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## Television viewing time and reduced life expectancy: a life-table analysis

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## **ABSTRACT**

**Background:** Prolonged television (TV) viewing time is unfavourably associated with mortality outcomes, particularly for cardiovascular disease, but the impact on life expectancy has not been quantified. We estimate the extent to which TV viewing time reduces life expectancy in Australia, 2008.

**Methods:** We constructed a life-table model that incorporates a previously-reported mortality risk associated with TV time. Data were from the Australian Bureau of Statistics and the Australian Diabetes, Obesity and Lifestyle Study (AusDiab), a national population-based observational survey that started in 1999-2000. We modelled impacts of changes in population average TV viewing time on life expectancy at birth.

**Results:** The amount of TV viewed in Australia in 2008 reduced life expectancy at birth by 1.8 years (95% uncertainty interval [UI]: 8.4 days to 3.7 years) for men and 1.5 years (95% UI: 6.8 days to 3.1 years) for women. Compared to persons who watch no TV, those who spend a lifetime average of 6 hrs/day watching TV can expect to live 4.8 years (95% UI: 11 days to 10.4 years) less. On average, every single hour of TV viewed after the age of 25 reduces the viewer's life expectancy by 21.8 (95% UI: 0.3 to 44.7) minutes. This study is limited by the low precision with which the relationship between TV viewing time and mortality is currently known.

**Conclusions:** TV viewing time may be associated with a loss of life that is comparable to other major chronic disease risk factors such as physical inactivity and obesity.

## **INTRODUCTION**

Sedentary behaviour (too much sitting, as distinct from too little exercise), assessed as either daily sitting time,[1] leisure time sitting,[2] time spent sitting in cars,[3] or television viewing time,[4-6] is associated with higher mortality risk – particularly from cardiovascular disease. Of these sedentary behaviours, TV viewing time is the most commonly examined.[7] This leisure-time behaviour is ubiquitous (the average adult in the USA, for example, spends 35.5 hours per week watching television),[8] and is unfavourably associated with several cardio-metabolic biomarkers.[9, 10] However, the impact of TV viewing time on life expectancy has not been quantified. We estimate the extent to which TV viewing time reduces life expectancy.

## **METHODS**

We constructed a simple life table model using previously published findings on the relationship between TV viewing time and mortality from analyses of the Australian Diabetes, Obesity and Lifestyle Study (AusDiab) and Australian population and mortality data.[4, 11-13]

### **The Australian Diabetes, Obesity and Lifestyle Study (AusDiab)**

AusDiab was a national population-based cross-sectional observational survey conducted in 1999-2000 with 11,247 participants aged  $\geq 25$  years (mean age 50 years). Over 85% of the sample was born in Australia, New Zealand or the UK, and over 94% spoke English as their first language. Using a reliable and valid measure,[7] participants reported the total time they spent watching TV or videos in the previous

week, when it was their main activity. Figure 1 presents mean TV viewing by age in the Australian population (with data weighted to match the age and sex distribution of the 1998 estimated residential population of Australia aged  $\geq 25$  years).

*Figure 1. Average daily hours of TV viewing by age and gender in Australia, 1999-2000.*

### **TV viewing time and mortality**

Using AusDiab data, Dunstan *et al.* previously reported a deleterious relationship between TV viewing time and all-cause mortality (median follow-up 6.6 years) in the 8800 participants with complete data (3846 men, 4954 women).[4] Following adjustment for age, gender, leisure-time exercise, waist circumference, smoking, education, total energy intake, alcohol intake, diet quality, hypertension, total cholesterol, HDL cholesterol, serum triglycerides, lipid-lowering medication use, previously reported cardiovascular disease, and glucose tolerance status, each additional hour of TV viewing time per day was associated with an 8% increased risk for all-cause mortality (hazard ratio 1.08 [95% confidence interval: 1.00 to 1.17];  $p=0.048$ ).

Associations between risk factors and mortality typically weaken with increasing age.[14] Accordingly, we used an age-attenuation in the hazard ratio, which we based on the age effects observed by the Prospective Studies Collaboration,[14] **assuming the strength of the relationship between TV viewing and mortality declines linearly with age**, and adjusted to ensure a total TV-related mortality identical to that observed by Dunstan *et al.* in deriving the overall hazard ratio.

### **Life table model**

In the model, we compared the life table for the Australian population from age 25 years (assuming current rates of TV viewing: Figure 1) with a life table for an identical population that watches no TV. We adopted a ‘period’ interpretation of the life table in which the hypothetical birth cohort experiences current rates of mortality and TV viewing (or no TV viewing) over their lifetime. We adjusted the rates of mortality in the life table for the population that watches no TV, using the following formula:

$$M' = M \times \exp(\ln[\text{HR} \times A])^{-\text{TV}}$$

where:

M is the all-cause mortality rate, by age and gender, for the Australian population in 2008;[13]

M' is the all-cause mortality rate, by age and gender, for an identical population that watches no TV;

HR denotes the hazard ratio for the effect of TV-viewing on all-cause mortality;[4]

A is the age-attenuation factor based on the Prospective Studies Collaboration trend;[14] and

TV is the average daily number of hours of TV currently viewed, by age and gender, in Australia (Figure 1).

Calculations were performed in MS Excel (Microsoft Corporation, Redmond USA).

Uncertainty was assessed by Monte Carlo simulation using the Ersatz program

(Epigear.com, Brisbane, Australia; 100,000 iterations), assuming a lognormal distribution of the hazard ratio and a normal distribution of average daily TV viewing time.

## **RESULTS**

Australians aged 25 and over watched a total of 9.8 billion hours of TV in 2008. Our estimates indicate these hours of TV viewing were associated with a loss of 286,000 (95% uncertainty interval: 4,000 to 547,000) life years for the Australian population in 2008, **assuming a stationary population with no trends in life expectancy or TV viewing time**. Without TV viewing, the 2008 life expectancy at birth of Australian men and women would have been 1.8 years (95% UI: 8.4 days to 3.7 years) and 1.5 years (95% UI: 6.8 days to 3.1 years) higher than observed. Every single hour of TV over the age of 25 reduces the viewer's life expectancy by 21.8 (95% UI: 0.3 to 44.7) minutes. An Australian who spends a lifetime average of 6 hours per day watching TV (i.e. in the top 1% of population TV viewing) can expect to live 4.8 years (95% UI: 11 days to 10.4 years) less than a person who does not watch TV (Figure 2).

*Figure 2. Life expectancy at birth by average daily amount of TV viewing time.*

## **DISCUSSION**

These findings suggest that substantial loss of life may be associated with prolonged TV viewing time among Australian adults. This is the first study to estimate the loss

of life from this ubiquitous sedentary behaviour, both at the level of individuals and a whole population. While we used Australian data, the effects in other industrialized and developing countries are likely to be comparable, given the typically large amounts of time spent watching TV and similarities in disease patterns.

The hazard ratio from the source study (AusDiab) may have been an underestimate due to random measurement error in TV viewing time (regression dilution bias).[15] However, our model does not include time lags and treats TV viewing behaviour as stable over time, whereas Australian time use data show time spent in leisure-time electronic media use has increased from 1.5 hours/day in 1992 to 2.1 hours/day in 1997 and 2.2 hours/day in 2006.[16] If there are time lags in the effects of TV viewing time on mortality, our results may have been slightly overestimated. Consistent with Australia as the setting for this study, we based the association between TV viewing time and mortality on Australian findings.[4] **The 95% uncertainty intervals for the estimates are very wide, but** our findings are supported by **two comparable studies that estimated the association between TV viewing and mortality. Stamatakis et al used data from Scotland and found a 7% increase in all-cause mortality risk per daily hour of TV (hazard ratio 1.07 [95% CI: 1.03 to 1.11]).**[6] Using data from **England**, Wijndaele et al estimated that each additional hour per day of TV viewing increased the risk by 4% (hazard ratio 1.04 [95% CI: 1.01 to 1.09]).[5] This **latter** association is half as strong as the one we used in this study and, consequently, its use would approximately halve the effects presented here. But that is still a sizeable effect, and the difference between the hazard ratios found may partly be due to a less stringent definition of ‘watching’ TV used by Wijndaele et al, which **might have included time with the TV on during other**



**activities. This would dilute the association with mortality. The higher average age of their study population may also play a role, given that the association between risk factors and mortality tends to weaken with age.[14]**

If these hazard ratios are confirmed, and shown to reflect a causal association, TV viewing is a public health problem comparable in size to established behavioural risk factors. In the Framingham Heart study, low physical activity levels led to a loss of about 1.4 years compared to moderate physical activity levels, and 3.6 years compared to high levels of physical activity, after age 50.[17] Using life expectancy at age 50, our model suggests that similar losses in life expectancy might be associated with watching about 2.1 and 5.4 hours of TV viewing a day respectively. In men and women aged 50 and over in Framingham, obesity (versus normal weight) was associated with a loss of 1.3 and 1.0 years, respectively.[18] This compares to the effect of 1.9 and 1.6 hours of TV viewing per day. Lifelong smoking was associated with a loss of life after age 50 of 4.3 years for men and 4.1 years for women,[18] which equates to 6.0 and 6.4 daily hours of TV in our model. The average loss of life due to the smoking of a single cigarette has been estimated at 11 minutes,[19] though this may be an underestimate.[20] Our findings suggest that half an hour of TV viewing above age 25 may shorten life to a similar degree.

Since TV viewing is a ubiquitous behaviour that occupies significant portions of adults' leisure time,[8] its effects are significant for overall population health. In the Australian Burden of Disease Study, physical inactivity was estimated to cause a loss of 117,000 life years in 2003, which would translate to 127,000 life years in 2008, adjusting for population size.[21] This is well under this study's best estimate of the

burden associated with TV viewing of 286,000 life years. The latter burden is larger than that due to obesity, which cost 99,000 life years in 2003 (109,000 in 2008), and may even surpass that due to tobacco (178,000 in 2008).[21] Socio-demographic groups among whom high TV viewing time is more prevalent (those with less than tertiary education, living outside of state capital cities, and/or having no paid employment) are particularly at risk.[22]

In conclusion, TV viewing time may have adverse health consequences that rival those of lack of physical activity, obesity and smoking; every single hour of TV viewed may shorten life by as much as 22 minutes. Further study is required to confirm this, and to specify the link of TV viewing time (and other common sedentary behaviours such as workplace sitting and time spent in cars) with mortality. The Australian and US guidelines for children recommend no more than two hours of screen time per day.[23, 24] With further corroborative evidence, a public health case could be made that adults also need to limit the time spent watching TV.

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Competing interests: All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) and declare that (1) they have no relationships with companies that might have an interest in the submitted work; (2) their spouses, partners, or children have no financial relationships that may be relevant to the submitted work; and (3) no authors have any non-financial interests that may be relevant to the submitted work.

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## **Figure legends**

**Figure 1. Average daily hours of TV viewing by age and gender in Australia, 1999-2000.** Based on data from the AusDiab study, weighted to the total Australian population, 1998. Men in black, women in white; error bars denote standard errors.

**Figure 2. Life expectancy at birth by average daily amount of TV viewing time.** Men in dashed lines and women in dotted lines; 95% uncertainty intervals in grey.





