

## A cost-effectiveness analysis of human papillomavirus vaccination of boys for the prevention of oropharyngeal cancer

Graham DM, Isaranuwachai W, Habbous S, *et al. Cancer*. Published Online First: 13 April 2015. doi:10.1002/cncr.29111

The human papillomavirus (HPV) is an oncogenic virus associated with anogenital and head and neck cancers in both sexes. HPV vaccination has already been introduced in the national immunisation programmes of 63 countries to prevent cervical cancer;<sup>1</sup> however, few countries are recommending HPV vaccination for male patients.

There are limited published data on the benefit of male HPV vaccination in preventing extra-genital HPV-related cancers. Furthermore, the efficacy of HPV vaccination in preventing oropharyngeal carcinoma (OPC) is as yet undemonstrated due to a lack of precursor lesions of disease. This recent Canadian study by Graham *et al.* is the first to provide substantial evidence that vaccinating boys may be cost-effective in reducing the incidence of OPC.

Using a theoretical cohort of 192 904 12-year-old Canadian boys, the authors used a Markov state-transition model to predict the lifetime risk of developing HPV-related OPC (HPV-OPC) if the quadrivalent vaccination was or was not offered. Literature data on patients with a diagnosis of OPC over a 10-year period

in Ontario, Canada were used to define costs and estimate values, which included vaccine efficacy and uptake, rate of HPV infection and HPV-OPC development. In order to add validity, vaccine uptake and efficacy were adjusted to rates as low as 50%. Morbidity and mortality outcomes were reflected as quality-adjusted life years (QALY).

Quadrivalent HPV vaccination produced between 0.023 and 0.050 QALY per individual. In addition, the vaccination saved \$41.85–\$145.00 Canadian dollars (CAD) per individual. Applied to the entire cohort, the potential savings were \$8–\$28 million CAD over its lifetime, which supports the cost-effectiveness of this strategy.

The incidence of HPV-OPC appears to be rising globally amongst men.<sup>2–4</sup> This paper challenges the efficacy of female-only HPV vaccination programmes providing initial evidence on the cost-effectiveness of male HPV vaccination in reducing rates of OPC. The study does not correct for herd immunity after female vaccination and we believe this requires further investigation. More studies are also needed to prove the validity of the quadrivalent vaccine in reducing the incidence of HPV-OPC. Were the preliminary results of this study to be confirmed by additional analysis, the inclusion of male HPV vaccination into current immunisation programmes worldwide could be beneficial. This study demonstrated significant cost benefits when vaccine uptake and efficacy were high. Countries, such as the UK, which already have a high HPV vaccination uptake (>80%)<sup>5 6</sup> could benefit significantly from the adoption of universal HPV vaccination.

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