I certainly hope this time around this subject will finally receive a resolution involving the entire House, Senate and Office of the Governor. Alas, I fear this effort will share the fate of similar legislation introduced since 1999 including HB4 (21st Legislature), HB409 (22nd Legislature), HB176 (24th Legislature), SB 120 (24th Legislature) and HB 19 (25th Legislature). The effort toward an open resolution of this issue ended abruptly when all of this prior legislation was ultimately held to death before various legislative committees with no explanation being required (or offered) following that defacto veto action.

This topic has now had numerous legislative hearings since 1999. I challenge the proponents of continuing to use DST in Alaska to review that testimony to find a compelling reason to continue to observe this law in Alaska. Please remember that following the 1983 time zone changes in Alaska most of Alaska advanced clocks permanently. Thereafter everyone residing west of the former Pacific Time zone (that then included Southeast Alaska) have been observing Daylight Saving Time permanently. Now, each year when Alaskans advance clocks for the period of DST observance these residents participate in what has been described as “double” or even “triple” daylight saving time. This effect can be seen in Anchorage when, during periods of DST observance, the Sun is highest in the sky at 2:00PM while in Nome and Kotzebue the Sun is at its zenith at 3:00PM.

The proponents of keeping DST have argued that observance of DST is necessary for commerce. When this practice began in Alaska business communications involved two hard wired telephones and we were much more “Seattle Centric”. Today business communications are possible 24/7 using technology that wasn’t even dreamed of in the days of hard wired business phones that were only accessible during “normal business hours”. Today, many international business organizations with operations in Alaska utilize GMT (Greenwich Mean Time) which doesn’t recognize DST. Also today Alaska has business relationships now with nations such as Japan and China where DST is not used. Time Zones are intended to impact commerce not the use of Daylight Saving Time.

The proponents of DST will argue that this practice is “no big deal”. Well, evidence is showing the disruption of the human circadian rhythm is a “big deal” to some. Absent a very good reason, providing for the personal convenience of select individuals should not trump the negative impact this irritating practice has on others. Several statewide surveys have shown a majority of Alaskans would support ending this practice, therefore shouldn’t the burden of justification be on the proponents of keeping DST?

This changing of clocks twice each year is perhaps the most impactful law foisted on Alaskans by our state government. Absent living in the far off Aleutian-Hawaiian time zone (where DST is not observed), or being a hermit in a cave somewhere, no Alaskan can avoid the direct impact of this law.

February 6, 2015

Testimony regarding Senate Bill (SB) 6 – Repeal of Daylight Saving Time in Alaska

From: Lynn Willis, 10140 Hillcrest Lane, Eagle River, Alaska 99577

I, for one, am tired of finding a virtual Alaska legislator with me in my bed at 2:00 a.m. on a Sunday morning twice each year demanding that I change my clocks.

The proponents will argue that this inconvenience is a sacrifice we all must endure until the entire nation no longer observes Daylight Saving Time. I consider myself to be no less of a patriot because I object to this inane practice. You obviously cannot make a day any longer than 24 hours so whatever daylight you might realize by delaying the time of sunset you're surely going to lose the following morning by also delaying the time of sunrise. DST is a "parlor trick" that only "works" in the temperate regions of the globe where day length changes moderately during the year. DST has virtually no effect near the Equator or in the Northern latitudes where day length is either substantially the same year round, or radically changes over the course of the seasons. Currently we are beginning to gain daylight as we approach our status as "the land of the midnight sun". If you want an extra hour of actual daylight in the spring when DST starts, just wait a few days.

For those seeking justification based on a compelling reason I suggest they remember the purpose of the federal law that allows the individual states to observe (or not observe) Daylight Saving Time. The specific justification in federal law for the use of Daylight Saving Time by the individual states is to save energy. A significant energy savings is supposed to occur when the time of sunset is delayed thus affording the populace a savings of energy by not having to use artificial lighting. I challenge the supporters of DST in Alaska to cite examples of energy savings attributable exclusively to the use of Daylight Saving Time in Alaska. Energy cost has been a topic of interest now for several years in Alaska and I am not aware of any testimony before the legislature or in another forum that mentions a positive impact of Daylight Saving Time on the cost of energy to Alaskans. Currently the legislature is discussing the options to provide energy relief to the Fairbanks area and, in all the discussion, has anyone reflected on the energy savings to Fairbanks that appear when we advance our clocks each spring? Do power cost equalization expenditures decrease because of the onset of DST? Several years ago I spoke to a utility manager who told me that ambient temperature and available daylight do affect energy costs; however, while increasing daylight does impact energy expense the actual time of day has little impact because again, for every hour you delay sunset you also delay sunrise. Also, technology has reduced the cost of lighting by use of Compact Fluorescent Lamp (CFL) and Light Emitting Diode (LED) devices and much lighting is now controlled by ambient light sensors that operate regardless of the time of day.

To summarize, if there ever was a reason to observe DST in Alaska, that reason has certainly left us and we can now end the existence of this public irritant as allowed by Federal Law.

Juneau

Chamber of Commerce

9301 Glacier Hwy, Suite 110 • Juneau AK 99801 • (907) 463-3488 • Fax (907) 463-3489

E-mail: juneauchamber@gci.net • jcc@alaska.com • Web site: <http://www.juneauchamber.com>

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True North FCU
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Wostmann and Associates

February 10, 2015

The Honorable Anna MacKinnon
Alaska State Senate
State Capitol, Room 516
Juneau, AK 99801

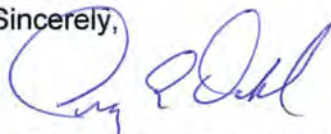
Dear Senator MacKinnon,

The Juneau Chamber of Commerce strongly supports the passage of SJR2, which if approved by the voters, will allow the Alaska Student Loan Corporation to issue general obligation bonds to fund the student loan program.

We believe that any action that encourages and improves access to post-secondary education is not only good for students but for the future of our communities. Funding the student loans through general obligation bonds should result in lower interest rates thereby making it easier to repay their obligation, and in turn lower default rates.

Thank you for your support and commitment to this important piece of legislation.

Sincerely,



Craig E. Dahl, Executive Director
Juneau Chamber of Commerce



Lance Stevens, President
Juneau Chamber of Commerce

Daniel George

From: Janet <zjboy@juno.com>
Sent: Wednesday, January 28, 2015 2:04 PM
To: Sen. Bill Stoltze
Subject: Daylight Savings Time

Follow Up Flag: Follow up
Flag Status: Completed

Please give SB 6. And HB 64 a fair hearing. Most of Alaska is already an hour ahead of Sun time. Moving another hour to the evening is ludicrous. Who needs daylight savings when the days are already 20 hours long? All it does is mess with our bio clock twice a year. It is time to cease this outdated practice.

Thank you.

Please include this message in your packet for public testimony.

Janet Boylan

18609 Man O War Rd.

Eagle River, Alaska. 99577

907-694-5387

ORIGINAL ARTICLE

Small shifts in diurnal rhythms are associated with an increase in suicide: The effect of daylight saving

Michael BERK,^{1,2,3} Seetal DODD,¹ Karen HALLAM,² Lesley BERK,¹ John GLEESON⁴ and Margaret HENRY¹

¹Department of Clinical and Biomedical Sciences, Barwon Health, University of Melbourne, Geelong, ²ORYGEN Research Centre, ³Mental Health Research Institute of Victoria and ⁴Department of Psychology, University of Melbourne, Melbourne, Victoria, Australia

Abstract

Large disruptions of chronobiological rhythms are documented as destabilizing individuals with bipolar disorder; however, the impact of small phase altering events is unclear. Australian suicide data from 1971 to 2001 were assessed to determine the impact on the number of suicides of a 1-h time shift due to daylight saving. The results confirm that male suicide rates rise in the weeks following the commencement of daylight saving, compared to the weeks following the return to eastern standard time and for the rest of the year. After adjusting for the season, prior to 1986 suicide rates in the weeks following the end of daylight saving remained significantly increased compared to the rest of autumn. This study suggests that small changes in chronobiological rhythms are potentially destabilizing in vulnerable individuals.

Key words: chronobiology, daylight saving, jet lag, suicide.

INTRODUCTION

Many of the body's most fundamental biological processes follow a circadian pattern, such as temperature, hormonal secretion, cardiovascular, respiratory and metabolic functions.¹ Phenomenological findings of sleep and activity disturbance in people with bipolar disorder are well established, and there is more recent evidence of a number of neuroendocrine abnormalities in the circadian system of bipolar patients.² Seasonal variation also occurs and is perhaps most evident in those with seasonal affective disorder where variations in light levels appear to trigger depressive episodes that

adjunctive light therapy has been demonstrated to reduce.³ There also appears to be some seasonal variation in suicide, with one group indicating that in people with affective disorders, a peak in suicide occurs around the summer solstice.⁴ Another group demonstrated a gender variation in this response. In this study, only women with depressive illness demonstrated a significant spring peak in suicides.⁵

Artificial manipulations of the sleep–wake cycle have pronounced effects on bipolar patients. The depressive phase of the illness may respond to sleep deprivation, however, sleep deprivation is known to trigger⁶ or worsen manic episodes.⁷ Circadian rhythms are being increasingly recognized as an integral aspect of bipolar disorder and suicide, with some studies demonstrating variations in suicide occurring at specific times of day.⁴ Recently management of the sleep–wake cycle through enforced bed rest and darkness has been shown to improve the symptoms of mania.^{8,9} Research has demonstrated that twins discordant for bipolar disorder, the

Correspondence: Professor Michael Berk, Department of Clinical and Biomedical Sciences, Barwon Health, PO Box 281 Geelong, Vic. 3220, Australia. Email: mikebe@barwonhealth.org.au

Received 29 April 2007/Accepted 28 July 2007.

affected twins were much more vulnerable to seasonal changes in mood, weight, appetite and levels of energy than their unaffected twin.¹⁰ In terms of biological foundations for these abnormalities, evidence indicates that melatonin (a hormone involved in circadian and seasonal rhythm regulation and entrainment to light) is abnormally suppressed by light in bipolar patients¹¹ and in twins discordant for bipolar disorder, melatonin sensitivity is discordant between bipolar probands and their sibling.¹²

The integration of these phenomenological and biological findings about seasonal, circadian and sleep dysregulation has led to the development of a form of psychotherapy, interpersonal and social rhythm therapy (IPSRT), that focuses on the regulation of sleep-wake cycles and social rhythms.¹³ While environmental factors are becoming increasingly integrated into our understanding and treatment of these disorders, the clinical impact of relatively small disruptions to the sleep-wake cycle have not been investigated. It is of theoretical and clinical relevance if such small chronobiological shifts have impacts on mood or behavior. These smaller shifts may prove triggers for episode onset, yet are potentially easier to manage than shift work or jet lag, increasing the rationale for addressing these as part of illness management. The aim of this article was to discover whether the time shift associated with daylight saving (DLS) has a measurable behavioral impact in changes in suicide rates.

METHODS

A list of registered suicide deaths requiring a coroner's report that the death was a potential suicide was obtained from the Australian Bureau of Statistics. The date of the event and gender of every person in Australia for whom the documented cause of death was suicide was collected from 1 January 1971 to 31 December 2001. There were 47 215 male and 14 383 female suicide victims in Australia during the study period. DLS was introduced into Victoria, Australian Capital Territory, South Australia, Tasmania and New South Wales in 1971. Two other states, Queensland and Western Australia briefly experimented with DLS (1971, 1974, 1983, 1989, 1990 and 1991).

In all cases the change to DLS from standard time occurred at 02:00 hours in October and the change to standard time from DLS occurred at 03:00 hours in March. The Northern Territory did not participate in DLS. In this study, we compared time periods, both at two and four weeks after the transition to start of DLS

and then again at the return to normal time. As the data were not broken down by state, the date chosen as the transition date was the date that most states started or ceased DLS. After adjusting for the year, two-way ANOVA assessed the average number of suicides for the time period after commencement of DLS, after the end of DLS and the rest of the year. This analysis was repeated on the ranks of the data and as the results were consistent, no deviation from the parametric test assumptions was apparent. Seasonality has a strong association with suicide. Therefore the analysis was repeated, comparing the time period immediately after the commencement of DLS with the number of suicides for the rest of spring, and adjusted for year. Similarly, the suicides for the time period after the end of DLS was compared to the rest of autumn.

RESULTS

There was no difference in suicide rates after the transition to DLS or from DLS compared to the rest of the year in the female data set, either, unadjusted or adjusted for season.

For the men there was a significant difference ($P < 0.05$) in the unadjusted data with more suicides for the weeks after DLS commenced than in the weeks after it finished (mean difference \pm SE, [2 weeks] 0.44 ± 0.15 suicides per day, [4 weeks] 0.48 ± 0.10 suicides per day) and for the rest of the year ([2 weeks] 0.36 ± 0.10 suicides per day, [4 weeks] 0.37 ± 0.08 suicides per day). After adjusting for season, as season is a significant predictor of suicide, the relationship weakened greatly. Comparing suicides in men for the weeks after DLS finished to the rest of autumn found that there was an increase before 1986 (mean difference \pm SE, [2 weeks] 0.52 ± 0.14 suicides per day and [4 weeks] 0.30 ± 0.11 suicides per day) ($P < 0.05$); but there was no significant difference after 1986 ([2 weeks] $P = 0.22$ and [4 weeks] $P = 0.51$). Comparing suicides in men for the 2 weeks after DLS started to the rest of spring found no significant relationship. Comparing suicides in men for the 4 weeks after DLS started to the rest of spring found a non-significant trend towards an increase in suicides (mean difference \pm SE, 0.13 ± 0.09 suicides per day) ($P = 0.138$).

DISCUSSION

The results of this study suggest that the period following the change to DLS was associated with an increase in completed suicides in men. This increase could be due

to the change in season, but the relationship remained as a trend after analysis of individual seasons. The impact was greater for shifts associated with phase advance than phase delay. There was a gender effect in these data, with significant results in men but not women. This may be related to the fact that suicides in men are three times greater than those in women, giving greater statistical power to the former group.

This could also be the result of the trend found in former studies of a bimodal distribution of illness and suicide in women.^{3,14} This would indicate that data for females may be "washed out" by a number of elevated periods. A final explanation for the stronger signal detection in men than women is that women have a significantly more complicated hormonal milieu. For example, while the circadian hormone melatonin shows gender differences in both light sensitivity¹⁵ and melatonin secretion,¹⁶ light sensitivity as a zeitgeber is unaffected by the menstrual cycle. In contrast, numerous circadian and rhythmic processes are disrupted by changes in the menstrual cycle, including overall melatonin secretion, luteinizing hormone and progesterone and temperature amplitude.¹⁷⁻²⁰ This may indicate that multi-oscillatory systems working through external zeitgebers and internal cues in women may be more robust in countering small environmental changes.

It is not possible to determine why this finding was only significant before 1986. However, it is likely to reflect the complex and varied factors which influence an individual's decision to attempt suicide. Suicide is influenced by a diversity of sociological, cultural and economic factors²¹ and perhaps the influence of these factors overrode more subtle factors such as shifts in diurnal rhythms.

This study was conducted in a temperate climate, and the effects of such time shift may differ in areas with varying distances to the equator, and photoperiod, and the magnitude of the shift. For example, Melbourne is located at -37.81° latitude and 144.97° longitude. Seasonal variation in the light-dark cycle varies between 9:50 h of light during mid-winter to 14:50 h in mid-summer. As some of the more robust findings on diurnal variations were found in the Netherlands, where light varies more markedly between seasons,⁴ multi-country comparisons would be informative. The pooling of data from all states is a limitation of the study: state-specific data may have increased the signal intensity.

These data provide the first evidence to support the notion that modest changes to diurnal rhythm have a measurable impact on a clinically critical outcome. This

study suggests that phase advance is more significant in terms of suicide risk than phase delay. In a study of psychiatric presentations following travel across time zones, significantly more eastbound travellers showed symptoms of mania, whereas significantly more westbound travellers showed symptoms of depression. A number of explanatory models have been proposed for such change with small diurnal modifications. In particular, the "beat phenomena" proposed by Georgi (as cited in Goodwin and Jamison²²) proposes that mood disturbance may be the result of a desynchronization between multiple circadian rhythms. In the case of DLS changes, the endogenous circadian rhythms may be uncoupled from the external environment (exogenous desynchrony) leading to a circadian system destabilization where multiple oscillators operate in isolation, disrupting mood and behavior. Such small changes in external zeitgebers have previously been shown to have marked effects on mood, for example, the depression- and mania-stimulating effects of long-haul travel on vulnerable individuals.²³ This adds support to the notion that attention to even modest changes in diurnal rhythms and phase positioning is clinically salient, and reinforces the value of biological and environmental considerations in the development of disorder specific psychotherapy and psycho-educational approaches such as IPSRT.²⁴ It also suggests that the level of control of such rhythms may need to be tighter than previously thought.

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The effects of daylight and daylight saving time on US pedestrian fatalities and motor vehicle occupant fatalities

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Abstract

This paper analyzes the effects of daylight and daylight saving time (DST) on pedestrian and motor vehicle occupant fatalities in the United States. Multivariate analyses of county level data from the Fatality Analysis Reporting System for 2-week periods in 1998 and 1999 are used. Results show that full year daylight saving time would reduce pedestrian fatalities by 171 per year, or by 13% of all pedestrian fatalities in the 5:00–10.00 a.m. and in the 4:00–9:00 p.m. time periods. Motor vehicle occupant fatalities would be reduced by 195 per year, or 3%, during the same time periods.

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1. Introduction

Daylight saving time (DST) in the US is a federal government regulation to improve the matching of daylight hours with the activities of the population. DST changes clock time to make sunset and sunrise 1 h later in the spring, summer, and early fall.²

Ferguson et al. (1995) estimated that the extension of DST to the full calendar year from the present DST period, which runs from the first Sunday in April to the last Saturday in October, would have reduced pedestrian deaths by 727 and

motor vehicle occupant deaths by 174 in the 5-year period from 1987 to 1991. Annual pedestrian fatalities and annual motor vehicle occupant fatalities averaged about 7000 and 35,000, respectively, during these years. The authors explain that extended daylight saving time is safety enhancing because there is more vehicle and pedestrian activity in the evening than in the morning and DST substitutes evening hour light for morning hour light. The smaller motor vehicle effect is explained by the presence of vehicle lights, which makes vehicles more visible in the dark to the drivers of other vehicles than are pedestrians. Several other studies that do not estimate full year DST effects have shown an *increase* in motor vehicle fatalities or motor vehicle accidents during the first week of daylight saving time in the spring as drivers adjust to the time change (Coren, 1996; Hicks et al., 1983, 1998). In this paper we revisit the DST—highway safety issue and estimate the effects of daylight and full year DST on pedestrian fatalities and on motor vehicle occupant fatalities for the 1998–1999 period, the most recent years for which data are available from the Fatality Analysis Reporting System.

2. Methods

2.1. Pedestrian and motor vehicle occupant fatality trends in the US, 1998–1999

In Table 1, the number of pedestrian fatalities and motor vehicle occupant fatalities by hour of the day are presented

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² Federally mandated DST was first established as a wartime regulation during World War I as an energy conservation measure. It was abolished in 1919 at the end of the war. Federally mandated DST returned during World War II to save energy and was abolished again at the end of the war in 1945. The immediate elimination of DST after the two World Wars was due to opposition in farming communities and a broader concern over the safety of school children during their morning journey to school. However, in 1966, a federal mandate returned and DST was established from the last Sunday in April to the last Saturday in October. Then, in 1973, after the first OPEC oil shock, the US Congress moved the start of DST to 6 January 1974, again with the goal of saving energy. However, concern over the safety of school children in the morning hours led Congress to push forward DST to 23 February 1975 and to its normal April starting date thereafter. This brief history is largely from Barky and Harrison (1979). In 1986, Congress shifted the daylight saving start date from the last Sunday in April to the first Sunday in April.

Table 1
Pedestrian and motor vehicle occupant fatalities for October and November, 1998 and 1999, by hour of the day

Crash hour	Pedestrian Fatalities				Motor Vehicle Fatalities			
	1998		1999		1998		1999	
	October	November	October	November	October	November	October	November
0:01–0:59 a.m.	22	23	31	10	110	134	160	126
1:00–1:59 a.m.	25	16	12	17	150	127	137	130
2:00–2:59 a.m.	8	13	23	13	127	120	146	129
3:00–3:59 a.m.	7	13	15	8	81	87	97	92
4:00–4:59 a.m.	5	3	13	5	64	54	80	94
5:00–5:59 a.m.	18	15	19	10	76	68	81	69
6:00–6:59 a.m.	26	19	30	14	115	120	96	118
7:00–7:59 a.m.	14	15	25	7	113	104	119	109
8:00–8:59 a.m.	10	14	8	14	97	108	114	109
9:00–9:59 a.m.	11	10	16	11	114	86	123	97
10:00–10:59 a.m.	8	10	10	8	93	105	113	115
11:00–11:59 a.m.	15	9	15	9	130	115	141	97
12:00–12:59 p.m.	11	6	7	8	106	127	111	137
1:00–1:59 p.m.	14	9	10	8	122	113	152	121
2:00–2:59 p.m.	18	14	10	6	148	161	154	155
3:00–3:59 p.m.	19	11	14	32	176	153	182	177
4:00–4:59 p.m.	22	27	13	17	191	179	196	179
5:00–5:59 p.m.	35	64	20	68	171	186	199	183
6:00–6:59 p.m.	36	96	34	71	146	156	140	159
7:00–7:59 p.m.	52	39	63	34	188	156	162	124
8:00–8:59 p.m.	46	31	37	37	124	123	158	138
9:00–9:59 p.m.	43	31	27	23	121	99	127	107
10:00–10:59 p.m.	35	24	32	18	132	117	128	120
11:00–11:59 p.m.	28	20	23	18	139	122	105	119
Midnight	0	0	0	1	1	3	1	4
Unknown	8	2	2	5	31	28	33	29
Total	536	534	509	472	3066	2951	3255	3037

Source: Fatality Analysis Reporting System, National Highway Traffic Safety Administration, 1998 and 1999.

for the months of October and November in 1998 and 1999. DST ended and standard time returned at the very end of October in each of these years (1 November and 31 October, respectively), so comparing data from these 2 months may be a good indicator of daylight effects on pedestrian and motor vehicle occupant fatalities. The population weighted average sunrise and sunset across counties of the US was 7:25 a.m. and 6:35 p.m. in the October months and 6:56 a.m. and 5:06 p.m. in the November months. There was therefore an average of about one and half hours more light in the mornings in November and one and half hours more light in the evenings in October.

A relationship between daylight and pedestrian fatalities is evident in Table 1. From 9:00 a.m. through 3:00 p.m. there is rough equality in the number of fatalities in October and November in the 2 years. These hours are ones of full daylight. The 5:00 and 6:00 p.m. hours contain much more daylight in October than in November and pedestrian fatalities are 125 in the October hours and 299 in the November hours in the 2 years. The 6:00 and 7:00 a.m. hours, in which there is more daylight in November than in October, show 55 fatalities in the November months and 95 in the October months. Repeating this exercise for motor vehicle oc-

cupant fatalities reveals no clear differences between the 2 months.

Further evidence of a daylight pedestrian fatality relationship is seen in Figs. 1–3, where pedestrian fatalities in the US in 1998 and 1999 by time of day are plotted against calendar time in 2-week intervals from the first of each year to the end. Fig. 1 shows pedestrian fatalities between 4:00 and 9:00 p.m.; Fig. 2 shows pedestrian fatalities between 5:00 and 10:00 a.m.; and Fig. 3 shows pedestrian fatalities between 10:00 a.m. and 4:00 p.m. The evening and morning

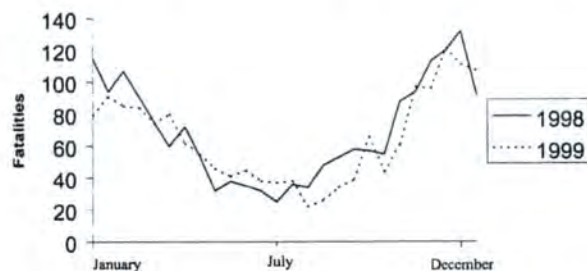


Fig. 1. January–December 2-week periods pedestrian fatalities (10:00 a.m. to 4:00 p.m.).

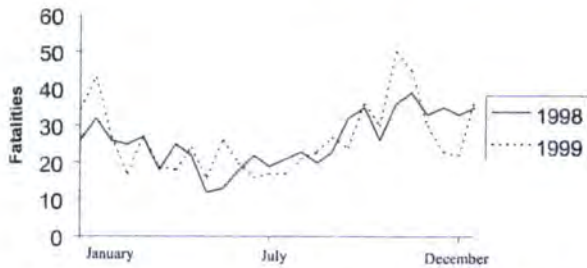


Fig. 2. January–December 2-week periods pedestrian fatalities (4:00–9:00 p.m.).

periods experience substantial light changes throughout the year, with less light at the beginning and end of the year and more light in the middle of the year. There is very little light change in the midday period. The evening period pedestrian fatality graph shows a U-shaped relationship with calendar time. The morning period does also, although the relationship is not as distinct as in the evening. Midday pedestrian fatalities are not obviously related to calendar time.

To consider these relationships another way, ordinary least squares regression results are presented with the evening and the morning pedestrian fatalities regressed on the population weighted average county sunset and sunrise, respectively, over the fifty-two 2-week time periods in the 2 years. The results are:

$$\text{PMPedfat} = 455.4_{(t=21.3)} - 20.5_{(t=-18.3)} (\text{sunset}), \quad R^2 = 0.87 (n = 52)$$

$$\text{AMPedfat} = -43.0_{(t=-4.4)} + 10.3_{(t=7.2)} (\text{sunrise}), \quad R^2 = 0.51 (n = 52)$$

The regression coefficients indicate a 1 h later sunset would reduce 4:00–9:00 p.m. pedestrian fatalities (PMPedfat) by 20 over 2 weeks and a 1 h earlier sunrise would reduce 5:00–10:00 a.m. fatalities (AMPedfat) by 10 over 2 weeks. These effects are roughly one-third of the sample means of 67 in the evening hours and 26 in the morning hours. The results imply that moving an hour of daylight from the morning to the evening year round (making double-hour daylight time during the usual DST period and single-hour daylight time during the standard time period) would result in a net reduction of 10 fatalities (20–10) over 2 weeks, or 260 over 1 year. Pedestrian fatalities were 5228 in 1998 and 4939 in 1999. Although these regression results are meant

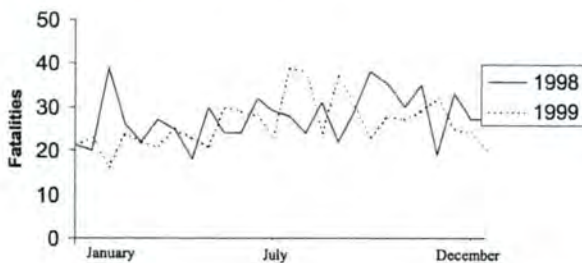


Fig. 3. January–December 2-week periods pedestrian fatalities (5:00–10:00 a.m.).

to just summarize trends in the data, the marginal effects approximate the results for the fuller models estimated below. This is likely due to the fact that sunrise and sunset are not strongly correlated with other independent variables in the fully specified models.

2.2. Data

The data used to estimate more complete models of the relationships between daylight, daylight saving time, and pedestrian fatalities and motor vehicle occupant fatalities are at the county level for fifty-two 2-week periods in 1998 and 1999. Counties in Alaska and Hawaii are excluded. There are 3111 counties remaining in the US, meaning there are 161,722 observations possible for the analysis (3111 × 52). The advantage of county level observations over 2-week periods is that the variation in sunrise and sunset times in the US can be reflected in the data.³ There is substantial variation in the sunrise and sunset time by day of the year in the United States and on a given day, by north–south location. Given the day of the year and north–south location, the distribution of sunrise and sunset time depends on east–west location in the time zone and on whether clock time is standard or daylight.

The dependent variables in the models are counts of pedestrian fatalities or of motor vehicle occupant

fatalities in the counties during the 2-week periods. Results are presented for the 5:00–10:00 a.m. morning hours and the 4:00–9:00 p.m. evening hours because sunrise and sunset changes occur during these hours in the US.

Independent variables in the fatality models are standard to the highway safety literature (Keeler, 1994; Loeb et al., 1994) and include the following: sunrise or sunset time; the percent of the county population living in a rural area in 1990; the percent of the county population age 25 and up with a 4-year college degree in 1990; motor vehicles miles traveled by states and months for 1998 and 1999; the average annual inches of rain in principal metropolitan area(s) of states for 1998 and 1999; the average annual inches of snow and ice pellets in principal metropolitan area(s) of states for 1998 and 1999; county income per capita in 1990; county unemployment rate in 1990; the percent of county population traveling 30 min or more to work in 1990; and dummy indicators for season and year.

³ Note that the state of Arizona and many counties in Indiana do not observe daylight saving time. This is accounted for in our data. The computer program we used to calculate sunrise and sunset times was written by James Brimhall. His program provides sunrise and sunset times for any given longitude, latitude, and time zone, and is accurate within 2 min (Sinnott, 1995).

In some of the models we also include state identifiers to capture the effects of highway safety determinants that do not vary within states or for which data are not available at the county level. These determinants include state speed limits, seat belt and motor vehicle inspection regulations, alcohol control policies including excise tax levels, and weather. State identifiers also help to control for the "supply of pedestrians." States in the southern part of the US, for example, have warmer weather than states in the north. As a result, these southern states may have more pedestrian activity in a given hour and more opportunity for a pedestrian death.

2.3. Functional form of the regression models

The dependent variables in the models are counts of pedestrian fatalities or of motor vehicle occupant fatalities in the counties during the 2-week periods. Because the count values are usually small and often zero, a Poisson or a negative binomial distribution will best describe the dependent variables (Long, 1997). The negative binomial distribution is used to characterize the fatality models estimated below because likelihood ratio tests reject the null hypothesis that the underlying distribution is Poisson. Huber robust standard errors clustered on counties are computed because counties repeat in the data and not all independent variables may be accounted for in the models that distinguish one county from another (Huber, 1967). Specifications of count data negative binomial models usually include an independent variable to normalize for exposure. County population is used as the exposure variable in the models presented later.

3. Results

The first three regressions in Table 2 are for pedestrian fatalities occurring from 4:00 to 9:00 p.m. for the full 2-year period. The fourth regression in Table 2 is for pedestrian fatalities occurring from 4:00 to 9:00 p.m. during the standard time period only (approximately November through March in each year). The results presented in columns 1–4 of Table 3 follow the same pattern as Table 2 for the 5:00–10:00 a.m. period. The regressions in column 2 of each table include a larger number of independent variables than those in column 1, while the regressions in columns 3 and 4 include the state identifiers. The marginal effects of sunrise and sunset, presented at the bottom of each table, are stable across the first three regressions for each time period. They indicate that an hour later sunset would reduce pedestrian fatalities in the evening by 0.006 and that an hour later sunrise would increase pedestrian fatalities in the morning by 0.003. These marginal effects refer to changes in the number of fatalities per county per 2 weeks and are 0.27 and 0.38, respectively, of the sample means of 0.022 and 0.008. Thus, an hour later sunset would reduce evening pedestrian fatalities by about one-quarter and an hour later sunrise would increase morning fatalities by about one-third.

The standard time period regression (regression 4) in Tables 2 and 3 can be used to evaluate the effects of a change to full year DST on pedestrian fatalities. The p.m. sunset marginal effect is -0.008 and the a.m. sunrise marginal effect is 0.003 . The results indicate that shifting an hour of daylight to the evening from the morning in the standard time period in 1998 and 1999 would have changed pedestrian fatalities by $(-0.008 \times 3111 \times 22) + (0.003 \times 3111 \times 22) =$

Table 2
Results of regressing 4:00–9:00 p.m. pedestrian fatalities on time of sunset and other variables, counties of the US, 1998–1999

	Negative binomial count models			
	1	2	3	4
Sunset	-0.240 (-9.69)	-0.248 (-9.32)	-0.304 (-11.28)	-0.368 (-8.52)
Percent rural	-0.457 (-3.68)	-0.362 (-2.98)	-0.259 (-2.39)	-0.233 (-1.58)
College education	-3.488 (-5.22)	-2.300 (-2.15)	-2.453 (-2.23)	-1.959 (-1.42)
1999	-0.079 (-2.29)	-0.075 (-2.15)	-0.082 (-2.35)	-0.083 (-1.88)
Motor vehicle miles	1.18E-08 (3.04)	-6.59E-09 (-1.14)	2.06E-08 (1.35)	8.02E-09 (0.46)
Spring	-0.159 (-2.08)	-0.127 (-1.64)	-0.044 (-0.58)	
Summer	-0.151 (-1.85)	-0.106 (-1.26)	-0.024 (-0.29)	
Fall	0.083 (1.96)	0.108 (2.56)	0.067 (1.37)	
Rain		-0.002 (-0.58)		
Snow		-0.012 (-6.14)		
Income		9.81E-06 (0.64)	1.36E-05 (0.83)	1.56E-05 (0.64)
Unemployment		4.949 (3.23)	4.697 (3.34)	5.823 (2.66)
Commute		0.106 (0.46)	0.260 (1.19)	-0.053 (-0.18)
Intercept	-9.889 (-21.55)	-9.962 (-18.92)	-9.501 (-14.98)	-8.544 (-9.12)
n	161772	161772	161772	68442
State fixed effects	No	No	Yes	Yes
Sunset marginal effect	-0.0052	-0.0054	-0.0066	-0.0076

The z-statistics are in parentheses and are calculated by using Huber standard errors adjusted for clustering by county. Models 1–3 are estimated over fifty-two 2-week periods. Model 4 is estimated over two 11-week standard time periods. County population is the exposure variable in each model, with its coefficient constrained to equal one.

Table 3
Results of regressing 5:00–10:00 a.m. pedestrian fatalities on time of sunrise and other variables, counties of the US, 1998–1999

	Negative binomial count models			
	1	2	3	4
Sunrise	0.292 (4.24)	0.368 (5.47)	0.348 (4.43)	0.319 (3.40)
Percent rural	-0.708 (-4.15)	-0.535 (-3.27)	-0.402 (-2.91)	-0.467 (-2.23)
College education	-2.714 (-2.83)	-2.472 (-1.79)	-2.743 (-2.06)	-1.979 (-1.02)
1999	0.018 (0.33)	0.019 (0.35)	0.024 (0.42)	-0.060 (-0.70)
Motor vehicle miles	1.05E-08 (1.95)	-8.78E-09 (-1.35)	-1.07E-08 (-0.51)	6.63E-09 (0.24)
Spring	-0.068 (-0.67)	0.021 (0.21)	-0.005 (-0.05)	
Summer	0.136 (1.46)	0.210 (2.31)	0.200 (1.97)	
Fall	0.198 (2.81)	0.220 (3.11)	0.221 (2.78)	
Rain		-0.004 (-0.96)		
Snow		-0.009 (-4.89)		
Income		1.77E-05 (0.94)	2.25E-05 (1.36)	1.20E-05 (0.45)
Unemployment		4.498 (2.38)	5.132 (2.67)	6.653 (2.40)
Commute		1.105 (4.36)	0.999 (3.35)	1.276 (3.08)
Intercept	-17.424 (-34.18)	-18.424 (-31.32)	-18.244 (-24.25)	-17.657 (-19.52)
<i>n</i>	161772	161772	161772	68442
State fixed effects	No	No	Yes	Yes
Sunrise marginal effect	0.0025	0.0031	0.0029	0.0026

The z-statistics are in parentheses and are calculated by using Huber standard errors adjusted for clustering by county. Models 1–3 are estimated over fifty-two 2-week periods. Model 4 is estimated over two 11-week standard time periods. County population is the exposure variable in each model, with its coefficient constrained to equal one.

–343 over these 2 years, or about 171 per year. This is 13% of the pedestrian fatalities that occurred in these morning and evening hours. These results are similar in nominal value to those of Ferguson et al. (1995), which were summarized previously. They reported that an annual average of about 150 pedestrian fatalities would have been avoided with full year DST in 1987–1991. Our results are larger as a proportion of all pedestrian fatalities because of the 30% decline

in pedestrian fatalities in the decade of the 1990s. These models show no increased risk to school children from full year DST. When the a.m. models are estimated with pedestrian fatalities in the 5–13 or 5–18 years age group as the dependent variable, sunrise is not an important variable.

If the same procedure is applied to the motor vehicle occupant fatality results in regression 4 of Tables 4 and 5, the calculations show that full year DST would decrease

Table 4
Results of regressing 4:00–9:00 p.m. motor vehicle fatalities on time of sunset and other variables, counties of the US, 1998–1999

	Negative binomial count models			
	1	2	3	4
Sunset	0.050 (3.50)	0.045 (3.29)	0.030 (2.18)	-0.098 (-3.75)
Percent rural	1.252 (18.50)	1.178 (16.72)	1.331 (22.22)	1.402 (16.97)
College education	-3.785 (-8.10)	-0.458 (-0.82)	-2.716 (-5.25)	-2.276 (-3.15)
1999	0.0003 (0.02)	0.003 (0.14)	-0.007 (-0.38)	0.009 (0.29)
Motor vehicle miles	5.94E-09 (1.99)	-3.48E-09 (-1.19)	5.69E-08 (4.50)	9.41E-08 (5.26)
Spring	0.029 (0.66)	0.047 (1.12)	0.032 (0.78)	
Summer	0.152 (3.33)	0.177 (4.04)	0.145 (3.29)	
Fall	0.231 (8.31)	0.237 (8.65)	0.196 (6.75)	
Rain		-0.008 (-5.51)		
Snow		-0.010 (-11.46)		
Income		-7.62E-05 (-6.59)	-1.74E-05 (-1.57)	-1.17E-05 (-0.79)
Unemployment		-2.609 (-4.06)	-1.906 (-2.65)	-1.510 (-1.41)
Commute		-0.052 (-0.25)	-0.249 (-1.53)	-0.117 (-0.54)
Intercept	-14.207 (-52.01)	-12.712 (-42.40)	-12.832 (-40.33)	-11.105 (-20.40)
<i>n</i>	161772	161772	161772	68442
State fixed effects	No	No	Yes	Yes
Sunset marginal effect	0.0060	0.0052	0.0035	-0.0097

The z-statistics are in parentheses and are calculated by using Huber standard errors adjusted for clustering by county. Models 1–3 are estimated over fifty-two 2-week periods. Model 4 is estimated over two 11-week standard time periods. County population is the exposure variable in each model, with its coefficient constrained to equal one.

Table 5

Results of regressing 5:00–10:00 a.m. motor vehicle fatalities on time of sunrise and other variables, counties of the US, 1998–1999

	Negative binomial count models			
	1	2	3	4
Sunrise	0.053 (1.76)	0.018 (0.63)	-0.006 (-0.20)	0.059 (1.49)
Percent rural	1.288 (17.07)	1.210 (15.13)	1.402 (19.58)	1.371 (14.37)
College education	-3.588 (-7.11)	-0.217 (-0.34)	-1.960 (-2.99)	-1.321 (-1.46)
1999	0.037 (1.57)	0.038 (1.65)	0.035 (1.52)	-0.003 (-0.09)
Motor vehicle miles	3.03E-09 (0.89)	-7.90E-09 (-2.19)	9.85E-09 (0.59)	2.74E-08 (1.47)
Spring	0.109 (2.29)	0.083 (1.82)	0.046 (0.99)	
Summer	0.224 (5.24)	0.206 (4.98)	0.172 (3.93)	
Fall	0.204 (6.26)	0.216 (6.74)	0.205 (5.85)	
Rain		-0.010 (-5.15)		
Snow		-0.011 (-10.42)		
Income		-7.76E-05 (-6.13)	-2.44E-05 (-1.95)	-2.93E-05 (-1.73)
Unemployment		-2.768 (-3.77)	-2.295 (-2.81)	-1.749 (-1.44)
Commute		-0.004 (-0.02)	-0.256 (-1.37)	-0.238 (-0.98)
Intercept	-14.142 (-58.12)	-12.394 (-41.33)	-12.444 (-38.91)	-13.150 (-28.50)
<i>n</i>	161772	161772	161772	68442
State fixed effects	No	No	Yes	Yes
Sunrise marginal effect	0.0039	0.0013	-0.0004	0.0040

The *z*-statistics are in parentheses and are calculated by using Huber standard errors adjusted for clustering by county. Models 1–3 are estimated over fifty-two 2-week periods. Model 4 is estimated over two 11-week standard time periods. County population is the exposure variable in each model, with its coefficient constrained to equal one.

fatalities by 390, or 3% of motor vehicle occupant fatalities during these morning and evening hours. Evening motor vehicle occupant fatalities are not negatively related to time of sunset in models 1–3 in Table 4, which are estimated over the full sample of fifty-two 2-week periods. When the sample is confined to the two 11-week standard time periods in the 2 years (regression 4), however, the coefficient is negative ($z = -3.75$). These more robust results may be explained by the fact that sunset during the standard time period occurs earlier in the evening when rush hour traffic is heavier.

Tables 2–5 also show the impact of other state and county level variables on pedestrian and motor vehicle occupant fatalities. Counties with larger percentages of the population living in rural areas have lower pedestrian fatalities and higher motor vehicle fatalities. Motor vehicle fatality rates may be higher in rural areas because travel distances and speeds are greater than in urban areas and because travel is on less safe roadways (e.g. more travel on two-way roadways). Pedestrian fatality rates are probably lower in rural areas because the supply of pedestrian activity is less. In urban areas, destinations are more proximate and amenable to pedestrian travel.

In addition, the results show that counties with larger percentages of the population having a 4-year college degree have lower pedestrian and motor vehicle fatalities. Higher unemployment rates are associated with higher pedestrian fatalities and lower motor vehicle fatalities. Higher income is associated with lower motor vehicle fatalities but has no relationship with pedestrian fatalities. Lastly, higher percentages of the population with long commutes raise pedestrian fatalities in the morning, but have no effect on evening pedestrian fatalities or motor vehicle fatalities.

4. Conclusions

Daylight is an important determinant of morning and evening pedestrian fatalities in the US. An additional hour of daylight would reduce pedestrian fatalities by about one-third in the 5:00–10:00 a.m. time period and by about one-quarter in the 4:00–9:00 p.m. time period. Because pedestrian activity is greater in the evening period than in the morning period, full year daylight saving time, or the changing of clock time to make sunset and sunrise 1 h later in the standard time period, would reduce pedestrian fatalities about 171 per year, or by 13% of all pedestrian fatalities in these two time periods. Daylight is a less consistent determinant of motor vehicle occupant fatalities in the morning and evening time periods. However, results for the standard time period indicate that full year daylight saving time would decrease fatalities by 195 per year, or 3% of motor vehicle occupant fatalities during the morning and evening hours. The smaller percentage decrease in motor vehicle occupant deaths relative to pedestrian deaths may be explained by the presence of vehicle lights, which make vehicles visible to other drivers during darkness.

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Daylight Gains by City

	Number of days it take to gain one hour of daylight after Daylight Saving Time	Number of days it takes to gain one hour of daylight in the morning after Daylight Saving Time
Barrow	6	12
Fairbanks	9	16
Nome	9	17
Anchorage	10	19
Juneau	11	21
Unalaska	14	24
Seattle	17	29
New York City	22	37
Denver	23	38
Washington DC	23	39
San Diego	30	48
Miami	40	62

AHSBlog

Keeping Time in Alaska: National Directives, Local Response

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By Frank Norris

Time zones and daylight savings time have an interesting history in Alaska, a state that straddles so many degrees of longitude and has more than its share of summer daylight and winter darkness. Frank Norris's article on keeping time in Alaska in the 2001 issue of Alaska History tells that story and is reproduced below. Copies of the issue may be ordered through the Publications page of the website.

Americans and Canadians established time zones for most of North America in the 1880s, and most of the continent has retained those time zones ever since. Changes in how residents have kept time have been rare and related primarily to wars, energy crises, and the imposition of daylight saving time. In Alaska, however, the issue of time measurement resurfaces with some regularity. A variety of issues central to Alaska history—rebelliousness against the sometimes unrealistic dictates of a distant federal government, Alaskans' struggle for political unity across their vast state, and diverse economic allegiances—have all been manifested in the evolution of the state's time zones.

Until fairly recently, people throughout the world gave little or no thought to measuring the time of day. Farmers, ranchers, hunters, gatherers, and other subsistence users rose with the sun and carried on their daily activities until dusk. When the sun set, some people responded by lighting a fire or a candle, while others went straight to bed. By the mid-eighteenth century, when the first European visited Alaska's shores, clockmakers were making timepieces that could trace the hours and minutes with remarkable accuracy. Most people, however, cared little about the exactness of time; in 1790, for example, fewer than 10 percent of Americans had a clock of any kind, and most of those clocks had no minute hand.(1)

Society's casual attitude toward time was also reflected in the consistency, or lack of consistency, between time keeping in various adjacent communities. In lieu of time zones, people kept time on the basis of longitude. Based on that system, clocks in Wrangell (located at 132° West longitude) would strike noon twelve minutes before those located in Sitka (at 135° West longitude). This system proved slightly vexing to ship captains and commercial traders who traveled long distances.(2) Most people, however, traveled little; thus there was little pressure to change the existing state of affairs.

In the United States and Canada, the expanding railroad network demonstrated the inadequacy of each town keeping its own "official time." By the 1850s, to guarantee the safety of its trains at crossing points, each carrier adopted its own time standard. In cities that were served by more than one railroad, travelers learned that there might be several official railroad times in addition to the clock that local residents used. To bring order, the railroads in November 1883 established the Eastern, Central, Mountain, and Pacific time zones, based on the 75th, 90th, 105th, and 120th meridians, respectively. Alaska, which had no railroads, was not included in the system.(3)

Because of its isolation and lack of commercial infrastructure, Alaska during this period was less concerned about time measurement than the rest of North America. Alaska and adjacent areas of Canada were splendidly isolated from Seattle, Edmonton, and other southern points; no telegraph reached the far northern latitudes, and steamship travel between Puget Sound and the nearest Alaskan port was a two- or three-day endeavor.

Prior to 1900, towns in Alaska and the Yukon set their clocks to a local time based on longitude. Historical accounts from the gold rush period reveal a relaxed attitude toward time. Stampeders' diaries, for example, often note the hour at which their train arrived in Seattle, and many diarists were also careful to note the hour in which their steamship departed for Alaskan waters. But once the stampeders disembarked in the north country, time became less important. This attitude is reflected in the general omission of time references in the early Skagway and Dyea newspapers, even for store hours or steamship departure times, and most diarists paid little attention to time once they headed inland.



Clock face with tutu-clothed woman posing, toes pointing to 10:30. ASL-P226-723. William R. Norton Photographs, Alaska State Library-Historical Collections



Telegraph station, Ft Gibbon, Tanana, Alaska, circa 1900. Photo by George M. Woods. UAF-1974-130-120. Edward R.

Uniform time keeping finally came to Alaska in the wake of the turn-of-the-century gold rushes. The U.S. Army, which around 1900 established a series of forts across the territory, was primarily responsible for the change. That same year, the Army Signal Corps, under the direction of Brigadier General Adolphus Greely, began constructing the Washington-Alaska Military Cable and Telegraph System (WAMCATS) to provide instantaneous communication between the forts. By 1903, the Signal Corps had built a line from Fort Davis, near Nome, to St. Michael and up the Yukon River Valley to Fort Egbert at Eagle; the Corps also constructed another line from Fort Egbert south to Fort Liscum near Valdez.(4) During this same period, Canadian construction crews completed a telegraph line connecting Dawson City to Canada's main telegraph grid at Quesnel, British Columbia. Unwilling to rely on the Canadians, though, the U.S. by 1905 had laid a submarine cable line between Seattle and various Alaska points.(5)

The implementation of a telegraph system, in practical terms, demanded the establishment of one or more time zones, and given the concentration of economic and political power at the time in Alaska's southeastern panhandle, it was unsurprising that "Alaska Standard Time," established in 1900, would be centered on the 135th meridian, just one hour before Pacific Standard Time.(6) This scheme proved suitable for the Southeast, but Alaskans elsewhere observed two other time zones, one each for central and western Alaska. These additional time zones were observed in everything except telegraphic communications.

McFarland Photographs, University of
Alaska Fairbanks Archives

It must not be concluded, however, that Alaskans immediately became more time-conscious merely because of the increasing reach of the telegraph system. Although most Alaskans during this period paid attention to some form of time measurement—a church bell, a cannery or mine whistle, or a railroad timetable—it also appears that most Alaskans, even those in the larger towns, lived by the clock far less than today. (7) It is highly likely, moreover, that many Alaska residents during this period, particularly those in rural areas, either owned no timepieces or paid little attention to the ones they had.

Not long after Alaska adopted standard time zones, territorial residents began to consider daylight saving time. World War I and the need to maximize daylight hours in armament manufacturing plants spurred national lawmakers to consider the idea's energy savings potential. In May 1916 both Germany and Great Britain adopted daylight saving time. The idea also took hold in various U.S. states and cities; Seattle, for example, adopted daylight saving time during that summer.

Alaska, at first blush, seemed an unlikely area for experimentation with this concept. It had a scant manufacturing presence, and it was also situated in the high latitudes, where the length of daylight, both in summer and winter, made daylight saving time largely irrelevant. But based on Seattle's example, at least one Alaskan community experimented with the concept during the fall of 1916. In Seward, a petition circulated by a "very charming personality" caused railroad company management, along with the school and a number of businesses, to adopt a daylight saving time experiment beginning on October 1. The city council, however, refused to sanction the idea, and neither the cable office nor steamship companies expressed interest in changing over to the new system. Local enthusiasm for the idea, moreover, proved short-lived. By October 3, some residents were already "disgusted" with having to pay attention to two systems of time keeping; by October 9, most of the town's businesses had declared the time change a nuisance and had reverted to standard time. The local newspaper editor, dead set against the time change, pilloried the idea as being one of those "egregious bits of rot," and the confusion brought on by the experiment forced its complete repeal by the end of November. (8)

Although Alaskans could muster little enthusiasm for daylight saving time, Congress in March 1918 mandated the adoption of "war time" throughout the country from the last Sunday in March to the last Sunday in October. "War time" remained in force until October 1919. The law also decreed that in addition to the United States' four major time zones, there would be a fifth zone for Alaska. "U.S. Standard Alaska Time" would be two hours slower than in Seattle. This was done either because of geographical centrality—the 150th meridian neatly bisected the territory—or perhaps because an increasing percentage of Alaskans were now living outside of the southeastern panhandle. But the act, whatever its virtues, had no enforcement mechanism. And in the words of a latter-day newspaper columnist, the use of official Alaska Time was "only compulsory on common carriers and for the various purposes of government administration." (9) Most Alaskans, therefore, continued to honor three time zones, as they had since the turn of the century.

Beginning in the mid-1920s, Southeast communities began to grow restless because their commonly observed time was an hour behind that in Seattle. Perhaps based on a move to summer daylight saving time in Seattle, Panhandle residents agitated to move area clocks ahead to Pacific Standard Time in order to narrow the two-hour seasonal time zone gap. Ketchikan pioneered the idea. On May 19, 1926, the city council passed a resolution adopting Pacific Standard Time the year round, to be effective at midnight on May 29. As a newspaper article noted, "The change in time is said to be a big convenience for boats, tourists, and establishments doing business with Seattle firms." Ketchikan interests invited other southeastern Alaska towns to follow suit, but so far as is known, none did. (10)

In May 1933, Seattle launched a new daylight saving time experiment. In reaction, Juneau city council member J. B. Burford presented a daylight saving time petition "signed by many business people." Hoping to avoid an "adverse effect on business with Seattle banks," the council unanimously adopted Burford's plan, and Juneau went on daylight saving time from May 24 through September 20. (11) It then reverted to standard time; and perhaps in response to Seattle, which made no further moves to experiment with daylight saving time for the next several years, Juneau also retained standard time on a year-round basis.

During the period between the two world wars, Alaskans abandoned their reliance on "Alaska Standard Time" as a reference either to that centered on southeastern Alaska (as the Army had declared in 1900) or on the Railbelt (as Congress had declared in 1918). In its stead, Alaskans implemented a territory-wide system based on meridians, not names. A typical maritime table, therefore, might note that a steamship would depart from Seattle on Tuesday at 8 p.m. Pacific Time; it would sail north to Juneau, where it would arrive on Friday at 10 a.m. 135°. It would then continue on to Seward, where it would arrive on Sunday at 2 p.m. 150°. (12)

In May 1939, Juneau commenced another, more sweeping time-change effort. Frank Metcalf, worried that residents were "losing the use of too much daylight," petitioned the city council to adopt Pacific Time. The idea became a discussion item at various civic meetings, and in early July the town's chamber of commerce lined up behind the plan. But the town's largest labor organization, the Mine, Mill and Smelter Workers' Union, opposed the change. Recognizing the idea's potential divisiveness, the council let area voters decide. On April 2, 1940, voters in the Juneau-Douglas area adopted the time-change move on a 753-564 vote, and at 11 p.m. on April 30, area clocks shifted an hour ahead. Other Southeast communities apparently followed suit, and by the eve of World War II nearly all of Southeast, except Skagway and Yakutat, had adopted Pacific Time. (13)

On February 9, 1942, Alaska, along with the other states and territories, went on daylight saving time or "war time" on a year-round basis. Because many southeastern communities had moved to Pacific Time in 1940, adopting federally mandated war time in those communities brought no changes to local clocks. The rest of the territory's residents—those observing 135° time in Skagway and Yakutat, 150° time centered on the Railbelt, or 165° in western Alaska—responded to war time by moving their clocks an hour ahead. The *Fairbanks Daily News-Miner*, perhaps speaking for many Alaskans, begrudgingly accepted the national mandate "despite the fact that Alaskan communities have observed the home rule on the time question." (14)

Congress kept war time in force until V-J Day in the summer of 1945. But no sooner had the Japanese surrendered than Congress began to agitate for war time's repeal. Congress took up legislation in early September, President Truman signed repeal into law on September 25, and war time ended five days later. On that day, people throughout the United States turned their clocks back one





Alaska State Library - Historical Collections
 Soldiers at Massacre Bay, Attu, Alaska, May 16, 1943. ASL-P175-052. U.S. Army Signal Corps Photograph Collection, Alaska State Library - Historical Collections

hour; many Alaskans did the same. Most residents of southeastern Alaska, however, did not change their clocks. They thus, in effect, moved to Pacific Standard Time, which they had observed prior to World War II.(15)

For the two decades that followed World War II, Congress continued to recognize that Alaska had only one time zone-U.S. Standard Alaska Time, which was two hours slower than Pacific Standard Time. Alaskans, however, conveniently ignored the officially-designated time zone. Telegraph offices, radio stations, road maps, and other media recognized four Alaska time zones during this period, just as they had since 1940. Alaska's time zones were Pacific Time in southeastern Alaska south of Icy Strait; Yukon Time in Skagway and Yakutat; Alaska Time for everything from the 141st to the 162nd meridian, and Bering Time west of Alaska time. For more than twenty years after V-J Day, no Alaska communities observed daylight saving time.(16)

In the spring of 1954, Anchorage considered a time change. Various sports and recreation groups touted the idea of a two-hour change (to Pacific Standard Time) that would be honored from late May through late September. But transportation companies and broadcasters opposed the move, and they prevailed on the city council to delay the proposal until the city election that fall. The council offered local voters a choice; they could opt for either Pacific Standard Time, two hours ahead on a year-round basis; daylight saving time, one hour ahead on a seasonal basis; or a continuation of the status quo. In the October 5 election, the status quo prevailed. Advocates of the existing system garnered 1,265 votes, far more than those who voted for either daylight saving time (316 votes) or Pacific Standard Time (166 votes).(17)

Attempts to tinker with the new state's time zones arose at both the state and local levels in the early 1960s. Railbelt legislators introduced bills to unify Alaska under a single time zone in 1961 and 1963. Efforts to shift the state to either Pacific or Alaska time, however, failed. The only change to occur in the early 1960s was at Skagway. In early 1965, the Yukon Territorial Council voted to move the Territory from a year-round observance of Yukon Standard Time to Pacific Time with daylight saving time in summer. The Council probably took this action to more easily communicate with British Columbia, which had a similar time system. Yukon Territory's time change left Skagway-which had long kept the same time zone as the Yukon with which it was linked by the White Pass & Yukon Route Railway-out of synch with communities in both the Yukon and southeastern Alaska. Skagway residents, opting for closer ties with both Whitehorse and southeastern Alaska, circulated a petition requesting a change to Pacific Standard Time. In October town voters approved the change by an overwhelming margin. These actions left Yakutat as the only substantial Alaska community observing Yukon Time.(18)

A major change in Alaska's time regime came with passage of the Uniform Time Act, which President Johnson signed on April 13, 1966. The bill had three primary impacts on the 49th state. First, it put all of Alaska on summer daylight saving time for the first time in its peacetime history. Second, the name "Alaska Time," used for clocks in the Railbelt, was changed to "Alaska-Hawaii Time" to reflect the 50th state's inclusion in the same time zone. And third, Congress finally recognized that Alaskans deserved four time zones, not the single "U.S. Standard Alaska time" that it had been in effect since 1918. Southeast, like Seattle, would have Pacific Time; Yakutat would observe Yukon Time; most of Alaska west of the border with the Yukon Territory would fall in Alaska-Hawaii Time; and the Aleutians and western Alaska would be in Bering Time, three hours behind the Southeast. In April 1968 Alaskans adopted the four-time-zone plan and implemented daylight saving time.(19)

During the mid to late 1970s, a major issue in state politics was whether the capital should be moved from Juneau to the booming Railbelt. Any questions about time zones had to be considered in the context of the looming capital move issue. In the spring of 1979, Juneau mayor Bill Overstreet and the city-borough assembly sought to lessen the tensions between Southeast and the Railbelt by sending a petition to the federal Department of Transportation (DOT) requesting that Juneau and other southeastern cities be moved to Yukon Time. This move would reduce the time difference between Juneau and the Railbelt from two hours to one. On September 20, the DOT approved the petition; departmental officials decreed that on April 27, 1980, Juneau and other nearby communities would move to Yukon Time. Sitka, Petersburg, Wrangell, and Ketchikan, however, would remain on Pacific Time.(20)

But soon after the DOT's decision, a broad spectrum of Juneau's population rose up to protest the change. Southeast, they declared, had closer business relationships to Seattle than to the Railbelt. On March 28, 1980, voters-by nearly a 2-to-1 margin-approved a non-binding referendum favoring repeal of the DOT's decision. Two weeks later, the Alaska State Senate unanimously passed a resolution asking that the time-change order be rescinded. Despite that vote, the federal agency refused to back down, and the switch to Yukon Daylight Time took place in late April. Some Juneau residents became so upset about the time change that they initiated recall petitions against Mayor Overstreet and four assembly members. This turn of events may have prodded DOT officials to announce that they would re-analyze their previous decision. The agency held a mid-July hearing to air citizens' views, and on September 22, 1980, DOT Secretary Neil E. Goldschmidt rescinded the Department's September 1979 decision. Juneau and other communities in northern Southeast reverted to Pacific Time on October 26.(21) That action, while it satisfied Southeast residents, re-aggravated tensions between Juneau and the Railbelt over the capital move issue.

For the next two years, the capital move issue dominated state politics. In the November 1982 election, Alaskans solidly defeated the capital move proposal. But William Sheffield, who won the governorship in that same election, tried to moderate the tension between Southeast and the Railbelt by proposing to the Alaska legislature that the two-hour time-zone gap be eliminated altogether. In his plan, clocks in the Railbelt would advance an hour while those in Southeast would move back an hour. The only part of the state that would remain out of that system, in Sheffield's plan, would be western Alaska and the Aleutian Islands; clocks in this part of the state would advance an hour from Bering Time to Alaska-Hawaii Time. The Alaska legislature agreed with Sheffield's proposal. On April 19, Sheffield signed a resolution asking for two Alaska time zones and forwarded it to the DOT.(22)

The DOT held hearings on the change. Most communities voiced support. At an August hearing in Nome, however, the town's common council, at the request of local radio stations, asked that most of western Alaska be moved to Yukon Time along with the rest of the state rather than Alaska-Hawaii Time. The DOT honored that request, and on September 15, it approved the statewide time change (23) Alaskans adjusted to the new system in the early hours of Sunday, October 30, 1983. All of Alaska became part of a single time zone-which was now called Alaska Time-with two exceptions. One area, the western Aleutian islands of Atka, Adak, Shemya, and

Attu, advanced an hour from Bering Time to Hawaiian-Aleutian Time. Annette Island, an Indian reservation near Ketchikan, was the other exception. On October 28, two days before the scheduled time change, the Metlakatla Indian Community Council voted unanimously to keep the reservation on Pacific Time.(24)

The government's move to unify Alaska's time zones antagonized many Southeast residents, who disliked being moved away from Pacific Time. They complained that it forced children to come home from school in the dark in midwinter; in addition, being in a new time zone, according to one source, had "adversely affected the business community's efforts to communicate with Seattle." Ketchikan residents soon circulated petitions to repeal the time change, and during the next several months additional support was gathered from either the governing bodies or residents' groups in Wrangell, Sitka, Petersburg, the Ketchikan Gateway Borough, and various Prince of Wales Island communities. All joined a petition to make a switch from Alaska Time to Pacific Time. The petitioners pressed for public hearings, hoping to publicize their case. But in two separate 1986 rulings, the DOT rejected the petition because it would have created an arbitrary, confusing "island of time." (25) With the exception of Metlakatla, Southeast communities have been part of Alaska Time ever since.

The first notable time zone action after the mid 1980s was a maverick move made by Little Diomed Island residents in the summer of 1993. This island, located west of the Seward Peninsula in northwestern Alaska, lies near the 170th meridian. Because the island is so far west of the 135th meridian (where the midday sun is at its zenith according to Alaska Time), the sun did not reach its zenith until 3:20 p.m. during the winter and 4:20 p.m. during the summer. Such a huge discrepancy from the norm made residents "weary of hunting and berry picking in the dark," so on August 1, 1993, they unilaterally decided to move their clocks back three hours and establish "Little Diomed Time." The move proved popular for island residents, and several months later, a newspaper update stated "So far, the state and federal powers-that-be have looked the other way while the village lives at its own rhythm." But before long transportation firms, government officials, and the villagers themselves became annoyed by the confusion it caused. A year after their initial decision, residents decided at a village council meeting to go back to Alaska Time.(26)

In recent years various Railbelt residents have grown restless with the existing time regime, and the primary manifestations of that restlessness have been attempts to eliminate daylight saving time. The first such move took place in January 1999, when Representative Vic Kohring introduced House Bill 4. That bill failed in committee, but the idea remained a hot-button issue to some in Southcentral Alaska. During the 2002 legislative session, Representative Ken Lancaster pushed a similar bill that generated the first significant debate on the topic in almost twenty years. While Lancaster's effort did not succeed, it and the discussions it generated suggest that Alaskans are far from unanimous in their acceptance of the present time zone regime.(27)

The history of time zones in Alaska has been much more dynamic and contentious than in other states. Certainly, for many states, geography placed them unarguably within a single time zone. But even states on the frontier between two time zones have had more stable time regimes than Alaska, and residents of other states have seldom engaged in extended public debate over time systems. The only nationwide changes experienced in time zones since their establishment in the 1880s came with the introduction of daylight saving during two world wars, passage of the Uniform Time Act, or because of the energy crisis of the early 1970s, when for two years the nation observed year-round daylight saving time.

In Alaska, however, several other factors have affected time regimes. Alaska's size gives it the unique status of spreading across nearly 60 degrees of longitude, equivalent to four time zones. When the federal government in 1918 ignored that complexity and attempted to dictate that all the territory fit in one time zone, Alaskans showed a characteristic unwillingness to accept the dictates of the distant U.S. Congress. Consequently, Alaskans and the federal government observed different systems of time zones for almost fifty years. Internal Alaskan politics has also played a role. Political motives tied to Juneau retaining the state capital prompted unification of the vast majority of the state in one time zone, even at the expense of placing most of the state's population an hour or more off sun time. Railbelt residents, moreover, were willing to go along with the move because it eased communications between Alaska and the Lower 48, and because it made satellite television transmission of sports and other live broadcasts more in synch with their daily schedules. Another factor relating to time zone dynamism has been the power of economic alliances. For example, between the two world wars, communities in Alaska's Southeast moved their clocks to Pacific Time in order to more easily conduct business with Puget Sound commercial interests, and in the 1980s, businesses in western Alaska argued to be placed in the same time zone as Anchorage, the state's business center.

Over the last century, Alaska's time zones have rarely been static for more than twenty years. There have been many local moves to revolt from prescribed time systems, and in a state spanning almost 60 degrees of longitude, many people remain unhappy with the current time system in Alaska. Future tension over time regimes, therefore, appears to be inevitable.

Notes

1. G. J. Whitrow, *The Nature of Time* (New York: Holt, Rinehart and Winston, 1973), 87; Michael Lemonick, "The Riddle of Time," *Time*, December 27, 1999, 144; W. A. Douglas Jackson, *The Shaping of Our World; A Human and Cultural Geography* (New York: John Wiley and Sons, 1985), 527-29; Ian R. Bartky, *Selling the True Time: Nineteenth-Century Timekeeping in America* (Stanford: Stanford University Press, 2000), 12-13.
2. In the summer of 1884, a Sitka visitor made the following observation: "A fine clock is in the [Russian Orthodox] church tower, and the tourist who has kept Astoria or ship's time realizes how far west he has gone when he finds his watch 45 minutes faster than the Sitka church clock." *New York Times*, October 27, 1884, 2.
3. Jo Ellen Barnett, *Time's Pendulum: The Quest to Capture Time* (New York: Plenum Trade, [1998]), 130; Pierre Berton, *The Last Spike: The Great Railway, 1881-1885* (Toronto: McClelland and Stewart, 1971), 328; *Encyclopedia Americana*, 1995, "time zone"; *New York Times*, April 19, 1883, 1 and November 18, 1883, 3. A full discussion of this process is provided in Ian R. Bartky "The Adoption of Standard Time," *Technology and Culture* 30 (January 1989): 25-56 and in Bartky, *Selling the True Time*, 47-89, 139-46. The coterminous U.S., and all Canadian provinces except Newfoundland, still observe the same five time zones that the railroads devised in 1883, although Provincial Time is now called Atlantic Time. Many changes, however, have been made in time zone boundaries. *World Almanac and Book of Facts, 1954* (New York: Press Publications, 1953), 418.

4. The Signal Corps also built a short segment between Eagle and the Canadian border, which they completed in May 1901. *Daily Alaskan* (Skagway), May 3, 1901. Also see the *Daily Alaska Dispatch* (Juneau), July 12, 1900; *Valdez News*, August 29, 1903 and November 28, 1903; U.S. Army Signal Corps, *Report of the Chief Signal Officer* for 1900 (pp. 945-60), 1901 (pp. 915-24), 1902 (pp. 661-71), and 1903 (pp. 30, 325-33).
5. *Daily Alaskan* (Skagway), August 27, 1901 and September 9, 1901; Ken S. Coates and William R. Morrison, *Land of the Midnight Sun* (Edmonton: Hurtig Publishers, 1988), 169; *Alaskan* (Sitka), September 3, 1904; *Annual Report of the Governor of Alaska to the Secretary of the Interior*, 1901 (pp. 39, 77), 1902 (p. 50), and 1903 (pp. 26-27); Major Gen. A. W. Greely, *Handbook of Alaska* (New York: Scribner's, 1909), 260; *Valdez News*, October 8, 1904; *Report of the Chief Signal Officer* for 1903 (pp. 32, 332), 1904 (pp. 357-69), and 1905 (pp. 171-200). Quesnel was the northernmost point in the British Columbia telegraph grid.
6. *Annual Report of the Governor of Alaska, 1901*, 73.
7. Alaska historian Robert N. DeArmond notes one colorful example of a town's deviance from standard time: "For many years on Gastineau Channel the Treadmill mine blew a noon whistle by which many people on both sides of the channel set their clocks. A problem was that Treadwell's clocks were half an hour different than standard time, . . . so it was common, when a time was to be specified, to announce that it would be '1 o'clock by the Treadwell,' etc." DeArmond to the author, March 24, 2000.
8. *Seward Gateway*, October 2-3, 9, and 23, 1916; Mary J. Barry, *Seward, Alaska; a History of the Gateway City, Vol. II: 1914-1923, the Railroad Construction Years* (Anchorage, the author, 1993), 46. The *Seward Gateway* on October 2 also stated that "Ketchikan is one town which has just gone back to normal time after putting its clocks ahead," suggesting that Ketchikan experimented with daylight saving time during 1916; but a perusal of the *Ketchikan Daily Progressive-Miner* for April through October 1916 showed no such activity.
9. *Congressional Record*, 65th Cong., 1st sess., 1917, 55:4355; *Fairbanks Daily News-Miner*, February 7, 1942.
10. *Daily Alaska Empire*, May 21, 1926 and May 19-20, 1933. The May 20, 1933 issue noted "This is the first time daylight saving time has been tried out in Juneau in several years." But a perusal of springtime issues of the *Empire* between 1925 and 1932 casts doubt that Juneau experimented with daylight saving time between 1919 and 1933.
11. *Daily Alaska Empire*, May 6, 19-20, and 24, 1933 and September 20, 1933.
12. Merle Colby, *A Guide to Alaska, Last American Frontier*, American Guide Series (New York, Macmillan, 1950), xxxv.
13. *Daily Alaska Empire*, May 20, June 6, and July 6-8 and 22, 1939, and April 3 and 30, 1940. One of the few Juneau Chamber members who opposed the change was grocer Frank Garnick, who exclaimed, "What are you going to do with that extra hour in the evening, anyway? You're running yourself to death as it is." The city council actions of various Southeast communities, independent as they were, had no bearing on the official Alaska time zone that had been legislated by Congress in 1918. Legislative Reporting Service, [Alaska Legislative] *Report*, 1967, 21.
14. *Seward Bulletin*, February 9, 1942; *Fairbanks Daily News-Miner*, February 9, 1942; *Daily Alaska Empire*, February 9, 1942 and September 29, 1945. An Alaska map published by the Kroll Map Co. of Seattle-undated, but probably drawn during World War II-suggests that all of southeastern Alaska followed Yukon Daylight Time except for Annette and Duke Islands, southwest of Ketchikan, which followed Pacific Daylight Time. Kroll Map Co., "Alaska," in author's collection, courtesy of Bruce Greenwood.
15. *Congressional Record*, 79th Cong., 1st sess., 1945, 91:8466, 8540; *Daily Alaska Empire*, September 29, 1945.
16. The 162nd meridian dividing line, new since the outbreak of World War II, meant that Bethel was now on Alaska Time, an hour later than it had been in prewar days. Alaska, during this period, was one of just a handful of states or territories where none of its residents observed daylight saving time.
17. *Anchorage Times*, May 14-15 and 21-22, September 29-30, and October 6, 1954.
18. Legislative Reporting Service, *Report* for 1960 (p. 135), 1961 (pp. 124, 164, and 181), and 1963 (pp. 46-47); *Daily Alaska Empire*, March 27, 1961, A1 and March 20, 1963, 2; *North Wind*, May 1965, June 1965, September 1965, October 1, 1965, and October 15, 1965. The Yukon Territory soon withdrew its action regarding Pacific Time; by 1966, it was back on Yukon Time, though it also observed daylight saving time. Pacific Northern Airlines, "Alaska Flight Maps," 1966, courtesy of Bruce Greenwood.
19. *Congressional Record*, 90th Cong. 2nd sess., 1968, 112:6009-10, 7565, 8285; *Juneau Alaska Empire*, April 26, 1968, 8. The federal Department of Transportation, just a year after its September 1966 establishment, proposed shifting southeastern Alaska back to Yukon Standard Time. Local communities, however, fought the change and it was put on hold-at least for the time being. *North Wind*, September 1967, 2.
20. *Juneau Empire*, September 21, 1979, 1; *Alaska Economic Report*, September 29, 1979, 2; *Southeastern Log*, November 1979, 2. During DOT's public comment period for the proposed change, only six of the 26 received comments supported the time change.
21. *Southeastern Log*, April 1980, 28; May 1980, 13; July 1980, 13; August 1980, 5; *Alaska Economic Report*, June 18, 1980, 6; *Juneau Empire*, September 22, 1980, 1. On August 26, Overstreet and the four assembly members survived the attempt to oust them from office.
22. *Alaska from the Inside*, January 26, 1983, 3; *Alaska Legislative Digest*, March 27, 1983, 6; April 2, 1983, 5; April 16, 1983, 7; *House Bill History, 1983-1984*, 446-47; *Senate Bill History, 1983-84*, 838. As noted in the *Alaska Economic Report*, March 24, 1983, 7, opponents of the capital move pushed the measure, hoping that "the time

shift will help put the bitter Alaska capital move issue to sleep." Voters rejected the capital move 96,931 (52.9%) to 86,312 (47.1%). *Juneau Empire*, November 11, 1982, 1.

23. *Juneau Empire*, September 16, 1983, 1-2; *Nome Nugget*, September 22, 1983, 1. In the hearings, a group of Anchorage and Juneau residents testified in support of the change, although there was "some opposition" from Fairbanks and Ketchikan.

24. *Milepost* [1985] (Anchorage: Alaska Northwest Publishing, 1985), 494. Because the time-zone boundary change brought so many Alaskans into a single time zone, Alaska's two senators acted to change the names of Yukon Time to Alaska Time, and the name of Alaska-Hawaii Time to Western Pacific Time. After modification through the legislative process, Yukon Time was changed to Alaska Time and Alaska-Hawaii Time was renamed Hawaii-Aleutian Time. This law also changed the name of Bering Time, which by then did not apply to any Alaskan territory, to Samoa Time. *Ketchikan Daily News*, October 29, 1983, 1; *Alaska Magazine*, August 1984, 30; *Congressional Record*, 98th Cong., 1st sess., 1983, 129:29511-12, 29524, 29570, 32700, 34225, 34227, 34684.

According to DOT official Joanne Petrie, Indian reservations are not bound to follow time zones imposed by neighboring jurisdictions. Given that independence, Metlakatla tribal members reiterated their interest in keeping Pacific Time in the November 1984 vote, and the community has remained in Pacific Standard Time, on a year-round basis, to the present day. Judy Lauth (MICC executive tribal secretary), interview with author, March 20, 2001.

25. *Alaska Magazine*, March 1984, 20 and February 1985, A4; *Anchorage Daily News*, April 23, 1986, C4 and July 10, 1986, C4; *Juneau Empire*, October 3, 1984, 12 and April 23, 1986, 2; *Alaska Economic Report*, September 9, 1985, 5; *Ketchikan Daily News*, September 4, 1985, 4; September 24, 1985, 4; October 8, 1985, 1; November 17, 1985, A3; December 29, 1985, B2; and July 8, 1986, 1; Joanne Petrie (DOT) to author, email, February 23, 2000. On December 1, at least one Ketchikan business unilaterally switched to Pacific Standard Time. *Southeastern Log*, December 1983, A4-A5; January 1984, A-18.

26. *Anchorage Daily News*, August 4, 1993, B1-B2 and November 3, 1993, B5; Herb Anungazuk, interview with author, March 15, 2001; Philip Ahkinga to author, fax, June 13, 2001; Philip Ahkinga interview with author, June 13, 2001.

27. *House Bill History, 1999-2000*, 17; *Anchorage Daily News*, June 12, 2000, A1; March 18, 2002, B1; April 6, 2002, B1-B2. [Editor's note: Although this issue is dated 2001, it was not published until the summer of 2002.]