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Smoking rates in Pacific islands

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The study reports data on the prevalence of smoking in the following Pacific islands: Cook Islands, Fiji, Kiribati, Nauru, New Caledonia, Niue, Tuvalu, and Western Samoa. A large variation was found in the prevalence of smoking among the populations surveyed. On Kiribati, for example, almost 90% of men and 74% of women were daily smokers, whereas on the Cook Islands 38% of men and 19% of women smoked. In contrast, less than 4% of the female population of Fiji smoked. Smoking was usually more common in rural than urban areas. More data, especially on trends in the prevalence of smoking in these populations, are needed to implement effective anti-smoking policies and to evaluate their outcome.

It is well known that there is a high risk of chronic, non-communicable diseases such as cardiovascular disorders, cancer, and diabetes among many Pacific populations. Prevention and control of major epidemics of these diseases in the Pacific islands must therefore be based on urgent steps directed at reducing the prevalence of smoking.

Tobacco smoking is practised worldwide and its introduction to any country is associated with immense health problems. The risk of a smoker dying before 65 years of age is twice that of a non-smoker (*1*), and it has been estimated that, in the world as a whole, cigarette smoking is now responsible for more than 1 million premature deaths annually. The effects of smoking on health have been a subject of concern in developed countries. In contrast, most developing countries have had to face other more exigent health problems, but authorities in these countries are now becoming increasingly aware of the health hazards of cigarette smoking.

Apart from the increasing mortality rates, smoking results in increased morbidity, excessive demands on medical services, and loss of working days (*2*). The impact of these effects is particularly marked in developing countries, and because of the perpetual shortage of health-care resources in these countries the additional burden of treating smoking-related diseases may be intolerable (*3*).

In the Pacific island countries and territories, action is needed to prevent the health problems associated with smoking from reaching the levels they have already assumed in the majority of developed nations. Here we report data on smoking rates in the Cook Islands, Fiji, Kiribati, Nauru, New Caledonia, Niue, Tuvalu, and Western Samoa (Fig. 1). The data were collected between 1975 and 1981 during diabetes-cardiovascular surveys carried out by an

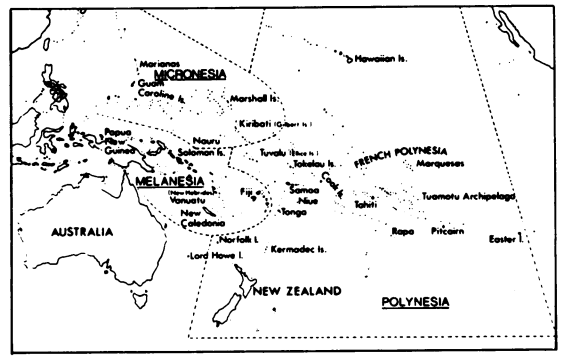

Fig. 1. Map showing the Pacific islands surveyed.

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MATERIALS AND METHODS

The study is based on data collected from adults aged ⩾20 years, except that in Tuvalu and Nauru the survey included persons ⩾10 and ⩽15 years, respectively. The samples studied were representative of the overall adult populations in the countries concerned. The sampling and survey procedures used in the study areas were as follows:

Nauru

The survey was carried out in May 1975. Of the 304 inhabitants identified, 221 (73%) took part (107 male, 114 female) (*4*). Age and sex distributions corresponded to those of the overall island population determined in an actuarial survey carried out in 1972 (Table 1).

Western Samoa

The survey was carried out in August and September 1978 by the local health staff during house-to-house visits (*5*). Altogether, 1992 people (1003 males and 989 females) in two rural areas and one urban area were identified. The response rate varied from 70.1% to 85.5%. There were no significant differences between the two rural samples and hence data were combined for the purpose of the analysis.

The age and sex distributions of the Western Samoa survey population are shown in Table 1. For the age group 45–54 years the response rate was slightly higher than that of the other age groups, resulting in slight overrepresentation of this group in the sample.

Table 1. Number of persons in the study, stratified by age

	Age group (years)											
	20–24		25–34		35–44		45–54		⩾55		Total	
Country or area	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Cook Islands	72	75	129	150	109	155	112	111	121	93	543	584
Niue	104	80	122	123	108	146	95	101	119	151	548	601
Fiji												
Melanesian												
Urban	55	76	120	125	78	112	77	84	71	65	401	462
Rural	39	36	68	71	48	44	40	41	47	43	242	235
Lakeba (Island)	28	36	53	51	52	50	37	34	44	45	214	216
Asian Indian												
Urban	68	81	119	152	77	90	55	80	65	59	384	462
Rural	33	39	67	71	50	52	35	47	29	29	214	238
Kiribati												
Urban	79	114	97	124	98	114	93	98	107	114	474	564
Rural	177	225	323	335	230	219	147	142	62	86	939	1007
Nauru	121	148	51	64	59	58	42	39	26	30	299	339
New Caledonia												
Urban	52	97	163	214	208	205	158	146	87	92	668	754
Rural	106	144	117	150	102	112	88	114	113	160	526	680
Tuvalu	144	169	58	65	47	57	60	50	37	44	346	385
Western Samoa												
Urban	57	60	65	84	57	83	77	90	69	102	325	419
Rural	74	60	61	84	69	84	70	74	84	85	358	387

Tuvalu

The survey, carried out in October 1976, identified 595 candidates, 77 of whom failed to participate. Since 59 individuals volunteered separately, there were 577 participants (269 male, 308 female) (*6*). The age and sex distributions of the survey population in Tuvalu are shown in Table 1.

Fiji

The first of the two survey populations selected in Fiji consisted of rural Melanesians and Asian Indians from the Sigatoka Valley, while the second consisted of urban Melanesians and Asian Indians from Suva on the main Fijian island of Niti Levu.

Rural sample: The Sigatoka Valley was selected because it is the only relatively isolated rural area in Fiji where substantial numbers of Melanesians and Indians live in close proximity, although usually in different settlements or villages.

Urban sample: The Melanesian study population lived in districts of Suva, whose populations are quite stable. The Indians lived in the suburb of Samabula, which was selected because it contains the highest density of Indian residents in Suva. Samabula is a typical suburb, similar in many ways to those in developed countries.

The survey was carried out in March and April 1980 in the course of house-to-house visits by local nursing staff (*7*). The level of response of the urban populations was good (Melanesians, 87.5%; Indians, 89.6%). Response rates among the rural populations in Sigatoka Valley were lower (Melanesians, 83.2%; Indians, 83.7%). The age and sex distributions of the Fijian survey population are shown in Table 1. The sample conformed closely to the age and sex distributions found in the Fijian population in the 1976 national census.

New Caledonia

In the urban survey conducted in 1979 in New Caledonia, 1422 people (668 males, 754 females) participated, and in the rural sample 1206 persons (526 males, 680 females) (*8*). The age and sex distributions of the participants are shown in Table 1.

Cook Islands and Niue

The survey was conducted in October 1980. The response rates varied between 77% and 91%, according to age groups. The overall response rate was 81% (*9*). For Niue the sample consisted of the entire population of 1201 (response rate, 96%) (*9*). The sample in the Cook Islands consisted of 1127 persons (543 males and 584 females). The survey was carried out by local health staff in the course of house-to-house visits.

Kiribati

The survey was conducted in April 1981, and 2938 people from rural (1038) and urban (1900) areas (*10*) were identified. In both areas the response rate was over 80% for both sexes. The age and sex distributions of the survey population are shown in Table 1. For both sexes there was a higher proportion of older people in the rural than in the urban population. This difference was significant, and was taken into account in all rural–urban comparisons.

The survey procedures used were the same in all the study areas and are described below.

Survey procedure

All study subjects were asked to fast overnight (about 12 hours) and come to the local survey centre, where their age, sex, occupation, and marital status were recorded. A blood sample was taken and a 75-g oral glucose load[a] administered. Any history in the family of diabetes or cigarette smoking, whether the individual was taking drugs, details of any known diseases, and, for women, obstetric history were recorded. The height, weight, triceps skinfold thickness, and blood pressure of each participant were also measured.

Two hours after intake of the glucose load, venous blood samples were drawn into tubes[b] containing 30 mg sodium fluoride. All blood samples were centrifuged, separated, frozen, and stored. At the end of the survey, they were sent to Melbourne, Australia, where the biochemical analyses were performed.

Data on smoking were collected by individual interview at local clinics and recorded on prestructured survey forms. Local health workers or other survey assistants carried out the interviews in the local language. Persons were classified into one of the following categories: non-smoker; ex-smoker; or daily smoker. Data on the average number of cigarettes smoked per day were also obtained, and smokers were then subgrouped in terms of their daily consumption of cigarettes: <20, 20–40, and >40 cigarettes per day.

The association between smoking and certain socioeconomic parameters, defined as described below, was also tested.

[a] Glucomet, available from Medos, Melbourne, Australia.

[b] Vacutainer, No. 4752, available from Becton Dickinson, Rutherford, NJ, USA.

Income level: low—high. Individuals were allocated at the time of interview. Different criteria for "low" and "high" were used depending on the populations being surveyed.

Alcohol consumption: No—yes. Individuals who reported at the interview that they drank alcohol, no matter how little the amount, were classified as alcohol users.

Marital status: single—married—other. The category "other" included mainly individuals who were widowed, separated, or divorced.

Physical activity: low—high. Individuals were grouped into these categories at the time of interview. Different criteria for "low" and "high" were used in the separate populations.

RESULTS

Table 2 shows the prevalence of smoking as a function of age among the populations surveyed. The highest prevalence among men was found in Kiribati and among the rural Melanesian population of Fiji. In general, the prevalence of smoking among men in rural populations was generally significantly greater in rural than in urban populations. The prevalence of smoking varied greatly among the study populations. At one extreme, 88% of men on Kiribati smoked, whereas at the other, only 38% of men in Rarotonga (Cook Islands) smoked. The highest prevalence of smoking among women was also found on Kiribati, and the level among the female rural Melanesian population in Fiji was also relatively high (Table 2). The lowest prevalence of smoking among women was

Table 2. Prevalence of smoking in men and women, stratified by age

Country or area	Percentage prevalence of smokers by age group					
	20–24 years	25–34 years	35–44 years	45–54 years	⩾55 years	Total
Cook Islands	33 (23)[a]	40 (26)	39 (17)	40 (19)	36 (8)	38 (19)
Niue	43 (15)	61 (17)	58 (25)	68 (15)	60 (11)	58 (17)
Fiji						
Melanesian						
Urban	60 (38)	68 (32)	69 (29)	68 (35)	63 (34)	66[b] (33)[b]
Rural	87 (22)	93 (37)	86 (64)	80 (71)	92 (63)	88[b] (50)[b]
Lakeba (Island)	64 (50)	70 (41)	79 (42)	81 (59)	73 (62)	74 (50)
Asian Indian						
Urban	43 (1)	43 (0)	48 (6)	38 (9)	37 (9)	42[b] (4)[b]
Rural	49 (0)	57 (4)	68 (29)	69 (43)	72 (48)	62[b] (22)[b]
Kiribati						
Urban	95 (63)	90 (75)	91 (78)	84 (71)	83 (82)	88[d] (74)[c]
Rural	85 (57)	83 (68)	84 (73)	87 (66)	79 (61)	84[d] (66)[c]
Nauru	32 (57)	73 (66)	58 (50)	71 (67)	69 (67)	53 (59)
New Caledonia						
Urban	67 (23)	77 (17)	75 (26)	75 (40)	86 (58)	76[b] (29)[b]
Rural	22 (3)	33 (13)	52 (21)	48 (24)	50 (20)	41[b] (16)[b]
Tuvalu	37 (17)	57 (48)	64 (32)	65 (54)	60 (32)	51 (31)
Western Samoa						
Urban	47 (17)	60 (10)	70 (21)	61 (21)	46 (18)	57[b] (17)[b]
Rural	66 (7)	71 (20)	90 (27)	80 (39)	70 (38)	75[b] (27)[b]

[a] Figures in parentheses refer to women, without parentheses to men.
[b] $P<0.001$ in χ^2-test.
[c] $P<0.01$ in χ^2-test.
[d] $P<0.05$ in χ^2-test.

Table 3. Prevalence of ex-smokers among men and women in the survey population, stratified by age

Country or area	Percentage prevalence of ex-smokers by age group					
	20–24 years	25–34 years	35–44 years	45–54 years	⩾55 years	Total
Cook Islands	14 (11)[a]	16 (15)	17 (11)	19 (14)	13 (7)	16 (12)
Niue	5 (5)	7 (9)	12 (5)	12 (7)	17 (4)	10 (9)
Fiji						
Melanesian						
Urban	7 (3)	8 (8)	8 (5)	13 (11)	14 (22)	10 (9)
Rural	3 (6)	4 (6)	8 (11)	10 (7)	6 (26)	6 (11)
Lakeba (Island)	4 (33)	6 (2)	4 (2)	11 (6)	21 (18)	9 (7)
Asian Indian						
Urban	3 (0)	6 (0)	9 (1)	13 (1)	5 (9)	7 (2)
Rural	3 (0)	3 (0)	8 (0)	3 (0)	0 (7)	4 (1)
Kiribati						
Urban	1 (7)	5 (5)	3 (8)	11 (12)	14 (6)	7 (7)
Rural	3 (4)	5 (5)	6 (6)	5 (7)	16 (9)	5 (6)
Nauru	1 (1)	2 (2)	9 (3)	7 (3)	8 (3)	4 (2)
New Caledonia						
Urban	4 (1)	0 (1)	1 (3)	3 (1)	1 (4)	1 (2)
Rural	26 (18)	39 (21)	36 (27)	41 (35)	36 (41)	36 (28)
Tuvalu	1 (2)	3 (8)	2 (11)	8 (4)	19 (7)	5 (5)
Western Samoa						
Urban	0 (0)	2 (1)	0 (0)	0 (0)	0 (2)	0 (1)
Rural	0 (0)	0 (2)	1 (1)	0 (3)	0 (1)	0 (2)

[a] Figures in parentheses refer to women, without parentheses to men.

found in the urban Asian population of Fiji. There was no apparent association between age and the prevalence of smoking: in some populations smoking decreased with age, whereas in others there was no change or even an increase with age (Table 2).

The prevalence of smoking was higher among men than women for each study population, irrespective of age group. The proportion of ex-smokers varied greatly among both men and women (Table 3), the highest proportion being found in rural New Caledonia (36% for men and 28% for women). The lowest proportion of ex-smokers was found in Western Samoa, where smoking was relatively common.

Table 4 shows the average number of cigarettes per day smoked by men and women in the islands surveyed. This was higher for men than women in all the populations studied. Among men, heavy smokers (⩾20 cigarettes per day) were particularly prevalent in the urban populations of Nauru (44%), Kiribati (44%), New Caledonia (41%), and Western Samoa (32%). Among women, consumption of ⩾20 cigarettes per day was not unusual in New Caledonia (37%), Nauru (35%), and Kiribati (24%). In other areas, it was rare to find a woman who smoked this number of cigarettes per day.

To analyse possible associations between smoking and other health or socioeconomic factors, we stratified the prevalence of smoking in the study populations using the following variables: income level, alcohol consumption, marital status, and physical activity. Men and women were treated separately.

Table 5 shows the proportion of smokers stratified by income level. For both men and women, the prevalence of smoking was higher among lower income groups. This was more marked among men than women and was statistically significant in the Cook Islands, Niue, and New Caledonia.

The association between smoking and alcohol intake is shown in Table 6. Smokers, both men and women, were also moderate or heavy alcohol con-

Table 4. Level of cigarette smoking per day among the male and female populations surveyed

Country or area	% Men smoking			No. of men surveyed	% Women smoking		No. of women surveyed
	<20 cigarettes	20–40 cigarettes	>40 cigarettes		<20 cigarettes	>20 cigarettes	
Cook Islands	91	9	0	207	99	1	111
Niue	83	15	2	318	92	8	101
Fiji							
Melanesian							
Urban	87	12	1	265	99	1	1521
Rural	93	6	1	213	95	5	118
Lakeba (Island)	91	9	0	158	98	2	108
Asian Indian							
Urban	88	9	3	162	100	0	18
Rural	95	5	0	133	100	0	52
Kiribati	56	36	8	64	76	24	45
Nauru	56	28	16	158	65	35	201
New Caledonia							
Urban	59	34	7	180	63	37	138
Tuvalu	90	9	1	177	96	4	118
Western Samoa							
Urban	68	20	12	185	91	9	72
Rural	84	14	2	269	97	3	105

Table 5. Stratification of male and female smokers according to income level

Country or area	% Men		% Women	
	Income level:		Income level:	
	High	Low	High	Low
Cook Islands	32[a] (159)[b]	48[a] (174)	18 (71)	24 (170)
Niue	48[a] (127)	64[a] (313)	26 (47)	21 (213)
Fiji				
Melanesian				
Urban	62 (100)	68 (274)	28 (39)	33 (401)
Rural	89 (9)	88 (232)	0 (0)	51 (230)
Lakeba (Island)	78 (9)	73 (195)	50 (10)	50 (192)
Asian Indian				
Urban	40 (174)	45 (89)	2 (88)	4 (339)
Rural	41 (17)	64 (194)	14 (7)	22 (227)
New Caledonia				
Urban	69[c] (338)	87[c] (224)	25 (208)	30 (312)

[a] $P<0.01$ in χ^2-test.

[b] Numbers of subjects are indicated in parentheses.

[c] $P<0.001$ in χ^2-test; other data were not statistically significant.

Table 6. Stratification of male and female smokers according to alcohol consumption

Country or area	% Men		% Women	
	Drank alcohol:		Drank alcohol:	
	No	Yes	No	Yes
Cook Islands	25[a] (171)[b]	44[a] (372)	10[a] (358)	34[a] (226)
Niue	18[a] (108)	68[a] (440)	10[a] (481)	43[a] (120)
Fiji				
Melanesian				
Urban	48[a] (139)	76[a] (262)	26[a] (366)	58[a] (96)
Rural	82[c] (71)	91[c] (171)	46[d] (203)	75[d] (32)
Lakeba (Island)	68 (85)	78 (129)	49 (199)	65 (17)
Asian Indian				
Urban	25[a] (130)	51[a] (254)	3[a] (420)	17[a] (42)
Rural	55 (80)	66 (134)	18[a] (212)	54[a] (26)
Kiribati				
Urban	88 (457)	94 (17)	74 (557)	86 (7)
Rural	79[a] (382)	88[a] (557)	64[a] (922)	87[a] (85)

[a] $P<0.001$ in χ^2-test.
[b] Numbers of subjects are indicated in parentheses.
[c] $P<0.05$ in χ^2-test.
[d] $P<0.01$ in χ^2-test.

sumers. When smoking status was stratified by marital status no clear trend was found: in some populations, smoking was more common among single persons, but, in others married people more commonly smoked.

Table 7 shows the prevalence of smoking stratified by physical activity. Physical activity was positively associated with smoking in men and also in most of the women surveyed.

DISCUSSION

In developing countries that have become progressively more affluent, marked social and behavioural changes have occurred, leading to changes in traditional life-styles. In several instances, the prevalence of chronic degenerative diseases has risen dramatically (*11–16*). The data presented here demonstrate that smoking has become a significant public health problem in Pacific island communities. The situation described is similar to that found in other developing countries (*17*), where tobacco consumption, particularly cigarette smoking, is continuing to spread rapidly.[c]

[c] *Smoking in developing countries*. WHO unpublished document WHO/SMO/83.1.

The study identified that the proportion of smokers among traditional communities in rural areas is greater than that among urban populations. This is of importance, since most studies have shown that the burden of degenerative illnesses is heaviest among urban populations, although many of these problems are associated with smoking.

The highest prevalence of smoking was found among men in Kiribati (both urban and rural) and the male rural Melanesian population of Fiji. A high proportion of women in Kiribati also smoked. The prevalence of smoking among Asian Indians in Fiji was lower than that among the Melanesian population. This illustrates that the prevalence of smoking can differ markedly in two culturally and ethnically different populations living side-by-side in a limited geographical area. Of note was the low prevalence of smokers in rural New Caledonia, both among men and women.

The prevalence of smoking among both men and women in many of the populations surveyed rose steadily up to the age group 45–54 years, but thereafter generally declined. No clear trend was found between the prevalence of smoking and marital status. In some instances, smoking was more prevalent

Table 7. Stratification of male and female smokers according to level of physical activity

Country or area	% Men		% Women	
	Physical activity:		Physical activity:	
	High	Low	High	Low
Cook Islands	40 (260)[a]	37 (283)	18 (375)	21 (208)
Niue	63[b] (384)	47[b] (164)	15[c] (494)	24[c] (104)
Fiji				
Melanesian				
Urban	68 (203)	65 (198)	31 (35)	33 (427)
Rural	88 (220)	86 (22)	59[d] (126)	40[d] (109)
Lakeba (Island)	77 (153)	66 (61)	36 (31)	52 (185)
Asian Indian				
Urban	45 (104)	41 (280)	7 (15)	4 (447)
Rural	66[c] (178)	44[c] (36)	25 (57)	21 (181)
Kiribati				
Urban	90[c] (354)	83[c] (119)	75 (452)	71 (110)
Rural	87[c] (477)	81[c] (441)	67 (478)	65 (500)
New Caledonia				
Urban	78[d] (543)	64[d] (87)	33 (251)	27 (383)

[a] Numbers of subjects are indicated in parentheses.
[b] $P<0.001$ in χ^2-test.
[c] $P<0.05$ in χ^2-test.
[d] $P<0.01$ in χ^2-test.

among single persons, but in others among married individuals.

It was found that people on lower incomes smoked more. This is consistent with the results of previous studies (*18*, *19*); this is surprising, however, because cigarette smoking is one of the features of "modernization" and urban drift. This high prevalence of smoking may, in part, be explained by the widespread practice of cultivating tobacco in many rural areas in the Pacific; the product is thus widely available to communities living there. The higher prevalence of smoking among young urban rather than young rural women arises because of this process of "modernization".

The prevalence of ex-smokers among the study populations was remarkably high. Between 5% and 20% of people, depending on age group, had stopped smoking, and this confirms that smoking is a transient habit also in Pacific island populations. This finding is important for formulating and promoting rational health education policies in the region surveyed. The morbidity and mortality statistics of diseases related to smoking in Pacific populations have been discussed in detail elsewhere (*13–15*).

In the present study, data were collected on standard forms during interviews conducted at local clinics. However, the method used varied slightly depending on the particular clinic, and the survey procedures themselves may therefore have produced some of the observed differences in smoking habits. Estimation of the variation introduced by the procedure is difficult since results were not validated independently by determining the level of serum thiocyanate, a reliable indicator for smoking. Also, no attempt was made to study the association between smoking and changes in health status.

Pacific island communities present a number of unique features that permit the study of habits that can affect health. Some of these features include: "modernization" of life-styles of populations; rural-to-urban migration, offering the opportunity to study groups, first in a traditional and subsequently in an urban environment; and situations where different cultural groups live in the same physical environment, thus providing the opportunity to study the role of genetic susceptibility or culture-specific factors in smoking-induced diseases.

Since longitudinal surveillance of chronic diseases,

their risk factors, and behaviour that affects health status are in their infancy in the Pacific area, there are little data on the trends of smoking patterns. One of the important tasks for the future is to organize a reliable survey of smoking patterns in Pacific islands, and, in prospective follow-up studies to correlate the results with the distribution of cardiovascular diseases and cancer. In this way, a rational basis for anti-smoking health education measures could be created. Cardiovascular diseases have emerged as the major public health problem in many Pacific countries (*13*, *15*, *16*), and, hence measures aimed at reducing or preventing smoking should be introduced as soon as possible.

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RÉSUMÉ

LES TAUX DE TABAGISME DANS LES ÎLES DU PACIFIQUE

Cette étude rapporte des données sur la prévalence du tabagisme dans les îles du Pacifique suivantes: Iles Cook, Fidji, Kiribati, Nauru, Nouvelle-Calédonie, Niue, Tuvalu et Samoa occidental. D'importantes variations de la prévalence du tabagisme ont été observées chez les populations enquêtées. A Kiribati, par exemple, près de 90% des hommes et 74% des femmes fumaient quotidiennement, alors qu'aux Iles Cook 38% des hommes et 19% des femmes étaient des fumeurs réguliers. En revanche, moins de 4% des femmes de la population indienne de Fidji fumaient. Le tabagisme était en général plus répandu dans les régions rurales que dans les régions urbaines. On devra recueillir davantage de données, en particulier sur les tendances de la prévalence du tabagisme dans ces populations, pour mettre en œuvre des politiques antitabac efficaces et évaluer leur impact.

On sait que parmi de nombreuses populations du Pacifique il existe un risque élevé de maladies chroniques non transmissibles telles que troubles cardio-vasculaires, cancer et diabète. La prévention des grandes épidémies de ces maladies dans les îles du Pacifique doit être fondée sur des mesures urgentes visant à réduire la prévalence du tabagisme.

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