

# Cancer Burden and Control in the Western Pacific Region: Challenges and Opportunities

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### ABSTRACT

**Background:** Cancer has become a priority public health challenge in the Member States of the World Health Organization's (WHO) Western Pacific Region (WPR). Rapid and unplanned urbanization, demographic transition, and lifestyle changes are driving the increase in noncommunicable diseases (NCDs), which include cancer. The WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020, targets a reduction in premature mortality from NCDs by 25% by 2025.

**Objectives:** The aim of this study was to review the epidemiology of cancer including cancer control efforts in the WPR.

**Methods:** Information was primarily extracted from Globocan 2012, *Cancer Incidence in Five Continents Vol. X*, and the NCD country capacity survey carried out by the WHO in 2013. The WPR, with one-fourth of the world's population, has one-third of all cancers globally. Cancer cases in the WPR are expected to increase from 4.5 million new cases in 2012 to 6.4 million in 2025.

**Findings:** In most of the low- and middle-income countries (LMICs) in Asia and in Pacific Island countries and areas, coverage of cancer registration is relatively low and they face many challenges in quality of cancer registry data. Eighty-five percent of LMICs have indicated the existence of a cancer control policy strategy and/or action plan. The predominance of lung, stomach, colorectal, breast, and cervical cancers makes control of the disease more amenable in the WPR. A relatively high ratio of mortality to incidence in LMICs reflects health-system limitations, especially in the diagnosis and management of cancer.

**Conclusions:** Strengthening cancer registration, tobacco control, and promotion of a healthy diet, as well as HBV and HPV vaccination, is the priority areas to reduce cancer burden. Health-system strengthening with a defined package of services at different levels, referral care, trained human resources, and appropriate technology is necessary to improve cancer management. Pain relief and palliative care are priorities as well. A well-planned national cancer control program with a strong component of surveillance and monitoring can help to reduce the cancer burden in LMICs and Pacific Island countries.

**Key Words:** cancer prevention and control, low- and middle-income countries, Pacific Island countries and areas, World Health Organization Western Pacific Region

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## INTRODUCTION

The Western Pacific Region (WPR) is 1 of the 6 regions of the World Health Organization (WHO), which is home to approximately 1.8 billion people, more than one-fourth of the world's population.<sup>1</sup> The WPR is a very heterogeneous region, including the most populous

country China to tiny islands in the Pacific and where nearly half of the population are in urban areas.<sup>2</sup> Prevention and control of noncommunicable diseases (NCDs), which include cardiovascular diseases, cancer, diabetes, and chronic respiratory disease and their common risk factors such as tobacco smoking, harmful-use alcohol drinking, physical inactivity, and unhealthy diet, is one of the highest priorities in the WPR as well as at the global level.

The Western Pacific Regional Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020 was endorsed by Member States in October 2013 and is aligned to the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020. The goal of the regional action plan is to reduce the burden of preventable morbidity and disability and avoidable mortality due to NCDs in the WPR. There are 9 global voluntary global targets for

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NCD prevention and control and 1 of them is to reduce the premature mortality from NCDs (30-70 years) by 25% in 2025 from a baseline in 2010. Cancer incidence is also included as 1 of the 25 indicators in the comprehensive surveillance framework for monitoring NCD prevention and control.<sup>3,4</sup>

In this study, we reviewed the epidemiology of cancer in the WPR and assessed cancer control capacity and challenges in low- and middle-income countries (LMICs) and Pacific Island countries and areas (PICs).

## DATA AND METHODS

There are 37 countries and areas in the WPR. They were grouped based on the World Bank list of economies (February 2014) as high-income countries and areas (HICs) and LMICs.<sup>5,6</sup> PICs were grouped as a separate category considering the common characteristics of the 22 islands. Table 1 presents the countries in the WPR by

this grouping. Information on cancer burden and pattern refers to all countries of the WPR and cancer control capacity is limited to LMICs and PICs.

For information on cancer burden, we used the global cancer database (Globocan 2012), by the International Agency for Research on Cancer (IARC), which provides the most recent estimates on cancer incidence and mortality.<sup>7</sup> *Cancer Incidence in Five Continents Volume X (CI5-X)* was also used to obtain information related to cancer registries and site-specific cancer information.<sup>8</sup> The WHO conducts periodic assessment of national capacity for NCD prevention and control using the global NCD Country Capacity Survey (NCD CCS). The survey, using a standardized tool, was conducted in 2005, 2010, and 2013, and the global and regional reports of the 2010 survey are available.<sup>9,10</sup> In this study, we used the data from the 2013 NCD CCS to capture information on the status of cancer control and availability of cancer services in primary health care.

## RESULTS

### Burden and Pattern of Cancer

Cancer burden is presented as incidence, mortality and mortality/incidence ratio (M/I ratio) by sex for HICs, LMICs, and PICs (Table 2). In HICs, incidence of cancer in men (incidence age-standardized rate [ASR]) of cancers varied from 149.4 to 379.3. Within the LMICs, the ACR range was from 139.9 to 237.7, whereas in PICs the variation was 330.7 to 89.3. Mortality rates are generally high in LMICs and PICs.

Figure 1 shows the 10 leading cancer sites by sex in WPR. Among men, the leading cancer sites are lung, stomach, liver, colorectum, and esophagus. In women the leading cancer sites are breast, lung, colorectum, stomach, and liver. Variations in the incidence of leading cancers in men and women by countries of the WPR are presented in Figures 2 and 3.

Figure 2 presents the incidence ASR and mortality of lung, stomach, and liver cancers in men. Lung cancer rates are relatively similar across the region, except in some Pacific Islands. Stomach cancer is common in China, Japan, Mongolia, Republic of Korea, and Vietnam. High rates of liver cancer are observed in all Asian countries.

Figure 3 shows the variation of cancers of the breast, lung, and uterine cervix in women in the WPR. Breast cancer rates are high in HICs and PICs compared with LMICs. Lung cancer rates are relatively higher in HICs than in LMICs and PICs. Cervical cancer rates are high in LMICs and PICs.

The M/I ratio is an indirect measure of cancer survival and is calculated by a dividing the mortality rate by incidence rate. HICs have higher cancer incidence but M/I ratios are lower compared with LMICs and PICs. M/I ratios in HICs range from lowest in women in the

**Table 1.** Classification of WPR Countries and Areas by Income Groups and Geographical Grouping

| HICs (n = 8)          | LMICs (n = 7)                    | PICs (n = 22)                    |
|-----------------------|----------------------------------|----------------------------------|
| Australia             | China                            | French Polynesia                 |
| Brunei Darussalam     | Malaysia                         | Guam                             |
| Hong Kong SAR (China) | Cambodia                         | New Caledonia                    |
| Japan                 | Lao People's Democratic Republic | Northern Mariana Islands         |
| Macao SAR (China)     | Mongolia                         | American Samoa                   |
| New Zealand           | Philippines                      | Cook Islands                     |
| Republic of Korea     | Vietnam                          | Fiji                             |
| Singapore             |                                  | Marshall Islands                 |
|                       |                                  | Nauru                            |
|                       |                                  | Niue                             |
|                       |                                  | Palau                            |
|                       |                                  | Pitcairn Islands                 |
|                       |                                  | Tonga                            |
|                       |                                  | Tuvalu                           |
|                       |                                  | Wallis and Futuna                |
|                       |                                  | Kiribati                         |
|                       |                                  | Micronesia (Federated States of) |
|                       |                                  | Papua New Guinea                 |
|                       |                                  | Samoa                            |
|                       |                                  | Solomon Islands                  |
|                       |                                  | Tokelau                          |
|                       |                                  | Vanuatu                          |

HIC, high-income countries; LMIC, low- and middle-income countries; PIC, Pacific Island countries and areas; WPR, Western Pacific Region.

Table 2. Estimated Cancer Incidence, Mortality, and M/I Ratio (2012), men and women, WPR

| Country                            | HICs                 |                                |             |                     |            |              |                      |                                |            |                     |            |              |
|------------------------------------|----------------------|--------------------------------|-------------|---------------------|------------|--------------|----------------------|--------------------------------|------------|---------------------|------------|--------------|
|                                    | Men                  |                                |             |                     |            |              | Women                |                                |            |                     |            |              |
|                                    | Population<br>(1000) | Estimated<br>Incident<br>Cases |             | Estimated<br>Deaths |            | M/I<br>Ratio | Population<br>(1000) | Estimated<br>Incident<br>Cases |            | Estimated<br>Deaths |            | M/I<br>Ratio |
|                                    |                      | n                              | ASR<br>(W)* | n (1000)            | ASR<br>(W) |              |                      | n                              | ASR<br>(W) | n                   | ASR<br>(W) |              |
| Australia                          | 11,428               | 69,670                         | 373.9       | 24,522              | 115.4      | 0.31         | 11,490               | 52,361                         | 278.6      | 18,881              | 80.1       | 0.29         |
| Brunei Darussalam                  | 208                  | 231                            | 149.4       | 119                 | 81.3       | 0.54         | 204                  | 290                            | 179        | 108                 | 77.1       | 0.43         |
| Japan                              | 61,551               | 411,379                        | 260.4       | 222,804             | 125.1      | 0.48         | 64,883               | 292,484                        | 185.7      | 155,832             | 69.2       | 0.37         |
| Korea, Republic of                 | 24,215               | 114,354                        | 340.0       | 50,745              | 145.7      | 0.43         | 24,372               | 105,166                        | 293.6      | 30,765              | 65.4       | 0.22         |
| New Zealand                        | 2192                 | 11,292                         | 320.1       | 4478                | 114.4      | 0.36         | 2268                 | 10,045                         | 274.3      | 4107                | 95.4       | 0.35         |
| Singapore                          | 2648                 | 7949                           | 218.8       | 3995                | 107.6      | 0.49         | 2607                 | 7744                           | 198.7      | 3197                | 75.9       | 0.38         |
| Country                            | LMICs                |                                |             |                     |            |              |                      |                                |            |                     |            |              |
|                                    | Men                  |                                |             |                     |            |              | Women                |                                |            |                     |            |              |
|                                    | Population<br>(1000) | Estimated<br>Incident<br>Cases |             | Estimated<br>Deaths |            | M/I<br>Ratio | Population<br>(1000) | Estimated<br>Incident<br>Cases |            | Estimated<br>Deaths |            | M/I<br>Ratio |
|                                    |                      | n                              | ASR<br>(W)  | n                   | ASR<br>(W) |              |                      | n                              | ASR<br>(W) | n                   | ASR<br>(W) |              |
| <i>Cambodia</i> <sup>†</sup>       | 7092                 | 6842                           | 155.3       | 5594                | 136.5      | 0.88         | 7385                 | 8374                           | 134.1      | 5727                | 95.9       | 0.72         |
| China                              | 706,481              | 1,822,769                      | 211.2       | 1,429,461           | 164.6      | 0.78         | 654,883              | 1,242,669                      | 139.9      | 776,485             | 82.6       | 0.59         |
| <i>Lao PDR</i>                     | 3182                 | 3246                           | 165.5       | 2817                | 148.8      | 0.90         | 3190                 | 2901                           | 122.4      | 2075                | 92.2       | 0.75         |
| Malaysia                           | 14,862               | 18,125                         | 144.9       | 11,281              | 91.8       | 0.63         | 14,459               | 19,301                         | 143.4      | 10,397              | 80.2       | 0.56         |
| Mongolia                           | 1403                 | 2128                           | 237.7       | 1773                | 202.5      | 0.85         | 1440                 | 1925                           | 171.9      | 1348                | 127.2      | 0.74         |
| Philippines                        | 48,366               | 43,058                         | 139.9       | 30,651              | 107.4      | 0.77         | 48,104               | 55,191                         | 143.4      | 28,361              | 78.6       | 0.55         |
| Viet Nam                           | 44,387               | 70,560                         | 172.9       | 58,890              | 148        | 0.86         | 45,342               | 54,476                         | 114.3      | 35,853              | 76.3       | 0.67         |
| Country,<br>Territory, and<br>Area | PICs                 |                                |             |                     |            |              |                      |                                |            |                     |            |              |
|                                    | Men                  |                                |             |                     |            |              | Women                |                                |            |                     |            |              |
|                                    | Population<br>(1000) | Estimated<br>Incident<br>Cases |             | Estimated<br>Deaths |            | M/I<br>Ratio | Population<br>(1000) | Estimated<br>Incident<br>Cases |            | Estimated<br>Deaths |            | M/I<br>Ratio |
|                                    |                      | n                              | ASR (W)     | n                   | ASR (W)    |              |                      | n                              | ASR (W)    | n                   | ASR (W)    |              |
| Fiji                               | 446                  | 340                            | 91.3        | 239                 | 65.4       | 0.72         | 429                  | 795                            | 189.3      | 418                 | 104.3      | 0.55         |
| French Polynesia <sup>‡</sup>      | 141                  | 392                            | 287.4       | 216                 | 153.9      | 0.54         | 135                  | 327                            | 227.3      | 163                 | 116.3      | 0.51         |
| Guam <sup>‡</sup>                  | 93                   | 194                            | 198         | 103                 | 105.4      | 0.53         | 90                   | 148                            | 143        | 59                  | 54.7       | 0.38         |
| New Caledonia <sup>‡</sup>         | 129                  | 475                            | 330.7       | 211                 | 145.9      | 0.44         | 129                  | 411                            | 269.3      | 168                 | 112        | 0.42         |
| <i>Papua New Guinea</i>            | 3657                 | 2908                           | 156.7       | 2285                | 131.6      | 0.84         | 3512                 | 4457                           | 179.8      | 2889                | 124.5      | 0.69         |
| <i>Samoa</i>                       | 95                   | 63                             | 92.5        | 43                  | 64.4       | 0.70         | 89                   | 74                             | 96.1       | 38                  | 49.4       | 0.51         |
| <i>Solomon Islands</i>             | 292                  | 153                            | 89.3        | 128                 | 77.9       | 0.87         | 273                  | 281                            | 145.1      | 165                 | 94.6       | 0.65         |
| Vanuatu                            | 128                  | 81                             | 98.2        | 71                  | 87.9       | 0.90         | 123                  | 108                            | 117        | 56                  | 66.6       | 0.57         |

ASR, age-standardized rates; HICs, high-income countries; LMICs, low- and middle-income countries; M/I, Mortality/Incidence; PDR, People's Democratic Republic; PIC, Pacific Island countries and areas; WPR, Western Pacific Region.

\*ASR (W): standardized rate for world population per 100,000.

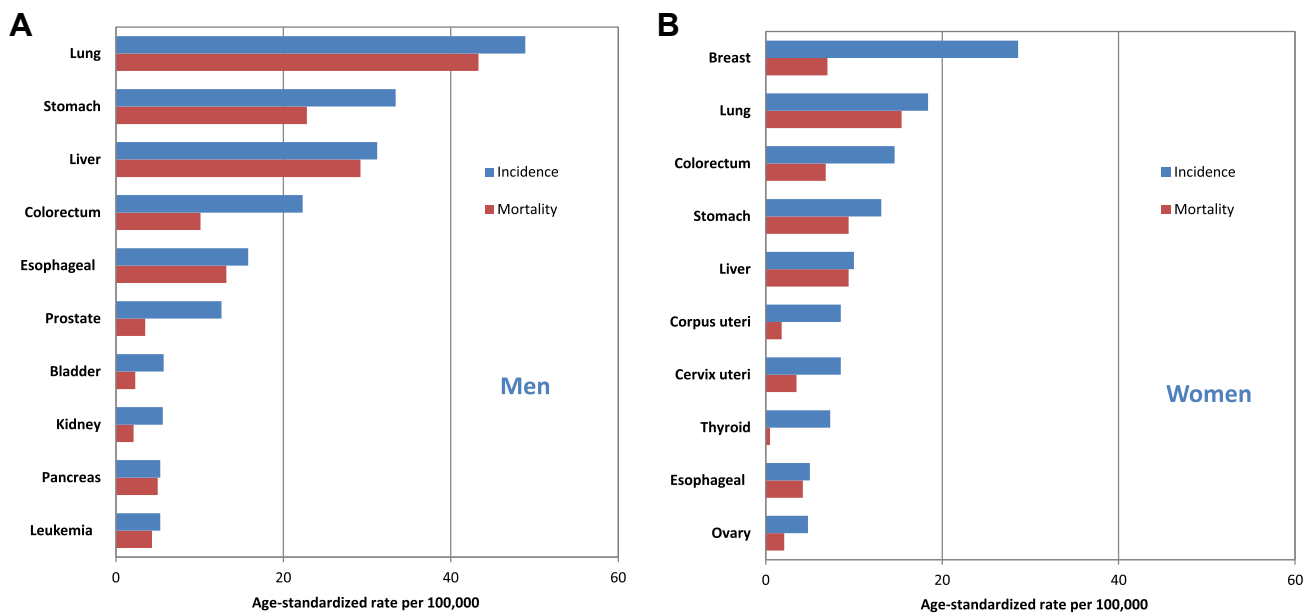
<sup>†</sup>Countries in *italics* used estimates from other countries (with similar characteristics to them) to compute the estimates. Information from these countries was excluded in the comparison with other countries.

<sup>‡</sup>High-income countries and areas.

Republic of Korea (22.3) to highest in men in Brunei (54.4), but were much lower than those in LMICs (ranges from lowest in women in Philippines [54.8] to highest in men in Lao [89.9]). In PICs, the lowest M/I

ratio (0.38) was for women in Guam to the highest for men in Vanuatu (0.90).

Cancer burden in 2012 and projected burden in 2025 are presented in Table 3. In the WPR, it is



**Figure 1.** Ten most common cancers in (A) men and (B) women in the Western Pacific Region, Globocan, 2012.

estimated to increase by 45% (1,193,570) in men and 35% in women (670,317) by 2025 from the 2012 burden compared with the expected increase in the global burden by 41% (3,011,849) in men and 33% (2,209,064) in women. The estimated number of new cancer cases in LMICs of the region will increase by 44% (3,351,565 in 2012 to 4,815,514 in 2025). The proportional increase in HICs will be 25% (1,082,965 in 2012 to 1,353,878 in 2025).

## Cancer Registration

Cancer incidence is 1 of the 25 indicators in the comprehensive global monitoring framework for NCD prevention and control.<sup>4</sup> Table 4 presents the data sources and methods used for the estimation of cancer burden in Globocan 2012. Information in the table presents the sources of cancer information from countries of the WPR.<sup>7</sup> In *CI5-X*, data from 8 countries in WPR were included. They were data of national cancer registration from Australia, Republic of Korea, New Zealand, and Singapore and data of regional/subnational registries in Japan (data of 8 registries with 15.4% coverage), Philippines (data of 2 registries with 14.4% coverage), Malaysia (data of 1 registry with 5.4% coverage), and China (data of 14 registries with 2.4% coverage).

In PICs, cancer registration is still in its early stages and some information is available from Cook Islands, Fiji, Niue and Tonga.<sup>11</sup> American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, Federated States of Micronesia, Republic of the Marshall Islands, and Republic of Palau are U.S. affiliated Pacific Islands (USAPI) and have been supported by the Pacific Regional Cancer Registry since

2003.<sup>12</sup> None of PICs contributed to the *CI5-X* publication.

## Cancer Control

Table 5 presents the status of cancer control policies, availability of guidelines, and service availability in primary health care levels in the public sector in LMICs and PICs. This information is made available from the NCD CCS conducted in 2013. The availability of services was specified as “available in primary health care (more than 50% of the facilities) in public sector.”

Of the 7 LMICs in the WPR, 6 have a policy, strategy, or action plan for cancer. Of these, 5 are operational. In PICs, 13 of the 21 islands and areas have a cancer policy. Of these, 9 are operational. Control of cancer risk factors, especially tobacco control, has gained momentum. Almost all countries have a tobacco control policy in place (6 LMICs and 18 PICs). Tobacco taxation and control of tobacco advertisement, promotion, and sponsorship has become a priority. Alcohol use is an important risk factor for cancer in the region and only 43% of LMICs (3) and 67% of PICs (14) have policy to reduce harmful use of alcohol. Evidence-based national guidelines, protocols, or standards are available in 71% of LMICs (5) and 57% of PICs (12).

Availability of cancer screening tests and procedures at the primary health care level in the public sector is limited in LMICs. Cervical cytology is available in 57% of LMICs (4) and 67% of PICs (21), acetic acid visualization in 29% of LMICs (2) and 24% of PICs (51), and fecal occult blood test in 14% of LMICs (1) and 71% of PICs (15). Community/home care for people with advanced or end-stage NCDs (e.g., advanced cancer pain management and palliative care, stroke sequelae, and disability care) is available in 67%

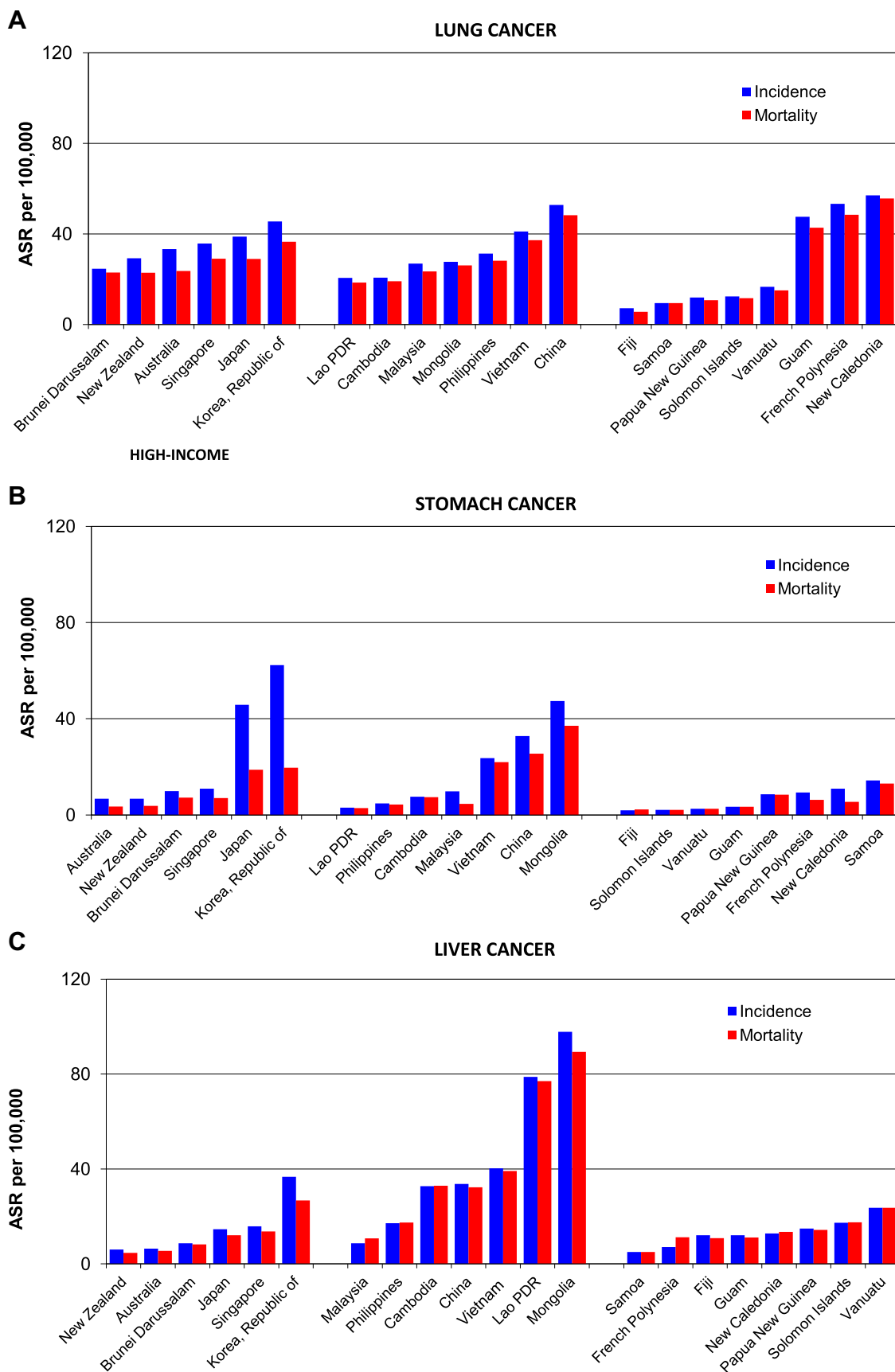
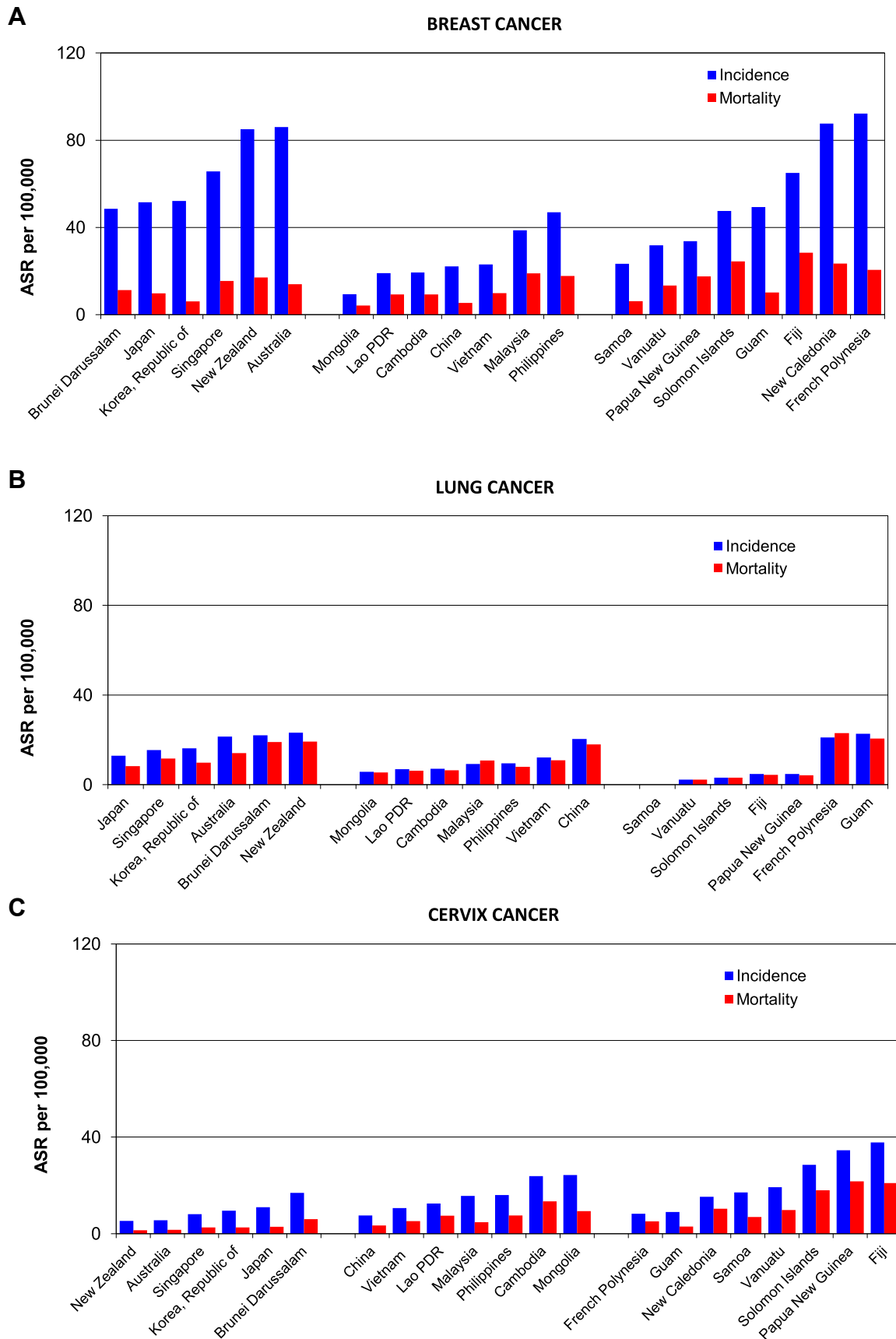


Figure 2. Incidence age-standardized rates (ASR) of leading cancers—(A) lung, (B) stomach, and (C) liver—in men in selected countries of the Western Pacific Region, Globocan, 2012.



**Figure 3.** Incidence age-standardized rates (ASR) of leading cancers—(A) breast, (B) lung, and (C) cervix uteri—in women in selected countries of the Western Pacific Region, Globocan, 2012.

**Table 3. Cancer Burden and Projections in WHO Regions and the World**

| WHO Region                   | Population, 2012<br>(thousands) |           | Estimated Number of<br>Cancer Cases, 2012 |           | Projected Number of<br>Cancer Cases, 2025 |           | Increase in<br>Cancer Cases<br>(%) |       |
|------------------------------|---------------------------------|-----------|---|-----------|---|-----------|------------------------------------|-------|
|                              | Men                             | Women     | Men                                       | Women     | Men                                       | Women     | Men                                | Women |
| African Region               | 439,124                         | 438,885   | 264,569                                   | 380,502   | 388,153                                   | 556,289   | 46.7                               | 46.2  |
| Region of the Americas       | 471,077                         | 482,691   | 1,453,678                                 | 1,428,747 | 2,080,058                                 | 1,940,090 | 43.1                               | 35.8  |
| Eastern Mediterranean Region | 318,367                         | 304,391   | 262,641                                   | 292,677   | 387,646                                   | 431,258   | 47.6                               | 47.3  |
| European Region              | 437,141                         | 465,356   | 1,987,190                                 | 1,749,772 | 2,403,651                                 | 2,001,413 | 21.0                               | 14.4  |
| South-East Asia Region       | 945,981                         | 907,214   | 816,013                                   | 908,319   | 1,163,060                                 | 1,246,655 | 42.5                               | 37.2  |
| Western Pacific Region       | 945,063                         | 897,238   | 2,641,596                                 | 1,901,763 | 3,835,166                                 | 2,572,080 | 45.2                               | 35.2  |
| World                        | 3,557,717                       | 3,496,728 | 7,427,148                                 | 6,663,001 | 10,438,997                                | 8,872,065 | 40.6                               | 33.2  |

WHO, World Health Organization.

of LMICs (2) and 71% of PICs (15). Oral morphine for pain relief is available in 29% of LMICs (2) and 71% of PICs (15).

## DISCUSSION

The WPR, which has more than one-fourth of the world's population, has one-third of global cancer burden. The WPR is expected to have a 41% increase in the cancer burden by 2025. Age-adjusted incidence rates of cancer are relatively high in HICs compared with LMICs and PICs. The low rates of cancer are partly due to the limitations in diagnostic capacity and incomplete cancer registration.

Leading cancer sites in the WPR are lung, stomach, liver, colorectum, oesophagus, breast, and uterine cervix. Prevention potential of these cancers can be fully utilized, along with early detection strategies. Tobacco control has gained momentum but needs strengthened implementation of policies. Stomach cancer is particularly common in East Asian countries and needs to be addressed appropriately. Hepatitis B vaccination coverage has improved, whereas HPV vaccination is not yet widely available. Screening for the cancer of uterine cervix can save lives and should be prioritized in all LMICs.

Globocan provides comparable estimates of cancer burden across countries. Data sources of many LMICs were hospital frequency information and rates of neighborhood countries were applied for estimation. Some caution may be exercised in comparison of these estimates from those published earlier as the sources of data for these estimates are not consistent and are continuously improving in quality and coverage. Despite these constraints, overall cancer incidence can be compared across the WPR and by subregions. Substantial work is needed to improve population-based cancer registration, including capacity building and strengthening of civil registration systems. Accurate data on the incidence, pattern and mortality from cancer registration and vital

registration system is one of the inputs to plan, effectively implement, and evaluate cancer control programs.<sup>13</sup> Limitations in diagnostic capacity and geographic limitations have an effect on cancer registration in the WPR. The referral scheme for treatment of cancer patients outside the islands adds to the complexity of coverage in some settings.<sup>25</sup> LMICs should enhance investment and capacity for an effective and sustainable surveillance system for cancer.

Cancers of the lung, stomach, esophagus, colorectal, breast, and cervix are the most common cancers in the WPR. Most of them are amenable to prevention and others can be controlled. Control of risk factors such as tobacco use, unhealthy diet, lack of physical activity, harmful use of alcohol, and overweight and obesity will not only reduce the incidence of many cancers, but will help to reduce other NCDs.<sup>14</sup> Among these factors, tobacco is the most widely used harmful product and main avoidable causes of cancer. One-third of male cancers and more than 70% of lung cancer are attributable to tobacco smoking.<sup>15,16</sup> To promote tobacco control, a framework for guidelines and protocols to reduce tobacco consumption and tobacco supply through evidence-based interventions was set by the WHO Framework Convention on Tobacco Control.<sup>17</sup> Stronger national initiatives on tobacco control will further reduce tobacco related cancers.<sup>18</sup>

Reducing harmful use of alcohol is an effective preventive strategy for cancers of the oral cavity, pharynx, larynx, esophagus, liver, colorectum, and breast. In 2010, the WHO endorsed a global strategy to reduce harmful use of alcohol. The strategy recommends 10 target areas for action in countries.<sup>19</sup>

Unhealthy diet increases the risk for some cancers, especially nasopharyngeal cancer, associated with intake of salted fish, and stomach cancer.<sup>20</sup> Additionally, promoting healthy diet and physical activity helps to prevent overweight and obesity, as well as colorectal and breast cancers.

In addition to these major modifiable behavioral risk factors, infection is also an important risk factor for

**Table 4. Methods and Data Used to Estimate Incidence and Mortality in Globocan 2012**

| Member States and Areas | Incidence  | Mortality   |
|-------------------------|--|---|
| <b>HICs</b>             |  |   |
| Australia               | National incidence rates (1989-2008) projected to 2009-2013 and applied to 2012 population.  | National mortality rates (2002-2011) projected to 2012 and applied to 2012 population.  |
| Brunei Darussalam       | Computed using estimated national mortality for 2012 and modeled survival supplemented by information from national cancer registry in 2006.   | Mortality rates (2006-2011) rates applied to 2012 population.   |
| Japan                   | Estimated from estimated national mortality for 2012 by modeling, using a set of age-, sex-, and site-specific incidence: mortality ratios obtained by the aggregation of recorded cancer registry data from 8 Japanese cancer registries (Aichi, Fukui, Hiroshima, Miyagi, Nagasaki, Niigata, Osaka, and Saga) covering 15% of the population for the period 2003-2007.<br>Kaposi sarcoma (C46): regional incidence rates from 8 Japanese cancer registries (2003-2007) were applied to 2012 population.<br>Female breast (C50) and prostate (C61) cancers: regional incidence rates from 3 Japanese cancer registries (Miyagi, Nagasaki and Osaka) for the period 1988-2007 were projected to 2008-2012, 2013-2017, and applied to 2012 national population. | National mortality rates (2002-2011) were projected to 2012 and applied to 2012 population.   |
| Korea, Republic of      | National incidence rates (2000-2009) were projected to 2012 (except for thyroid cancer [C73] for which incidence rates for 2009 were applied to 2012 population).  | National mortality rates (2002-2011) were projected to 2012 and applied to 2012 population.   |
| New Zealand             | National incidence rates (1989-2008) projected to 2009-2013 and applied to 2012 population.  | National mortality rates (2000-2009) projected to 2012 and applied to 2012 population.  |
| Singapore               | National incidence rates (1988-2007) were projected to 2008-2012, 2013-2017, and applied to the national population (2012, UN estimates, which includes nonresidents).   | National mortality rates (2002-2011) were projected to 2012 and applied to 2012 population. For Kaposi sarcoma (C46), mortality rates were computed from incidence using age-specific incidence:mortality ratios from Republic of Korea (2012). |
| <b>LMICs</b>            |  |   |
| Cambodia                | <i>Estimated as the mean average of the incidence rates from:</i><br>1. Sex- and age-specific "All sites" from Vietnam, Ho Chi Min City (2006-2010) partitioned by site and age using proportions from Phnom Penh Cancer Registry (2001-2003).<br>2. Simple mean of the rates from Thailand, Ubon Ratchathani (2004-2006) and Rayong (2004-2006) cancer registries.  | <i>Estimated national cancer incidence for 2012 and modeled survival.</i>   |

(continued)



**Table 4 (continued).** Methods and Data Used to Estimate Incidence and Mortality in Globocan 2012

| Member States and Areas | Incidence  | Mortality  |
|-------------------------|--|--|
| China                   | <p>Three sets of estimates have been prepared for:</p> <ol style="list-style-type: none"> <li>1. China but Hong Kong and Macao: the estimated mortality for 2012 was converted to incidence by modeling using age-, sex-, and site-specific mortality:incidence ratios derived from recorded data in 23 Chinese cancer registries covering 3% of the total population (source <i>C15-X</i>). Mortality:incidence ratios were prepared for rural and urban populations and combined according to the estimated urban:rural ratio for 2005 (40%, source UN).</li> <li>2. China, Hong Kong SAR: incidence rates (2000-2009, source Hong Kong cancer registry) were projected to 2012 and applied to 2012 population.</li> <li>3. China, Macao SAR: incidence rates (2003-2009, source Macao cancer registry) were projected to 2012 and applied to 2012 population.</li> </ol> <p>The Chinese incidence estimates are the sum of the 3.</p> | <p>Three sets of estimates have been prepared for:</p> <ol style="list-style-type: none"> <li>1. China but Hong Kong and Macao: mortality rates for a representative sample (6% of the population) for the period 2004-2010 (source DSP) were projected to 2012 and applied to the corresponding population in 2012. For the missing cancer sites (C23-24, C45, C46, C62, C64-66, C70-72, and C73), the "other and unspecified cancer sites" category was partitioned into specific categories using proportions obtained from mortality data in 23 Chinese cancer registries.</li> <li>2. China, Hong Kong SAR: mortality rates (2001-2009, source WHO) were projected to 2012 and applied to 2012 population.</li> <li>3. China, Macao SAR: mortality rates (2003-2009, source Macao cancer registry) were projected to 2012 and applied to 2012 population.</li> </ol> <p>The Chinese mortality estimates are the sum of the 3.</p> |
| Lao PDR                 | <p><i>Estimated as the population-weighted average of Thailand, Udon Thani (2004-2006), and Khon Kaen (2003-2007) cancer registries.</i></p>   | <p><i>Estimated from estimated incidence in 2012 and modeled survival.</i></p>   |
| Malaysia                | <p>Simple mean of the incidence rates recorded in peninsular Malaysia less Penang (2006), Penang (2004-2007), and Sarawak (1998-2002).</p>   | <p>National mortality rates (2000-2008) were projected to 2012 and applied to 2012 population.</p>   |
| Mongolia                | <p>National incidence rates (2012).</p>  | <p>Sex-, site, and age-specific incidence:mortality ratios were computed using cancer registry data for the period (2007-2008) and applied to estimated incidence.</p>   |
| Philippines             | <p>The national incidence rates were computed as the weighted average (85% and 15%, respectively) of the incidence rates from:</p> <ol style="list-style-type: none"> <li>1. Those obtained using the mortality estimates for 2012 converted to incidence using modeled survival.</li> <li>2. The population-weighted average of the Manila and Rizal incidence rates (1988-2007) projected to 2008-2012</li> </ol>  | <p>National mortality rates (2008) applied to 2012 population.</p>   |
| Vietnam                 | <p>The national incidence rates were computed as the weighted average (70%, 15%, and 15%, respectively) of the incidence rates from:</p> <ol style="list-style-type: none"> <li>1. Those obtained using the mortality data (2005-2006) for rural provinces converted to incidence using modeled survival.</li> <li>2. Ho Chi Minh city cancer registry (2006-2010)</li> <li>3. Ha Noi city cancer registry (2007-2009)</li> </ol>  | <p>Estimated from estimated national cancer incidence for 2012 and modeled survival.</p>   |

(continued)

**Table 4 (continued).** Methods and Data Used to Estimate Incidence and Mortality in Globocan 2012

| Member States and Areas | Incidence   | Mortality   |
|-------------------------|---|---|
| PICs                    |   |   |
| Fiji                    | Site-specific incidence rates for all ages were estimated from estimated national mortality data for 2012 and modeled survival and partitioned using sex- and age-specific proportions from Fiji cancer registry (1991-1999).   | National rates (2009) applied to 2012 population.                                 |
| French Polynesia*       | Incidence rates (1988-2002) were projected to 2008-2012 and applied to the 2012 population.   | Mortality rates (2003-2005) were applied to the 2012 population.                  |
| Guam*                   | Incidence rates (2003-2007) applied to 2012 population.   | Estimated from national incidence estimates using modeled survival                |
| New Caledonia*          | Incidence rates (2008-2010) applied to the 2012 population.   | Mortality rates (2008-2010) applied to the 2012 population.                       |
| Papua New Guinea        | Two data sets were computed:<br>1. Simple mean of "All sites but skin" incidence rates from Fiji, Vanuatu, and New Caledonia, partitioned by sex, site, and age using data from histopathology registry (1978-1983) for the main land (part of New Guinea).<br>2. Simple mean of Fiji, Vanuatu, and New Caledonia for the islands.<br>The final rates are the weighted (80%, 20%) rates according to 2000 census. | Estimated from estimated national incidence for 2012 and modeled survival.        |
| Samoa                   | National incidence rates (1983-1987) were applied to the 2012 population.   | Estimated from estimated national cancer incidence for 2012 and modeled survival. |
| Solomon Islands         | Simple mean of Fiji and Vanuatu.  | Estimated from estimated national incidence for 2012 and modelled survival.       |
| Vanuatu                 | Incidence rates (1999-2003) applied to the 2012 population.   | Estimated from estimated national incidence for 2012 and modeled survival.        |

HICs, high-income countries; LMICs, low- and middle-income countries; PICs, Pacific Island Countries and Areas.

\*High-income countries.

cancer in LMICs, as well as in some HICs. As much as one-fourth of cancer cases and deaths were attributable to infection with *Helicobacter pylori*, hepatitis B (HBV) and C viruses, and HPV in the Republic of Korea.<sup>21</sup> Thus cancer-specific strategies should include specific interventions aimed at avoidance or control of cancer-associated infections. The key milestone on HBV control in the WPR is the reduction of HBV infection prevalence to less than 2% in 5-year-old children by 2012 by at least 30 Member States, and then aiming toward the goal of less than 1% prevalence by 2015. Both birth-dose and 3-dose vaccine coverage have steadily increased in the WPR, which now has the highest rates of coverage of any WHO region.<sup>22</sup> HPV vaccination for prevention of cervical cancer control is yet to be taken up widely in the WPR.

Screening for cervical cancer is a priority public health intervention and substantial reduction in

cervical cancer incidence can be achieved through this program when there is adequate coverage and good systems to follow-up and manage screen-positive cases. Visual inspection with acetic acid followed by cryotherapy has been shown to be feasible for cervical cancer control in low-resource settings and can be considered. Diagnostic and management capacity are critical for any early detection program. Lack of pathologists and histo-cytopathology services are a serious limiting factor in many LMICs and PICs. Health-system strengthening, especially the primary health care, is needed for early detection of suspected cancer cases and referral for further investigations and management. Well-functioning primary care systems are needed to ensure continuing and palliative care for cancer patients.

Trained human resources are critical for all components for cancer control and have to be a priority for all

**Table 5. Availability of Cancer Prevention and Control Services at the Primary Health Care Level in LMICs and PICs, Western Pacific Region**

| Country/Area                        | Cancer                                | Cancer                                  | Fecal Occult         |                              |  | Home Care  | Oral     |
|-------------------------------------|---------------------------------------|---|----------------------|------------------------------|--|--|----------|
|                                     | Policy/<br>Strategy or<br>Action Plan | Evidence-based<br>National<br>Guideline | Cervical<br>Cytology | Acetic Acid<br>Visualization | Blood Test or<br>Fecal Immunologic<br>Test | for People<br>with<br>Advanced/<br>End-stage<br>NCDs |          |
| China                               | Yes                                   | Yes                                     | No                   | No                           | No   | No   | No       |
| Malaysia                            | Yes                                   | Yes                                     | Yes                  | Yes                          | Yes  | No   | Yes      |
| Cambodia                            | Yes                                   | Yes                                     | Yes                  | Yes                          | DK   | No   | No       |
| Lao People's Democratic<br>Republic | No                                    | DK                                      | Yes                  | No                           | No   | Yes  | No       |
| Mongolia                            | Yes                                   | Yes                                     | Yes                  | No                           | No   | Yes  | Yes      |
| Philippines                         | Yes                                   | No                                      | No                   | No                           | No   | No   | No       |
| Viet Nam                            | Yes                                   | Yes                                     | No                   | No                           | No   | No   | No       |
| <b>Total (N = 7)</b>                | 6 (86%)                               | 5 (71%)                                 | 4 (57%)              | 2 (29%)                      | 1 (14%)                                    | 2 (29%)  | 2 (29%)  |
| French Polynesia                    | Yes                                   | Yes                                     | Yes                  | Yes                          | Yes  | Yes  | Yes      |
| Guam                                | Yes                                   | Yes                                     | Yes                  | Yes                          | Yes  | Yes  | DK       |
| New Caledonia                       | Yes                                   |   | Yes                  | Yes                          | Yes  | Yes  | Yes      |
| Northern Mariana Islands            | Yes                                   | Yes                                     | Yes                  | No                           | Yes  | Yes  | Yes      |
| American Samoa                      | Yes                                   | Yes                                     | Yes                  | No                           | No   | Yes  | Yes      |
| Cook Islands                        | No                                    | No                                      | Yes                  | Yes                          | Yes  | Yes  | No       |
| Fiji                                | Yes                                   | Yes                                     | Yes                  | No                           | Yes  | Yes  | Yes      |
| Marshall Islands                    | Yes                                   | Yes                                     | Yes                  | No                           | Yes  | Yes  | Yes      |
| Nauru                               | No                                    | No                                      | Yes                  | No                           | No   | Yes  | Yes      |
| Niue                                | Yes                                   | Yes                                     | Yes                  | No                           | Yes  | Yes  | Yes      |
| Palau                               | Yes                                   | Yes                                     | Yes                  | No                           | Yes  | Yes  | No       |
| Tonga                               | No                                    | No                                      | No                   | No                           | No   | Yes  | Yes      |
| Tuvalu                              | No                                    | Yes                                     | Yes                  | No                           | Yes  | Yes  | Yes      |
| Wallis and Futuna                   | No                                    | Yes                                     | Yes                  | DK                           | Yes  | Yes  | Yes      |
| Kiribati                            | Yes                                   | No                                      | Yes                  | No                           | Yes  | No   | No       |
| Micronesia (Federated States<br>of) | Yes                                   | Yes                                     | No                   | Yes                          | Yes  | No   | Yes      |
| Papua New Guinea                    | Yes                                   | No                                      | No                   | No                           | Yes  | No   | No       |
| Samoa                               | No                                    | No                                      | No                   | No                           | Yes  | Yes  | Yes      |
| Solomon Islands                     | No                                    | No                                      | No                   | No                           | No   | No   | Yes      |
| Tokelau                             | No                                    | No                                      | No                   | No                           | No   | No   | Yes      |
| Vanuatu                             | Yes                                   | Yes                                     | No                   | No                           | No   | No   | No       |
| <b>Total (N = 21)</b>               | 13 (62%)                              | 12 (57%)                                | 14 (67%)             | 5 (24%)                      | 15 (71%)                                   | 15 (71%)   | 15 (71%) |

DK, don't know; LMICs, low- and middle-income countries; PICs, Pacific Island countries and areas.

\*Availability in the public health sector.

LMICs. The WHO Western Pacific Regional Office has developed a program for cancer control capacity building that can be adapted at national level.<sup>23</sup> The WHO has published a series of modules for putting cancer control knowledge into action, which helps to guide national cancer control program development.<sup>24</sup> Countries can identify their stage in the cancer control continuum and start a feasible programme. Tobacco control and palliative care are entry points applicable to all countries. Wider partnerships with all sectors of the government and the civil society are needed for advancing cancer control. A well-conceived and well managed national cancer control

program lowers cancer mortality and improves the life of cancer patients, no matter what resource constraints a country faces.

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