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Abstract

Objective: To describe the social patterning of and trends in the prevalence of Aboriginal and Torres Strait Islander smoke-free homes, and the association between these smoke-free homes and smoking initiation, intensity and cessation.

Methods: Analyses of responses to questions about whether any householders usually smoke inside in the 2004 National Aboriginal and Torres Strait Islander Health Survey, the 2008 National Aboriginal and Torres Strait Islander Social Survey, and in the comparable National Health Surveys in 2004 and 2007.

Results: The proportion of Indigenous children living with at least one daily smoker who smokes inside declined significantly from 28.4% in 2004 to 20.8% in 2008, with significant improvements only detected among the most disadvantaged categories of Indigenous children. The proportion of Indigenous daily smokers who lived in multi-person households where no daily smoker householder usually smoked inside increased significantly from 45.0% in 2004 to 56.3% in 2008. The absolute size of these changes was greater among Indigenous children and smokers than among all Australians. More disadvantaged Indigenous children were more likely to be exposed to secondhand smoke at home, and more disadvantaged Indigenous smokers were more likely to live in households where smokers usually smoked inside. Indigenous smokers in smoke-free homes smoke significantly less cigarettes.

Conclusions and Implications: The increases in Indigenous smoke-free homes are encouraging, especially as they are from the period before recent increased attention to Indigenous tobacco control, which should accelerate these trends and their resultant health benefits for Aboriginal and Torres Strait Islander children and families.

Key words: Indigenous population, Australian Aborigines, smoke-free homes, smoking, trends

Secondhand smoke caused an estimated 603,000 deaths globally in 2004, mainly from ischaemic heart disease, respiratory infections, asthma and lung cancer.[1] Smoking bans in public places to protect people from the dangers of secondhand smoke are a core component of effective tobacco control programs.[2] Smoke-free public places also increase the proportion of smokers making their homes smoke-free, with smoke-free homes also associated with increased quit attempts and the increased success of these attempts.[3]

Children are particularly vulnerable to the effects of secondhand smoke, because of both their respiratory physiology and their lack of control over their local environment, with secondhand smoke increasing their risk of SIDS, lower respiratory tract infections, otitis media and exacerbations of asthma. Children are most likely to be exposed to secondhand smoke in the home.[4]

The proportion of the population living in smoke-free homes has increased in all countries with available trend data. These trends are only partly explained by falling smoking prevalence, with explanations including changing social norms, mass-media campaigns about secondhand smoke, and smoking bans in public places.[5] Smoke-free homes increased in Australia in the 1990s, a time of increasing publicity about the dangers of secondhand smoke and related litigation, accompanied by mass-media campaigns promoting smoke-free homes.[6]

Aboriginal and Torres Strait Islander people have more than double the smoking prevalence of other Australians, with higher Indigenous smoking prevalences in remote areas and among more disadvantaged Indigenous people.[7-9] Questions about smoking in homes were asked in the last two national surveys in 2004 and 2008 of Aboriginal and Torres Strait Islander people, and in the comparable National Health Surveys in 2004 and 2007, all conducted by the Australian Bureau of Statistics. The proportion of Aboriginal and Torres Strait Islander children aged less than 15 years lived who in homes with smokers who usually smoked inside declined from 28% in 2004 to 21% in 2008.[8,10] Much lower proportions of non-Indigenous children reported living in homes with smokers who smoked inside (9% in 2004 and 7% in 2007).[8,10] This paper expands these limited analyses to better understand the social patterning and trends of Aboriginal and Torres Strait Islander smoke-free homes, and how some smoking behaviours are associated with smoke-free homes.

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Methods

Surveys and sampling

The Australian Bureau of Statistics (ABS) conducted the 2004 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) and the 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) from August 2004 to July 2005 and August 2008 to April 2009, respectively, and are described in detail elsewhere.[7,11] Briefly, both surveys used a stratified multi-stage sample design, with stratification by remoteness. Both randomly selected up to four Indigenous residents (with up to two over and two under 15 years of age) from randomly selected Indigenous households from a stratified sample of Collection Districts, or up to two residents (one over and one under 15 years) from a random sample of discrete Indigenous communities and outstations. Non-private dwellings (e.g. prisons, hostels, hospitals, and caravan parks) were excluded in both surveys. Experienced ABS interviewers, who had completed cultural awareness training, interviewed participants face-to-face in English, with or without an interpreter, arranging to call back if the selected resident was not available. In discrete Indigenous communities, these ABS interviewers were accompanied and assisted by a local Indigenous facilitator.

The 2004 and 2007 National Health Survey (NHS) were conducted by the ABS in private dwellings across Australia from August 2004 to July 2005, and from August 2007 to July 2008, respectively. Both surveys used the same stratified multi-stage sampling design, but excluded dwellings in very remote locations. Both randomly selected up to two residents (one under 18 and one 18 years or over) from randomly selected households.[12,13]

The response rate of all four surveys was more than 80%.[7,11-13]

Questions about smoke-free homes

The NATSISS 2008 asked one person in the household if anyone in the household smoked inside the house, but only if they had already reported that at least one person in the house smoked daily; lone person households were not asked the question. The NHS 2004 and NATSIHS 2004 asked this question of all people in a household with at least one daily smoker, except those in lone person households, but the NHS 2007 included those in lone person households.

Statistical analysis

For each Indigenous survey, we estimated the percentage of children younger than 15 years who lived in homes with (a) with no daily smoker in the household, (b) with at least one daily smoker but where no householder usually smokes inside the house, (c) with at least one daily smoker where any householder usually smokes inside the house, and (d) with at least one daily smoker where whether any householder usually smokes inside the house was not stated. We also calculated these percentages according to demographic and socioeconomic variables. We were not able to calculate these values for all Australian children, due to restrictions in the data released for external analysis by ABS for the 2007 survey, and so just use the values previously reported by ABS which do not provide confidence intervals or values for when no response was stated.[8,10]

For each survey, we estimated the percentage of Indigenous or all Australian daily smokers living in lone-person households and in multi-person households (a) where no householder usually smokes inside the house, (b) where any householder usually smokes inside the house, and (c) where whether any householder usually smokes inside the house was not stated. For the two Indigenous surveys, we also calculated these percentages according to demographic and socioeconomic variables. For each NHS there were no 'not stated' values reported.

The prevalence of current smoking among 15-17 year olds in different household types is reported as an indicator of smoking initiation: 68% of Aboriginal and Torres Strait Islander smokers and ex-smokers report having started smoking before the age of 18 years.[8] Smoking behaviour change is assessed by whether a current daily smoker reported they tried to quit or reduce the amount they smoked in the last year, and the quit ratio ([number of ex-smokers÷(number of ex-smokers + number of current smokers)]×100). Quit ratios (30% in 2008) have previously been reported using these surveys.[14] Smoking intensity of daily smokers is measured by the mean number of cigarettes per day (CPD).

All analyses were carried out via the ABS Remote Access Data Laboratory (RADL) web portal[15] using Stata v10 (StataCorp LP, College Station, TX). The estimates from the two Indigenous surveys were weighted to the estimated resident population on 31 December 2004 and 2008. The estimates from the two National Health Surveys were weighted to population estimates for December 2004 and 2007. All confidence intervals and standard errors accounted for the sample design and were calculated using the jack-knife method with 250 replicate weights for the Indigenous surveys and 60 replicate weights for the total population surveys. We have not age-standardised the Indigenous comparisons, given the minimal changes in the age distribution of the population in four years and the predominant interest being absolute change for the total and Indigenous populations. Data is only available for Tasmania combined with the Australian Capital Territory; as this combination is meaningless, we have not reported values for this category. We tested the statistical significance of differences in proportions in the Tables using the t-statistic, highlighting significant differences with asterisks.

Results

Social patterning of exposure of Indigenous children to household secondhand smoke in 2008

Indigenous children (aged 0-14 years) with more socio-economic disadvantage were significantly more likely to be exposed to secondhand smoke in the home: more likely to live in households with a daily smoker who usually smokes inside and less likely to live in households with no daily smoker (Table 1). These socio-economic differences were shown for household income, household tenure, and evidence of financial stress. Children in the Northern Territory (NT), in remote areas or living in households with three or more adults were significantly more likely to live in a home with a daily smoker.

Social patterning of smoking inside homes of Indigenous smokers in 2008

Indigenous daily smokers (aged 18 and over) living in multi-person households with more socio-economic disadvantage were significantly more likely to live in homes where at least one daily smoking householder smokes inside, using the same socio-economic variables (Table 2). There was no significant variation by location, but daily smokers living in households with children were significantly more likely to have no smokers smoking inside.

Table 1: Percentage (95% CI) of Indigenous children aged 0-14 years exposed to household secondhand smoke in 2004 and 2008 .

	No daily smoker in household		At least one daily smoker in household				N[a]	
			None usually smoke inside		At least one smokes inside			
	2004	2008	2004	2008	2004	2008	2004	2008
Total Indigenous children	**31.4 (27.6, 35.4)**	**33.8 (31.1, 36.7)**	**37.3 (33.9, 40.9)**	**41.6 (38.7, 44.6)**	**28.4 (25.1, 31.9)**	**20.8 (18.4, 23.4)****	**180,669**	**193,249**
Jurisdiction[b]								
New South Wales	36.2 (28.0, 45.1)	38.2 (32.3, 44.5)	34.9 (27.6, 43.1)	37.5 (31.5, 43.9)	27.1 (20.7, 34.6)	21.9 (16.7, 28.2)	54,169	58,318
Victoria	45.7 (27.4, 65.2)	34.7 (29.7, 40.0)	24.6 (14.8, 37.9)	41.7 (36.1, 47.4)**	28.4 (15.8, 45.6)	20.9 (16.9, 25.6)	10,817	12,343
Queensland	30.8 (24.7, 37.8)	34.6 (29.4, 40.2)	42.5 (35.9, 49.5)	40.8 (34.6, 47.2)	24.0 (19.1, 29.7)	21.3 (16.5, 27.0)	50,758	56,275
South Australia	33.5 (24.3, 44.1)	32.8 (26.6, 39.7)	31.4 (23.3, 40.9)	48.1 (41.0, 55.2)**	32.1 (24.3, 41.1)	14.3 (10.0, 20.2)**	10,014	10,301
Western Australia	28.7 (21.8, 36.8)	32.6 (26.6, 39.1)	39.6 (33.3, 46.2)	45.9 (40.1, 51.9)	25.2 (17.8, 34.4)	15.8 (12.3, 19.9)*	25,984	25,580
Northern Territory	14.9 (10.9, 19.9)	21.7 (17.6, 26.5)*	37.2 (29.9, 45.2)	47.7 (41.7, 53.8)*	44.4 (36.2, 52.9)	23.5 (19.4, 28.1)**	20,552	22,081
Remoteness								
Non-remote	33.9 (29.5, 38.5)	37.1 (33.9, 40.5)	36.6 (32.3, 41.1)	39.6 (36.2, 43.2)	26.9 (23.2, 30.9)	20.2 (17.4, 23.3)**	134,893	147,946
Remote	24.0 (16.4, 33.7)	23.2 (19.9, 26.9)	39.5 (34.1, 45.3)	48.0 (43.3, 52.8)*	32.8 (27.0, 39.1)	22.7 (19.0, 26.9)**	45,776	45,303
Number of people <15/18 yrs[c]								
1	34.6 (29.5, 40.1)	34.5 (30.2, 39.1)	31.1 (26.1, 36.6)	40.5 (36.0, 45.2)**	31.1 (26.2, 36.5)	22.6 (18.9, 26.8)*	23,651	32,000
2	35.9 (30.4, 41.8)	40.5 (35.4, 45.9)	38.4 (32.8, 44.2)	38.3 (33.3, 43.5)	22.8 (18.9, 27.4)	17.0 (13.7, 21.0)*	44,122	58,582
3	31.5 (24.8, 38.9)	33.2 (27.9, 38.9)	39.7 (33.5, 46.2)	41.9 (36.0, 48.1)	27.2 (21.3, 33.9)	22.1 (17.7, 27.1)	44,060	43,362
4 or more	27.3 (20.6, 35.1)	27.4 (22.3, 33.1)	37.3 (31.0, 44.2)	45.2 (39.5, 51.1)	31.7 (25.8, 38.3)	22.6 (18.2, 27.6)*	68,836	59,305
Number of people 15/18+ yrs[c]								
0-1	40.1 (32.5, 48.1)	41.4 (35.5, 47.6)	31.8 (25.5, 38.8)	38.2 (33.0, 43.6)	27.5 (21.4, 34.6)	20.2 (15.9, 25.3)	55,327	42,759
2	33.6 (29.0, 38.6)	38.2 (34.0, 42.7)	38.3 (33.9, 42.9)	41.6 (37.4, 45.8)	24.9 (20.8, 29.4)	17.4 (14.5, 20.9)**	89,898	88,778
3 or more	12.0 (8.7, 16.4)	22.3 (18.9, 26.1)**	43.7 (37.2, 50.3)	44.1 (39.2, 49.1)	38.6 (32.7, 45.0)	26.0 (21.8, 30.6)**	35,444	61,712
House tenure type								
Owner with/out a mortgage	49.8 (40.8, 58.8)	50.0 (43.9, 56.0)	33.3 (26.2, 41.2)	34.9 (29.5, 40.8)	15.3 (10.5, 21.8)	11.5 (8.4, 15.6)	44,892	50,855
Renter/other	25.3 (21.8, 29.0)	28.2 (25.3, 31.3)	38.7 (34.7, 42.9)	44.2 (41.0, 47.4)*	32.7 (29.1, 36.5)	24.2 (21.4, 27.3)**	135,777	141,390
Household equivalised income								
1st & 2nd quintiles	28.5 (23.8, 33.7)	33.3 (30.0, 36.7)	38.6 (34.6, 42.9)	40.8 (37.5, 44.2)	31.7 (27.4, 36.3)	24.2 (21.0, 27.7)**	123,450	126,320
3rd to 5th quintiles	48.2 (41.7, 54.8)	45.3 (37.2, 53.7)	34.9 (28.3, 42.2)	44.7 (37.0, 52.7)	16.7 (11.5, 23.5)	9.4 (5.9, 14.7)	33,815	31,337
Unknown	27.7 (21.4, 35.1)	25.7 (20.7, 31.5)	33.9 (25.9, 43.0)	41.7 (35.7, 48.0)	27.7 (21.4, 35.1)	18.7 (14.5, 23.7)*	23,264	35,592
Financial stress								
Could NOT raise $2000 in emergency	23.5 (19.9, 27.6)	25.8 (22.8, 29.1)	38.2 (34.0, 42.6)	44.4 (40.5, 48.4)*	35.5 (31.3, 39.9)	25.7 (22.4, 29.3)*	96,831	97,995
House could raise $2000 in emergency	41.8 (35.6, 48.3)	43.0 (38.8, 47.3)	37.2 (31.6, 43.3)	39.1 (34.9, 43.5)	18.5 (14.5, 23.2)	14.9 (12.0, 18.3)	73,012	84,122

a Weighted population denominator; un-weighted total sample denominators = 4,114 (2004) and 5,484 (2008). N for a variable may not add to total due to missing data.
b Results not reported for Tasmania and Australian Capital Territory, as data only available for these two jurisdictions combined.
c 2004 Number of people less than 15 years; 2008 Number of people less than 18 years
** Significant difference between 2008 and 2004 percentage, p<0.05; ** Significant difference between 2008 and 2004 percentage, p<0.01.*
NOTE: Row totals will not add to 100% with the difference being the percentage from households with a daily smoker but 'not stated' whether any smokes inside.
Sources: 2004 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) and the 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS).

Indigenous and Australian trends in smoking inside homes, 2004-2008

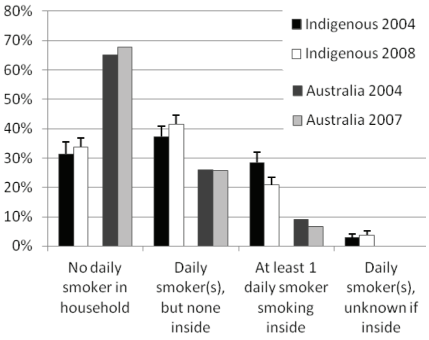
The proportion of Indigenous children living with at least one daily smoker who smokes inside declined statistically significantly from 28.4% in 2004 to 20.8% in 2008, with significant declines among children in the NT, Western Australia and South Australia, remote and non-remote areas, and more disadvantaged children as measured by income, household tenure and financial stress. There were smaller mainly non-significant increases in the proportion living with no daily smoker and no daily smoker who smoked inside (Table 1).

Similar overall trends were seen among all Australian children. Indigenous children were much more likely than all Australian children to be exposed to smokers in the home: much less likely to live in a household without a daily smoker and much more likely to live with a smoker who usually smokes inside (Figure 1).

The proportion of Indigenous daily smokers who lived in multi-person households where no daily smoker householder usually smoked inside increased statistically significantly from 45.0% in 2004 to 56.3% in 2008 (Table 2). These increases were statistically significant in many categories of most of the variables assessed.

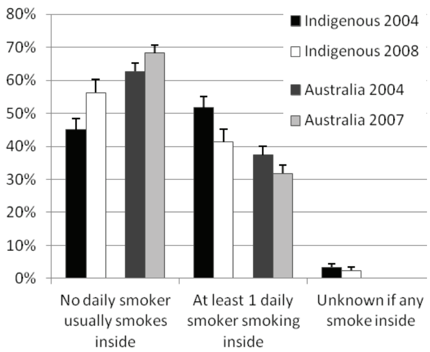
Similar overall trends were seen in the proportions of Indigenous and all Australian daily smokers who lived in households where no daily smoker householder usually smoked inside; however these proportions were consistently lower for Indigenous smokers (Figure 2).

Figure 1: Trends in percentage of children 0-14 years exposed to household secondhand smoke.



Sources: 2004 NATSIHS, 2008 NATSIHS, 2004 and 2007 NHS.

Figure 2: Trends in percentage of daily smokers living in multi-person households where no daily smoker usually smokes inside.



Sources: 2004 NATSIHS, 2008 NATSIHS, 2004 and 2007 NHS.

Smoking initiation, intensity and cessation

Smoking prevalence among Indigenous 15-17 year olds, the age most start smoking, was lower among those living in households with at least one daily smoker but none who smoke inside than in homes with at least one daily smoker who smokes inside (25.1% [95%CI 18.0-33.8] vs 40.2% [95%CI 28.5-53.1]). However, this was not statistically significant.

Daily smokers smoked significantly fewer cigarettes per day (13.3) if they lived in a multi-person household where no-one smoked inside than if they lived with others in a home where at least one household smoker smoked inside (16.8) or if they lived alone (18.3) (Table 3).

Daily smokers were non-significantly more likely to have tried to quit or cut down if they lived in a multi-person household where no-one smoked inside than if they lived with others in a home where at least one household smoker smoked inside or if they lived alone (Table 3). However, the quit ratio, the proportion of ever smokers who have successfully quit, was significantly higher (17.3% [95% CI 15.0-19.7] vs 12.2% [95% CI 9.6-15.5]) if they lived in a multi-person household where no one smoked inside than if they lived with others in a home where at least one household smoker smoked inside or if they lived alone.

Discussion

Social patterning and trends

There was clear social patterning of the exposure of Indigenous children to secondhand smoke, and of where smokers smoked at home. As has been shown in other populations, more disadvantaged Indigenous children were more likely to be exposed to secondhand smoke at home, and more disadvantaged Indigenous smokers were more likely to live in households where smokers usually smoked inside.[5] Social patterning and the geographic variation in Indigenous smoke-free homes may in part be driven by similar socio-economic and geographic variation in Indigenous smoking prevalence.[9] Previous research has shown that the arrival of a new baby leads to Indigenous households becoming smoke-free.[16] As in other contexts, we have shown that smokers are less likely to smoke inside homes with children.[3]

The significant decline in the proportion of Indigenous children exposed to secondhand smoke from household members smoking inside is encouraging. The size of the absolute increase in the protection of children from secondhand smoke was greater among Indigenous children than among all Australian children, but with significant improvements only detected among the most disadvantaged categories of Indigenous children.

The size of the increases in the proportions of smokers living in homes where household members don't smoke inside were also greater among Indigenous than all Australian smokers. These improvements were more consistent, and more likely to be significant, across many categories of Indigenous disadvantage, than the improvements in Indigenous children's exposure. The greater size of improvements in the Northern Territory and remote areas are strong signs of progress in settings with the highest Indigenous smoking prevalence and where tobacco control activity has been more limited.

These results replicate research which found greater improvements among Māori than other New Zealanders in secondhand smoke exposure at home and in smoke-free home rules associated with the introduction of the Smokefree Environments Act.[17] We share those authors' enthusiasm about this rare evidence in the tobacco control literature of disproportionate benefits for a more disadvantaged group. However this contrasts with the persistence of the socioeconomic gap in the proportion of the children in Australian households exposed to indoor smoking, and the widening of the gap in the proportion children living with a smoker between 2001 and 2010.[18] Detailed longitudinal data (rather than less methodologically rigorous data from

Table 2: Percentage (95% CI) of Indigenous daily smokers aged 18+ years in multi-person households by where householders smoked in 2004 and 2008 .	No householder usually smokes inside		At least one householder smokes inside		N[a]	
	2004	2008	2004	2008	2004	2008
Total daily Indigenous smokers	**45.0 (41.7, 48.3)**	**56.3 (52.4, 60.2)****	**51.7 (48.3, 55.0)**	**41.3 (37.5, 45.2)****	**116,951**	**125,111**
Jurisdiction[b]						
New South Wales	38.7 (31.9, 45.9)	52.8 (44.9, 60.4)**	57.8 (50.5, 64.8)	45.7 (38.3, 53.3)*	33,610	36,612
Victoria	45.8 (36.4, 55.6)	56.7 (50.6, 62.7)	50.6 (41.3, 59.9)	40.7 (34.7, 47.1)	6,627	7,959
Queensland	50.6 (44.8, 56.4)	55.5 (46.6, 64.0)	46.3 (40.7, 51.9)	41.5 (32.8, 50.7)	32,667	34,160
South Australia	40.7 (30.1, 52.3)	56.6 (47.8, 65.0)*	57.3 (45.7, 68.1)	40.3 (31.9, 49.3)*	6,458	6,841
Western Australia	47.6 (38.8, 56.6)	58.7 (51.0, 65.9)	47.3 (37.9, 56.9)	36.4 (29.3, 44.1)	15,278	15,963
Northern Territory	44.2 (35.9, 52.9)	62.1 (53.7, 69.9)**	52.7 (44.1, 61.0)	37.3 (29.7, 45.6)**	17,295	18,336
Remoteness						
Non-remote	44.7 (40.8, 48.7)	54.7 (49.9, 59.4)**	52.1 (47.9, 56.2)	42.4 (37.8, 47.2)**	81,053	88,524
Remote	45.6 (40.2, 51.0)	60.3 (54.6, 65.7)**	50.7 (45.5, 56.0)	38.5 (33.1, 44.2)**	35,898	36,587
Age group (years)						
18-24	48.3 (41.8, 54.7)	62.6 (54.9, 69.7)**	46.8 (40.2, 53.5)	35.1 (28.2, 42.6)*	27,544	32,696
25-34	53.3 (48.2, 58.3)	60.1 (53.8, 66.0)	43.8 (38.8, 48.8)	38.4 (32.5, 44.6)	35,629	34,585
35-44	42.8 (37.2, 48.5)	54.0 (48.1, 59.8)**	53.5 (47.8, 59.2)	42.8 (37.2, 48.6)**	29,850	29,695
45-54	30.9 (24.7, 37.9)	51.6 (43.7, 59.5)**	68.3 (61.3, 74.6)	45.5 (37.5, 53.8)**	16,210	17,966
55+	33.1 (22.6, 45.5)	38.7 (30.5, 47.6)	63.4 (51.3, 74.0)	59.3 (50.9, 67.1)	7,718	10,170
Number of people < 15/18 years[c]						
None	35.9 (30.4, 41.9)	45.5 (39.8, 51.3)*	61.3 (55.2, 67.1)	51.7 (46.0, 57.4)*	32,799	44,850
1	40.8 (34.9, 47.0)	62.3 (55.3, 68.9)**	55.4 (49.3, 61.4)	36.3 (29.9, 43.2)**	27,068	26,320
2	56.5 (49.5, 63.3)	61.3 (53.0, 69.1)	38.9 (32.3, 45.9)	34.7 (27.2, 43.1)	21,688	24,179
3	52.1 (44.3, 59.8)	61.9 (53.5, 69.6)	44.2 (36.6, 52.2)	37.4 (29.7, 45.8)	16,685	14,279
4 or more	47.1 (39.5, 54.8)	64.8 (56.0, 72.7)**	50.8 (43.0, 58.6)	33.4 (25.7, 42.2)**	18,710	15,482
Number of people 15/18+ years[c]						
1	51.8 (44.2, 59.3)	68.9 (62.0, 75.0)**	46.5 (39.1, 54.0)	30.8 (24.7, 37.8)**	15,506	9,859
2	46.3 (41.7, 51.1)	58.8 (54.3, 63.1)**	49.8 (45.1, 54.5)	40.3 (36.0, 44.8)**	56,471	48,602
3 or more	40.9 (35.0, 47.1)	52.7 (47.0, 58.4)	55.8 (49.6, 61.9)	43.5 (38.0, 49.2)**	44,975	66,650
House tenure type						
Owner with/out a mortgage	52.2 (44.3, 60.0)	68.6 (61.2, 75.3)**	46.0 (38.2, 53.9)	29.6 (23.1, 37.1)**	21,157	25,591
Renter/other	43.4 (39.8, 47.0)	53.2 (48.8, 57.5)**	52.9 (49.3, 56.6)	44.3 (40.0, 48.6)**	95,794	98,605
Household equivalised income						
1st & 2nd quintiles	44.2 (40.0, 48.4)	52.1 (47.7, 56.5)*	53.8 (49.6, 58.0)	46.5 (42.2, 50.9)*	73,147	72,671
3rd to 5th quintiles	51.4 (43.7, 59.0)	68.7 (59.9, 76.2)**	47.2 (39.6, 55.0)	30.9 (23.3, 39.7)**	24,542	24,201
Unknown	39.6 (32.5, 47.1)	56.7 (50.0, 63.2)**	49.4 (42.1, 56.7)	36.7 (30.5, 43.3)*	19,102	28,240
Financial stress						
Could NOT raise $2000 in emergency	41.4 (37.2, 45.7)	52.0 (46.7, 57.2)**	55.5 (51.2, 59.8)	45.4 (40.3, 50.5)**	69,148	68,652
Could raise $2000 in emergency	51.7 (45.6, 57.7)	64.7 (59.7, 69.5)**	45.0 (38.9, 51.3)	33.5 (28.7, 38.6)**	40,895	48,151

a Weighted population denominator; un-weighted total sample denominators = 2,564 (2004) and 3,010 (2008). N for a variable may not add to total due to missing data.
b Results not reported for Tasmania and Australian Capital Territory, as data only available for these two jurisdictions combined.
c 2004 Number of people less than 15 years; 2008 Number of people less than 18 years
** Significant difference between 2008 and 2004 percentage, p<0.05; ** Significant difference between 2008 and 2004 percentage, p<0.01.*
Note: Row totals will not add to 100% with the difference being the percentage from households with a daily smoker but 'not stated' whether any smokes inside.
Sources: 2004 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) and the 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS).

repeated cross-sectional surveys) from the International Tobacco Control Four Country project in Australia, Canada, US and UK also showed that smokers from higher socio-economic groups were more likely to introduce and retain smoking bans in their homes.[19] A similar national longitudinal study of Aboriginal and Torres Strait Islander smokers, currently under way, should provide similarly rigorous information in this population.

The results demonstrate real progress in Indigenous tobacco control and, in particular, protection from secondhand smoke. The trends in the exposure of Indigenous children to secondhand smoke in their home are only in small part driven by reducing Indigenous smoking prevalence,[14] and the associated rise in the number of children who do not live with a smoker. There were much greater reductions in exposure due to the increasing proportion of homes where no householder regularly smokes inside than due to fewer children living with a smoker, even though the latter would better protect children.

Table 3: Smoking behaviour of daily smokers aged 15+ years by where householders smoked, 2008.

Smoke-free home status	Cigarettes per day Mean (95% CI)	Tried to quit % (95% CI)	Tried to reduce % (95% CI)	Tried to quit or reduce % (95% CI)	N[a]
Lone person households	18.3 (16.3, 20.2)*	43.8 (36.6, 51.3)	35.5 (28.1, 43.8)	62.2 (55.4, 68.5)	13,609
Other households					
No householder usually smokes inside	13.3 (12.7, 14.0)	46.2 (42.5, 49.9)	37.2 (33.6, 41.0)	63.6 (60.1, 67.0)	73,111
At least one smokes inside	16.8 (15.7, 18.0)*	43.2 (38.4, 48.0)	33.8 (29.7, 38.2)	60.8 (56.2, 65.1)	55,947
Not stated if anyone smokes inside	14.2 (9.9, 18.6)	32.0 (16.1, 53.5)	25.3 (11.5, 46.8)	47.6 (26.9, 69.2)	3,095
Total	15.1 (14.5, 15.8)	44.5 (41.9, 47.2)	35.5 (32.9, 38.2)	62.0 (59.6, 64.4)	145,761

a Weighted population denominator; un-weighted total sample denominator = 3,588. N for a variable may not add to total due to missing data.
** Significant difference with smokers living in houses where 'No householder usually smokes inside', p<0.01.*
Note: Lone person households were not asked about smoking inside.
Source: 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS).

Indigenous social norms about secondhand smoke and smoking are changing, but it is difficult to attribute the changes we have found to any particular tobacco control policy or activity.

One literature review has emphasised the importance of comprehensive national tobacco control policies in driving increases in the prevalence of smoke-free homes.[20] Between 2004 and 2008 there was only scattered and limited tobacco control activity targeting Indigenous people, but Australia has a long history of excellent mainstream tobacco control policies and activity. In this period, Australia introduced graphic health warnings on cigarette packs and associated broader social marketing campaigns.[21] Since 2008, there has been a dramatic increase in Indigenous-specific tobacco control activity which has included new Indigenous tobacco control workers employed throughout the country, an Indigenous social marketing campaign (including television advertisements), improved access to Quitline and nicotine replacement therapy, and has complemented increased mainstream tobacco control activity.[22] This should all lead to further increases in the prevalence of Indigenous smoke-free homes when these results from the next national survey results are available in 2014.

The presence of smoking bans in public places is associated with the adoption of smoke-free homes.[3] Many Australian states and territories expanded smoking bans in indoor or outdoor public places during this period, and South Australia introduced the first ban on smoking in cars with children in 2007.[23] It is not known if there was any increase in the adoption and enforcement of smoke-free public places used by Indigenous people between 2002 and 2008, but in more recent years the new Indigenous tobacco control workforce have focused on this issue. There is more modest evidence supporting the effectiveness of mass media campaigns and counseling of parents and families which target secondhand smoke in the home.[23,24] There has been increased activity on both fronts by the new workforce and as part of increased attention to Indigenous tobacco control since the 2008 survey.

Smoking initiation, intensity and cessation

Our finding that Indigenous smokers in smoke-free households smoke significantly fewer cigarettes replicates research in other settings[25] and is consistent with a recent study of Aboriginal smokers in Arnhem Land.[26] The significant association between smoke-free homes and successful cessation, and non-significant associations with quit attempts and attempts to reduce consumption were all in the same direction as findings from other settings. Longitudinal studies show smoke-free homes encourage quit attempts, prevent relapses, and the adoption of a smoke-free home leads to a reduction in consumption.[3,25] And in the other direction, low-intensity smokers are more likely to adopt and maintain a smoke-free home and smokers are likely to adopt a smoke-free home as part of a quit attempt.[3,25] The increasing adoption of smoke-free homes is likely to be of benefit to Indigenous smokers, as well as protecting non-smokers from secondhand smoke.

Qualitative research with Indigenous young people in different settings in the Northern Territory has suggested that smoke-free homes seem to be associated with young people not starting smoking, and that parents who smoke can prevent their children starting to smoke by making their home smoke-free and sending clear messages that smoking is not acceptable.[27] This is consistent with our non-significant but much lower prevalence of youth smoking in smoke-free homes. A recent review found only inconsistent evidence from longitudinal and cross-sectional studies that smoke-free homes reduce youth smoking initiation.[5]

Strengths and limitations

These are large nationally representative surveys where response rates have remained high. But the surveys are based on self-report without biochemical verification of exposure to secondhand smoke. The most recent Australian Health Survey (incorporating the next NHS and NATSIHS) included cotinine measures from a sub-sample of participants, with the Indigenous cotinine results due for release in late 2014.[28] Examinations of US national surveys found that many non-smokers reporting no secondhand smoke exposure at home have detectable levels of serum cotinine.[29,30] This could be due to exposure to secondhand smoke outside the home, inaccurate recall or social desirability bias. Our estimates of smoke-free homes may be falsely inflated and the trends falsely exaggerated, however with very high smoking prevalence and smoking still normalised in Indigenous communities at the time of these surveys this is less likely for the Indigenous estimates.

The surveys did not directly ask if homes are smoke-free (if anyone smokes inside or is allowed to) but rather only if any household smokers who are daily smokers usually smoke inside. It excludes exposure to secondhand smoke from visitors to the home, perhaps falsely inflating the protection of children from secondhand smoke in their homes.

This may be important as complete smoking bans are far more effective in assisting cessation than partial bans.[5] Nevertheless, the consistency of the questions between surveys allows the useful comparisons over time and between the Indigenous and the all Australian survey. The ABS should consider adding a question about whether anyone smokes inside the home, but keep the existing questions to enable trends to be monitored.

Conclusions

This research again demonstrates how Indigenous children (and smokers) are far less likely than other Australians to live in smoke-free homes. But, more importantly, we found encouraging increases in Indigenous smoke-free homes. These trends should lead to improvements in child health. For example, they would begin to address the estimated 27% of the population attributable risk of otitis media among Aboriginal children due to secondhand smoke exposure in the home.[31] These smoke-free home trends may also contribute to reductions in Indigenous smoking prevalence, by increasing cessation and reducing initiation. Even more encouragingly, the trends are from a period before massive increased attention to and government funding for Indigenous tobacco control, and expanding mainstream tobacco control activity including plain packaging and new tax rises. These comprehensive Indigenous and mainstream tobacco control policies should accelerate these trends and their resultant health benefits for Aboriginal and Torres Strait Islander children, families and communities.

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