

HPV vaccination in boys should not be discounted



In *The Lancet Public Health*, Marc Brisson and colleagues¹ report pooled results from multiple mathematical models to predict the effect of human papillomavirus (HPV) vaccination on HPV infections. A unified input dataset was used to obtain results from 16 models that were combined using meta-analysis, yielding interesting findings about the dynamics of vaccination in girls and boys. Models such as those included in this study have become increasingly important to inform policy makers about predicted effects of interventions as well as other endpoints, such as cost, and the authors should be commended for their approach.

One major finding of this paper is that a high rate of HPV vaccination in girls confers adequate protection of boys through herd immunity. For example, for men, predicted overall prevalence of HPV 16 decreased by 36% (80% uncertainty interval 28–61) after 70 years of girls-only vaccination assuming 40% coverage, and by 83% (75–100) assuming 80% coverage. Notably, elimination of viral prevalence in boys, especially for HPV 16, was not achieved with this girls-only strategy. In view of the substantial herd effects of girls-only vaccination when coverage is moderate to high, the authors conclude that the incremental benefit of vaccinating boys is predicted to be small. Such conclusions could focus policy makers away from vaccination programmes targeting boys. However, HPV-related cancers have become an increasingly important issue for men in high-income countries.

HPV is thought to cause about 91% of anal cancers, 72% of oropharyngeal cancers, and 63% of penile cancers in the USA.^{2,3} The vast majority of HPV-related cancers in men are attributable to type 16.^{4,5} Oropharyngeal cancers specifically have caused a substantial shift in the landscape of HPV-related cancers. Oropharyngeal carcinoma is approximately five times more common in middle-aged men than in middle-aged women.⁶ Incidence has been increasing at an alarming, even epidemic, rate, with an increase of 225% between 1988 and 2004 in the USA (from 0.8 cases per 100 000 people in 1988, to 2.6 cases per 100 000 people in 2004).³ Meanwhile, comprehensive screening programmes have been successful in decreasing the incidence of cervical cancer in high-income countries. In 2010, incidence of oropharyngeal cancer overtook that of cervical cancer

in the USA.³ Furthermore, it is predicted that cases of HPV-related oropharyngeal cancer will surpass all cases of cervical cancer in 4 years, with more recent evidence suggesting that this might have already occurred in the USA.^{3,6}

Unfortunately, unlike with Pap and HPV testing of the cervix, no effective screening measures are available for oropharyngeal cancer. As such, patients often present with late-stage disease, requiring extensive multimodality treatment, which often results in long-term morbidity.⁷ Without any method of early detection of HPV-related oropharyngeal cancer in men, the importance of primary prevention through the vaccination of boys is further emphasised.

The cost of treating patients with oropharyngeal cancer has also been underestimated in the scientific literature. Costs for oropharyngeal cancers are often pooled with costs for oral cavity or salivary cancers, whose treatment and long-term outcomes, and hence costs, are on average much lower than that of oropharyngeal cancers.^{8,9} Because most patients present with advanced disease, multimodality therapy is almost always required, substantially increasing health-care use and cost. Our group is currently investigating the cost of treating oropharyngeal cancer in Texas, USA, specifically omitting cancers of other head and neck sites. Our preliminary findings suggest that the true cost of oropharyngeal cancer treatment greatly exceeds the costs currently reported in the literature.

Published Online
September 27, 2016
[http://dx.doi.org/10.1016/S2468-2667\(16\)30003-2](http://dx.doi.org/10.1016/S2468-2667(16)30003-2)
See [Articles](#) page e8



This changing landscape of HPV-related cancers is an essential factor that needs to inform policy on HPV vaccination programmes. Although programmes have traditionally focused on vaccination of girls, the importance of vaccination of boys needs to be addressed, especially as oropharyngeal cancer comes to the forefront of HPV-related cancers in high-income countries. This shift is particularly essential in countries where vaccination rates in both girls and boys are low, such as the USA, where only about 42% of girls and 28% of boys completed the government recommended schedule for HPV vaccination in 2015.¹⁰ It is essential not to diminish the importance of vaccination of boys, especially considering the increasing representation of men in the HPV-related cancer burden, substantial costs of treatment, and lack of screening for early detection of disease.

*Samantha Tam, *Erich M Sturgis*
 Department of Head and Neck Surgery (ST, EMS) and Department of Epidemiology (EMS), The University of Texas MD Anderson Cancer Center, Houston, TX 77030, USA
 esturgis@mdanderson.org

We declare no competing interests. We acknowledge funding contributions from the Christopher and Susan Damico Chair in Viral Associated Malignancies, the Stiefel Oropharyngeal Research Fund, and The University of Texas MD Anderson Moon Shots Program.

Copyright © The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY-NC-ND license.

- 1 Brisson M, Benard É, Drolet M, et al. Population-level impact, herd immunity, and elimination after human papillomavirus vaccination: a systematic review and meta-analysis of predictions from transmission-dynamic models. *Lancet Public Health* 2016; published online Sept 27. [http://dx.doi.org/10.1016/S2468-2667\(16\)30001-9](http://dx.doi.org/10.1016/S2468-2667(16)30001-9).
- 2 Saraiya M, Unger ER, Thompson TD, et al. US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. *J Natl Cancer Inst* 2015; **107**: djv086.
- 3 Chaturvedi AK, Engels EA, Pfeiffer RM, et al. Human papillomavirus and rising oropharyngeal cancer incidence in the United States. *J Clin Oncol* 2011; **29**: 4294–301.
- 4 Kreimer AR, Clifford GM, Boyle P, Franceschi S. Human papillomavirus types in head and neck squamous cell carcinomas worldwide: a systematic review. *Cancer Epidemiol Biomarkers Prev* 2005; **14**: 467–75.
- 5 De Vuyst H, Clifford GM, Nascimento MC, Madeleine MM, Franceschi S. Prevalence and type distribution of human papillomavirus in carcinoma and intraepithelial neoplasia of the vulva, vagina and anus: a meta-analysis. *Int J Cancer* 2009; **124**: 1626–36.
- 6 Viens LJ, Henley SJ, Watson M, et al. Human papillomavirus-associated cancers—United States, 2008–2012. *MMWR Morb Mortal Wkly Rep* 2016; **65**: 661–66.
- 7 Dahlstrom KR, Calzada G, Hanby JD, et al. An evolution in demographics, treatment, and outcomes of oropharyngeal cancer at a major cancer center: a staging system in need of repair. *Cancer* 2013; **119**: 81–89.
- 8 Hu D, Goldie S. The economic burden of noncervical human papillomavirus disease in the United States. *Am J Obstet Gynecol* 2008; **198**: 500, e1–e7.
- 9 Jacobson JJ, Epstein JB, Eichmiller FC, et al. The cost burden of oral, oral pharyngeal, and salivary gland cancers in three groups: commercial insurance, Medicare, and Medicaid. *Head Neck Oncol* 2012; **4**: 15.
- 10 Reagan-Steiner S, Yankey D, Jeyarajah J, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years—United States, 2015. *MMWR Morb Mortal Wkly Rep* 2016; **65**: 850–58.