



## Cancer epidemiology in the small nations of Pacific Islands



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### ARTICLE INFO

**Keywords:**  
Pacific islands  
Epidemiology  
Neoplasms  
Incidence  
Mortality  
Indigenous

### ABSTRACT

**Background:** Pacific island countries and territories (PICTs) comprise 20,000–30,000 islands in the Pacific Ocean. PICTs face challenges in relation to small population sizes, geographic dispersion, increasing adoption of unhealthy life-styles and the burden of both communicable and non-communicable diseases, including cancer. This study reviews data on cancer incidence and mortality in the PICTs, with special focus on indigenous populations.

**Methods:** PICTs with populations of < 1.5 million ('small nations') were included in this study. Information on cancer incidence and mortality was extracted from the GLOBOCAN 2012 database. Scientific and grey literature was narratively reviewed for publications published after 2000.

**Results:** Of the 21 PICTs, seven countries were included in the GLOBOCAN 2012 (Fiji, French Polynesia, Guam, New Caledonia, Samoa, Solomon Islands, Vanuatu). The highest cancer incidence and mortality rates were reported in New Caledonia (age-standardized incidence and mortality rates 297.9 and 127.3 per 100,000) and French Polynesia (age-standardized incidence and mortality rates 255.0 and 134.4 per 100,000), with relatively low rates in other countries. Literature indicated that cancer was among the leading causes of deaths in most PICTs; thus they now experience a double burden of cancers linked to infections and life-style and reproductive factors. Further, ethnic differences in cancer incidence and mortality have been reported in some PICTs, including Fiji, Guam, New Caledonia and Northern Mariana Islands.

**Conclusion:** Cancer incidence in the PICTs was recorded to be relatively low, with New Caledonia and French Polynesia being exceptions. Low recorded incidence is likely to be explained by incomplete cancer registration as cancer had an important contribution to mortality. Further endeavors are needed to develop and strengthen cancer registration infrastructure and practices and to improve data quality and registration coverage in the PICTs.

### 1. Introduction

Pacific island countries and territories (PICTs) comprise 20,000–30,000 islands in the Pacific Ocean [1]. They are small nations in terms of both population sizes and geographic land areas. Populations in the PICTs are relatively young and multi-ethnic, including native (indigenous) people, migrants from other PICTs and migrants outside the Pacific region [2]. PICTs are at different stages of economic development but they all face similar challenges in relation to small populations, geographic dispersion, long distances and the triple burden of communicable diseases, non-communicable diseases (NCDs) and the health impact of climate change [1]. The prevalence of common risk factors for NCDs, such as obesity, physical inactivity, poor diet and tobacco and alcohol consumption, is high. NCDs are the

leading cause of mortality in the PICTs comprising 75% of all deaths in 2011.

In addition to other NCDs, the burden of cancer is increasing in the PICTs; however, evidence is limited due to low coverage and sub-optimal quality of cancer registration and paucity of reliable mortality data, especially data on causes of deaths [3,4]. Since the report on cancer incidence in the Pacific region published in 1985 [5], cancer epidemiology in the PICTs has been reviewed by several authors [3,4,6–9]. Dachs et al. examined cancer disparities in indigenous Polynesian populations and found disproportionately higher cancer mortality in Polynesian people compared with Europeans living in New Zealand and Hawaii, whereas data were limited on indigenous disparities in Polynesian people living in Pacific Islands [3]. The most recent review by Varghese et al. focused on cancer burden and control

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in the whole Western Pacific Region and compared Pacific Islands to high and low/middle income countries in the region [4]. Age-adjusted cancer incidence was lower in the Pacific Islands compared with high income countries and of similar magnitude compared with low/middle income countries in the Western Pacific Region although breast and cervical cancer incidence was relatively high in the Pacific Islands.

Previous reviews have highlighted the early stages of cancer registration in the PICTs and the lack of health care infrastructure, such as pathologist services [3,4,8,9]. In 2014, International Agency for Research on Cancer (IARC) with several partner organizations established a Pacific Islands Regional Hub, which is part of the Global Initiative for Cancer Registry Development (<http://gicr.iarc.fr>) [10]. The aim of the emerging Pacific Islands Hub is to develop and support cancer registration systems in the region in order to inform national cancer control policies and strategies. More accurate and reliable data on cancer incidence and mortality are needed to understand the scale of the problem and to develop prevention and control strategies accordingly.

This study examines cancer incidence and mortality in the small nations of Pacific Islands (population < 1.5 million) using GLOBOCAN 2012 data alongside existing literature to provide an updated review of cancer epidemiology in the region, with a special focus on indigenous populations.

## 2. Methods

Information on cancer incidence and mortality was extracted from the GLOBOCAN 2012 database [11]. GLOBOCAN is a project of the International Agency for Research on Cancer (IARC), managed by the Section of Cancer Surveillance, and it aims to provide global estimates of cancer incidence, mortality and prevalence. The most recent data, GLOBOCAN 2012, provide cancer incidence, mortality and prevalence estimates for 184 countries by sex and cancer site using the best available data in each country and several methods of estimation. For this study, we included numbers of incident cases and cancer deaths, age-standardized incidence and mortality rates (ASR) per 100,000 persons per year (World population used as a standard population) and the most common cancer sites based on total number of cases by sex in the PICTs. Mortality to incidence (M/I) ratios were calculated using ASRs. We also reviewed national data quality indicators according to GLOBOCAN (availability of incidence and mortality data, methods to estimate incidence and mortality).

None of the PICTs submitted their data to Volume X of *Cancer Incidence in Five Continents* (CI5-X, mainly comprising data from 2003 to 2007), while only French Polynesia has contributed to earlier CI5 volumes (CI5-VII, CI5-IX) [12]. Therefore, CI5 data could not be used in this study. Scientific literature and grey literature were narratively reviewed for publications published after 2000 to complement the GLOBOCAN data and to examine cancer epidemiology in countries which were not included in the GLOBOCAN 2012. We searched PubMed, Google and Google Scholar using the following key words: “Pacific”; “Pacific islands”; “cancer”; “neoplasm”; “incidence”; “mortality”; “death”; “indigenous” and the names of all included PICTs. We also reviewed the reference lists of included papers. This study focused on cancer incidence and mortality among people living in the PICTs and; therefore; studies examining cancer epidemiology among Pacific people living elsewhere; e.g.; in the United States (US) or New Zealand; were not included. For this study; indigenous and native people refer to people with Pacific background (in comparison to people with European/Asian background) who live in the country/territory of their origin.

## 3. Results

There are 21 countries/territories in the Pacific Islands area, with populations of < 1.5 million (Table 1). The characteristics of these PICTs are presented in Table 1, including population size, information

about cancer registry and population characteristics in relation to ethnicity/indigenous status.

Seven countries were included in the GLOBOCAN 2012, and all had national cancer incidence rates available for varying time periods, except for the Solomon Islands, where cancer incidence was estimated using a simple mean of Fiji and Vanuatu (Table 2). Mortality data were available in Fiji, French Polynesia and New Caledonia, whereas for other countries, cancer mortality was estimated from national incidence for 2012 and modelled survival [11]. The quality of the estimation depends on the quality and amount of information available for each country.

### 3.1. Cancer registration

In the PICTs included in this review, the first cancer registries were started in Fiji in 1965 [13], in New Caledonia in 1977 [14] and in French Polynesia in 1984 [15]. To date, most PICTs have national or subnational cancer registries according to information from the World Health Organization (Table 1). No information about cancer registration was available from Pitcairn Islands, Tokelau and Wallis & Futuna. In addition, we could not confirm the existence of cancer registry in Tuvalu. The US associated PICTs (Guam, American Samoa, Northern Mariana Islands, Marshall Islands, Palau and Micronesia) established the Pacific Regional Central Cancer Registry in 2003 in order to collectively collect cancer data in the region, maximize scarce resources, develop capacity and infrastructure, provide training and improve cancer control [16,17]. The Pacific Regional Central Cancer Registry is housed at the Guam Cancer Registry and information about cancer cases has been collected since 2007 [18].

Although there are several cancer registries in the PICTs, the quality, coverage and completeness of registration are likely to vary. However, data on quality are scarcely available. In New Caledonia, the completeness and quality of cancer registry data has improved over time [14]. In Fiji, issues with data recording have been reported (under-registration of cases, gender miscoding, and variations in coding causes of deaths on death certificates) [19]. Concerns over the completeness of data and validity of diagnoses have also been reported in Tonga, the Cook Islands and Niue [20]. A relatively high proportion of clinically diagnosed cancer cases (35%) was reported in a Samoan study [21]. In the US associated PICTs, there are likely to be missing cases in all states due to historical barriers and the lack of resources for diagnosis and staging [16]. However, the magnitude of under-recording is unknown. People from Tokelau, Cook Islands and Niue are eligible for cancer treatment in New Zealand and, therefore, may be inadvertently registered on the New Zealand Cancer Registry [3].

### 3.2. Cancer incidence and mortality according to the GLOBOCAN 2012 data

Age-standardized cancer incidence was highest in New Caledonia (ASR 330.7 for males and 269.3 for females per 100,000) and French Polynesia (ASR 287.4 for males and 227.3 for females per 100,000) (Table 3) [11]. Cancer incidence was relatively low in other countries, especially among males in Fiji, Samoa, Solomon Islands and Vanuatu. Overall cancer incidence was higher among females than males in these countries. The highest cancer mortality was reported in French Polynesia (ASR 153.9 for males and 116.3 for females per 100,000) and New Caledonia (ASR 146.0 for males and 112.0 for females per 100,000). The highest M/I ratios for males were detected in Vanuatu (0.90) and Solomon Islands (0.87), and for females in Solomon Islands (0.65).

The most common cancers among males were prostate, lung and liver cancers, with prostate being the most common cancer in Fiji, French Polynesia, Guam and New Caledonia (Table 4). Stomach cancer was the most common cancer for males in Samoa and liver cancer in Solomon Islands and Vanuatu. For females, breast cancer was the most

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