FREE subscription
HPVWorld & Share it
The newsletter on Human Papillomavirus because we can envisage cervical cancer elimination

nº 65

Australia on-track to be the first country to achieve cervical cancer elimination

Karen Canfell, D.Phil
Professor and Director of Research at Cancer Council NSW, Sydney, Australia
Adjunct Professor at Sydney Medical School, The University of Sydney, Australia
The University of UNSW, Australia
karen.canfell@nswcc.org.au

Michaela Hall, M. Math
Modelling Specialist Cancer Council NSW, Sydney, Australia
The University of UNSW, Australia
michaela.hall@nswcc.org.au

Kate Simms, PhD
Postdoctoral research fellow Cancer Council NSW, Sydney, Australia
kate.simms@nswcc.org.au

Recently, the International Papillomavirus Society (IPVS) issued a 'call to action' to health authorities to achieve elimination of cervical cancer as a public health problem.[1] In principle, cervical cancer rates can eventually be reduced to near-zero given the highly effective primary prevention (HPV vaccination) and secondary prevention (cervical screening) interventions now available.[2,3] But even if these interventions can be deployed very rapidly at a global level, the timeline to elimination is uncertain.

The issue of timing is complex, because HPV vaccination is most effective in younger cohorts prior to HPV exposure. But cervical cancer occurs in mid-adult and older women, and it will thus take several decades for the full impact of vaccination to be realised. Cervical screening has a much nearer-term impact on cervical cancer, but the extent of coverage and level of organisation for screening varies widely between countries. Furthermore, a large body of evidence now demonstrates that primary HPV screening is more effective than cytology in protecting against invasive cervical cancer; so countries introducing primary HPV should be able to accelerate the reductions.[3,4] So how will all these factors combine to influence the timing of cervical cancer elimination?

It is useful to look at a specific example. Australia is poised to be the first country to approach cervical cancer elimination, since it has now fully implemented all these major prevention interventions. Australia was the first country to introduce a national publicly-funded HPV vaccination program in 2007, with a wide catch-up age range from 12 to 26 years. In 2013, Australia introduced vaccination for adolescent males, and in 2018 the next generation nonavalent vaccine was introduced, which protects against seven carcinogenic types which are associated with ~90% of cervical cancers. Multiple studies have documented the impact on health outcomes: the prevalence of vaccine-included type-specific infections in young women aged 25-35 years has now drop-ped by a factor of 10 (even in unvaccinated females, due to herd immunity),[5] the prevalence of anogenital warts has dropped substantially in both females and heterosexual males,[6] cervical precancerous abnormalities (CIN2/3) have now dropped by 41% nationally in women aged 20-24 years,[7] and the rate of excisional treatment has now also fallen in young women.[8]

Australia has also had a comprehensive organised screening program since 1991, which by 2010 had already halved cervical cancer incidence rates in women aged 25+ years.[9] Prompted by the impact of vaccination and established evidence on primary HPV-based screening, on December 1st, 2017, Australia transitioned to 5-yearly screening with validated HPV assays, which is expected to reduce cervical cancer incidence and mortality rates by at least a further 20% (Table 1).[10] First out-

Quote this article as:

K Canfell, M Hall, K Simms, M Smith, M Saville (2018). Australia on-track to be the first country to achieve cervical cancer elimination.

Table 1

Projected long term impact of switching to primary HPV screening on health outcomes, costs and health resources utilisation[10]

	CYTOLOGY SCREENING		HPV: FINAL GUIDELINES*	
	If HPV vaccination had not been introduced	Cohort offered vaccination at age 12 year	If HPV vaccination had not been introduced (reduction compared to cytology screening program)	Cohort offered vaccination at 12 years (reduction compared to cytology screening program)
Cervical cancer incidence †	6·92	2·87	4·73 (-31%)	2·17 (-24%)
Cervical cancer mortality †	1·80	0·74	1·15 (-36%)	0·53 (-29%)
Cervical cancer cases (n) ‡	850	353	584 (-265;-31%)	267 (-85;-24%)
Cervical cancer deaths (n) ‡	227	94	145 (-82;-36%)	66 (-28;-29%)
Colposcopies (n) ‡	85795	60995	116889 (31094; 36%)	56479 (-4516;-7%)
Treatments (n) ‡	22661	13899	23963 (1302;6%)	13240 (-659;-5%)
Annual cost‡ of screening programme (AUS$)	$223 million	$192 million	$182 million ($41 million; -19%)	$142 million ($50 million; -26%)

*"Cytology screening" is the prior cytology-based program (2-yearly cytology from ages 18-20 to 69 years). "HPV: Final Guidelines" are final estimates for the HPV-based screening program (5-yearly HPV screening ages 25-74 years) after considering detailed clinical management guidelines for colposcopy referral and post-colposcopy management in new program. †Age-standardised rate (0–84 years), standardised using the 2001 Australian standard population and represented per 100 000 women. ‡Using the female Australian standard population as predicted for 2017.

Megan Smith, PhD, MPH, BE
Research Fellow
Cancer Council NSW,
Sydney, Australia
megan.Smith@nswcc.org.au

Marion Saville, MB ChB, Am Bd, FIAC, Grad Dip Med, GAICD
Executive Director
at VCS Foundation,
Melbourne Australia
Honorary Clinical Associate
Professor, Department of Obstetrics and Gynaecology,
The University of Melbourne,
Australia
marionsaville@icloud.com

comes from a major trial of screening in unvaccinated populations, Compass, have demonstrated that the increased detection of CIN2+ with HPV compared to cytology screening (well documented in unvaccinated populations) is seen even in Australia's population, with its high vaccine uptake.[11]

Recently, we modelled the impact of these multiple interventions on cervical precancerous abnormalities, invasive cervical cancer and mortality, out to 2035 (Figure 1).[12] Because of the increased sensitivity of HPV testing, it is initially expected to result in an apparent transitional increase in cancer rates due to earlier detection. In the intermediate term, cervical cancer rates are expected to halve (again) by 2035, and mortality rates should remain stable until about 2020, but then decline by 45% by 2035. These findings indicated that both HPV vaccination and primary HPV screening represent significant and timely steps in Australia's journey towards elimination of cervical cancer.

In the intermediate term, cervical cancer rates are expected to halve (again) by 2035, and mortality rates should remain stable until about 2020, but then decline by 45% by 2035

Thus, the experience in Australia demonstrates that there is potential to drastically reduce the incidence of one of the world's major cancers in women. However, the large majority of the global cervical cancer burden is in low and middle income countries where access to screening is very limited or non-existent.[13] The key will be effective action to fund, implement and monitor widespread HPV vaccination and cervical screening initiatives in these countries, which have the greatest need.

The key will be effective action to fund, implement and monitor widespread HPV vaccination and cervical screening initiatives

Acknowledgement: This work was funded via a number of National Medical Research Council (NHMRC) Australia grants and the authors are part of C4, The NHMRC Centre of Research Excellence in Cervical Cancer Control. ■

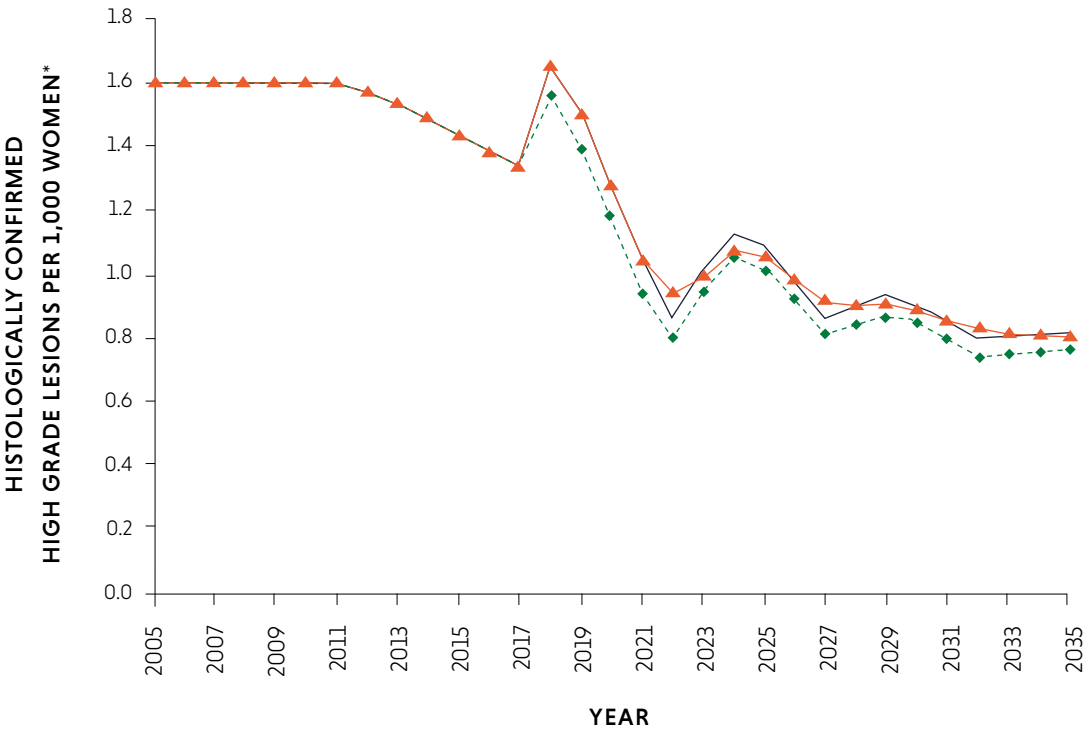
Quote this article as:

K Canfell, M Hall, K Simms, M Smith, M Saville (2018). Australia on-track to be the first country to achieve cervical cancer elimination.

Figure 1

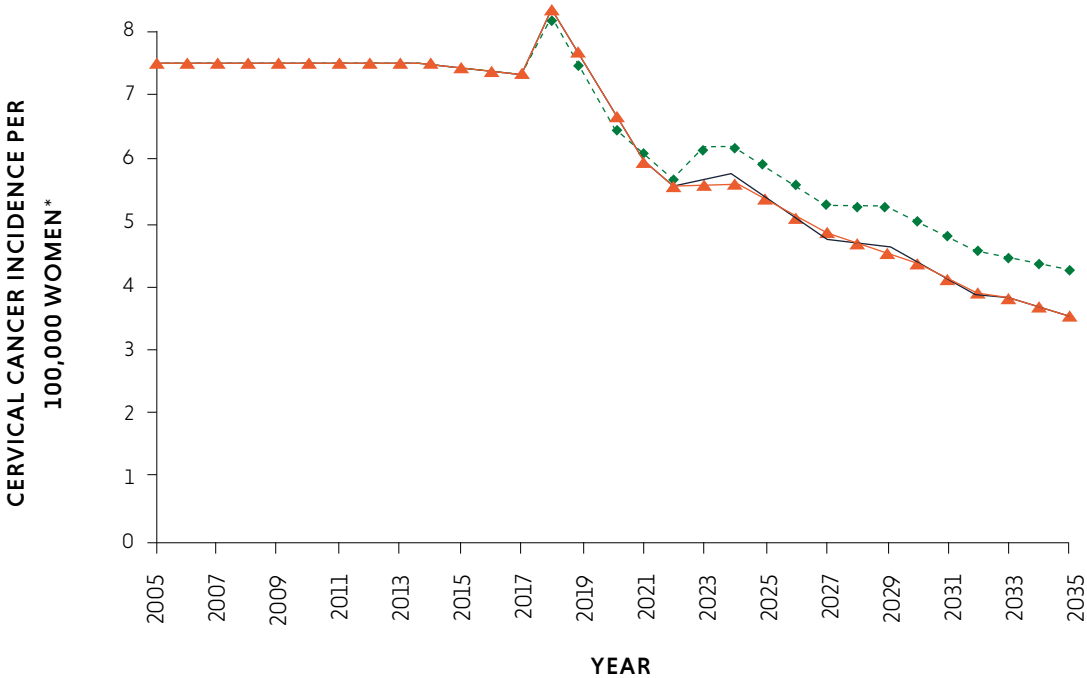
Combined effect of HPV vaccination and HPV screening on detected CIN2/3 (a), cervical cancer incidence (b) and cervical cancer mortality (c) in Australia to 2035[12]

(a)

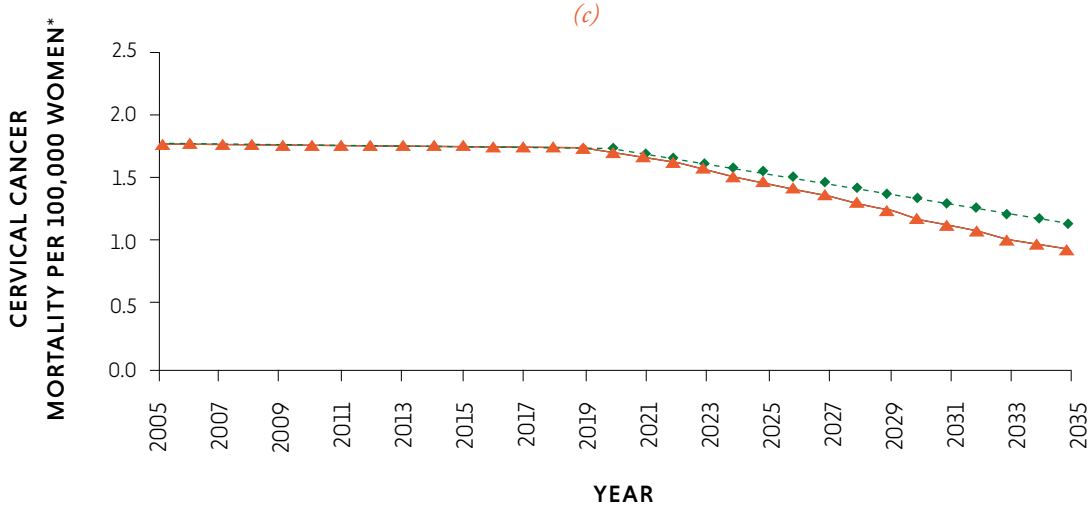


* Age-standardised rate (0–84 years), standardised using the 2001 Australian population

(b)



(c)



Text legend: "Sensitivity Analysis" explores the impact on disease reduction (i.e. cervical cancer incidence) in a changing range of values of the key variables influencing the prediction (i.e. the variation in disease incidence reduction in the presence of low, intermediate or high vaccination coverage rates). For the three outcomes displayed in the figure the lower bounds of two critical screening variables, namely screening coverage and test sensitivity are shown.

References:

1. Garland SM, Giuliano A, Brotherton J, et al. IPVS statement moving towards elimination of cervical cancer as a public health problem. Papillomavirus Res 2018;5:87-8.

2. Arbyn M, Xu L, Simoens C, Martin-Hirsch PPL. Prophylactic vaccination against human papillomaviruses to prevent cervical cancer and its precursors (Review). Cochrane Database of Systematic Reviews 2018, Issue 5. Art. No.: CD009069.

3. Arbyn M, Ronco G, Anttila A, et al. Evidence regarding human papillomavirus testing in secondary prevention of cervical cancer. Vaccine 2012;20;30 Suppl 5:F88-99.

4. Ronco G, Dillner J, Elfström KM, et al. Efficacy of HPV-based screening for prevention of invasive cervical cancer: follow-up of four European randomised controlled trials. Lancet 2014; 8;383(9916):524-32.

5. Machalek DA, Garland SM, Brotherton JML, et al. Very Low Prevalence of Vaccine Human Papillomavirus Types Among 18- to 35-Year Old Australian Women 9 Years Following Implementation of Vaccination. J Infect Dis 2018; 23;217(10):1590-1600.

6. Smith MA, Liu B, McIntyre P et al. Fall in genital warts diagnoses in the general and Indigenous Australian population following a national HPV vaccination program: analysis of routinely collected national hospital data. J Infect Dis 2015;211(1):91-9.

7. Australian Institute of Health and Welfare. Cervical screening in Australia 2014–2015. Cancer series no. 105. Cat. no. CAN 104. Canberra: AIHW, 2017.

8. Robertson G, Robson SJ. Excisional Treatment of Cervical Dysplasia in Australia 2004-2013: A Population-Based Study. J Oncol 2016;2016:3056407.

9. Smith M, Canfell K. Impact of the Australian National Cervical Screening Program in women of different ages. Med J Aust 2016;205(8):359-64.

10. Lew JB, Simms KT, Smith MA, et al. Primary HPV testing versus cytology-based cervical screening in women in Australia vaccinated for HPV and unvaccinated: effectiveness and economic assessment for the National Cervical Screening Program. Lancet Public Health 2017;2(2):e96-e107.

11. Canfell K, Caruana M, Gebski V, et al. Cervical screening with primary HPV testing or cytology in a population of women in which those aged 33 years or younger had previously been offered HPV vaccination: Results of the Compass pilot randomised trial. PLoS Med 2017;14(9):e1002388.

12. Hall MT, Simms KT, Lew J-B, et al. Projected future impact of HPV vaccination and primary HPV screening on cervical cancer rates from 2017-2035: Example from Australia. PLoS One 2018;13(2):e0185332.

13. Bruni L, Diaz M, Barrionuevo-Rosas L, et al. Global estimates of human papillomavirus vaccination coverage by region and income level: a pooled analysis. The Lancet Global Health 2016;4(7):e453-e63.

HPVWorld is a project endorsed by