

## RESEARCH ARTICLE

# Mapping HPV Vaccination and Cervical Cancer Screening Practice in the Pacific Region-Strengthening National and Regional Cervical Cancer Prevention

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### Abstract

**Objective:** To provide background information for strengthening cervical cancer prevention in the Pacific by mapping current human papillomavirus (HPV) vaccination and cervical cancer screening practices, as well as intent and barriers to the introduction and maintenance of national HPV vaccination programmes in the region. **Materials and Methods:** A cross-sectional questionnaire-based survey among ministry of health officials from 21 Pacific Island countries and territories (n=21). **Results:** Cervical cancer prevention was rated as highly important, but implementation of prevention programs were insufficient, with only two of 21 countries and territories having achieved coverage of cervical cancer screening above 40%. Ten of 21 countries and territories had included HPV vaccination in their immunization schedule, but only two countries reported coverage of HPV vaccination above 60% among the targeted population. Key barriers to the introduction and continuation of HPV vaccination were reported to be: (i) Lack of sustainable financing for HPV vaccine programs; (ii) Lack of visible government endorsement; (iii) Critical public perception of the value and safety of the HPV vaccine; and (iv) Lack of clear guidelines and policies for HPV vaccination. **Conclusion:** Current practices to prevent cervical cancer in the Pacific Region do not match the high burden of disease from cervical cancer. A regional approach, including reducing vaccine prices by bulk purchase of vaccine, technical support for implementation of prevention programs, operational research and advocacy could strengthen political momentum for cervical cancer prevention and avoid risking the lives of many women in the Pacific.

**Keywords:** Pacific - cervical cancer - human papillomavirus - vaccination - screening practice

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### Introduction

Infection with oncogenic types of the sexually transmitted human papillomavirus (HPV) is a prerequisite for the development of cervical cancer (Walboomers et al., 1999). Of the 528,000 new cervical cancer cases globally each year, 85% occur in low-income countries, where it ranges between the first to fourth most common type of cancer in women (Ferlay et al., 2015). Despite the existence of evidence based primary and secondary prevention measures, 266,000 women die throughout the world each year from cervical cancer. The vast majority of these deaths occur in low-income countries (Ferlay et al., 2010; Ferlay et al., 2015). Primary prevention by high coverage of vaccination against the highly prevalent

oncogenic HPV genotypes 16 and 18 among girls before sexual debut has the potential to reduce the global burden of cervical cancer by 70-80% (WHO, 2009). Secondary prevention by screening and treatment of pre-cancerous lesions in young and middle aged women has been shown to reduce the incidence of and mortality from cervical cancer substantially in countries with well established health systems and has also recently been demonstrated to be effective in low-income countries (Denny and Anorlu, 2012).

Low- and middle income countries currently face considerable barriers for the prevention of cervical cancer. The most commonly mentioned barriers for introduction of HPV vaccination include: *i*) the high price of the HPV vaccine; *ii*) lack of effective communication and

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partnerships for building political momentum and support among health authorities, professional organizations, opinion leaders as well as direct beneficiaries; *iii*) lack of functioning delivery systems for achieving high vaccination coverage among adolescents; and *iv*) lack of monitoring systems to measure coverage and effectiveness of the vaccination program (Garland et al., 2008b; Garland, 2009; Denny and Anorlu, 2012; Tsu et al., 2013).

Since 1947, 22 Pacific Island countries and territories (hereafter referred to as the Pacific Region) from Polynesia, Micronesia and Melanesia, with a population of approximately 10.5 million (Secretariat of the Pacific Community, 2013), have collaborated for development, including public health strengthening, through the regional inter-governmental organization Secretariat of the Pacific Community (SPC) (Secretariat of the Pacific Community, 2011). A systematic review of cervical cancer incidence and mortality found that the annual age standardized incidence and mortality rates for cervical cancer in the Pacific Region ranges between 8.2-50.7/100,000 and 2.7-23.9/100,000 respectively. This translates into approximately 800 new cases of cervical cancer and 500 preventable deaths per year (Parkin et al., 2008; Foliaki et al., 2011; IARC, 2012; Obel et al., 2014). The Melanesian island countries rank among the highest cervical cancer incidence and mortality rates in the world (Ferlay et al., 2010; Garland et al., 2012; IARC, 2012) and recent cancer registration from the Micronesian islands found similarly high cervical cancer incidence with the great majority of cases diagnosed at advanced stages (stage II or higher) which is beyond the on-island treatment capacity (Buenconsejo-Lum et al., 2014). Despite the high burden of disease, only a few studies of HPV and cervical cancer have been conducted in the Pacific Region, and there is no updated regional information published regarding screening and vaccination practices in the Pacific Region.

As a means of identifying gaps and to help facilitate initiatives for strengthening cervical cancer prevention in the Pacific Region, the present study maps the current HPV vaccination and cervical cancer screening practices in the Pacific Region as well as the views of Ministry of Health officials in the region on the importance of the prevention programs and barriers to implementation of HPV vaccination in their countries.

## Materials and Methods

The study used a cross-sectional, questionnaire-based survey design to assess current vaccination and screening practices in the Pacific Region, the perceived importance of cervical cancer screening and HPV vaccination as well as barriers to introducing and maintaining HPV vaccination programs. The questionnaire consisted of 26 close-ended questions regarding current national cervical cancer screening and vaccination practices. Further, it covered current screening methods, the target group for screening, screening intervals, coverage of screening as per national guideline as well as whether the country had introduced HPV vaccination, the target group for HPV vaccination, type of vaccine and national data on coverage of 3-dose HPV vaccination within the target

group. Additionally, the respondents were asked to rate the perceived importance of cervical cancer screening and HPV vaccination within their state or territory of origin on a scale from one to eight.

To obtain information about how Pacific Island countries and territories, perceive barriers to the introduction or maintenance of a national HPV vaccination program, the respondents were asked to rank with a score of one to ten the following ten barriers to the introduction or strengthening of HPV vaccination: (1) Visible government endorsement of HPV vaccine programs, (2) Training of health workers, teachers and others involved in the HPV program, (3) Well coordinated planning and implementation, (4) Good communication and engagement of communities, (5) Appropriate education messages, (6) Having sustainable financing for a long term HPV vaccine program, (7) Availability of a national monitoring mechanism to support HPV vaccine programs, (8) Clear guidelines/policy for HPV vaccination, (9) Public perception of value/safety of the HPV vaccine and (10) Other barriers. The barriers listed were deducted from previous recommendations from successful cervical cancer prevention programs (Garland et al., 2008a; Garland et al., 2008b; Garland et al., 2012). Barriers were subsequently grouped as highly important (score of ten to eight), of medium importance (score of seven to four) or of low importance (score of three to one) and for each barrier the proportions of countries that reported each barrier of high, medium or low importance were calculated.

As the questionnaire aimed to assess not only the current vaccination and screening practices, but also the perceived importance, barriers and intent of vaccination implementation, the target groups were the "heads of health" in the region, represented by the administrative chief of health below the minister of health. Government titles vary between the countries and territories in the region; hence the specific title of the heads of health would vary, but typically being: "Director of Health" or "Secretary of Health". The questionnaire was sent to 21 heads of health. Pitcairn Island was not included due to small population size ( $n < 60$ ). To assist the heads of health in providing the technical details for the questionnaire, the questionnaire was also distributed to national focal points for the Pacific Society for Reproductive Health, a charitable trust for strengthening the professional development of sexual, reproductive and neonatal health care professionals in the Pacific. In the United States Affiliated Pacific Islands (American Samoa, Guam, Northern Mariana Islands, Federated States of Micronesia (FSM), Marshall Islands and Palau) information was retrieved by distributing the questionnaire to the cancer program officers in each jurisdictions and the University of Hawaii who together with the Center for Disease Control and Prevention, Division of Cancer Prevention and Control had surveyed cervical cancer prevention activities in the US Affiliated Pacific Islands in 2011 and again in 2013 (Townsend et al., 2014).

The first questionnaires were sent mid October 2013 and the last end December 2013. If countries or territories did not respond, or clarifications were

needed, communication via e-mail and in some cases telephone was initiated within two weeks of distributing the questionnaires. Two countries, Solomon Islands and Vanuatu, were visited by one of SPC field workers in order to obtain answers to the questionnaires. All data was entered into an Excel data sheet and analysis was performed in Excel.

## Results

All 21 countries and territories replied to the questionnaires: however 3 countries (Tuvalu, Wallis and Futuna and Marshall Islands) did not respond to the questions regarding the perceived importance of screening and vaccination, whilst 5 countries did not rate the barriers to HPV vaccination (Tuvalu, Wallis and Futuna, Marshall Islands, Northern Mariana Islands and Niue).

### *Cervical cancer screening practices in the pacific region*

Figure 1 maps the current national screening practices within the Pacific Region. Eleven countries and territories (American Samoa, Cook Islands, Palau, Tokelau, French Polynesia, New Caledonia, Guam, Northern Mariana Islands, FSM, Fiji and Marshall islands) out of the 21 currently implement screening programs based on cytological screening or a combination of cytology and HPV test or cytology and visual inspection. Ten countries and territories (Kiribati, Nauru, Niue, Samoa, Solomon Islands, Tonga, Vanuatu, Papua New Guinea, Tuvalu and Wallis and Futuna) do not have a screening program or only screen opportunistically for cervical cancer. In the case of Papua New Guinea, a formal screening policy exists; however the coverage of the screening program is reported to only reach 1% of eligible women.

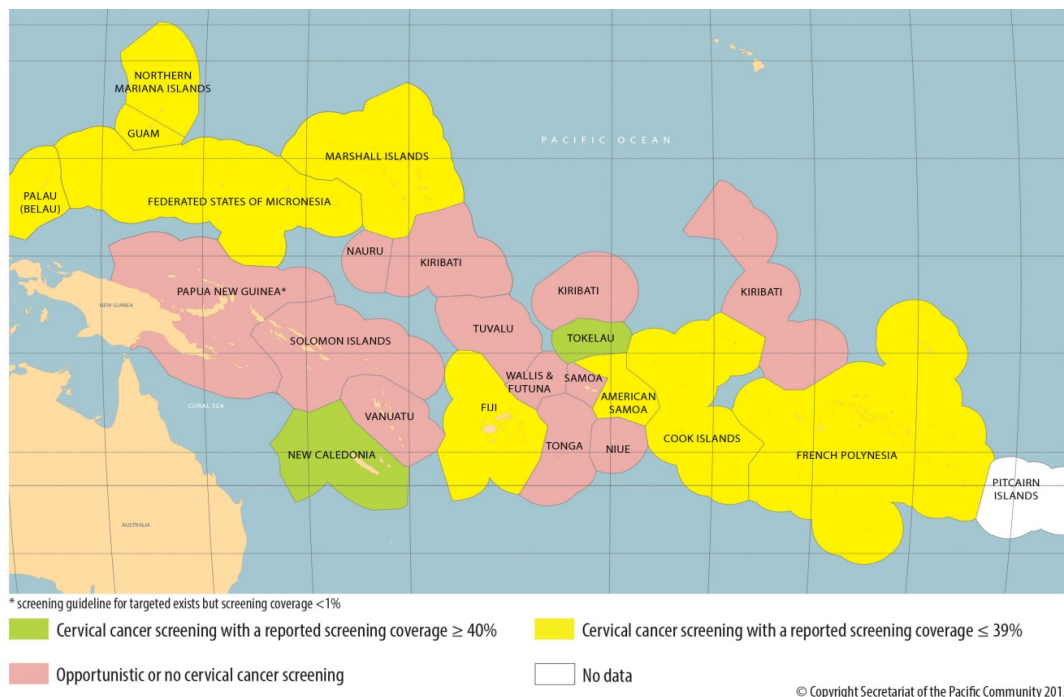
All countries and territories that implement cervical cancer screening were asked to report on the coverage of their screening programs, i.e. the proportion of eligible

women screened according to the national guideline. Tokelau reported 100% coverage. New Caledonia reported not having a fully functioning monitoring mechanism but estimated coverage at 50-60%. Fiji reported to have no monitoring mechanism in place, but 8% coverage has been reported elsewhere (Law et al., 2013). The remaining 7 countries reported screening coverage rates of 4-39% among eligible women.

### *HPV vaccination practice in the pacific region*

Figure 2 maps the current HPV vaccination practices within the Pacific Region. 10 countries and territories (New Caledonia, Cook Islands, FSM, Fiji, Guam, Kiribati, Wallis and Futuna, Marshall Islands, Northern Mariana Islands and Palau) reported HPV vaccination to be included in their national immunization schedule. Three countries (American Samoa, Nauru and Vanuatu) had not yet started to implement national vaccination but Ministry of Health officials reported that a national HPV vaccination program was planned for implementation within the next year or two. Six countries (Niue, Samoa, Solomon Islands, Tokelau, Tonga and Tuvalu) had not introduced the vaccine and two countries and territories (Papua New Guinea and French Polynesia) had implemented the vaccine in pilot sites only or provided the vaccine opportunistically through the private sector.

In the 10 countries and territories that had included HPV vaccination in their national immunization schedule, only five states and territories reported national coverage rates of fully immunized girls. Three countries and territories (New Caledonia, Wallis and Futuna and Palau) reported not having a monitoring system in place to measure vaccine coverage. Cook Island reported high coverage (93%) of HPV dose two, but that the third dose of HPV vaccine had not been provided as the vaccine was out of stock. Fiji had just very recently introduced the vaccine and reported high coverage of 92% out of



**Figure 1. Map of Cervical Cancer Screening Practices in the Pacific Region, 2013**

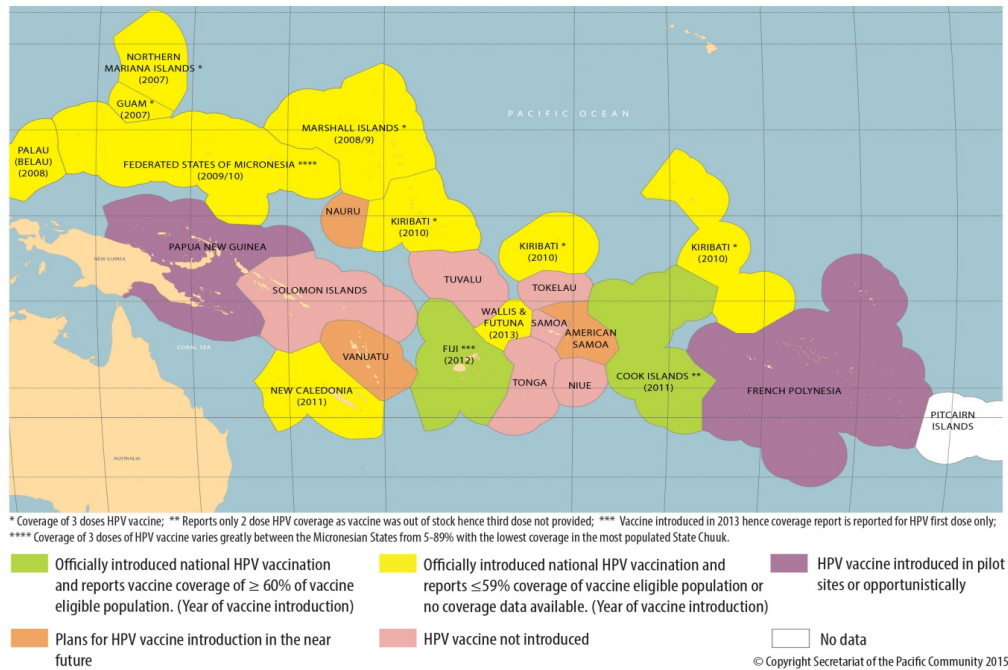


Figure 2. Map of HPV Vaccination Practice in the Pacific Region, 2013

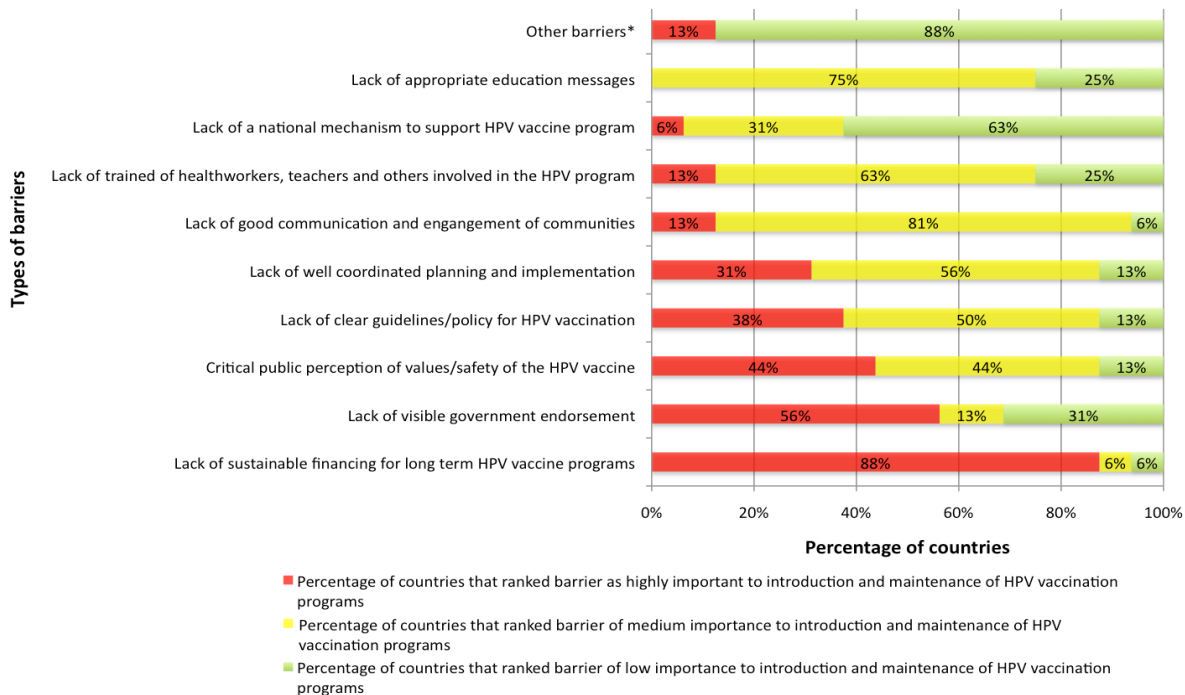


Figure 3. Barriers to Introduction and Implementation of National HPV Vaccination Programs in the Pacific Region, 2013. \*Barriers under the category “Other barriers” were: Lack of quality standards for vaccines and cold chains; Lack of human resources; Lack of national champions to drive the process of vaccine introduction; Lack of acceptance for school-based vaccination among school authorities and school nurses; Lack of awareness campaigns targeting parents

the vaccine eligible population for the first dose of HPV vaccine, but no available data regarding second and third dose coverage. Four countries and territories (Guam, Kiribati, Marshall Island and Northern Mariana Island) reported coverage rates ranging 2-56%. The Federated States of Micronesia reported coverage rates for each island as opposed to overall coverage with coverage varying between <5%-89%.

*The perceived importance of cervical cancer screening and HPV vaccination*

Countries and territories were asked to rank the importance of HPV vaccination and cervical cancer

screening on a scale from 1 to 8, with eight being the most important. Eighteen of 21 countries and territories replied to this question.

Fifteen of the 18 countries and territories ranked cervical cancer screening importance as high (score of seven to eight). The mean score of all countries and territories was 7.3. When asked about the importance of HPV vaccination, all countries and territories with the exception of French Polynesia, Samoa, Solomon Island and Niue (14 out of 18) ranked the importance the highest possible (score 8). The mean score for importance of HPV vaccination across countries and territories was found to be 7.4.



### Barriers to introduction of vaccination

Figure 3 presents how countries and territories ranked each barrier to vaccine introduction: highly important (rank 8 to 10), medium important (rank 4 to 7) and less important (rank 1 to 3). Sustainable long-term financing for HPV vaccination programs was ranked as a highly important barrier by the vast majority of countries and territories (88%). Only Papua New Guinea ranked sustainable financing as a less important barrier to HPV vaccine introduction. Visible government endorsement, public perception of value/safety of the HPV vaccine and clear guidelines/policy for HPV vaccination was respectively the 2nd, 3rd and 4th highest ranked barrier to introduction and maintenance of national HPV vaccination programs.

Availability of a national monitoring mechanism and appropriate education messages was rated as the least important barrier to national HPV vaccination programs. There was no clear difference in the ranking of barriers between countries and territories that are currently vaccinating against HPV and those that have not embarked on HPV vaccination.

## Discussion

Pacific countries and territories rated the importance of both screening and HPV vaccination high on their public health agenda. Most countries and territories had a national policy to implement cervical cancer screening programs, including a screening interval, eligible target population and screening method but only few countries had data to report on the performance of the implementation of their screening program. Where coverage of cervical cancer screening could be reported, it generally ranged low among women eligible for screening according to the national screening guideline. Approximately half of the Pacific countries and territories had included HPV vaccination in their national immunization program; however most countries and territories reported coverage rates below 50%. Sustainable financing for long term HPV vaccination was in all but two countries rated as a key barrier to introduction and/or maintenance of national HPV vaccination programs, followed by visible government endorsement, public perception of value/safety of the HPV vaccine and clear guidelines/policy for HPV vaccination in that order.

The monitoring mechanisms to measure performance and coverage of national screening programs were weak and the majority of states and territories report coverage levels comparable to those reported from Sub-Saharan Africa and low income Asian countries such as Myanmar, Nepal and Laos (Akinyemiju, 2012). Only few other studies from the region have assessed coverage of cervical cancer screening, and with the exception of Guam, these studies confirm low coverage of cervical cancer screening in the Pacific Region (Mishra et al., 2001; Balajadia et al., 2008; McAdam et al., 2010; Aruhuri et al., 2012; Hernandez et al., 2013; Law et al., 2013). A recent study from the US Affiliated Pacific Island Jurisdictions (Palau, Guam, American Samoa, Northern Mariana Islands, Federated States of Micronesia and Marshall Islands)

examined the practices, attitudes and knowledge of health care workers on cervical cancer screening (Townsend et al., 2014). Screening was considered a high priority in clinical practice, although the cost associated with screening as well as quality assurance to ensure coverage of all eligible women and that abnormal test results are followed in a timely manner were perceived as key barriers to reducing the cervical cancer burden (Townsend et al., 2014).

Even though cervical cancer screening is an effective measure to reduce the burden of cervical cancer, programs are highly dependent on: health seeking behavior among women, access to service delivery points, training of health personnel and appropriate means of follow-up for screening-positive cases and a well resourced comprehensive national screening program. Furthermore, the choice of screening tests requires careful assessment and adaptation to national circumstances. The regional research based body Asia Oceania Research Organisation in Genital Infections and Neoplasia (AOGIN) has developed a guideline for cervical cancer screening in Asia-Oceania for both low- and high income countries which could serve as a guide for Pacific countries and territories regarding screening test method (Ngan et al., 2011). The findings of this study suggest that monitoring mechanisms to measure screening program performance and enhance coverage within Pacific countries and territories should be strengthened as a means to effectively prevent cervical cancer in this Region. A successful implementation of high level coverage of HPV vaccination in the Pacific Islands and thus reduction in the rates of cervical dysplasia reduces the sensitivity of the screening tests, and HPV DNA may in the future be recommended as the primary screen test (WHO, 2014a).

Ten out of 21 Pacific countries and territories currently have a policy to implement HPV vaccination on a national scale. This number is significantly higher than what was found by retrieving national immunization data year 2012 from the global WHO database on vaccine-preventable diseases. The WHO database reports immunization schedules for 13 out of the 21 Pacific Island countries and territories, and reported that only four countries had included the HPV vaccine in the national immunization schedule at that time (WHO, 2013).

The majority of the ten Pacific countries and territories that has a policy to implement national scale HPV vaccination reported either no monitoring mechanism for measuring national HPV vaccination coverage or limited coverage, below 60% among the eligible population. No countries or territories had to our knowledge conducted base line surveys to measure HPV genotype prevalence or prevalence of cervical dysplasia before commencing national vaccination against HPV. Only two studies from the Pacific Region have reported genotype prevalence in healthy women. Both studies were carried out among women in Vanuatu and may in the future serve as baseline for measuring vaccine effectiveness when the plans for HPV vaccine introduction in Vanuatu are implemented (McAdam et al., 2010; Aruhuri et al., 2012).

A limitation of the study was that only one representative from each Ministry of Health reported

on the national cancer prevention situation. The grading of importance of screening and vaccination as well as barriers to introduction and/or maintenance of national HPV vaccination programs may represent the opinion and perception of only the one informant or a wider group of health professionals, depending on the method the informant used to gather information for the questionnaire. A strength of the study is the good coverage of the region, with 21 officials from 21 Ministries of Health responding fully or partly on the questionnaire.

The introduction and maintenance of a high coverage HPV vaccination program in the Pacific could be a highly effective approach to reducing the burden of cervical cancer, premature deaths and potentially other HPV related cancers (vulvar, vaginal, anal cancer and oro-pharyngeal cancers) (Garland et al., 2007; Garland, 2011). Global estimates and two studies from the Pacific Region of HPV genotype prevalence in women with cervical cancer predict that high coverage of HPV vaccination against HPV16 and 18 among HPV naïve women can prevent approximately 70-80% of cervical cancer cases (Clifford et al., 2003; Tabrizi et al. 2011; Tabone et al., 2012). With the recently FDA approved nine-valent HPV vaccine, protection could be as high as 90-95% (Joura et al., 2014). Studies from countries where high coverage levels has been achieved have found reduced prevalence of genital warts and pre-cancerous cervical lesions among both the vaccinated and un-vaccinated populations, indicating herd immunity with a reduction in the circulating pool of HPV virus (Ali et al., 2013; Baandrup et al., 2013; Gertig et al., 2013; Baldur-Felskov et al., 2014).

Current HPV vaccination regimes rely on vaccinating girls aged 9 years and above, before sexual debut. The introduction of the HPV vaccine falls outside the current scope of the national EPI programs which generally targets children age 0-12 months of age. School-based delivery mechanisms have been shown to be effective in reaching high vaccine coverage levels (Garland et al., 2008a). A recent multi-country study from Peru, Uganda and Vietnam assessed the feasibility and cost of vaccine delivery per fully immunized girl. The study found the school-based delivery mechanism to be more costly than health-center-based delivery or integrated approaches which combined school and health-center based delivery with the average delivery cost per dose USD 3.88-2.08 for school based delivery, USD 1.92 for health center based delivery and USD 1.44 for integrated delivery. The delivery costs varied between countries. Albeit more costly, school-based delivery mechanisms achieved substantially higher coverage rates (82.6-88.9%) than delivery through integrated approaches (60.7%). No coverage estimate was provided among the population in which HPV vaccination was delivered via health facilities only (Levin et al., 2013).

HPV vaccine prices have recently been reduced in GAVI countries (Solomon Island and Papua New Guinea) in the region. These countries can purchase vaccines at a significantly reduced price of 4.5 USD per dose if they are able to establish and show capacity to maintain a high coverage level among the target groups via pilot studies (GAVI, 2013). At this level of vaccine price, a

regional cost-effectiveness study from the Asia-Pacific suggest HPV vaccination to be cost-effective, using annual gross domestic product (GDP) per capita as the cost-effectiveness threshold (Goldie et al., 2008). A recent systematic review of cost-effectiveness of HPV vaccination in low- and middle-income countries confirms these findings and also suggests that HPV vaccination is particularly likely to be cost-effective in settings without an organized cervical cancer screening program (Fesenfeld et al., 2013). In Latin America, a regional financing mechanism via the Revolving Fund of the Pan American Health Organization (PAHO) has been able to lower the HPV vaccine price to USD 10-15 per dose through negotiation with the vaccine companies and bulk purchases (Levin et al., 2013). New developments with the introduction of a two-dose instead of the three-dose regime will further increase cost-effectiveness as well as simplify delivery and lead to improved coverage rates (Dobson et al., 2013; WHO, 2014b). Packaging HPV vaccination programs with national adolescent health efforts targeting sexual risk behavior, substance abuse, under- and over nutrition and physical inactivity could additionally increase cost-effectiveness of the intervention (Broutet et al., 2013).

The Pacific Region is inhabited by approximately 10.5 million people distributed over 22 islands countries and territories with population sizes ranging from below 1,000 to approximately 7 million people (Secretariat of the Pacific Community, 2013). Individual small countries have limited bargaining power to reduce the vaccine related costs. Across the Pacific Island countries and territories, sustainable financing mechanisms for the introduction and/or maintenance of HPV vaccination programs was highlighted as a key barrier to HPV vaccination. Building upon the experience from the PAHO Revolving Fund, a regional financing mechanism in collaboration with neighboring highly populated countries in Asia-Oceania may be a promising avenue to explore as a means to reduce vaccine prices and thereby increasing the cost-effectiveness of the intervention (Andrus et al., 2008).

The cervical cancer disease burden in the Pacific Region is high, especially in the Melanesian countries where incidence ranks among the world's highest (Ferlay et al., 2010; Garland et al., 2012; Obel et al., 2014). Current preventive efforts in the region do not match the burden of disease. In countries where HPV vaccination and screening has been introduced, the coverage levels are generally low. The Pacific Region consists of many small countries and territories, and several international development partners are engaged in the field of reproductive health and cervical cancer prevention. This situation calls for a regional concerted effort to coordinate and support the introduction of the HPV vaccine. A regional approach, ensuring momentum and technical support for strengthening operational research and national monitoring mechanisms as well as building capacity among health workers and other stakeholders could reduce the burden on national health systems, enhance the quality of prevention programs and ensure continuous learning from successful national programs. As has been the case previously in other regions with the cancer-preventing

hepatitis B virus vaccine (Colombara and Wang, 2013), a very powerful intervention may be delayed for several years if we fail to coordinate stakeholders and achieve political momentum for cervical cancer prevention, risking the lives of many women in the Pacific Region.

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