



Has smoking prevalence markedly decreased in New Zealand despite more cigarettes released for sale?

Murray Laugesen

Abstract

Aims To assess whether smoking declined markedly since 2003, as reported by the New Zealand Health Survey (NZHS) of 2007.

Method Comparison of daily smoking prevalence from the NZHS, Census, and annual ACNielsen Ltd smoking prevalence survey against tobacco and cigarette volumes released to the domestic market, 1996-2007.

Results From 2003 to 2007, NZHS-reported daily cigarette smoking prevalence decreased from 22.8% to 18.1%, implying 125,000 (-17%) fewer smokers, whereas cigarettes annually released for sale increased 7.5% from 3957 to 4253 million sticks. In contrast, the Census and the ACNielsen commercial survey estimated 1.0 and 1.5 percentage point decreases respectively in numbers smoking. Identifiable factors explained up to 34% of the decrease in numbers smoking. Anti-smoking sentiment was greater in 2007.

Conclusion It is highly doubtful if adult daily smoking prevalence has yet decreased below 20%. Smokers responding to the 2007 NZHS, more than in previous health surveys, tended to underreport their smoking. They may have opted out of responding altogether, or otherwise not reported they smoked. Future health surveys should include biochemical validation of smoking status.

In its report to the incoming government in November 2008, the Ministry of Health noted that "Since 2003 there has been a 5% fall in the total number of people who smoke every day."¹ This refers to the National Health Survey result showing daily adult smoking prevalence had fallen 4.8 percentage points between 2003 and 2007, from 22.9% to 18.1%.² As smoking prevalence is now the bottom line for measuring success in tobacco control, success depends on health surveys to call the results correctly.

Despite every statistical precaution being taken, surveys still depend on eliciting truthful answers. For illegal drugs, this requires urine testing. For tobacco smoking we rely on self-report. However, public opinion against smoking is now severe. In a telephone poll in 2006, 52% of adults supported a ban on the sale of all tobacco products,³ while in 2007, 76% said smoking is 'not at all acceptable' at outdoor children's playgrounds.⁴

Surveys tend to under-report community levels of smoking, but (for reasons of cost) few surveys report biochemically-validated results, which would detect those responders who report their smoking incorrectly. For example, testing for cotinine (a by-product of nicotine in saliva) has shown national surveys underestimated smoking

prevalence by 0.6, 2.8, and 4.4 percentage points in the United States, England, and Poland respectively.

Cotinine concentrations in those misclassified as non-smokers were indicative of high levels of smoke intake.⁵ In 1997, in Christchurch, pregnant women tested for serum cotinine showed they under-reported smoking prevalence by 5.5 percentage points, meaning that 22% of the smokers would otherwise have been unidentified as such by their midwife or doctor.⁶

In particular, health surveys encourage healthier responders and/or responses. New Zealand-wide health surveys to date—in 1990⁷, 1993, 1997,⁸ 2003,⁹ and 2007²—have reported cigarette smoking prevalences respectively 3.0, 4.0, 0.7, 2.1, and 4.9 percentage points below that of ACNielsen's commercial survey in that year.¹⁰ Census smoking prevalence was intermediate between NZHS and ACNielsen's results (Table 1).

As a reality check, trends in numbers smoking were compared against cigarettes and tobacco volumes released, as given by Customs excise data. If smoking prevalence (the percentage of adults who smoke) decreases, then fewer smoke, and the volume of demand for cigarettes decreases as expected. If, however, the cigarette supply holds up, remaining smokers must be buying and smoking more on average.

Method

Focusing on ages 15 years and over from 1996 to 2007, tobacco and cigarettes released for sale from Statistics New Zealand were compared against daily smoking prevalence reported from the periodic New Zealand health surveys during these years, the Census smoking questions in 1996 and 2006, and by the annual ACNielsen commercial survey of cigarette smoking.

Statistics New Zealand annually publish Customs data on tobacco and cigarette volumes released for sale,¹¹ and on resident population aged 15 and over.¹² Tobacco for hand-rolling was estimated to produce 2 million roll-your-own (RYO) cigarettes per tonne, based on an estimated national average tobacco weight of 0.5 g per RYO cigarette in 2006.¹³

All smoking prevalence surveys involved visits to homes. To enable cross-survey comparison only daily cigarette smoking prevalence was considered, defined to include both factory-made and RYO cigarette smoking. Results were not standardised for differences in age structure of the population; instead crude prevalence data were used to estimate actual numbers of smokers in each year, for appropriate comparison with the numbers of cigarettes released for sale.

The ACNielsen cigarette survey purchased by the Ministry of Health from 1982 to 2007 was based on an annual omnibus survey asking about various consumer items (cars, whiskey), and used a show card of various tobacco products to ask about regular use. Smoking is thus accepted as normal consumer behaviour in a way not possible in a health survey.

The NZHS of 1996/7 was mainly fielded in 1997.¹⁴ The 2002-3 NZHS, based on computer-assisted personal interviews, was mainly in the field in 2003.⁹ The Census asked a question on cigarette smoking in March 1996 and March 2006. The Census, being filled in by parents, tends to under-report smoking at age 15 to 19 years, compared with the ACNielsen survey, in which the teenager is interviewed individually. Of adults age 15 years and over, 8.6% gave an unusable answer to the Census smoking question, and daily smoking prevalence was estimated from the 91% giving usable answers.¹⁵

The 2006-7 NZHS was in the field from October 2006 to November 2007, and thus mainly reports on the 2007 year.² The 2006 and 2008 Tobacco Use surveys and the 2007 Alcohol and Drug Use surveys only included smokers aged 15 to 64 years and are not reported here, but four government surveys in 2006-7 were available for age-standardised comparisons for ages 15 to 64 years.

The Health Sponsorship Council's Monitor is a telephone survey of 1500 to 2000 people age 15 years and over⁴ annually from 2003 to 2007, excepting 2006.

Results

All tobacco sold is smoking tobacco, and 99% is smoked as cigarettes, as analysed from tobacco manufacturers' annual returns to the Ministry of Health.¹⁷ Factory-made cigarettes accounted for 69% and RYO tobacco for 30% of the dry weight of all tobacco used.¹⁷

Cigarettes released for sale—In contrast, total cigarettes released, including factory-made and RYOs, rose by 7.5%, from 3957 million in 2003 to 4253 million in 2007^{11,17} (Table 1).

Numbers of smokers—NZHS reported a 17% decrease in numbers smoking in 2007; that is, 125,000 fewer smokers (Table 1). The ACNielsen survey, however, showed only a 1.5% decrease in smoking population from 2003 to 2007, and the Census showed a 1% decrease from 1996 to 2006.

Smoking prevalence (Table 1)—The NZHS reported a sharp decrease in daily smoking prevalence from 22.8 in 2002-3 to 18.1% in 2006-7. (The value for 2006-7 age-standardised to the 2006 census value was 17.8 %.) ACNielsen reported a gradual decline in smoking prevalence: 26% in 1996-7, 23.6% in 2006, and 23% in 2007—a decline of only 3 percentage points in 10 years (Table 1), but showed no decline between 2004 and 2007 (Table 1).

Table 1. Changes in proportions and numbers smoking, versus cigarettes released for sale, 1996–2007

Year	Cigarettes released counting RYOs as 0.5 g each Millions	Resident population age 15 and over Millions	Smoking prevalence as percentage of adults age 15 and over, and smoking population in thousands, not age-standardised					
			ACNielsen %—'000		New Zealand Health Surveys %—'000		Census %—'000	
1996	4976	2.8958	26	753	24.8	718	23.7	660
1997	4913	2.9282	26	761				
2003	3957	3.1259	25	781	22.9	716		
2004	4002	3.1780	23	731				
2005	4214	3.2210	23.5	757				
2006	4197	3.2665	23.6	771			20.7	654
2007	4253	3.3424	23	769	18.1	591		
2003–7 Difference	296 7.5%	0.2165 6.9%	-2.0 -8%	-12 -1.5%	-4.8 -21%	-125 -17%	-3.0, -6.0 (1996–2006)	

Source: Cigarettes,^{10,17} Resident population,¹¹ AC Nielsen,⁹ New Zealand Health Surveys,^{1,7,8} Census.¹⁴ Numbers smoking estimated from survey prevalence fraction × resident population.

The Census reported a 3-percentage points decrease in smoking prevalence over 10 years, from 23.7% in 1996 to 20.7% of adults in 2006. This was paralleled by a similar *increase* in the percentage of never-smokers, while the percentage of ex-smokers remained at 21% in both Censuses, indicating that the proportion quitting was matched by the proportion resuming smoking.

Comparisons, based on daily smoking at ages 15 to 64 years, and age-standardised against the 2006 Census, showed that the lowest smoking prevalence was given by the 2007 New Zealand Health Survey,^{8,16} though the three 2007 surveys (New Zealand Health Survey, Alcohol and Drug Survey, and the 2008 Tobacco Use Survey) had overlapping confidence limits. The narrow confidence intervals of the Census did not overlap the confidence limits of the 2007 or 2008 surveys.¹⁷ Thus three Ministry of Health surveys in 2007–8 reported lower smoking prevalence in 2007 than the Census of March 2006.

Action on Smoking and Health (ASH) national surveys show smoking prevalence at 14–15 years of age decreased steadily from 1999 to 2007. By 2007, these students populated the 15–24 year age group. The New Zealand Health Surveys found smoking prevalence for 15–24 year-olds decreased 3.3 percentage points, from 27% in 2003 to 23.7% in 2007, equal to 9,400 fewer youth smoking.

After smoking was banned in all workplaces and hospitality venues from December 2004, the proportion of adults reporting it was “not at all acceptable” to smoke at outdoor sports fields or courts, increased from 35–37% in 2003–05, to 51% in 2007.⁴

Discussion

As Table 1 shows, smoking prevalence values in 2006, 2007, and 2008 were lower than in 2003. Also, smoking prevalence was recorded as lower in 2007–8 than in (the Census of) 2006. The question is, how credible are the lower smoking prevalences found in 2007–8, and how to interpret them?

NZHS results from 2003 and 2007, equate to 125,000 fewer smokers, a 17% decrease in numbers of adults smoking in 4 years. (Table 1) The numbers of cigarettes released to the market increased 7.5%, however, during these 4 years, from 2003 to 2007—an increase of 296 million in cigarettes released annually (Table 1).

These two trends are incompatible. For the NZHS result to be compatible with cigarette volumes released, remaining smokers would have to buy 30% more cigarettes per day [$100 * 1.075 / (1 - 0.17) = 130$], those previously smoking 20 a day and still smoking would need to buy 26 cigarettes a day.

The 2006 Census recorded smoking prevalence to be three percentage points below the value from the 1996 Census. If this decrease was due to quitting, the proportion of former smokers (21% in 1996, 21% in 2006) should have increased. Instead, the proportion which had never smoked increased 3 percentage points, suggesting no change attributable to smoking cessation between 1996 and 2006.

What factors might explain the 125 000 decrease in numbers smoking reported by the New Zealand Health Surveys from 2003 to 2007?.

Firstly, how much is explained by survey methods and demographics? For example, how much of the NZHS decrease is confirmed by other surveys? As Table 1 shows, 12,000 fewer smokers or 1.5% of 125,000 can be explained by the AC Nielsen survey 2003 to 2007. Again, how much can be explained by changing age structure of the population?

Age-standardisation of the health survey data to the 2006 Census population (Ministry of Health data, unpublished 2008) would narrow the decrease in prevalence from 4.8

percentage points in Table 1, to 4.5 percentage points, equivalent to 6% of the decrease in numbers of smokers. The 95% upper confidence limit for the NZHS in 2007 was 19.0%, which reduces the decrease since 2003 by 19%. Finally, 9400 fewer youth taking up smoking would account for 7.5% of the 2003–7 decrease in smoking numbers at age 15 years and above. Thus in total, these factors account at best for 34% of the NZHS decrease in numbers smoking from 2003 to 2007.

Secondly, was this a smokefree law effect? The evidence suggests not. AC Nielsen's survey showed 25% smoked in 2003, 23% in 2004, and 23.5% in 2005. The Smokefree Environments Amendment Bill banning smoking in bars and remaining workplaces was enacted in December 2003, and took effect from December 2004. Any effect of this legislation on smoking prevalence was in place by 2004, and does not explain a decrease in smoking prevalence between the Census of 2006 and the New Zealand Health Survey result of 2007.

Thirdly, did smoking decrease due to graphic cigarette packet warnings? No. Regulations required manufacturers to put new warnings on sale between February and August 2008. The Health Survey, however, was in the field in 2006–7 before these regulations took effect, so smokers responding to NZHS had not yet seen graphic warnings on their cigarette packets.

Fourthly, was this a price effect? No. Price increases tend to lower sales. Cigarette excise and prices, however, remained the same in real terms from 2001 to 2007 inclusive.

Lastly, is the 2007 New Zealand Health Survey defective in a unique way? No; the 2007 Alcohol and Drug Survey gave a similar low result, and the confidence limits overlap. The New Zealand Health Survey result is not an outlier on its own. Rather these two health surveys may both have been prone to a health bias in 2007 favouring a lower reported smoking prevalence.

The decline in smoking prevalence from 2003 to 2007 reported by the New Zealand Health Surveys is implausible and incompatible with the increased volumes of cigarettes released for sale. This was not due to commercial fluctuations in volumes released for sale, as tobacco volumes used in manufacture show similar annual trends.¹⁷

The one possible cause of the apparent 2007 decrease in smoking prevalence (which is not seen in the 2006 surveys) is the increased unacceptability of smoking that was detected in the Health Sponsorship Council monitor of 2007.⁴ Social undesirability of smoking may have influenced some smokers to either opt out of responding to the survey as a whole or to the smoking questions in particular, or disown their smoking when responding.

Admitting to smoking is embarrassing for many smokers. There is no biochemical proof that this was the case in the New Zealand Health Survey, but for future health surveys it would be advisable to validate reported smoking status, by testing salivary cotinine or exhaled carbon monoxide. Although cotinine tests are expensive, such costs are only a small fraction of the total cost of a national smoking survey, and essential to its correct interpretation. There is no other way to measure for changes in the tendency for smokers to under-report their smoking.

Until future surveys can be validated, the rate of recent decline in smoking is best judged by the Census, namely 3 percentage points in 10 years, at which rate it would take 70 years to reach near-zero smoking.

If smoking prevalence is falling no faster than indicated by the 1996–2006 Censuses, ending the cigarette deaths epidemic (4500 deaths a year) requires intervention from Government, and not just the health sector. Government can induce marked decreases in smoking prevalence, as in 1987 to 1991, when adult smoking prevalence declined from 30% to 26%; successive cash-strapped governments repeatedly increased tobacco excise above the level of inflation.

Government last increased the real tobacco excise rate in 2000. Annual excise adjustments for inflation have since kept the price of smoking of factory-made cigarettes high. However nearly half of all smokers now smoke RYOs, for 4 or 5 dollars a day.¹¹ The price of a cup of coffee buys enough tobacco for 12 RYO cigarettes.

Unsurprisingly, smoking prevalence overall is reducing extremely slowly, despite greater government funding for a wider range of stop smoking programmes and products since 2000. The tobacco excise rate on factory-made cigarettes, when adjusted for incomes, is one of the highest among industrialized nations, so that any government seeking extra revenue may hesitate to raise it much. Moreover, if the excise rate is simultaneously increased on loose RYO tobacco by the same percentage, the effect on smoking prevalence would be blunted by more smokers shifting to the cheaper RYOs instead of quitting smoking.

As in 2000,^{17,18} increasing the tobacco excise rates *evenly* on all tobacco products is unlikely to gain revenue or reduce smoking prevalence.

Action is now required to focus on the real problem—RYO smoking is cheap and available at half the cost of smoking factory-made cigarettes. The lower tax on RYOs deprives government of over \$300 million annually,¹⁷ and dissuades smokers from quitting. It is necessary to raise the excise on RYO cigarettes to the same level *per cigarette* as for factory-made cigarettes. This would require a doubling of the current excise per gram on loose tobacco, probably phased in over several steps.

Competing interests: None (Murray Laugesen is a public health physician and independent contract researcher). No funding was received for this study.

Author information: Murray Laugesen, QSO, Health New Zealand Ltd, Lyttelton, Christchurch

Correspondence: Dr Murray Laugesen, 36 Winchester St, Lyttelton, Christchurch 8082, New Zealand. Email: hnz@healthnz.co.nz or chair@smokeless.org.nz;
Website: www.healthnz.co.nz

References:

1. Ministry of Health. Briefing for the incoming Minister of Health. Wellington: Ministry of Health November 2008. [http://www.moh.govt.nz/moh.nsf/pagesmh/8705/\\$File/BIM-2008.doc](http://www.moh.govt.nz/moh.nsf/pagesmh/8705/$File/BIM-2008.doc)
2. A Portrait of Health – Key results of the 2006/07 New Zealand Health Survey: Second-hand smoke exposure and Tobacco use sections only. Ministry of Health 30 May 2008. [http://www.moh.govt.nz/moh.nsf/pagesmh/7440/\\$File/second-hand-smoke-and-tobacco-use-nz-health-survey-jun08.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/7440/$File/second-hand-smoke-and-tobacco-use-nz-health-survey-jun08.pdf)

3. TNS national telephone survey, 1000 participants, age 18 and over. March 2006. Released by TV3, 2 April 2006. <http://www.smokeless.org.nz/polls1.htm>
4. Health Sponsorship Council. Acceptability of smoking in outdoor public places. HSC monitor. Wellington: HSC; 2007. <http://www.hsc.org.nz/publications/Settings-080326.pdf>
5. West R, Zatonski W, Przewozniak K, Jarvis MJ. Can we trust national smoking prevalence figures? Discrepancies between biochemically assessed and self-reported smoking rates in three countries. *Cancer Epidemiol Biomarkers & Prevention* 2007;16:820–2. <http://cebp.aacrjournals.org/cgi/content/full/16/4/820>
6. Ford RP, Tappin DM, Schluter PJ, Wild CJ. Smoking in pregnancy: how reliable are maternal self-reports in New Zealand? *J Epidemiol Community Health*. 1997;51:246–51. <http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=1060468&blobtype=pdf>
7. Mann J, Nye T, Wilson B, et al. University of Otago. Life in New Zealand survey. Volume 5. Wellington: Hillary Commission; June 1991. ISBN 0-908826-15-X.
8. New Zealand Health Survey 1996/7. Ministry of Health; 1999. [http://www.moh.govt.nz/moh.nsf/Files/ttp_c2/\\$file/ttp_c2](http://www.moh.govt.nz/moh.nsf/Files/ttp_c2/$file/ttp_c2)
9. Ministry of Health. A Portrait of Health: Key results of the 2002/03 New Zealand Health Survey. Wellington: Ministry of Health; 2004: Chapter 3. [http://www.moh.govt.nz/moh.nsf/0/3D15E13BFE803073CC256EEB0073CFE6/\\$File/aportraitofhealth4.pdf](http://www.moh.govt.nz/moh.nsf/0/3D15E13BFE803073CC256EEB0073CFE6/$File/aportraitofhealth4.pdf)
10. Ministry of Health. Tobacco Trends 2007. A brief update on monitoring trends. Wellington: Ministry of Health. June 2008. www.moh.govt.nz
11. Department of Statistics. Alcohol and tobacco available for consumption: Year ended December 2007. <http://www.stats.govt.nz/NR/rdonlyres/586F8BF6-D1EF-4B25-B388-AE6234AA0ABF/34167/atacdec07yralltables.xls>
12. Department of Statistics. Estimated resident population of New Zealand, 1991-2007. <http://www.stats.govt.nz/NR/rdonlyres/D06B6286-577C-4E11-8972-12C6B11D5E82/0/NatPopEstMYE31Dec.xls>
13. SmokeLess New Zealand. Half price RYO smoking: Government losing \$300 million a year. NZ SmokeLess e-News 28 August 2007. 2:9, at Table 1, updated 12 December 2008. <http://www.smokeless.org.nz/RYOhalfprice.htm>
14. Haslett SJ with Statistics New Zealand. 1996-7 New Zealand Health Survey Statistical Methodology [http://www.moh.govt.nz/moh.nsf/Files/method/\\$file/method.pdf](http://www.moh.govt.nz/moh.nsf/Files/method/$file/method.pdf)
15. District Health Board Area and Smoking status, Table 5. Census 2006. District Health Boards. Statistics New Zealand. <http://www.stats.govt.nz/NR/rdonlyres/7010C24E-D738-4227-93E6-CF37AAE382C6/0/DHBtables.xls>
16. Ministry of Health 2008. Monitoring tobacco use in New Zealand. A technical report on defining smoking status and estimates of smoking prevalence. Wellington: Ministry of Health. <http://www.moh.govt.nz/moh.nsf/indexmh/monitoring-tobacco-use-in-nz-technical-report?>
17. Laugesen M. Analysis of manufacturers' and importers' tobacco returns for 2006. (and 2007 when available) at Table B2, H2. <http://www.ndp.govt.nz/moh.nsf/indexcm/ndp-tobacco-returns-2006#analysisreports>
18. Laugesen M. How 80,000 smokers quit and then relapsed 3 months later. A case study in tobacco control policy. <http://www.smokeless.org.nz/casestudy.htm>