Health Economic Analysis of a Bivalent HPV Vaccine and the Value of Cross Protection in a US Female Population

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INTRODUCTION

• In 2010, there were an estimated 12,200 incident cases of cervical cancer and 4,210 cervical cancer deaths in the United States (US).1
• The annual cost of cervical cancer in the US in 2009 was estimated at $172 million,2
• Human papillomavirus (HPV) types 16 and 18 account for ~70% of cervical cancer cases; 10 other high-risk (10-HR) types account for the majority of the remaining cases.3

A bivalent HPV vaccine has been established as being highly efficacious in preventing HPV infections caused by types 16 and 18 that may subsequently evolve into cervical disease.4 Clinical trial data for the bivalent vaccine indicate additional cross-protection (XP) efficacy against 10-HR types (31,33,35,39,51,52,56,58,59)4
• Previous studies have shown HPV vaccination to be cost-effective in 12-year-old girls5,6

OBJECTIVE

Use a mathematical model of cervical cancer to evaluate the benefits of HPV vaccination and to estimate the additional value of cross-protection in 18-year-old women.7

METHODS

Model Overview
A lifetime Markov model was developed to simulate the natural history of HPV infection and cervical cancer.8

Clinical outcomes include lifetime numbers of abnormal Pap smears, detected CIN1, CIN2, CIN3, cervical cancer (all stages) and deaths.8

METHODS (CONTINUED)

Analysis
Model outcomes were assessed for two populations of 100,000 18-year-old women distinguished by HPV status (Table 2)9
• For both populations, outcomes were assessed for cohorts of unvaccinated women and vaccinated women, assuming full vaccination coverage (3 doses)10
• Bivalent and cross-protection CIN2 vaccine efficacies (using HPV infection as a proxy) were applied in accordance with clinical trial results11 in the more recent end of study analysis, higher vaccine efficacy estimates have been observed3
• QALYs were calculated by multiplying the time spent in the health state by the age-specific general utility and multiplying that by the health state utility cost

RESULTS

• HPV vaccination may result in significant reductions across all cervical event types for both the HPV naive and general populations (Figure 2)
• The bivalent HPV vaccine with cross-protection against 10 other high-risk types could prevent an additional 5-20% of cervical disease events compared with the bivalent vaccine

CONCLUSIONS

• HPV vaccination with cross protection may offer substantial clinical and economic benefits in 18-year-old US women
• Model results suggest that HPV vaccination of 18-year-old women in the US may offer substantial clinical and economic benefits

REFERENCES

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Table 1: Selected model inputs

Table 2: Study population characteristics

Table 3: Economic results with and without HPV vaccination for the HPV naive and general populations

Figure: Estimated lifetime number of clinical events with no HPV vaccination and events averted and percent reductions with vaccination vs. no vaccination for 100,000 18-year-old women

Figure 1: Model structure