

Prevalence and concordance of smoking among mothers and fathers within the Pacific Islands Families Study

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Type of article: Original article.

Abstract

Cigarette smoking continues to contribute to the adverse mortality and morbidity rates for Pacific people in New Zealand. Using a large cohort study of Pacific families, this paper investigates the prevalence of smoking amongst Pacific mothers and fathers over three time-points, up to six years after the arrival of their child, to determine the concordance of both partners' reports of that smoking. Moreover, the patterns of smoking between partners were investigated over the three major Pacific ethnicities that reside in New Zealand (Samoan, Tongan and Cook Island Māori). Maternal self-report prevalence of smoking estimates ranged from 29.8% (1-year) to 33.6% (6-years). Paternal self-reported prevalence of smoking estimates were higher, and ranged from 37.9% (2-years) to 45.2% (6-years). The prevalence estimates for smoking in both mothers and fathers over all three measurement waves were higher than the 26.9% reported for Pacific people in the 2006/07 New Zealand Health Survey. No significant change in fathers' smoking prevalence over time was observed ($p=0.37$); however a significant increase in mothers' smoking prevalence over time was noted ($p=0.002$). Significantly, for about 25% of Pacific children both their parents were current smokers. Reducing infant exposure to tobacco smoke, by encouraging parents to quit smoking or banning smoking in the home and local environment (such as vehicles), is likely to bring about improved health outcomes for many Pacific children. Findings suggest that the interaction between parents should be considered rather than focusing on mothers' or fathers' smoking behaviour in isolation.

Introduction

Tobacco smoking kills up to half of all its users and is currently responsible for the death of one in ten adults worldwide – roughly 5 million deaths per year.¹ Smoking tobacco is a risk factor for six of the eight leading causes of death globally, and the economic effects of tobacco use are similarly distressing.^{1,2} These economic effects include not only the high health costs for treating tobacco-caused diseases, but the loss of prospective productivity and workforce capacity due to potential premature death.¹

In recent years cigarette smoking has been identified as one of the most preventable causes for premature death and poor health worldwide.³ Smoking harms nearly every organ and system in the body and has been linked to many cancers, including approximately 80% of lung cancer cases.⁴ Smoking has been acknowledged as a major cause of heart attacks, heart disease, stroke, respiratory diseases such as



emphysema and chronic bronchitis, and can also cause blindness, impotence and infertility.⁵ Perhaps of most concern is the significant impact smoking has on children's health either directly during pregnancy, or indirectly during childhood.⁶ These impacts include increased risk of serious respiratory tract conditions such as croup, bronchitis and pneumonia and increased risk of middle ear infections.⁶

Within the New Zealand context, it is estimated that half of all long-term smokers will die from a smoking related disease.⁶ Those smokers who die from a smoking-related illness lose on average 15 years of life compared with non-smokers.⁷ About 5,000 deaths each year in New Zealand are attributed to direct smoking or second hand smoke – approximately 13 people a day.⁷ Cigarette smoking continues to contribute to the adverse mortality and morbidity rates for Pacific people in New Zealand. Current statistics indicate that over one in four Pacific adults smoke (26.9%), and this is markedly higher than the general New Zealand European (18.6%) and Asian (11.2%) populations.⁸ In addition, the Pacific population is largely young,⁹ and evidence indicates an alarmingly high rate of smoking amongst youth. Findings from the National ASH Year 10 survey (with students typically 14–15 years of age) study on smoking show that despite a huge drop from 1999–2008,¹⁰ the prevalence of smoking is still too high amongst Pacific youth (7.2% of girls and 6.0% of boys smoking daily) compared to New Zealand European youth (3.7% of girls and 3.2% of boys smoking daily).¹⁰

Pacific people in New Zealand numbered 266,000 and comprised 6.9% of the population at the 2006 Census.⁹ Samoans constitute the largest ethnic group (49.2%), followed by Cook Island Māori (21.8%) and Tongans (19.0%); 60.0% were born in New Zealand and 65.8% lived in the Auckland urban area.⁹ This ethnic diversity is manifest in differing cultures, languages, generations of immigrants, and strength of acculturation.¹¹ However, Pacific peoples suffer from an excess of social, health and economic deprivation.¹² There is a growing recognition that issues which have a significant impact on Pacific people's lives need to be understood, of which parental smoking stands out.

While good information is available about men and women's smoking rates in New Zealand, there is little epidemiological information and understanding about Pacific mothers' and fathers' smoking status and the relationship between the smoking status of parents within a family setting despite the health impact this potentially wields over their children. If the public health approach to smoking cessation is based on the rigorous requirement of scientific method that moves from understanding and measuring the problem to finding, implementing and evaluating a solution,¹³ then such robust epidemiological information is essential. Using a large cohort study of Pacific families, this paper aims to determine the prevalence of smoking amongst Pacific mothers and fathers over three time-points, up to six years after the arrival of their child, and to determine the concordance of both partners' reports of that smoking. Moreover, the patterns of smoking between partners will be investigated over the three major Pacific ethnicities that reside in New Zealand (Samoan, Tongan and Cook Island Māori).

Methods

Study design

The Pacific Islands Families study (PIFS) follows a cohort of Pacific infants born at Middlemore Hospital, South Auckland, between 15 March and 17 December 2000.

Participants

All potential participants were selected from births where at least one parent was identified as being of Pacific Islands ethnicity and a New Zealand permanent resident. Recruitment occurred through the Birthing



Unit, in conjunction with the Pacific Islands Cultural Resource Unit. Information about the study was provided and consent was sought to make a home visit.

Procedure

Approximately 6-weeks postpartum, potential participants were allocated to a team of female Pacific interviewers fluent in both English and Pacific language(s). In most cases the interviewers were ethnically matched to the potential participant. The interviewers visited the potential participant in their own homes and fully described the study to the parent(s). Once eligibility was confirmed and informed consent obtained, mothers participated in one hour interviews concerning family functioning and the health and development of the child. This interview was conducted in the mother's preferred language.

When the children reached their first, second, fourth and sixth birthdays all maternal participants were re-contacted and revisited by a female Pacific interviewer. Again, consent was obtained before the interview was conducted in the mother's preferred language. At the time of the first, second and sixth year interviews, mothers were asked to give permission for a male Pacific interviewer to contact and interview the father of the child. If permission and paternal contact details were obtained then a Pacific male interviewer contacted the father to discuss participation in the study. Once informed consent was obtained, fathers participated in one-hour interviews concerning family functioning and the health and development of the child. This interview was conducted in the preferred language of the father. This study utilises maternal and paternal data from the 1-year, 2-years and 6-years measurement waves. Detailed information about the PIFS and procedures has been described elsewhere.^{14,15}

Smoking status

At all measurement waves, maternal and paternal smoking status was assessed using the following question from the survey: "How many cigarettes did you smoke yesterday?". Participants who answered with zero cigarettes were referred to in this study as 'non-smokers', and participants who answered more than zero cigarettes were referred to as 'smokers'.

Socio-demographic variables

Additional socio-demographic variables with known associations with smoking were incorporated in the analysis in order to identify whether the pattern of smoking concordance between mothers and fathers varied or was relatively stable. These variables included age, ethnicity, highest educational qualification, being New Zealand born and household income. Even though age, highest educational qualification and household income are time-varying, baseline values were used throughout. Ethnicity classifications included: 'Other Pacific' for participants who were identified equally with two or more Pacific Island groups or with a Pacific Island ethnic group that was not Samoan, Tongan or Cook Island Māori; and 'Non-Pacific' for participants who were eligible for the PIFS due to the Pacific ethnicity of their partner.

Statistical analysis

Prevalence estimates and 95% confidence intervals (CIs) were made using the binomial distribution. Concordance between response pairs was measured using the kappa (κ) statistic. Using Landis and Koch's characterisation,¹⁶ $\kappa > 0.75$ was taken to represent strong agreement, $\kappa < 0.40$ to represent poor agreement and $0.40 \leq \kappa < 0.75$ to represent moderate agreement beyond chance. Symmetry of the discordant observations was compared using McNemar's test.¹⁷ Linear trends in prevalence estimates of smoking status over time were investigated separately for mothers and fathers using binomial generalised estimate equation



(GEE) models, with unstructured correlation between repeated measures. Comparisons of categorical and continuous response distributions between groups were made using Fisher's exact test and Wilcoxon's rank sum test, respectively. SAS version 9.2 (SAS Institute Inc., Cary, NC, US) was used for all computations and a significance level of $\alpha=0.05$ defined statistical significance.

Ethical clearance

Careful consideration is always applied to the ethical aspects of this longitudinal study with Pacific peoples. Ethical approval for the PIFS was obtained from the Auckland Branch of the National Ethics Committee, the Royal New Zealand Plunket Society, and the South Auckland Health Clinical Board.

Results

In total, 1,477 mothers were eligible for the PIFS, 1,376 (93.2%) participated at the baseline 6-weeks interview, 1,224 (82.9%) completed the 1-year interview, 1,144 (77.5%) completed the 2-years interview and 1,001 (67.8%) completed the 6-years interview. At baseline, the ethnic frequencies of the PIFS cohort were broadly similar to those seen in the general New Zealand Pacific population.^{14,15}



Table 1. Frequencies and percentages of socio-demographic variables for participating mothers and fathers over 1-year, 2-year and 6-year measurement waves.

	Mothers			Fathers		
	1-year n (%)	2-years n (%)	6-years n (%)	1-year n (%)	2-years n (%)	6-years n (%)
<i>Age (years) at baseline</i>						
<20	91 (7.4)	84 (7.3)	73 (7.3)	17 (2.1)	11 (1.8)	6 (1.4)
20-24	314 (25.7)	282 (24.7)	241 (24.1)	148 (18.0)	101 (16.9)	61 (13.9)
25-29	325 (26.6)	306 (26.8)	278 (27.8)	204 (24.8)	136 (22.7)	107 (24.4)
30-34	291 (23.8)	275 (24.1)	229 (22.9)	228 (27.7)	169 (28.3)	127 (28.9)
≥35	202 (16.5)	196 (17.1)	179 (17.9)	226 (27.5)	181 (30.3)	138 (31.4)
<i>Ethnicity</i>						
Samoaan	589 (48.1)	545 (47.6)	463 (46.3)	440 (53.3)	350 (58.3)	213 (48.4)
Tongan	242 (19.8)	242 (21.2)	218 (21.8)	199 (24.1)	121 (20.2)	143 (32.5)
Cook Island Māori	214 (17.5)	190 (16.6)	174 (17.4)	73 (8.8)	50 (8.3)	32 (7.3)
Other Pacific	94 (7.7)	85 (7.4)	78 (7.8)	54 (6.5)	39 (6.5)	28 (6.4)
Non-Pacific	85 (6.9)	82 (7.2)	68 (6.8)	59 (7.2)	40 (6.7)	24 (5.5)
<i>Highest educational qualification at baseline</i>						
No formal qual.	467 (38.2)	429 (37.5)	371 (37.1)	481 (58.4)	345 (57.7)	271 (61.9)
Secondary	415 (33.9)	391 (34.2)	358 (35.8)	220 (26.7)	163 (27.3)	96 (21.9)
Post-secondary	342 (27.9)	324 (28.3)	272 (27.2)	122 (14.8)	90 (15.1)	71 (16.2)
<i>New Zealand born</i>						
Yes	411 (33.6)	376 (32.9)	341 (34.1)	203 (24.6)	149 (24.8)	95 (21.6)
No	813 (66.4)	768 (67.1)	660 (65.9)	621 (75.4)	541 (75.2)	345 (78.4)
<i>Household income at baseline</i>						
≤\$20,000	398 (32.5)	364 (31.8)	331 (33.1)	216 (26.2)	185 (24.4)	152 (25.7)
\$20,001-\$40,000	639 (52.2)	600 (52.4)	511 (51.0)	486 (58.9)	455 (60.1)	333 (56.3)
>\$40,000	146 (11.9)	143 (12.5)	120 (12.0)	103 (12.5)	102 (13.5)	85 (14.4)
Unknown	41 (3.3)	37 (3.2)	39 (3.9)	20 (2.4)	15 (2.0)	21 (3.6)



At the 1-year interview, 999 mothers had partners who were able to act as collateral respondents, of whom 825 (83%) consented and completed the interview. Some 757 and 591 fathers participated at the 2-years and 6-years measurement waves, respectively.^{14,15} Respondents' baseline socio-demographic characteristics over the three measurement waves are presented in Table 1. While there has been attrition over the course of the PIFS, the relatively frequencies of the presented socio-demographics appear relatively stable over these three measurement waves.

Prevalence of smoking

The prevalence and associated 95% CIs of smoking by mothers and fathers over the three measurement waves are summarised in Table 2. Maternal self-report prevalence of smoking estimates ranged from 29.8% (1-year) to 33.6% (6-years). Paternal self-reported prevalence of smoking estimates were significantly higher than maternal values, and ranged from 37.9% (2-years) to 45.2% (6-years). No significant change in fathers' smoking prevalence over time was observed (OR 0.99, 95% CI: 0.96, 1.01, $p=0.37$); however a significant change in mothers' smoking prevalence over time was noted (OR 1.04, 95% CI: 1.01, 1.06, $p=0.002$). This implies that the odds of maternal smoking increased by an average of 1.04 compared to the previous year for every year postpartum in the 1-6 year period.

When investigating the rate of attrition for mothers who smoked at the 1-year compared to non-smoking mothers, no differential attrition was noted at the 2-years (Fisher's exact test, $P=0.64$) or 6-years (Fisher's exact test, $P=0.88$) measurement waves. Similarly, when investigating the rate of attrition for fathers who smoked at the 1-year compared to non-smoking mothers, no differential attrition was noted at the 2-years (Fisher's exact test, $P=0.75$) or 6-years (Fisher's exact test, $P=0.18$) measurement waves.

Smoking concordance

The distributions of the smoking status of couples over measurement waves 1-year, 2-years and 6-years, together with associated kappa (κ) statistics and 95% CIs and McNemar's p -values are presented in Table 3. Approximately half of couples were of two non-smokers and between 14.4% and 19.8% were of two smokers over the three measurement waves. There was significant asymmetry between discordant smoking status relationships (all McNemar's $P<0.001$), with many more smoking fathers coupled with non-smoking mothers than vice versa. In approximately a quarter of couples the fathers self-reported as being smokers and mothers self-reported as being non-smokers over the three measurement waves, while between 7.6% and 10.4% of couples consisted of smoking fathers and non-smoking mothers (Table 3).



Table 2. Prevalence (%) of smoking among participating mothers and fathers over the 1-year, 2-year and 6-year measurement waves.

	1-year		2-years		6-years	
	n	smokers prevalence (95% CI)	n	smokers prevalence (95% CI)	n	smokers prevalence (95% CI)
Mother	1,219	29.8 (27.2, 32.4)	1,136	30.6 (28.0, 33.4)	987	33.6 (30.7, 36.7)
Father	823	40.6 (37.1, 43.9)	756	45.2 (41.7, 48.9)	585	37.9 (34.0, 42.0)

Table 3. Distribution of the smoking status of couples over measurement waves 1-year, 2-years and 6-years, together with associated kappa (κ) statistics and 95% confidence intervals (95% CIs) and McNemar's p-values.

Measurement wave	Mother:		Non-smoker		Smoker		McNemar's P-value
	Father:	Non-smoker n (%)	Smoker n (%)	Non-smoker n (%)	Smoker n (%)	k (95% CI)	
1-year		404 (49.4)	80 (9.8)	204 (25.0)	129 (15.8)	0.24 (0.17, 0.30)	<0.001
2-years		354 (47.1)	57 (7.6)	191 (25.4)	149 (19.8)	0.31 (0.25, 0.37)	<0.001
6-years		296 (51.3)	60 (10.4)	138 (23.9)	83 (14.4)	0.22 (0.14, 0.30)	<0.001

Table 4. Distribution of the relationship between mothers' and fathers' smoking status by major ethnic groupings at the 1-year measurement wave, together with associated kappa (κ) statistics and 95% confidence intervals (95% CIs) and McNemar's p-values.

Mother's ethnicity	Mother:		Non-smoker		Smoker		McNemar's P-value
	Father:	Non-smoker n (%)	Smoker n (%)	Non-smoker n (%)	Smoker n (%)	k (95% CI)	
Samoa		214 (56.9)	32 (8.5)	85 (22.6)	45 (12.0)	0.24 (0.14, 0.34)	<0.001
Non-Samoan		28 (45.9)	11 (18.0)	13 (21.3)	9 (14.8)	0.13 (0.00, 0.38)	0.68
Tongan		19 (31.1)	6 (9.8)	16 (26.2)	20 (32.8)	0.30 (0.07, 0.52)	0.03
Non-Tongan		76 (47.8)	10 (6.3)	57 (35.8)	16 (10.1)	0.11 (0.00, 0.23)	<0.001
Cook Island Māori		8 (47.1)	2 (11.8)	5 (29.4)	2 (11.8)	0.09 (0.00, 0.54)	0.26
Non-Cook Island Māori		17 (45.9)	2 (5.4)	10 (27.0)	8 (21.6)	0.34 (0.07, 0.62)	0.02
Cook Island Māori		21 (50.0)	3 (7.1)	8 (19.0)	10 (23.8)	0.45 (0.18, 0.72)	0.13
Non-Cook Island Māori		18 (29.5)	10 (16.4)	12 (19.7)	21 (34.4)	0.28 (0.04, 0.52)	0.67
Cook Island Māori		14 (46.7)	3 (10.0)	5 (16.7)	8 (26.7)	0.45 (0.12, 0.77)	0.48



When considering the number of cigarettes smoked yesterday, mothers who smoked and had smoking partners self-reported consuming significantly more cigarettes than mothers who smoked and had non-smoking partners at the 1-year measurement wave ($P < 0.001$) but not at the 2-years ($P = 0.59$) or 6-years ($P = 0.86$) measurement waves. The median (Q1, Q3) self-reported cigarette consumption for mothers who smoked and had smoking partners was 5 (4, 10), 5 (4, 10) and 6 (4, 10) over the 1-year, 2-year and 6-year measurement waves respectively, while the median (Q1, Q3) self-reported cigarette consumption for mothers who smoked and had non-smoking partners was 4 (2, 5), 5 (4, 8) and 5 (4, 10). When considering fathers who smoked, there was no difference in their self-reported cigarette consumption between those who had a smoking partner and those who had a non-smoking partner over all measurement waves (all Wilcoxon's rank sum tests $P > 0.05$). The median (Q1, Q3) self-reported cigarette consumption for fathers who smoked and had smoking partners was 10 (6, 13), 10 (5, 14) and 10 (6, 15) over the 1-year, 2-year and 6-year measurement waves respectively, while the median (Q1, Q3) self-reported cigarette consumption for fathers who smoked and had non-smoking partners was 10 (6, 15), 8 (5, 14) and 10 (6, 15).

The distributions of the smoking status of couples by the three major maternal and paternal ethnic groupings (Samoan, Tongan and Cook Island Māori) at the 1-year measurement wave are presented in Table 4, to identify whether important and different patterns emerged. A significant difference in the distribution of smoking status existed between Samoan mothers and fathers (Fisher's exact test, $P < 0.001$) and between Tongan mothers and fathers ($P < 0.001$), but none was found for Cook Island Māori ($P = 0.13$) mothers and fathers. In particular, significantly more couples with non-Samoan mothers and Samoan fathers were both smokers (32.8%) than couples with Samoan mothers and Samoan fathers (12.0%) or Samoan mothers and non-Samoan fathers (14.8%). This pattern was also apparent in the 2-year and 6-year measurement wave distributions; it was significant in the 2-years distributions (Fisher's exact test, $P = 0.04$) but not in the 6-years distributions (Fisher's exact test, $P = 0.25$) due to the reduced sample numbers (data not shown).

Discussion

Prevalence estimates for smoking in both mothers and fathers over all three measurement waves were higher than the 26.9% reported in the 2006/07 New Zealand Health Survey.⁸ Indeed, 45.2% of fathers within the PIFS self-reported smoking at the 2-years measurement wave; a prevalence figure 67% higher than the national health survey figure. Comparison with national data and trends indicates the prevalence of cigarette smoking among Pacific people has fluctuated between 30% and 38% over the 5 years from 2000 to 2005.¹⁸ However, between 2006 and 2008 the percentage of Pacific smokers decreased by nearly 5%, with similar levels of decline amongst Pacific males and females.¹⁹ This trend of decline is encouraging given the concerted efforts to reduce Pacific tobacco consumption, and improve the health and well-being of Pacific families in New Zealand.

While no significant change in fathers' smoking prevalence over time was observed, a significant increase in mothers' smoking prevalence over time was noted. This result suggests that mothers smoking prevalence may be returning to pre-pregnancy smoking levels. Previous research has found that many women modify their smoking behaviour once they discover they are pregnant.²⁰ Women who quit smoking at this stage are often a highly motivated group that are very successful in abstaining throughout their pregnancy.²¹ However, these women are often susceptible to very high rates of relapse postpartum²¹, with one study estimating that between 29-85% of women who quit smoking as a result of pregnancy relapse after delivery.²² Supporting mothers to stay abstinent during pregnancy as well as postpartum could be a cost effective use of cessation resources as they are likely to be a very motivated group.²³ Research from Melvin and



colleagues suggests that recognition and encouragement of mothers, including affirming their decision to quit, describing the health benefits for them and their baby, and encouraging them to remain abstinent, may be helpful in preventing relapse.²⁴

While the concordance of smoking between mothers and fathers was statistically significant, it was classified as being poor over each of the three measurement waves – according to the classification of Landis and Koch.¹⁶ Moreover, there was significant asymmetry seen between the smoking status of parents, with fathers being more likely than mothers to be the smoker in one-smoker couples. This might be predicted from the difference between maternal and paternal smoking prevalence noted above. However, what this study empirically demonstrates is the extent to which the smoking behaviour of coupled mothers and fathers overlaps. Specifically, around 50% of Pacific children have parents that both do not smoke, although other members of the household not surveyed in this study may be smokers. Naturally, this implies that at least half of Pacific children are subject to at least one smoking parent. Clearly, unless parents are proactive in shielding or eliminating environmental tobacco smoke from their children's environment, a large proportion of Pacific children are likely to be exposed and face the myriad of sequelae causally related to cigarette smoke.⁶

Significantly, around 25% of Pacific children had both their mothers and fathers who smoke. It is likely that these children are at the greatest risk of being exposed to environmental tobacco smoke. Tobacco smoke from both mothers and fathers makes substantial contributions to infant exposure to tobacco smoke, and the relationship is complex, as consumption levels and smoking attitudes can be different for parents when both smoke versus couples where only one partner smokes, as demonstrated here and elsewhere.²⁵ This interaction between parents needs to be considered rather than focusing on mothers' or fathers' smoking behaviour in isolation.²⁵ Health promotion programmes need to place more emphasis on tackling fathers' smoking. Currently, fathers' smoking receives far less research or health promotion attention than mothers' smoking. Protecting infants from fathers' as well as mothers' smoking is key to reducing environmental tobacco exposure, especially among Pacific children.

When investigating whether importantly different ethnic patterns of parental smoking concordance existed, a significant difference was found between non-Samoan mother and Samoan father couples (with 32.8% both smokers) and the Samoan mother and Samoan father couples (with 12.0% both smokers) and Samoan mother and non-Samoan father couples (with 14.8% both smokers). However, it is unclear whether this is explained by differences in socioeconomic status, a spurious association through multiple testing, or is indicative of a difference in maternal behaviours and influences amongst Samoan mothers. No such difference was found between Tongan or Cook Island Māori couple combinations.

The PIFS has many salient strengths, including that it follows a large birth cohort over time, it involves the family triad (mother, father and child) and it has achieved a relatively small attrition rate to date.^{14,15} Moreover, no differential attrition associated with smoking status over time was observed in the study for either mothers or fathers. Thus the missing data were likely to be missing at random, not differentially related to smoking status and yielding importantly biased estimates. Arguably, the most important limitation of this study is the reliance on self-report of smoking, not validated by any biochemical tests. However, self-reported data on current smoking status can have high validity, and this has been demonstrated in previous research regarding the prevalence of smoking measured using self-report data.²⁶ Moreover, the question used in the PIFS - "How many cigarettes did you smoke yesterday", differs from the question used in other



tobacco surveys in New Zealand e.g. "On a typical day how many cigarettes do you smoke?".⁷ While the question in the PIFS is likely to capture information on current smokers, there are limitations to its ability to capture "intermittent" or "daily" smokers. Nevertheless, previous research has utilised this question.²⁷ Furthermore, additional investigations have established the utility of self-report data as a reliable indicator of smoking status, particularly within population based studies^{28,29}. Another limitation is that smoking behaviour was not elicited from either parent, so it is unknown whether parents of Pacific children routinely engage in protective practices such as smoking outdoors and having smokefree vehicles. There is a need to explore in further depth the reasoning behind the results seen within, thus motivating the need for focus groups and further exploration into the attitudes and behaviours of smoking amongst Pacific parents.

Reducing infant exposure to tobacco smoke, by encouraging parents to quit smoking or banning smoking in the home and local environment (such as vehicles), is likely to bring about improved health outcomes for many Pacific children. However, unlike mothers' smoking, very few studies have examined the factors linked to fathers' smoking.²⁵ Although men's smoking has received some research attention, men as fathers have received scant attention in the literature on smoking, their motivations and behaviours. Yet smoking fathers are a potential major contributor to the environmental tobacco exposure within a household; especially with their higher smoking prevalence and their generally higher cigarette consumption. Findings here and elsewhere²⁵ suggest that the interaction between parents should be considered rather than focusing on mothers' or fathers' smoking behaviour in isolation. Health promotion programmes need to focus on both fathers and mothers. However, the scant information in the literature about fathers' smoking means there is little research to underpin such health promotion programmes. Research efforts are thus urgently needed in this area to help prevent Pacific people's premature death and poor health.

References

1. World Health Organization. *WHO Report on the Global Tobacco Epidemic*. Geneva: World Health Organization; 2008.
2. Guindon G. *The cost attributable to tobacco use: a critical review of the literature*. Geneva: World Health Organization; 2006.
3. Jha P, Chaloupka FJ. *Tobacco control in developing countries*. Oxford, UK: Oxford University Press; 2000.
4. World Health Organization. *The tobacco health toll*. Cairo: WHO Regional Office for the Eastern Mediterranean; 2005.
5. Tobacco Control Research Steering Group. *Tobacco Control Research Strategy for New Zealand 2009-2012*. Wellington: Health Sponsorship Council; 2009.
6. Ministry of Health. *Tobacco Control and Smoking: Health Effects of Smoking*. 2008; <http://www.moh.govt.nz/moh.nsf/indexmh/tobacco-effects>. Accessed 21 September, 2010.
7. Ministry of Health. *Tobacco Trends 2008: A Brief Update of Tobacco Use in New Zealand*. Wellington: Ministry of Health; 2009.
8. Ministry of Health. *A Portrait of Health. Key Results of the 2006/07 New Zealand Health Survey*. Wellington: Ministry of Health; 2008.
9. Statistics New Zealand and Ministry of Pacific Island Affairs. *Demographics of New Zealand's Pacific Population*. Wellington: Statistics New Zealand and Ministry of Pacific Island Affairs; 2010.
10. Paynter J. *National Year 10 ASH snapshot survey, 1999-2009: trends in tobacco use by students aged 14-15 years*. Auckland, New Zealand: Action on Smoking and Health (ASH); 2010.



11. Borrows J, Williams M, Schluter P, Paterson J, Helu SL. Pacific Islands Families Study: The association of infant health risk indicators and acculturation of Pacific Island mothers living in New Zealand. *J Cross Cult Psychol.* 2010;[Epub]:DOI: 10.1177/0022022110362750.
12. Ministry of Health. *Te Ora Ora: Pacific Mental Health Profile.* Wellington: Ministry of Health; 2005.
13. Rothman KJ, Greenland S. *Modern Epidemiology.* 2nd ed. Philadelphia: Lippincott-Raven; 1998.
14. Paterson J, Tukuitonga C, Abbott M, et al. Pacific Islands Families: First Two Years of Life Study - design and methodology. *N Z Med J.* 2006;119(1228):U1814.
15. Paterson J, Percival T, Schluter P, et al. Cohort profile: The Pacific Islands Families (PIF) Study. *Int J Epidemiol.* 2008;37(2):273-279.
16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33(1):159-174.
17. Agresti A. *Categorical data analysis.* New York: Wiley; 1990.
18. Ministry of Health. *Tobacco Trends 2006: Monitoring tobacco use in New Zealand.* Wellington: Ministry of Health; 2006.
19. Ministry of Health. *New Zealand Tobacco Use Survey 2008.* Wellington: Ministry of Health; 2008.
20. Alliston L, Kapa J, Nosa V, Dowden A, Taylor S. *Promoting smokefree pregnancies: A review of international and New Zealand literature.* Wellington: BRC Marketing and Social Research; 2005.
21. Solomon L, Quinn, V. Spontaneous quitting: Self-initiated smoking cessation in early pregnancy. *Nicotine and Tobacco Research.* 2004;6(S2):203-216.
22. Fang W, Goldstein A, Butzen A. Smoking cessation in pregnancy: A review of postpartum relapse prevention strategies. *J Am Board Fam Pract.* 2004;17(4):264-275.
23. Panjari M, Bell R, Astbury J. Women who spontaneously quit smoking in early pregnancy. *Aust N Z J Obstet Gynaecol.* 1997;37(3):271-278.
24. Melvin C, Dollan-Mullen P, Windsor R. Recommended cessation counselling for pregnant women who smoke: A review of the evidence. *Tob Control.* 2000;9(S3):80-84.
25. Blackburn CM, Bonas S, Spencer NJ, Coe CJ, Dolan A, Moy R. Parental smoking and passive smoking in infants: fathers matter too. *Health Educ Res.* 2005;20(2):185-194.
26. Patrick DL, Cheadle A, Thompson DC, Diehr P, Koepsell T, Kinne S. The validity of self-reported smoking: a review and meta-analysis. *Am J Public Health.* 1994;84(7):1086-1093.
27. Tappin D, Lumsden M, McIntyre D, McKay C, Gilmour W, Webber R, Cowan S, Crawford F, Currie F. A pilot study to establish a randomized trial methodology to test the efficacy of a behavioural intervention trial. *Health Educ Res.* 2000;15(4):491-502.
28. Vartiainen E, Seppala T, Lillsunde P, Puska P. Validation of self reported smoking by serum cotinine measurement in a community based study. *J Epidemiol Community Health.* 2002;56:167-170.
29. Rebagliato M. Validation of self-reported smoking. *J Epidemiol Community Health.* 2002;56:163-164.

