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Cancer Epidemiology in the Pacific Islands - Past, Present and Future

Malcolm A Moore[1,2], **Francine Baumann**[3], **Sunia Foliaki**[4], **Marc T Goodman**[5], **Robert Haddock**[6], **Roger Maraka**[7], **Josefa Koroivueta**[8], **David Roder**[9], **Thomas Vinit**[10], **Helen JD Whippy**[6], and **Tomotaka Sobue**[2]

[1]UICC Asian Regional Office for Cancer Control, apocpcontrol@yahoo.com [2]Cancer Information Services and Surveillance Division, Center for Cancer Control and Information Services, National Cancer Center, Tokyo [3]Registre du Cancer de Nouvelle-Calédonie, Nouméa, New Caledonia [4]Cancer Registry, Ministry of Health, Kingdom of Tonga, and Centre for Public Health Research, Massey University, Wellington, New Zealand [5]Hawaii Tumor Registry, Cancer Research Center of Hawaii, University of Hawaii, Honolulu, Hawaii [6]Guam Cancer Registry, University of Guam, Guam [7]Cancer Registry, Ministry of Health, Solomon Islands [8]Fiji Cancer Registry, Ministry of Health, Fiji [9]Cancer Australia, Canberra [10]Papua New Guinea Cancer Registry, Disease Control Branch, National Department of Health, Port Moresby, Papua New Guinea

Abstract

The Pacific Ocean contains approximately 25,000 islands, stretching from Papua New Guinea to Easter Island, populated by mixtures of Melanesians, Micronesians and Polynesians, as well as migrant groups from Asia and Europe. The region encompasses a third of the surface of the earth although it is sparsely populated at a total of around 9 million. With the exception of some of the more populated islands, such as New Zealand and Hawaii, few surveys of chronic diseases have been conducted, but it is increasingly recognized that obesity, diabetes and associated conditions are emerging public health problems and clearly there is a need for cooperation to optimize control. Here we focus on cancer registry and epidemiological findings for Papua New Guinea, the Solomons, Vanuatu, Samoa, New Caledonia, Fiji, Polynesia, French Polynesia, Maori in New Zealand, Native Hawaiians, Micronesia, including Guam, and Aboriginal populations in Australia as assessed by PubMed searches and perusal of the International Agency for Cancer Research descriptive epidemiology database. Overall, the major cancers in males are oral and liver in Papua New Guinea and the Solomon Islands, and lung and prostate elsewhere (Fiji being exceptional in demonstrating a predominance of esophageal cancer), whereas in females it is breast and either cervix or lung, depending largely on whether cervical cancer screening program is active. In certain locations thyroid cancer is also very prevalent in females. The similarities and variation point to advantages for collaborative research to provide the evidence-base for effective cancer control programs in the region.

Introduction

In a recent review of patterns of cancer incidence, focusing on mortality and survival in indigenous populations compared with populations of European origin in Polynesia, the

limited nature of available findings for Pacific populations was highlighted (Dachs et al., 2008). The paucity of cancer data for Native Hawaiians and other Pacific Islanders has already been stressed (Hughes et al., 2000), although it had been noted that there are cancers of public health importance as well as a disproportionately high mortality rates compared to non-Maori, non-Pacific people in New Zealand (Foliaki et al., 2004b). The situation 30 years ago appeared far better when Henderson et al (1985) reported 'The South Pacific Commission Cancer Registry has been operational since 1977, and reasonably complete cancer incidence rates are available for New Caledonia, Fiji, Micronesia, the Cook Islands, and Niue. In addition, less complete reporting is available from American Samoa, Papua New Guinea, and French Polynesia'. The earlier significant increase in the trend of cancer during 1952 to 1985 was concluded to not be due to improved registration alone (Finau and Tukuitonga, 2001). More recently, change with time has only been followed in Hawaii, Guam and French Polynesia.

Cancer Registration in the Pacific Islands

The registries which are now known to exist in the Pacific Islands are indicated in Figure 1 and relevant population based-data from the Cancer Incidence in Five Continents of the International Agency for Research on Cancer (IARC) (www-dep.iarc.fr) or from other sources are listed for Papua New Guinea, New Caledonians, Maoris, Native Hawaiians, Chamorros and French Polynesians in Tables 1 and 2 for males and females, respectively. For other populations, reference has been made to the Globocan 2002 datafile (Ferlay et al., 2004), with the percentages of total cancers accounted for by the five most common malignancies being indicated in Figure 2. The Centre for Public Health Research of Massey University has now installed the IARC cancer registry software CanReg4 in Tonga, the Cook Islands and Niue. The data are not yet regularly forwarded to IARC, pending clearance from the respective governments, but they have been included in the map.

There have also been a number of reports of general cancer incidence in the Pacific region over the years. For example, an analysis of the pathology reports of cancer at the Central Hospital, Honiara, Solomon Islands from 1970 to 1982 revealed that skin cancer, lympho-haematopoietic malignancies, cancer of the digestive organs and oral cancer were the most common cancers in males, with cancer of the genito-urinary organs, skin cancer, breast cancer and lympho-haematopoietic malignancies predominating in females (Taylor et al., 1983).

Registry data for the period 1958–1988 in Papua New Guinea demonstrated malignancies of the oral cavity, cervix, breast, and skin, a well as hepatomas, and lymphomas, to be the most common types of neoplasm, with oral cancer increasingly prevalent in the Highlands region, associated with the spread of betel nut chewing (Talonu, 1989). Earlier the incidence rates for oral cancer were significantly lower in the Highlands than in the Lowland regions of Papua New Guinea (Jamrozik, 1985). During the period 1980–88 data in Western Samoa, now Samoa, stomach, prostate and liver cancers were the most common malignancies in males and breast and cervix, followed by stomach, in females (Paksoy et al., 1991). Among American Samoan females, breast carcinoma was most frequent, followed by cancer of the corpus uteri, cervix uteri and thyroid, and leukemia (Mishra et al., 1996), along with

relatively high rates for prostate in males (Ruidas et al., 2004). In Niue, lung, stomach and liver cancer in males, and ovarian, uterine and cervical cancer in females were reported to be most common for the 1962–1985 period (Finau and Tukuitonga, 2001).

Chamorros in Guam are reported to have higher rates for diabetes (Pinhey et al., 1997) and mortality from mouth and pharyngeal, nasopharyneal and prostate cancer, but lower rates for leukemia and Non-Hodgkin's lymphoma compared to Caucasians (Haddock and Naval, 2002; Haddock et al., 2007). Recent data suggest that Chamorros experience higher incidence rates for cancers of the mouth and pharynx, nasopharynx, liver, and cervix than in the United States population, while rates for cancers of the prostate, female breast, ovary and colon-rectum-anus, as well as leukemia, and non-Hodgkin lymphoma, were all relatively low in comparison (Haddock et al., 2009). Considerable variation was also noted among the other ethnic groups.

In a first report based on data from the Cancer Registry of French Polynesia (Gleize et al., 2000), laryngeal cancer in men and cervix, corpus uteri, and thyroid cancer incidence rates in women were documented to be higher among populations born in French Polynesia than among immigrants, while rates for oral, colorectal and prostate cancers and melanomas were lower. There may be considerable variation between islands (Le Vu et al., 2000).

In New Zealand, cancer incidence from 1996–2000 was higher in Maori than in non-Maori females, but lower in Maori than in non-Maori males (Foliaki et al., 2004). However, more recent data appear to indicate that both male and female Maori are at higher cancer risk overall than non-Maori populations (Dachs et al., 2008). Furthermore, Maori and Pacific Islanders experience relatively poor survival overall, largely because they are more likely than other ethnic groups to be diagnosed at an advanced stage disease (Foliaki et al., 2004; Haynes et al., 2008). The same is the case for Aboriginal patients in Australia (Cottrell et al., 2007), basically independent of the cancer, with especially marked differences reported for lung (Supramaniam et al., 2006) and ovary (Laurvick et al., 2003).

As described in a recent review (Roder and Currow, 2009), Aboriginal and Torres Strait Islander Australians have a cancer incidence for all sites combined equivalent to or slightly lower than for other Australians. They have a higher incidence of cancers of the cervix, liver and gallbladder, oesophagus, unknown primary site, mouth and throat, lung and pancreas, but a lower incidence of cancers of the prostate, female breast, colon/rectum and skin (melanoma).

It was futher argued that case survivals are lower for Aboriginal and Torres Strait Islander patients, partly due to an excess of cancer types with a high case fatality, relatively low numbers with a low case fatality, and due to more advanced cancer stages at diagnosis (South Australian Cancer Registry, 1997; Condon et al., 2005a; 2005b; Valery et al., 2006; Cottrell et al., 2007; Cunningham et al., 2008). After accounting for these factors, Aboriginal and Torres Strait Islander Australians still fare worse, probably due to elevated co-morbidity and less complete care resulting from geographic remoteness, limited access to transport and accommodation services, and sometimes a cultural disconnect with mainstream services.

Organ Specific Epidemiology

Skin

Skin cancer is generally rare in Pacific Islanders, except among immigrants. Melanesians of the North Solomons are exposed to intense equatorial sunlight and yet have a very low incidence of skin cancer (Foster and Webb, 1988). As expected, cutaneous malignant melanomas have been reported to be frequent in whites but low in non-whites in New Caledonia (Di Schino et al., 1989; Baumann and Rougier, 2005).

Oral and Esophageal

Oral cancer is the most prevalent neoplasm in Papua New Guinea and the nearby Solomon Islands, with lower rates in Vanuatu. Combinations of tobacco smoking and chewing of betel quid are the main risk factors (Lumukana and King, 2003) and a recent study and systematic review provided evidence of the role of betel quid not containing tobacco in oral cancer development (Thomas et al., 2008). Interestingly, although the prevalence of betel nut use among Chamorro residents of Guam is higher than that of other Micronesians residing on the island, their incidence of oral cancer is lower (Haddock, 2005). However, it is difficult to draw conclusions from this observation because of the small populations and confounding by migration from other islands to Guam for cancer treatment.

Esophageal cancers are rare except in the Indian population of Fiji.

Gastric

Gastric cancer is common in Polynesia and to a certain extent also in Fiji and Vanuatu, as well as Maori in New Zealand and Native Hawaiians. Particularly high rates have been reported for Maori in Whangarei (Thompson, 2002). From the limited data available from CIV, the incidences are decreasing in almost all populations for which data are available (see Tables 1 and 2).

Colorectal

Incidence rates in the Pacific Islands other than Hawaii appear to be low. Increase over time has been found for Maori and other Pacific Islanders in New Zealand, catching up with the white population to some extent (Shaw et al., 2006). However, it was earlier argued that Maori consume more calires, eat more red meat, drink more alcohol, consume more saturated fat, have a higher prevalence of obesity and have a lower proportion of individuals consuming a given level of fruit and vegetables per day, so that they would be expected to have more rather than less colorectal cancer than people of European ancestry (Thomson and Shaw, 2002). Whether there may be protective chemical constituents present within their food plant supply is of obvious interest (Cambie and Ferguson, 2003).

Liver

Liver cancer is found at high frequency in Vanuatu, the Solomons and Papua New Guinea, with lower rates elsewhere in the Pacific. An early paper suggested the main risk factor at that time to be HBV (Paksoy et al., 1989) and in Maori and Pacific Islanders in New Zealand HBsAg carriage was found to explain most of the excess standardized rate

compared to people of European stock (Blakely et al., 1999). Hepatitis B vaccination has been an effective means for reducing HBsAg carriers, as indicated by the results of an infant hepatitis B immunisation program in Fiji, Kiribati, Tonga and Vanuatu (Wilson et al., 2000). The effect of vaccination on HCC incidence has yet to be determined, however. The occurrence of liver cancer in Native Fijians was earlier found to be significantly higher than in the Indo-Fijian population (Lovelace and Aalbersberg, 1989). The same study showed contamination of food samples with aflatoxin to be low.

Larynx

Laryngeal cancer rates appear to be comparatively low among Pacific Islanders from teh data accessible through Globocan 2002.

Lung

Lung cancer is number one or two in most of the Pacific region, with Papua New Guinea and Fiji as interesting exceptions. Tobacco is the major risk factor, with gender and ethnicity predicting the likelihood of having ever smoked (Kaholokula et al., 2006). In Fiji, the low rate of lung cancer does not appear to be due to lower rates of tobacco smoking (Le Marchand et al., 1995). There may be some genetic influence. In this context it should be mentioned that among cigarette smokers, Native Hawaiians are more susceptible to lung cancer than other ethnic groups in Hawaii (Le Marchand et al., 1992).

Smoking levels were very low in PNG at one time but more recently tobacco use has become common in young people (Hiawalyer, 2002). There may be specific occupational or non-occupational exposures, for example to tremolite fibres, which increase the risk of lung cancer in New Caledonia (Menvielle et al., 2003). Rates of mesothelioma are exceedingly high in New Caledonia due to environmental asbestos (Baumann et al., 2007). However, there is no evidence that exposures specific to the nickel industry are important (Goldberg et al., 1994).

Kidney and Urinary Bladder

Kidney and bladder cancer are relatively infrequent, but appear to be increasing in those populations for whom data are available. New Zealand Maori have higher rates than non-Maori for all smoking-related cancers except in the bladder and larynx, pointing to a partial role for genetically determined or lifestyle-related protective effects (McCredie et al., 2000).

Prostate

Prostate cancer is very prevalent in all populations of the region except the Papua New Guineans, Solomon Islanders and inhabitants of Vanuatu (see Figure 2) and incidence rates appear to be increasing rapidly from the CIV data (see Table 1). Whether any role has been played by increased screening using the prostate-specific antigen (PSA) test is unclear. A study of the correlation of prostatic pathology and serum prostate-specific antigen (PSA) levels has been published for Papua New Guinea (Murthy et al., 1998).

Breast

Breast cancer is common in all of the communities of the Pacific, without exception. Apart from Guam (Balajadia et al., 2008) and Hawaii and New Zealand, there are no breast cancer screening programs in place. As in Asia, mammary cancer incidences appear to be rising, particularly among relatively young age groups. It is reported that native patients throughout the region tend to present at hospital with more advanced stage lesions (Kuska, 1999; Halder et al., 2001).

Endometrium

Endometrial cancer is the fourth or fifth most common malignancy in females in most Pacific Islander populations. In Chamorros on Guam, it now appears to be the third most common in women, after breast and lung cancers.

Cervix

Cervical cancer is the first or second most common neoplasm among women in five of the locations shown in Figure 2. Increase has been attributed to both social changes and improved registration (Martin et al., 1992). More recently, a collaborative mission by the World Health Organisation (WHO) and the Fiji Ministry of Health resulted in a report prepared by Irwin Law of the University of Melbourne on “Burden of cervical cancer and CIN in Fiji (2004–2007)”. Incidence rates were found to be over 65 /100,000 for Fijians and 38/100,000 for Indo-Fijians aged between 20 and 69 years, with respective mortality rates of 33/100,000 and 17/100,000. Human papillomavirus (HPV) types-16 and 18 appear to be the commonest high-risk types, with the highest infection rates in women under 25 years of age, although there are minimal data for many countries in Oceania (Garland et al., 2008). The regional status of cancer screening is unclear.

Thyroid

With the highest incidence rates ever reported, thyroid cancer is a major public health problem for Melanesians of New Caledonia (Ballivet et al., 1995; Baumann and Rougier, 2005). It is also relatively prevalent in Vanuatu (Paksoy et al., 1989). Data from French Polynesia do not point to a major role for radioiodine fallout (de Vathaire et al., 2000). Rather, menstrual and reproductive parameters with excess body weight, especially with onset during early adulthood, may be the most important risk factors (Brindel et al., 2008a; 2008b).

Perspectives

While cancer registration is not sophisticated in most of the region, the major cancers are nevertheless clear, allowing for priority targets for control. Unfortunately, it needs to be emphasized that the Pacific is experiencing a dual burden of the infection-related cancers of developing countries (like oral cavity and cervix) as well as emerging obesity-related cancers (including the colon, prostate, breast and endometrium) common in developed countries. In terms of recommendations for prevention: lifestyle improvement for oral and breast malignancies, and to a certain extent colorectal cancer; vaccination for liver and cervix cancers, if the costs become substantially reduced for the latter; tobacco control for

lung cancer; and screening for cervical cancer; all need to be stressed. Such preventive measures could also reduce other chronic diseases.

Obesity and cardiovascular disease are documented problems in Samoa (Hodge et al., 1994; Hodge et al., 1997), along with hypertension (Wahi et al., 1997). The latest published prevalence of diabetes in Tonga is 15.1%, of which 80% is undiagnosed, the incidence having doubled over the past 25 years (Colagiuri et al., 2002). A similar experience has been reported for Melanesian and Indian Fijians, with excess mortality due to cardiovascular causes (Collins et al., 1996; Tomisaka et al., 2002). Tongans also appear prone to excessive obesity (Sawata et al., 1988), with affordability rather than "commonsense" as the key factor in food consumption (Evans et al., 2002).

Diabetes mellitus was earlier reported to be relatively rare in highland Papua New Guinea, very common in Micronesian Nauruans and the rural Wanigelas of coastal PNG and intermediate in Polynesian Western Samoans (Dowse, 1996). However, changes are taking place predominantly due to the adoption of a western lifestyle and diet (Natsuhara et al., 2000). In one report at the turn of the century, intake of Western food was described to be negligible and stroke and ischemic heart disease were absent or rare (Lindeberg et al., 1999). Betelnut chewing may also be independently associated with diabetes (Benjamin, 2001).

Given the relatively small populations and financial constraints, coordination of activity would be of great advantage for the region. In fact, the groundwork for the Pacific Islander cancer control network (PICCN) began in the early 1990s with a study of the cancer control needs of American Samoans (Hubbell et al., 2006). The project's principal objectives were to increase cancer awareness and to enhance cancer control research among American Samoans, Tongans, and Chamorros and incorporated a training program to educated Pacific Islander students in the field and conducted pilot research projects (Hubbell et al., 2006). One focus of attention has been on building native Maori (Sporle and Koea, 2004) and Hawaiian responsiveness and capacity in cancer research (Braun et al., 2006) and a Pacific Cancer Initiative was launched to promote Pacific island partnerships (Palafox et al., 2006).

In addition, a "Regional Course for Cancer Registrars in Pacific Island Countries and Territories" was held in 1998 in Noumea, New Caledonia, this being organized by the Secretariat for the Pacific Community in collaboration with International Agency for Research on Cancer (IARC) and the Western Pacific Regional Office of WHO. Thirteen Pacific islands countries and territories attended. A further IARC "International Course on Cancer Epidemiology: Principles and Methods" was also held in Tonga in 2004 and a series of Japan International Cooperation Agency (JICA) funded courses on community-based cancer prevention included three participants from Fiji, one from Micronesia, three from Papua New Guinea, three from the Solomon Islands and one from Vanuatu (Wakai and Matsuo, 2007). Unfortunately, these activities do not appear to have been translated into many additions to the published literature. It has been stressed that interventions targeting the needs of the local populations in the Pacific are welcome but should not be another opportunity for "research colonialism" (Foliaki et al., 2004a). This should be borne firmly in mind in future efforts.

Whether a local research meeting can be organized with involvement of WHO, IARC and the International Union Against Cancer - Asian Regional Office (UICC-ARO) and the Asian Pacific Organization for Cancer Prevention should be explored. In addition to cancer registration and all aspects of epidemiology, through descriptive to clinical, tobacco control and screening needs to be covered. Effects of the unique local nutritional background and cultural interdictions against cancer screening might also be explored (Steiner, 2000; Cambie and Ferguson, 2003). If the recent Tongan finding of a very strong association of cancer with the idea of unavoidable death is typical (McMullin et al., 2008), then a major effort to educate and improve awareness at the community level must be encouraged.

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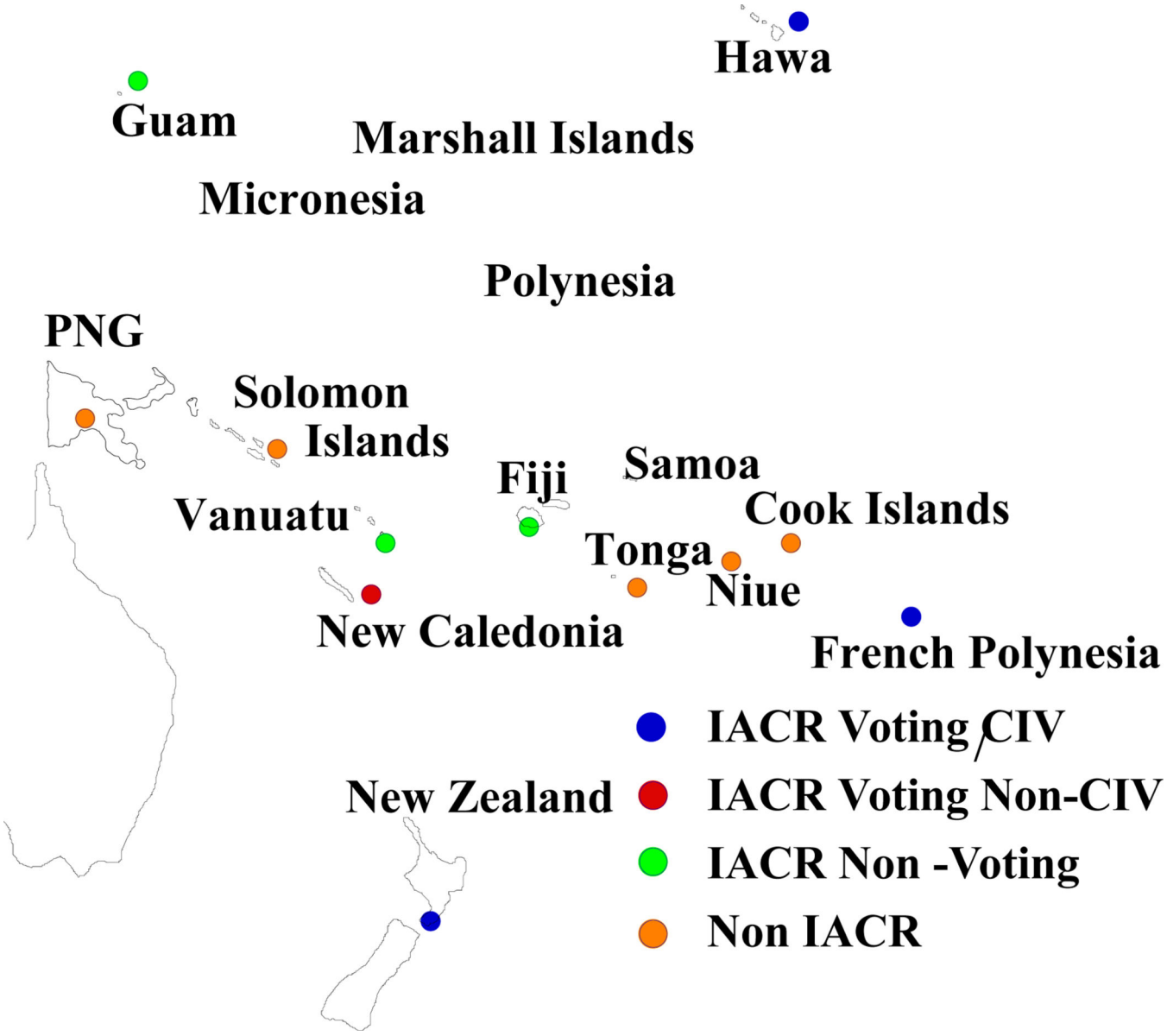

Figure 1.
Cancer Registries in the Pacific Islands

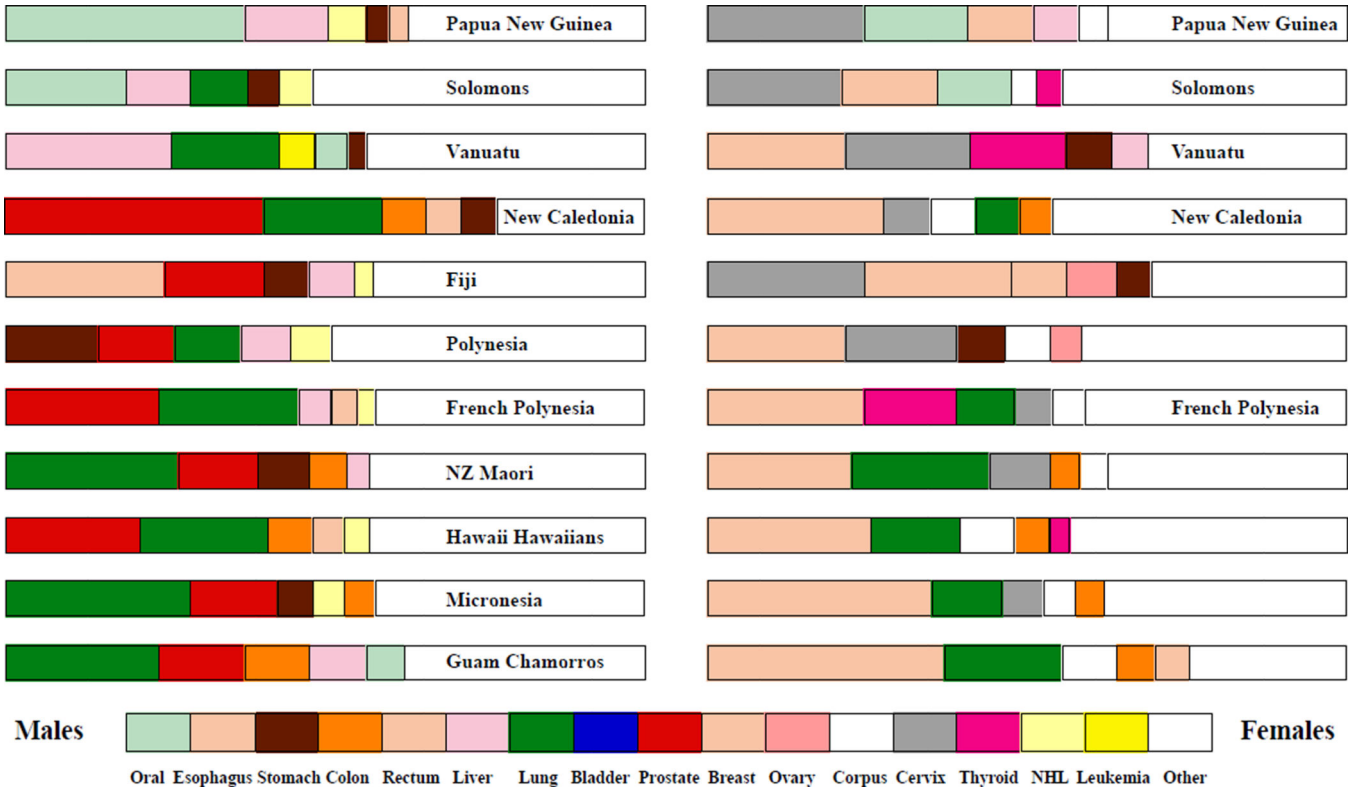

Figure 2.

Percentage Incidence Data for the Five Most Prevalent Cancers in Countries/Populations of the Pacific

Table 1

Population-based Cancer Incidence Registry Data for Pacific Islanders - Males (100,000)

	French Polynesians		Hawaiians		Chamorros		Maori	New Caledonians	
	1997*	2007**	1997*	2007**	1996–8#	2005–7#	1997*	1997##	2007##
Buccal	7.8	5.0	4.7	4.4	4.4	8.3	6.7	9.3	8.5
Pharynx	11.9	3.2	6.3	2.4	1.1	0.9	4.1	10.0	5.9
Nasopharynx	-	2.6	-	2.0	13.2	5.5	-	1.5	0.8
Oesophagus	7.2	9.3	7.6	7.1	3.3	5.5	9.2	4.4	6.6
Stomach	10.9	6.8	15.1	12.8	4.4	3.7	27.9	10.8	14.5
Colon	9.5	9.6	19.9	24.5	11.0	13.7	21.5	7.9	18.0
Rectum	8.6	7.2	13.9	16.5	4.4	12.8	12.8	10.7	14.9
Liver	11.8	13.4	6.8	11.0	7.7	20.1	12.8	8.2	4.5
Gallbladder	3.5	1.5	2.0	3.2	0.0	0.9	2.4	1.5	1.8
Pancreas	4.4	4.0	8.8	10.1	0.0	4.6	9.8	3.0	3.3
Larynx	8.3	4.7	3.8	4.2	3.3	0.9	3.1	8.7	6.0
Trachea, lung	73.7	62.3	72.3	68.4	49.6	48.5	99.7	71.9	50.3
Prostate	23.2	67.9	42.1	71.3	19.8	43.9	44.4	50.5	114.0
Kidney	5.5	5.7	8.6	10.7	1.1	2.8	7.6	2.1	4.0
Bladder	8.3	11.3	3.9	12.2	3.3	2.8	10.5	12.5	7.4
Brain	3.1	4.9	3.8	5.1	1.1	3.7	5.2	0.0	3.1
Thyroid	2.9	5.4	3.0	4.3	0.0	0.9	1.6	4.1	7.5
Non-Hodgkin	3.9	8.6	11.0	13.4	12.1	9.2	8.1	6.3	5.7
Leukemia	9.3	8.8	9.5	10.1	3.3	5.5	12.2	4.5	1.7
Total	249	284	276	345	143	194	360	267	351

*Data from Parkin et al., 2002;

**Curado et al., 2007;

#Haddock and Whippy (unpublished data);

##Baumann et al (unpublished data)

Table 2

Population-based Cancer Incidence Registry Data for Pacific Islanders - Females (/100,000)

	French Polynesians		Hawaiians		Chamorros		Maori	New Caledonians	
	1997*	2007**	1997*	2007**	1996–8#	2005–7#	1997*	1997##	2007##
Buccal	3.7	1.9	2.1	2.7	4.1	0.0	2.2	6.1	0.9
Pharynx	2.2	0.3	1.2	0.4	1.0	0.0	0.7	1.5	1.4
Nasopharynx	-	0.9	-	0.2	5.1	4.5	-	0.0	0.7
Oesophagus	1.5	1.1	1.3	1.8	1.0	0.0	2.1	1.5	0.6
Stomach	7.5	5.0	10.4	8.3	5.1	0.9	13.7	6.7	3.0
Colon	4.8	5.6	16.6	18.9	8.1	14.5	16.0	13.4	13.1
Rectum	4.0	3.5	8.2	9.5	5.1	7.3	9.2	5.1	5.0
Liver	3.6	4.4	2.6	4.4	5.1	3.6	3.6	1.2	1.7
Gallbladder	1.6	2.2	1.4	1.2	1.0	0.9	1.2	1.5	1.4
Pancreas	3.5	4.5	7.2	11.5	2.0	4.5	6.7	0.0	4.4
Larynx	1.7	0.3	0.6	1.4	1.0	0.0	1.2	0.0	1.0
Trachea, lung	28.1	23.6	35.0	45.9	15.3	31.8	72.9	23.3	18.9
Breast	65.7	75.1	83.9	118.9	42.7	51.8	77.1	59.9	72.7
Ovary	11.0	8.2	8.3	8.8	7.1	0.0	12.2	14.5	3.1
Corpus uteri	9.7	12.9	20.6	28.0	13.2	22.6	15.8	10.2	19.0
Cervix uteri	27.7	15.6	8.6	9.3	6.1	4.5	32.2	20.0	19.7
Kidney	1.5	2.1	3.0	3.9	1.0	0.9	3.5	0.0	3.3
Bladder	1.9	3.3	3.2	3.7	0.0	0.0	2.2	4.9	3.5
Brain	4.6	4.0	2.9	4.5	0.0	0.9	4.0	1.0	0.0
Thyroid	15.9	37.4	9.1	10.4	3.1	10.9	6.5	60.4	27.7
Non-Hodgkin	4.4	6.4	5.0	8.0	3.1	4.5	6.7	2.5	3.9
Leukemia	7.1	7.2	6.6	7.7	2.0	5.5	7.8	9.0	6.0
Total	253	261	263	335	132	170	340	265	263

*Data from Parkin et al., 2002;

**Curado et al., 2007;

#Haddock and Whippy (unpublished data);

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##Baumann et al (unpublished data)