# Changes in smoking intensity among Aboriginal and Torres Strait Islander people, 1994–2008

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MJA 2012; 197: 503-506 doi: 10.5694/mja12.10558 moking causes an estimated 15 500 deaths every year in Australia, with nearly 600 of these deaths among Aboriginal and Torres Strait Islander people. 1,2 Seventeen per cent of the health gap between Indigenous and other Australians is due to smoking. In 2008, the age-standardised prevalence of current smoking among Indigenous people was more than double that among other Australians (49.8% compared with 20.5% of those aged 18 years and over). 4

Smoking prevalence is falling in Australia, but has decreased more slowly among Indigenous Australians. From 1994 to 2008, smoking prevalence fell among all Indigenous men and Indigenous women in non-remote areas but increased among Indigenous women in remote areas.<sup>5</sup>

Smoking causes greater damage at higher doses.<sup>6,7</sup> This dose response, which has been well known since the mid 1960s and the first report from the United States Surgeon General on smoking and health, leads clinicians to calculate patients' pack-years of smoking, and epidemiologists to monitor smoking intensity (mean number of cigarettes per day [CPD] smoked) as well as smoking prevalence in populations.

The triennial National Drug Strategy Household Surveys (NDSHSs) have shown a decline in mean smoking intensity among Australian non-Indigenous people from 15.5 to 14.4 CPD per smoker aged 14 years and over between 2001 and 2010.8,9 The larger samples of Indigenous people from the national Indigenous surveys conducted by the Australian Bureau of Statistics (ABS) since 1994 provide more precise estimates of smoking behaviour among the Indigenous population.<sup>5</sup> The first of these surveys reported similar Indigenous smoking intensity to that reported from contemporary surveys of the entire Australian population. 10 Subsequent surveys did not ask questions about

### **Abstract**

**Objectives:** To describe smoking intensity among Indigenous Australians and any changes that occurred between 1994 and 2008.

**Design, setting and participants:** Analysis of data from two national cross-sectional household surveys conducted among Aboriginal and Torres Strait Islander people — the 1994 National Aboriginal and Torres Strait Islander Survey, and the 2008 National Aboriginal and Torres Strait Islander Social Survey, with 8565 and 7803 respondents aged 15 years and over, respectively.

**Main outcome measure:** Self-reported number of cigarettes per day (CPD) smoked.

**Results:** In 2008, the mean number of CPD smoked by Indigenous smokers was 14.8 (95% CI, 14.1–15.4 CPD). The age-standardised proportion of Indigenous people who smoked more than 20 CPD declined from 17.3% in 1994 (95% CI, 15.8%-18.7%) to 9.4% in 2008 (95% CI, 8.4%-10.5%), a 45% relative reduction. The proportion of respondents who smoked 1-10 CPD increased from 16.8% (95% CI, 15.1%-18.5%) to 21.6% (95% CI, 20.1%-23.2%).

Conclusions: Together with reports of the decreasing prevalence of smoking among Indigenous people, this first report of a significant reduction in heavy smoking by Indigenous smokers is good news. Reducing smoking intensity and prevalence will lead to fewer deaths and less illness due to smoking. Reducing the number of heavy smokers will also assist smoking cessation among Indigenous people. These changes in smoking intensity occurred before the recent increase in attention to and investment in tobacco control in Indigenous communities, but at a time of significant mainstream anti-tobacco public health activity. Similar trends in smoking intensity have been reported in the total Australian population.

smoking intensity until the 2008 survey. Smaller local and regional estimates of Indigenous smoking intensity have provided various results. <sup>11-14</sup> I aimed to describe national Indigenous smoking intensity using the 2008 national Indigenous survey, and changes since 1994.

# Methods

The ABS conducted the National Aboriginal and Torres Strait Islander Survey (NATSIS) from April to July 1994 and the second National Aboriginal and Torres Strait Islander Social Survey (NATSISS) from August 2008 to April 2009, and their methods have been described previously. 15-17 Both surveys used multistage random sampling of Indigenous residents from households and from either census collection districts or discrete Indigenous communities and outstations. Non-private dwellings were only included in the first survey, but have

been excluded from this analysis. Response rates were about 90% in 1994 and 80% in 2008. In 1994, 8565 Indigenous people aged 15 years and over (4478 smokers) responded, and 7803 (3710 smokers) responded in 2008.

# Smoking questions

The 1994 survey asked participants if they smoked cigarettes; and if they answered yes or sometimes, they were asked how many cigarettes they usually smoked per day. The 2008 survey asked those who smoked at least once a week how many cigarettes they usually smoked per day or week. 18

# Statistical analyses

I analysed the survey data using Stata, Version 10 (StataCorp) accessed through the ABS's Remote Access Data Laboratory. I used person weights to reflect the Indigenous population on 30 June 1994 and 31

Proportion (95% CI) of Indigenous people aged ≥ 15 years, by number of cigarettes smoked per day (CPD), age group, sex and remoteness of residence\*

	≥ 21 CPD		11–20 CPD		1–10 CPD		<1CPD	
Category	1994	2008	1994	2008	1994	2008	1994	2008
All people	17.3%	9.4%	16.3%	14.8%	16.8%	21.6%	49.6%	54.2%
	(15.8%–18.7%)	(8.4%–10.5%) <sup>†</sup>	(14.8%–17.8%)	(13.5%–16.1%)	(15.1%–18.5%)	(20.1%–23.2%) <sup>†</sup>	(47.4%–51.9%)	(52.3%-56.1%) <sup>†</sup>
Age (years)								
15–24	10.5%	4.7%	13.4%	9.2%	22.7%	27.1%	53.4%	59.0%
	(8.3%–12.6%)	(3.0%-6.4%) <sup>†</sup>	(11.3%–15.6%)	(7.2%–11.2%)†	(19.4%–26.0%)	(24.1%–30.2%)†	(49.5%–57.3%)	(55.5%–62.5%) <sup>†</sup>
25–34	20.9%	8.6%	22.4%	20.8%	19.4%	25.6%	37.4%	45.0%
	(17.8%–24.0%)	(6.5%–10.7%) <sup>†</sup>	(19.3%–25.5%)	(17.8%–23.8%)	(15.0%–23.7%)	(22.5%–28.7%) <sup>†</sup>	(32.6%–42.1%)	(41.5%-48.6%) <sup>†</sup>
35–44	25.4%	13.4%	19.4%	18.8%	11.5%	20.3%	43.7%	47.5%
	(21.7%–29.2%)	(11.0%–15.8%)†	(16.0%–22.8%)	(15.9%–21.7%)	(8.9%–14.0%)	(17.3%–23.2%) <sup>†</sup>	(38.9%–48.5%)	(43.3%–51.7%)
45–54	22.8%	15.8%	13.1%	16.8%	12.6%	14.3%	51.4%	53.1%
	(18.1%–27.6%)	(12.3%–19.3%) <sup>†</sup>	(9.9%–16.4%)	(13.7%–19.8%)	(8.8%–16.5%)	(11.1%–17.6%)	(45.7%–57.1%)	(48.4%–57.7%)
≥ 55	9.5%	9.3%	12.2%	10.5%	10.7%	11.6%	67.6%	68.7%
	(6.4%–12.6%)	(7.0%–11.5%)	(6.0%–18.4%)	(8.2%–12.8%)	(6.5%–15.0%)	(8.4%–14.7%)	(59.9%–75.2%)	(64.7%–72.7%)
All men	20.5%	10.4%	17.1%	16.2%	16.6%	21.2%	45.8%	52.2%
	(18.1%–22.8%)	(8.7%–12.1%) <sup>†</sup>	(14.8%–19.5%)	(14.2%–18.2%)	(14.3%–18.9%)	(18.9%–23.5%) <sup>†</sup>	(42.4%–49.1%)	(49.2%-55.1%) <sup>†</sup>
Remote region	21.9%	13.0%	19.1%	15.8%	20.0%	27.3%	38.9%	43.9%
	(18.4%-25.4%)	(9.6%–16.4%) <sup>†</sup>	(15.9%–22.3%)	(13.4%–18.2%)	(16.7%-23.4%)	(23.6%–31.0%) <sup>†</sup>	(35.4%–42.5%)	(39.4%–48.3%)
Non-remote region	19.6%	9.5%	16.6%	16.3%	15.0%	19.1%	48.9%	55.0%
	(16.6%–22.6%)	(7.5%–11.6%) <sup>†</sup>	(13.5%–19.7%)	(13.9%–18.8%)	(12.1%–17.9%)	(16.3%–22.0%) <sup>†</sup>	(44.3%-53.4%)	(51.5%–58.6%) <sup>†</sup>
All women	14.3%	8.5%	15.5%	13.5%	17.0%	22.0%	53.2%	56.0%
	(12.5%–16.1%)	(7.3%–9.7%) <sup>†</sup>	(13.5%–17.4%)	(12.0%–15.0%)	(14.9%–19.1%)	(20.1%–24.0%) <sup>†</sup>	(50.4%–56.0%)	(53.5%-58.4%)
Remote region	13.7%	8.8%	12.4%	12.7%	16.4%	26.6%	57.5%	51.9%
	(11.4%–16.0%)	(6.5%–11.1%) <sup>†</sup>	(10.3%–14.5%)	(10.4%–14.9%)	(13.9%–18.9%)	(23.2%–29.9%) <sup>†</sup>	(54.2%–60.7%)	(48.1%–55.7%)
Non-remote region	14.5%	8.4%	16.6%	13.8%	17.4%	20.5%	51.6%	57.3%
	(12.1%–16.9%)	(7.0%–9.9%)†	(14.0%–19.2%)	(11.9%–15.7%)	(14.5%–20.2%)	(18.1%–22.9%)	(47.9%–55.3%)	(54.3%–60.2%)†

<sup>\*</sup> Data from the 1994 National Aboriginal and Torres Strait Islander Survey, with 8565 respondents aged ≥ 15 years, and the 2008 National Aboriginal and Torres Strait Islander Social Survey, with 7803 respondents aged ≥ 15 years. The weighted 1994 estimates have been directly age-standardised to the Indigenous population on 31 December 2008 as in the 2008 survey, using the 10-year age categories in the table. † Statistically significant difference, *P* < 0.05.

December 2008, and replicate weights generated by the ABS to calculate standard errors and confidence intervals of estimates.<sup>19</sup> The weighted 1994 estimates have been directly age-standardised to the Indigenous population on 31 December 2008 as in the 2008 survey, using 10-year age categories from 15 years to ≥ 55 years. The standard errors (and so confidence intervals) of the difference between the 1994 and 2008 survey estimates were calculated from the square root of the sum of the squares of the standard errors.

Smoking intensity was only available as categorical data (1–10, 11–20, 21–30, 31–40,  $\geq$  41 CPD) in the 1994 survey. The last three categories have been combined for this analysis. The 2008 results have been reported using these same categories and as mean number of CPD. Analyses were of respondents aged 15 years and over, and non-respondents were excluded. Data were missing in 1994 for smoking status of 11 participants and for number of CPD for 28 smokers; and in 2008 for number of CPD for 20 smokers.

## Results

In 2008, the mean number of CPD smoked by Indigenous smokers was 14.8 (95% CI, 14.1-15.4 CPD). The age-standardised overall proportion of Indigenous people who smoked more than 20 CPD declined from 17.3% in 1994 to 9.4% in 2008, a 45% relative reduction (Box), with significant declines among men and women, and in remote and nonremote areas, and among all except the older age groups. There were corresponding increases in most categories among people who smoked 1–10 CPD (Box), increasing overall from 16.8% to 21.6%, a 29% relative increase. There were few significant changes in the proportions of people in different categories who smoked 11-20 CPD.

The 1994 age-standardised results were very similar to the 1994 results without age-standardisation. Without age-standardisation, changes over time were similar when using smokers rather than the total Indigenous population as the denominator (supplementary tables are available from the author on request). The propor-

tion of Indigenous smokers who smoked more than 20 CPD declined from 33.6% in 1994 (95% CI, 30.3–37.0) to 20.5% in 2008 (95% CI, 18.4–22.7), a 39% relative reduction.

# Discussion

This study, comparing smoking intensity in 1994 with that in 2008, is the first report of a significant overall reduction in heavy smoking among Australian Indigenous smokers. It also reveals a corresponding increase in the proportion of light smoking.

The 2008 NATSISS estimate of mean smoking intensity among Indigenous people of 14.8 CPD is lower than the estimates from the NDSHS in 2007 (16.4 CPD) and 2010 (21.0 CPD). These NDSHS estimates are likely to be less accurate, as the sample sizes were small (372 and 460, respectively), response rates were low and Indigenous people from very remote areas were underrepresented. However, the NDSHSs did include large representative samples of non-Indigenous Australians. These non-Indigenous smokers had similar mean smoking intensity (13.8 CPD in 2007;

14.4 CPD in 2010) to the NATSISS sample of Indigenous smokers. But the NDSHS sample included smokers aged 14 years and smokers who smoked less than weekly, who would be expected to have smoked fewer CPD, and so slightly reduce this non-Indigenous estimate.<sup>9</sup>

Similar trends in heavy and light smoking were seen in annual crosssectional phone surveys of the total Australian population aged 18 years and over from 1997 to 2005. Among daily smokers, heavy smoking (≥25 CPD) decreased from 26% to 15%, light smoking (<15 CPD) increased from 42% to 52%, and moderate smoking (15-24 CPD) was unchanged, at 33%. 20 Recent analysis of the decline in heavy smoking in the US has provided more detail about changing smoking patterns over the life course, showing fewer smokers in younger age cohorts ever becoming smokers of more than 10 CPD.<sup>21</sup> It is not possible with the more limited data in this study to conclude whether the results are due to such cohort effects or just due to previously heavy smokers cutting down, but the greater relative declines in heavy and moderate smoking in younger age groups may be an early indication of a similar cohort effect. This is important, as health outcomes are better for light smokers who have never smoked heavily than for those who once smoked heavily and have since reduced their consumption, which only affords a modest improvement.<sup>22-25</sup>

Unlike in the US, where heavy smoking fell but there was little change in moderate or light smoking,<sup>21</sup> among Indigenous Australians light smoking has increased when heavy smoking has fallen. In this study, significantly increased numbers in several age, sex and remoteness categories among Indigenous people who smoked < 1 CPD reflected previously reported decreases in smoking prevalence.<sup>5</sup> Indigenous tobacco-control programs should potentially include activities that focus on secondhand smoke and smoke-free policies and are likely to be successful with light smokers who may not identify as smokers.<sup>26</sup> Such a lack of identification may lead to the rising prevalence of light smoking becoming associated with falsely reduced national estimates of smoking prevalence among the Indigenous population.

This study has several limitations. All estimates are based on selfreported smoking intensity. There have been long-held concerns about the increasing underreporting of cigarette consumption in surveys due to the increasing denormalisation of smoking.<sup>27</sup> This may be less of a problem in the Indigenous setting, where smoking prevalence is still very high. The mean cigarette consumption per person in the remote Northern Territory sample of the NATSISS has been shown to be the same as that estimated by store turnover in 22 remote Northern Territory communities.<sup>28</sup>

The large differences in smoking intensity found between the 1994 and 2008 surveys may have been in part due to their different methods. The responses of some participants who smoked less than weekly were included in 1994 but not in 2008, increasing the numbers of light smokers in 1994 and reducing the trend; but less than 0.7% of respondents in the 2008 NATSISS smoked less than weekly, so the effect would have been small. In the other direction, the more detailed series of smoking questions in 2008 may have enumerated more low-intensity smokers. The two surveys were conducted at different times of the year, the first only over winter when smoking intensity may be higher, which may have exaggerated the decline in heavy smoking.

The changes in Indigenous smoking intensity between 1994 and 2008 occurred before the recent increase in attention to and investment in tobacco control in Indigenous communities, but at a time of significant mainstream anti-tobacco public health activity associated with the National Tobacco Campaign (1997-2005). While there was little targeting of Indigenous people, smoking among Indigenous people may have been affected by the increases in price (through tax rises, the recommended retail price of a packet of 20 Craven A cigarettes increased by 70% from 1994 to 2006 [adjusted for inflation]), the messages in social-marketing campaigns, reduced exposure to tobaccoindustry marketing and increased exposure to smoke-free legislation.<sup>7</sup>

Reducing the number of Indigenous heavy smokers will assist smoking cessation. Smokers who smoke fewer CPD are more likely to make quit attempts, and these attempts are more likely to be successful.<sup>29</sup> However, some caution is needed in neatly equating number of CPD with nicotine and carcinogen exposure. People who smoke fewer CPD tend to smoke each cigarette more intensively, inhaling more nicotine and carcinogens. Different populations (black and white Americans) have been demonstrated to smoke their cigarettes differently, leading to different patterns in the association between CPD and nicotine and carcinogen exposure.<sup>30</sup>

Inadequate data quality means that it is not yet possible to confidently describe current national mortality trends from the three leading diseases causing smoking-attributable deaths among Indigenous people: ischaemic heart disease, chronic obstructive pulmonary disease, and lung cancer. 2,31,32 Nevertheless, together with reports of the decreasing prevalence of smoking among Indigenous people, this first report of a significant reduction in heavy smoking by Indigenous smokers is good news. Reducing smoking intensity and prevalence will lead to reduced deaths and illness due to smoking.

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