Smoking in the Kingdom of Tonga: report from a national survey

Alistair Woodward, Henry Newland, Maika Kinahoi

Abstract

Objective – To measure the prevalence of smoking amongst adults in the Kingdom of Tonga

Design – Cross-sectional survey.

Setting – Villages and census blocks throughout the Kingdom, selected by stratified cluster sampling.

Participants – 4065 adults aged 20 years and over, interviewed during July 1991.

Main outcome measure – Self-reported smoking behaviour.

Results – The response rate was estimated to be about 78% and the study population numbered approximately 9% of the national population aged 20 years and over. Current smoking (defined as smoking in the three months prior to the survey) was reported by 62% of men and 14% of women. The national prevalence of smoking, adjusted for the sampling weights used in this study, is estimated to be 64.8% (95% confidence interval = 58.7%–71.9%) for men and 13.7% (9.9%–17.6%) for women. The highest proportions of smokers were found amongst young and middle-aged men, but the prevalence of smoking tended to increase with age amongst women. Smoking was negatively related to years of education, more so amongst women than men. Amongst men, smoking was more common in rural areas than in the capital city. The pattern for women was quite different, with higher rates of smoking reported in the city than in rural areas. Amongst ever-smokers, women were more likely to report that they had quit than were men, in all age groups. It is not known whether smoking rates are changing in Tonga as there are no earlier comparable data.

Conclusions – Tonga will experience high levels of tobacco-related disease in the future, especially amongst men, unless smoking rates are reduced.

(Tobacco Control 1994; 3: 41–45)

Introduction

In developing countries of the world, smoking is becoming more important as a cause of ill-health as tobacco consumption increases, smokers change from traditional forms of tobacco to commercially manufactured cigarettes, and other causes of mortality and morbidity are reduced.1

In the Pacific, tobacco has been used for more than 150 years since it was first introduced by traders, whalers and other European visitors to the islands. However, manufactured cigarettes were rarely smoked by the local peoples until after the Second World War, and did not replace home-grown and twist tobacco in most countries until the 1960s.2

The prevalence of tobacco smoking in modern times appears to vary markedly from one Pacific nation to another. Surveys carried out between 1975 and 1981 in eight Pacific island nations (Tonga not included) reported smoking prevalence rates amongst men from 38% in the Cook Islands to 88% in Kiribati.3 Rates in women were lower, and ranged from 19% (Cook Islands) to 70% (Kiribati). The only study of smoking prevalence in Tonga4 consists of a survey conducted in 1973 of 791 persons in Nuku’alofa and Foa Island, in which 80% of men and 24% of women reported “regular smoking”.

The aim of this survey was to obtain up-to-date information on smoking from a large sample, representative of the Tongan national adult population, to assist plans for control of tobacco-related disease in the Pacific.

Methods

The Kingdom of Tonga includes approximately 100,000 people, living on 40 islands, spread over 360,000 km² of ocean. It is the only country in the Pacific that has not been colonised by a foreign power. The population is Polynesian, literate, lives mainly in rural areas, and shares a Gross Domestic Product estimated in 1991 to be about US$1280 per person.5 Life expectancy is estimated to be approximately 67 years (men and women combined), and heart disease and cerebrovascular disease are now the most commonly reported causes of death.6

This survey of smoking behaviour was combined with a study of the frequency and causes of blindness and low vision. The study was limited to the adult population of Tonga, and aimed to include approximately 10% of persons aged 20 and over. The study methods are described in detail elsewhere.7

The study population was selected by stratified cluster sampling, based on the results of the 1986 national census of Tonga.8 Within statistical divisions, villages were selected randomly until the accumulated number of adults aged 20 years and over exceeded 10% of
the total in the division. Nuku'alofa, which is the capital of Tonga and the only substantial urban area in the Kingdom, was sampled separately, using census blocks.

The study areas were visited during July 1991 by two survey teams, consisting of Tongan health workers, fluent in Tongan and English. All households in the study areas were visited, the resident population was enumerated, and interviews sought with persons aged 20 years and over. Special efforts were made to include those at work, by visits very early in the morning, and in the evening. Interviews were conducted wherever participants were found, including homes, workplaces, roadsides, and gardens.

The questionnaire was based on World Health Organisation (WHO) guidelines for tobacco smoking surveys. Participants were asked "Have you ever smoked even one cigarette?" Those who answered "yes" were asked two further questions; "Have you ever smoked at least once per week for three months or more?" and, "How often have you smoked during the last three months?" Cessation ratios were calculated as the ratios of ex-smokers to ever-smokers.

Data coding, entry, and analysis was carried out using appropriate personal computer-based statistical packages. Adjusted prevalence estimates and confidence intervals (CIs) were calculated using the method of Cochran.

Results

At the time of the 1986 census, the villages and census blocks chosen for this study contained 5175 people aged 20 years and over (11.8% of the total national population of similar age). The informal census conducted as part of this study provided a similar count. Therefore we estimate that the number of participants in the survey (4056) represents approximately 78% of those eligible. Of those asked to participate in the survey, only four persons refused.

Of the 4056 respondents to the survey, 1665 (41%) reported that they had smoked during their life ("ever-smokers"), and 1585 (39.1%) reported that they had smoked at least one cigarette per week for three months or more. 1465 respondents (36.1%) reported that they had smoked in the three months prior to the survey ("current smokers"). Of the ever-smokers, 200 reported that they had not smoked at all in the previous three months, and this group was labelled "ex-smokers".

Amongst current smokers, 93% of men reported that they smoked every day, as did 99% of women. The overall prevalence of smoking in the population of Tonga aged 20 and over, adjusted by Cochran's method, was estimated to be, for current smoking, 64.8% (95% CI = 58.7-71.0) for men and 13.7% (95% CI = 9.9-17.6) for women. The adjusted prevalence estimates for ever-smoking were 70.1% (60.1-79.5) for men and 18.1% (13.3-22.9) for women. The prevalence of smoking, by sex and age group, is shown in table 1.

The independent association of age, sex, years of education, and district of residence with prevalence of smoking was examined using a logistic regression model. This analysis showed that the frequency of ever-smoking increased with years of age, decreased with years of education, and was more common amongst men than women (figure 1). There were statistically significant interactions of sex with years of education and district of residence (table 2).

Smoking cessation ratios were calculated for specific age and sex groups, and are displayed in figure 2.

Discussion

The major finding from the survey is the high prevalence of smoking amongst men. Almost

![Figure 1 Prevalence of ever-smoking by years of education, Tonga 1991.](image)

Males

Females

<table>
<thead>
<tr>
<th>Age group</th>
<th>Current smoker</th>
<th>Ex-smoker</th>
<th>Never-smoker</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-24</td>
<td>203 (60.4%)</td>
<td>11 (3.3%)</td>
<td>122 (36.3%)</td>
<td>336</td>
</tr>
<tr>
<td>25-29</td>
<td>137 (60.7%)</td>
<td>8 (3.5%)</td>
<td>84 (37.2%)</td>
<td>229</td>
</tr>
<tr>
<td>30-34</td>
<td>112 (64.4%)</td>
<td>15 (3.5%)</td>
<td>56 (32.2%)</td>
<td>183</td>
</tr>
<tr>
<td>35-39</td>
<td>119 (74.8%)</td>
<td>11 (6.9%)</td>
<td>29 (18.5%)</td>
<td>159</td>
</tr>
<tr>
<td>40-44</td>
<td>76 (58.9%)</td>
<td>8 (6.2%)</td>
<td>45 (34.9%)</td>
<td>129</td>
</tr>
<tr>
<td>45-49</td>
<td>88 (63.8%)</td>
<td>10 (7.7%)</td>
<td>41 (27.3%)</td>
<td>139</td>
</tr>
<tr>
<td>50-54</td>
<td>102 (68.0%)</td>
<td>10 (6.7%)</td>
<td>41 (27.3%)</td>
<td>153</td>
</tr>
<tr>
<td>55-59</td>
<td>84 (64%)</td>
<td>10 (7.6%)</td>
<td>37 (28.2%)</td>
<td>131</td>
</tr>
<tr>
<td>60-64</td>
<td>81 (66.4%)</td>
<td>12 (9.8%)</td>
<td>29 (23.8%)</td>
<td>122</td>
</tr>
<tr>
<td>65-69</td>
<td>48 (54.5%)</td>
<td>10 (11.4%)</td>
<td>30 (34.1%)</td>
<td>88</td>
</tr>
<tr>
<td>70-74</td>
<td>39 (60.9%)</td>
<td>5 (7.8%)</td>
<td>20 (31.3%)</td>
<td>64</td>
</tr>
<tr>
<td>75-79</td>
<td>23 (43.3%)</td>
<td>12 (22.4%)</td>
<td>18 (34.0%)</td>
<td>53</td>
</tr>
<tr>
<td>80 and over</td>
<td>18 (43.9%)</td>
<td>11 (26.8%)</td>
<td>12 (29.3%)</td>
<td>41</td>
</tr>
<tr>
<td>All ages</td>
<td>1130 (62.4%)</td>
<td>116 (6.4%)</td>
<td>565 (31.2%)</td>
<td>1811</td>
</tr>
</tbody>
</table>

Table 1 Prevalence of current smokers and ex-smokers, by sex and age group (percentages shown in brackets), Tonga 1991.
Table 2  Factors associated with lifetime ever-smoking in multiple logistic regression, Tonga 1991

<table>
<thead>
<tr>
<th>Variable (years)</th>
<th>Parameter estimate</th>
<th>Standard error</th>
<th>Relative risk</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>0.009</td>
<td>0.002</td>
<td>1.01</td>
<td>1.005-1.014</td>
</tr>
<tr>
<td>Years of education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>female</td>
<td>-0.115</td>
<td>0.0242</td>
<td>0.89</td>
<td>0.85-0.93</td>
</tr>
<tr>
<td>male</td>
<td>-0.052</td>
<td>0.0215</td>
<td>0.95</td>
<td>0.91-0.99</td>
</tr>
<tr>
<td>Sex: (male vs female; educ = 6, dist = 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 vs 1 female</td>
<td>-0.365</td>
<td>0.228</td>
<td>0.69</td>
<td>0.44-1.10</td>
</tr>
<tr>
<td>male</td>
<td>0.162</td>
<td>0.214</td>
<td>1.18</td>
<td>0.77-1.79</td>
</tr>
<tr>
<td>3 vs 1 female</td>
<td>-0.378</td>
<td>0.189</td>
<td>0.69</td>
<td>0.47-0.99</td>
</tr>
<tr>
<td>male</td>
<td>0.594</td>
<td>0.183</td>
<td>1.81</td>
<td>1.27-2.59</td>
</tr>
<tr>
<td>4 vs 1 female</td>
<td>0.196</td>
<td>0.287</td>
<td>1.22</td>
<td>0.69-2.14</td>
</tr>
<tr>
<td>male</td>
<td>0.682</td>
<td>0.294</td>
<td>1.98</td>
<td>1.11-3.52</td>
</tr>
<tr>
<td>5 vs 1 female</td>
<td>-0.983</td>
<td>0.226</td>
<td>0.37</td>
<td>0.24-0.58</td>
</tr>
<tr>
<td>male</td>
<td>0.388</td>
<td>0.205</td>
<td>1.47</td>
<td>0.92-2.20</td>
</tr>
<tr>
<td>6 vs 1 female</td>
<td>-0.810</td>
<td>0.222</td>
<td>0.45</td>
<td>0.29-0.69</td>
</tr>
<tr>
<td>male</td>
<td>0.645</td>
<td>0.210</td>
<td>1.91</td>
<td>1.20-2.88</td>
</tr>
</tbody>
</table>

Note: Districts 1 = Kolofo'ou, 2 = Kolomotou'a, 3 = Tongatapu, 4 = Eua, 5 = Ha'apai, 6 = Vava'u.

Figure 2  Cessation ratio (ex-smokers:ever-smokers) by age and sex. — male, ○ female.

two-thirds of males aged 20 years and over reported that they had smoked in the previous three months, and more than 90% of these men smoked daily.

In this survey the participation rate was high, and there were very few refusals. The most common reasons for missing eligible adults were fishing, work in gardens that were some distance from the village, and short trips to other parts of the Kingdom. (We included as eligible adults those who “usually” lived in the village but had not spent the previous night there. If the strict census definition had been applied, the participation rate in the survey would be considerably greater than 80%.)

It is likely that the survey over-sampled older age groups. (Persons aged 50 and over made up 27.7% of all Tongans over 20 in the 1986 census. In this study, the 50 and over category made up 34.7% of the total.) Also, males were under-represented (survey sex ratio = 0.81, census sex ratio = 0.94). As a consequence, if there is error in the results due to missing information, it is likely to have resulted in an under-estimate of the overall (population) smoking prevalence.

The survey relied on self-reports of smoking behaviour. The questions were well-understood and readily answered; they were not the principal focus of the survey and, in general, in Tonga no social stigma is associated with smoking. (Although smoking by young women is often regarded with disapproval.) Overall, we believe that the self-reported data are likely to be unbiased measures of true smoking behaviour in this study population.

Levels of smoking in this survey are higher than those reported amongst Tongan men in New Zealand (in 1981 50% aged 15 and over smoked regularly, as did 19% of Tongan women). However, the survey gives lower rates of smoking amongst men and women than reported by Finau et al. This seems unlikely to be due to differences in the definition of smoking, or age structures of the study populations (the sex-specific prevalence figures reported by Finau et al were not reached in any age category in the 1991 survey). If there has been a real decline in the prevalence of smoking, this is welcome. However, this is unlikely. Tonga imports all its tobacco products, and trade figures show that the quantity of cigarettes brought into the country rose by 50% from 1981 to 1990, during which time the national population increased by no more than 4-5% (unpublished, Department of Statistics). An unknown part of this rise may be due to increased tourism and duty-free shopping. Nevertheless the prevalence of smoking amongst Tongan men is higher than figures for most of the Pacific countries, and is more than twice the prevalence of smoking that now exists in New Zealand and Australia.

The pattern of smoking by age shows no sign of a cohort effect on uptake of smoking. The difference between the sexes is marked, and is greater in younger age groups. In Tonga smoking is said to be tolerated more readily amongst older women than younger, a social pattern that is repeated in a number of other countries in Asia, and this is consistent with the pattern shown in table 1.

Other studies in the Pacific have reported a stronger effect of income or education on smoking prevalence for men than women. This was not noted here – in this study the reduction in smoking prevalence with increasing years of education tended to be greater for women than men (table 2).

Finau et al. found that the prevalence of smoking was higher in urban than rural areas.
for women, although not for men. In this study
the prevalence of ever-smoking was higher
amongst men in all districts outside the capital
city than in Nuku’alofa (table 2), while the
reverse was true for women (with the exception
of Eua, where no difference was observed).
Very similar results were obtained for current
smoking. The distinction between urban and
rural residence in Tonga is not sharply defined.
Nevertheless, it is notable that smoking pat-
tterns differed between Nuku’alofa and the
remainder of the country, and that patterns
were not the same for men and women. Closer
examination of these differences may provide
clues for prevention. For example, there may
be a weakening in the city of traditional social
restrictions on smoking by young women, and
differences in disposable income and access to
cigarettes may apply between districts.

As far as the data in this study go, there is no
evidence that urban populations smoke more
heavily—the proportion of current smokers who
reported that they were smoking daily was
93% in Nuku’alofa, 94% in Eua, and 91% in
Ha’apai.

In this study, cessation rates tend to
increase with age, although in men the ratio of
ex-smokers to ever-smokers changes little until
age 70 and over. Women smokers are more
likely to report that they have stopped than
men, at all ages. Faau et al reported a similar
finding, and Waldron et al argue that in non-
Western societies in general women are more
likely to stop smoking than men. In contrast,
in developed countries quit rates tend to be
higher amongst men than women, although
the difference appears to be diminishing.14,15

It should be noted that this study relied
together on self-reporting, as has most research
carried out in developing countries. It is
possible that under-reporting of current smok-
ing by younger women, in response to per-
ceived social pressure, may contribute to the
pattern observed in figure 2.

Medical staff in Tonga report the impression
that women commonly stop smoking during
pregnancy, and this is strongly encouraged by
antenatal education and prevailing social atti-
tudes regarding pregnancy. Another possible
reason for a higher cessation ratio in women
may be that they tend to be lighter smokers
than men, and are more likely to have experi-
enced with smoking without establishing a
regular pattern of cigarette consumption. In
this population a lower proportion of female
ever-smokers had smoked at least once a week
for three months or more (92.5%) than male
ever-smokers (97.5%). However, when the
small group of "experimental" smokers was
excluded, the proportion of female ever-
smokers who had stopped smoking remained
considerably greater than amongst males (21%'
compared with 8%).

There was no association of cessation ratio
with years of education, amongst men or
women. Neither did the ratio of ex-smokers to
ever-smokers differ consistently between
Nuku’alofa and other districts, when the
results for men and women were examined
separately. If new behaviours begin in the
cities, one might hope to see rejection of
smoking first in the major urban area of Tonga,
but there is no sign in these data of such a
trend.

What effect may this pattern of smoking
have on future disease trends in Tonga? This
is an important question for public health and
the managers of health services, because it is
not known how closely the experience of
cohorts in developed countries will be repeated
in this region. The background of disease in
the Pacific differs from that in North America
or Europe. For instance, in the Pacific there is
an increasing frequency of vascular disease
associated with particular dietary patterns,
obesity, and possibly, genetic factors influ-
encing carbohydrate metabolism.16 These risk
factors may interact with the cardio-toxic
components of cigarette smoke to magnify the
effects of smoking on coronary heart disease
and peripheral vascular disease. Pacific
islanders may also be particularly susceptible
to smoking-related chronic obstructive lung
disease; Maori and other Polynesians are
known to suffer high background rates of
bronchiectasis,17 possibly due to genetic factors
and high rates of early childhood lower respira-
tory tract illness. The magnitude of the
disease burden due to smoking will vary also
with age of smoking initiation and daily
cigarette consumption, our study did not collect
information on these two important variables.

What steps should be taken to reduce
smoking and prevent smoking-related disease
in Tonga? Taxation of tobacco products has
been demonstrated elsewhere in the Pacific to
influence consumption strongly.4 There is no
local tobacco industry in Tonga and levies on
imported cigarettes have increased by 50% since
1989. In dollar terms the price of cigarettes is
approximately half that in Australia or New Zealand, although lower
disposable household incomes mean that cig-
aretes are less affordable in Tonga for most
people. Nevertheless, there is a strong case on
health grounds for further increases in the
taxes on the import and sale of tobacco.

There have been moves taken recently to
strengthen health education programmes
against smoking, with the assistance of non-
governmental organisations, and especially
in the area of antenatal education. However,
on the basis of our survey’s findings, there is
plainly a need to expand these activities. The
patterns of smoking for men and women are
very different and specific education strategies
will be indicated. It will be necessary also to
adopt other measures to inform the population
of the health risks of smoking. For example,
although cigarettes in Tonga are mainly manu-
factured in New Zealand or Australia, packets
carry no warning labels nor any information on
tar and nicotine content. Such information
should be provided, and a model which may be
considered in Tonga is the legislation on
cigarette packaging requirements that will
shortly be introduced in Australia. It would be
a mistake to simply reproduce the Australian
warnings—the health messages will very prob-
ably need to be adapted for use in Tonga, in terms of language and content. Research should be undertaken to identify the most effective warnings for the local population and these warning labels should then be made mandatory.

There are few restrictions at present in Tonga on the promotion of smoking. Advertising is permitted on radio and cigarette ads are widely promoted through newspapers, magazines, and billboards. Tobacco sponsorship of sport occurs, as it does throughout the Pacific (for example, Rothmans provided $400,000 sponsorship for the South Pacific Games in Papua New Guinea in 1991). With a fine touch of irony, Benson and Hedges (Tonga) recently publicised its image of social responsibility by sponsoring a child to travel to Australia for biliary tract surgery.

A tobacco control strategy for Tonga must contend with the interests that seek to maintain and expand use of tobacco products. Tonga should consider adopting the legislative measures introduced in Australia and New Zealand to prevent promotion of products now known to be the major preventable cause of ill-health, throughout the Pacific.

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