# The Introduction of Daylight Saving in Western Australia:

## Analytical Approaches using Surveillance Data

Government of Western Australia
Department of Health

# Contributing authors

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# Daylight saving in Western Australia

- The introduction of daylight saving on the 3rd December 2006 provided a unique natural experiment to measure the effect, if any, additional "daylight" had on participation in physical activity.
- There were two potential sources of information about the effect:
  - The Western Australian Physical Activity Task Force's (WAPTF) survey conducted in October and November 2006 with a follow-up of respondents who agreed to be recontacted
  - The WA Health and Wellbeing Surveillance System (WAHWSS) which has been collecting information on physical activity since 2002.

# The PATF survey extra questions methodology

- A random sub sample from an original 3000 who completed the PATF survey in November were recontacted in early December 2006. Respondents were asked three additional questions in relation to the time of day they were usually active, the time of day they thought they would be physically active and what impact, if any, daylight saving was likely to have on their physical activity.
- During the last week of March 2007, 83% of those recontacted in December the second post day light saving survey.

# Some key results from the PATF

- While 27.3% believed that they had increased their physical activity, 22.3% believed that they had decreased their physical activity.
- A higher proportion of women (25.9%) reported that they had decreased their physical activity compared with men (18.0%).
- 53.1% disagreed with the statement that daylight saving enabled most people to increase their physical activity levels and rural people were significantly more likely to report this.
- The time of day for physical activity shifted from 53% exercising in the morning and 28% exercising in the evening pre daylight saving to 39% exercising in the morning and 39% exercising in the evening during daylight saving.
- 25.8% reported doing fewer sessions of physical activity compared with 12.3% who reported doing more sessions of physical activity during daylight saving.
- 30.9% believed that daylight saving provided more opportunity for people to engage in family-based physical activity.

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# The WAHSWW – methods and extra questions

**Data is collected continuously over the year but each month is a collection unit. It is done as a computer assisted telephone interview (CATI).**

**Content Areas**

General health status
Chronic diseases
Risk factors
Protective factors
Social factors
Health service use
Demographics

**At least 550 interviewed each month**

**Occasional special additions**

Bellevue fire
Food poisoning
Environmental health concerns
Important health promotion campaign evaluations- DAYLIGHT SAVING!!

# HWSS Comparison with PATF survey findings about time and place of exercise during daylight saving

- In December, the WAHWSS added the PATF questions about the place and time of day physical activity took place.
- There was no significant difference in the proportion of people who reported that they did their physical activity in the morning or during the day.
- There was a significant increase in the proportion of people who reported that they did their physical activity in the afternoon and evening during daylight saving.
- There was a significant increase in the proportion of people who went to the beach for their exercise, but this may have been due to the season (summer).

# WHAT TIME SERIES ANALYSIS CAN TELL US WITH SURVEILLANCE DATA USING THE WAHWSS DATA

→Time series can show a pattern over a long period with trends (up or down) over that same period.

→Time series can show whether or not an event has any impact over time.

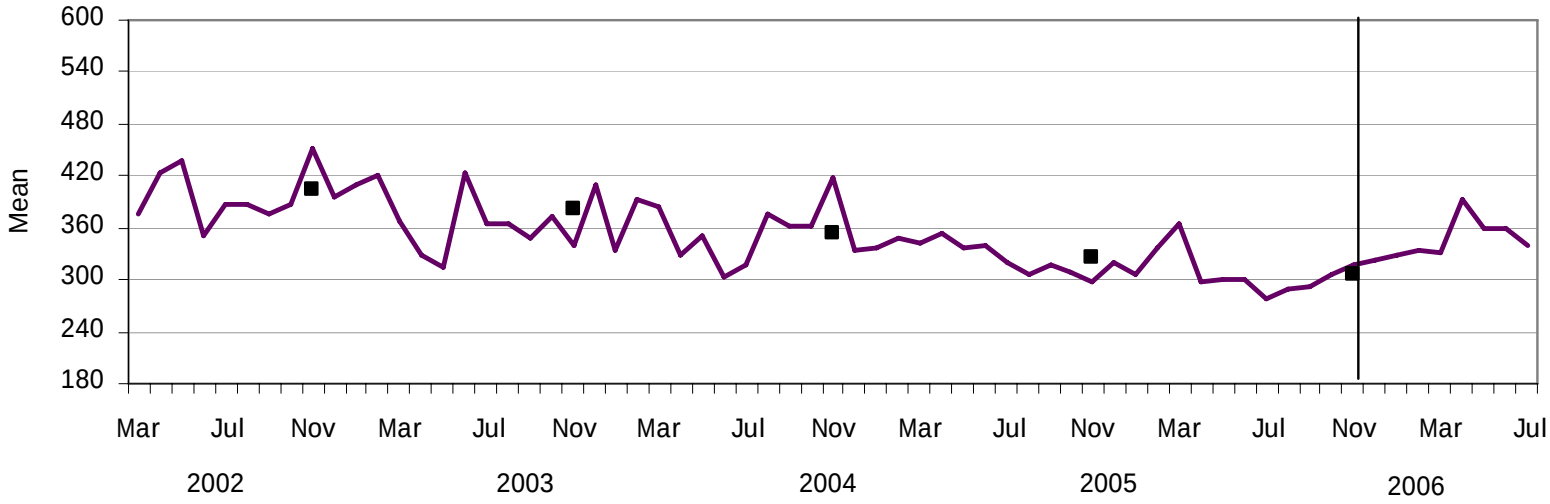
→Time series can show when decay of the impact of an event occurs.

→Time series can help to identify when campaigns should run

→Time series can identify the gap between occasions of a campaign to minimise the decay of impact.

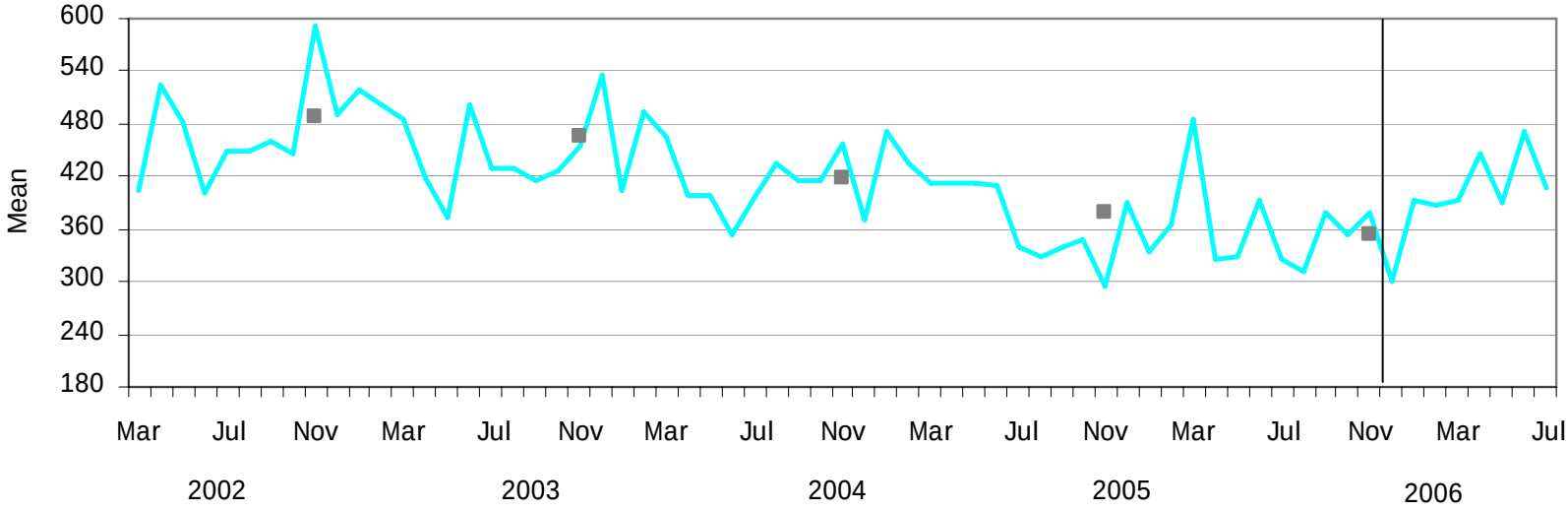
# WHAT THE DATA TOLD US ABOUT PHYSICAL ACTIVITY OVER TIME – TIME SERIES

**The mean minutes of physical activity over time for WA residents aged between 16 and 64 years with the average for each year**




**This time series shows a sustained downward trend and indicates that there has been a positive change since daylight saving was introduced.**

## The mean minutes of physical activity over time for **WA males** aged between 16 and 64 years with the average for each year




**This time series indicates a much more pronounced downward trend over time and impact of daylight saving.**

**The ARIMA model estimate a significant seasonal effect.**

**Auto regressive model shows, beside a significant negative trend ($p<0.001$), a positive 'shift' of 81 minutes ($p=0.001$) after the introduction of daylight saving**

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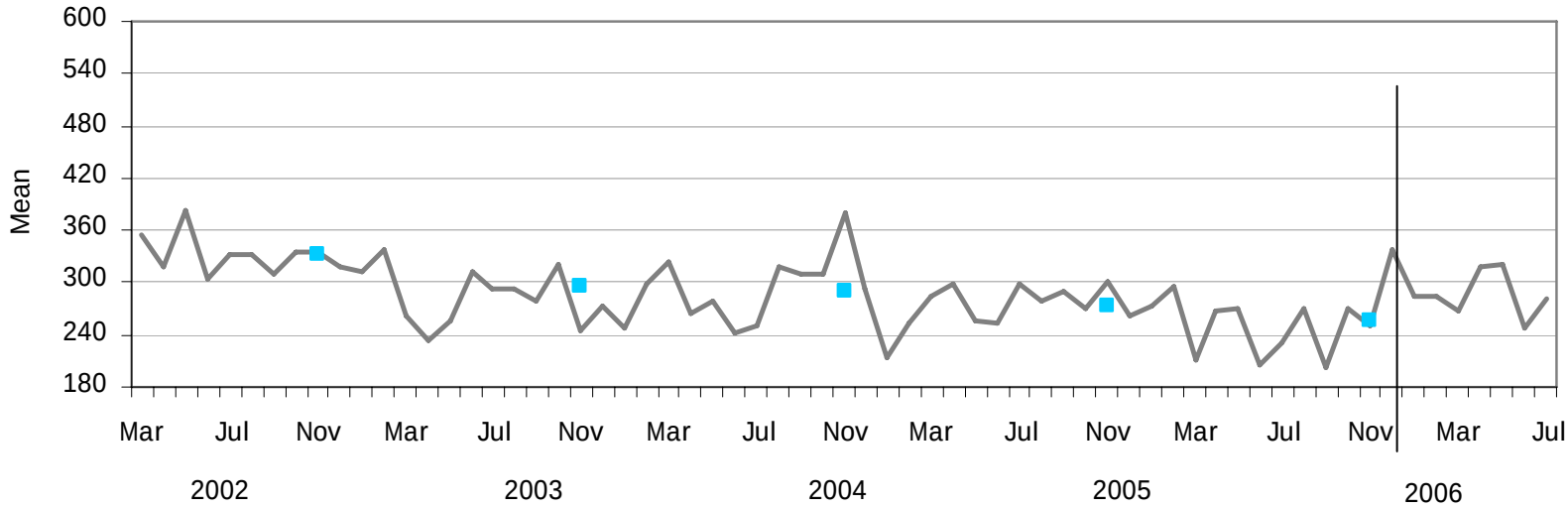
## The mean minutes of physical activity over time for **WA females** aged between 16 and 64 years with the average for each year




**This time series indicates a sustained but less pronounced downward trend with lower impact of daylight saving.**

**The ARIMA model does not show any significant seasonal effect.**

**Auto regressive model shows, beside a significant negative trend ($p<0.001$, still lower compared to males: -2.6 per month males and –1.2 females) a positive 'shift' of 38 minutes ($p<0.05$) after the introduction of daylight saving**

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# WHAT GENERALISED LINEAR MODELING CAN TELL US USING WAHWSS DATA

→GLMs can operate with a variety of link functions to model continuous, dichotomous, count and other dependent variables.

→GLMs treat the data as a series of cross-sectional surveys which means that they can be used with continual data collection surveillance as well as a series of point-in-time surveys.

→GLMs can identify significant change over time.

→GLMs can identify important independent predictors of change over time and control for confounders.

→GLMs can be used to assess the impact of an event or health promotion campaign more quickly than time series analysis.

# WHAT THE DATA TOLD US ABOUT PHYSICAL ACTIVITY OVER THE DAYLIGHT SAVING MONTHS USING 2005 AS A COMPARISON YEAR – GENERALIZED LINEAR MODEL

## Basic Model

| Variables | Coefficient | LCL | UCL | p |
|---|---|---|---|---|
| Daylight saving months | 0.121 | 0.021 | 0.0222 | 0.018 |
| Age (years) | -0.014 | -0.018 | -0.015 | <.001 |
| Sex (M) | 0.367 | 0.275 | 0.460 | <.001 |
| Constant | 3.315 | 3.158 | 3.471 | <.001 |

**The log-linear model shows that there is a significant increase in time spent doing physical activity during months of daylight saving compared to the same months in the previous two years. This estimate controls for the strong association with age (decreasing) and male gender.**

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# Final model

| Variables | Coefficient | LCL | UCL | p |
|---|---|---|---|---|
| Daylight saving months | 0.069 | -0.038 | 0.177 | 0.207 |
| Age (years) | -0.009 | -0.014 | -0.005 | <.001 |
| Sex (M) | 0.366 | 0.260 | 0.474 | <.001 |
| Income (>$60,000) | 0.185 | 0.080 | 0.291 | 0.001 |
| Education (Further education) | 0.140 | 0.036 | 0.244 | 0.009 |
| SEIFA (Top two quintiles) | 0.333 | 0.264 | 0.454 | <.001 |
| Body Mass Index | -0.025 | -0.361 | -0.142 | <.001 |
| Constant | 3.500 | 3.20 | 3.800 | <.001 |

**This model incorporates powerful socio-economic indicators and BMI. When these variables are controlled the impact of daylight saving is reduced by about 30% and no longer significant, indicating that daylight saving has its greatest impact in younger males who are of higher socio-economic status and with low BMI.**

# IN CONCLUSION:

→Analysis of surveillance data, whether continuous or a series of point-in-time surveys require a variety of analytical approaches.

These include:

- ⇒ descriptive statistics to summarise the data and guide further analysis.
- ⇒ Time series analysis to describe change over time.
- ⇒ Generalized Linear Models to provide inferential evidence of change over time.