

3 Doses versus 2 Doses Cervical Cancer Vaccination Regimen: Cost–Utility Analysis Based on Tropical Southeast Asian Country, Thailand, Situation

Sir,

Cervical cancer is the most common type worldwide. Human papillomavirus (HPV) is an important etiology of this cancer.^[1] At present, the prevention of this cancer is possible since cervical cancer vaccine is available.^[2] For vaccination, there is still an argument on the effective regimen. The topic that is widely discussed is the selection for two-dose or three-dose regimens for vaccinating the young women who should receive the cervical cancer vaccine.^[2] Indeed, the two-dose and three-dose cervical cancer vaccination regimens are mentioned in several reports from different settings.^[3–9] Many reports usually use the immunogenicity for judgment of proper regimen. For example, the study from India noted that the two-dose regimen could induce sufficient immunogenicity.^[6] Sankaranarayanan *et al.* studied difference regimens and recommended the two-dose regimen for the Indian situation.^[7–9] Similar observations are also reported in the study from UK and France.^[4,5] In another report from the Netherlands, the immunogenicity of vaccine in the two-dose and three-dose regimen is not different.^[3] Nevertheless, the economical concern is also important in regimen selection.

In this short report, the author compares the two regimens. The cost–utility comparison based on the present epidemiology of HPV in Thailand is done. In analysis, the cost refers to the unit for each regimen reported by referencing tertiary hospitals in Thailand (Vibhavadi hospital, Bangkok) and presented in USD. The utility is referred to the expected adjusted immunogenicity determined in geometric mean titer at 36 months after vaccination as shown in previous validation study and presented in mMU/mL.^[10] The path probability assignment is according to the recent data from epidemiological study on HPV in cervical smear samples in Thailand.^[11] The primary data of utility quoted from the referenced study^[10] and derived expected utility after assignment of path probability are shown in Table 1. Then, cost per utility values for two-dose and three-dose regimens are calculated. The final cost–utility analysis result is presented in Table 2. Based on this study, the three-dose regimen has less cost per utility than the two-dose regimen; hence, the three-dose regimen of cervical cancer vaccination should be used in the study setting. In conclusion, the three-dose regimen of cervical cancer vaccination is hereby recommended based on cost–utility analysis. The finding is an important topic and relevant to other settings^[12,13] including India. For each setting, the comparative cost–utility analysis is recommended.

Table 1: Path probability and utility according to the type of human papillomavirus

Utility according to the type of HPV (mMU/mL)		
Reported utility ^a	Two-dose regimen	Three-dose regimen
HPV-16	1151	1407
HPV-18	104	237
HPV-6	243	376
HPV-11	298	404
Expected utility after assignment of path probability ^b		
HPV type	Path probability ^c (%)	
HPV-16	1.313	15.112
HPV-18	0.053	0.055
GPV-6	0.131	0.318
HPV-11	0.197	0.587
Overall	1.694	16.073

^aThe reported utility is referred to the expected adjusted immunogenicity determined in geometric mean titer at 36 months after vaccination as shown in previous validation study and present in mMU/mL,^[10]

^bExpected utility after assignment of path probability is calculated for each HPV type by multiplying the path probability with corresponding reported utility, ^cThe path probability assignment is according to the recent data from epidemiology of HPV in cervical smear sample in Thailand.^[11] HPV – Human papillomavirus

Table 2: Cost-utility analysis comparing three-dosage cervix cancer vaccination regimen for young women based on the situation in Thailand

	Two-dose regimen	Three-dose regimen
Overall cost (USD) ^a	154.41	181.49
Overall utility (mMU/mL) ^b	16.07	19.89
Cost per utility (USD) ^c	9.61	9.12

^aThe overall cost is referred to the unit for each regimen reported by referencing tertiary hospitals in Thailand (Vibhavadi Hospital, Bangkok) and presented in USD, ^bThe overall utility derived from the calculation as presented in Table 1, ^cCost per utility value is equal to overall cost/overall utility. For example, the cost per utility for two-dose regimen is equal to 181.49/19.89 USD

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Conflicts of interest

There are no conflicts of interest.

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References

1. McCance DJ. Human papillomavirus (HPV) infections in the aetiology of cervical cancer. *Cancer Surv* 1988;7:499-506.
2. Harper DM, DeMars LR. HPV vaccines – A review of the first decade. *Gynecol Oncol* 2017;146:196-204.
3. Donken R, Schurink-Van't Klooster TM, Schepp RM, van der Klis FR, Knol MJ, Meijer CJ, *et al*. Immune responses after 2 versus 3 doses of HPV vaccination up to 4½ years after vaccination: An observational study among Dutch routinely vaccinated girls. *J Infect Dis* 2017;215:359-67.
4. Hernández-Ávila M, Torres-Ibarra L, Stanley M, Salmerón J, Cruz-Valdez A, Muñoz N, *et al*. Evaluation of the immunogenicity of the quadrivalent HPV vaccine using 2 versus 3 doses at month 21: An epidemiological surveillance mechanism for alternate vaccination schemes. *Hum Vaccin Immunother* 2016;12:30-8.
5. Lazcano-Ponce E, Stanley M, Muñoz N, Torres L, Cruz-Valdez A, Salmerón J, *et al*. Overcoming barriers to HPV vaccination: Non-inferiority of antibody response to human papillomavirus 16/18 vaccine in adolescents vaccinated with a two-dose vs. a three-dose schedule at 21 months. *Vaccine* 2014;32:725-32.
6. Bhatla N, Nene BM, Joshi S, Esmey PO, Poli UR, Joshi G, *et al*. Are two doses of human papillomavirus vaccine sufficient for girls aged 15-18 years? Results from a cohort study in India. *Papillomavirus Res* 2018;5:163-71.
7. Sankaranarayanan R, Joshi S, Muwonge R, Esmey PO, Basu P, Prabhu P, *et al*. Can a single dose of human papillomavirus (HPV) vaccine prevent cervical cancer? Early findings from an Indian study. *Vaccine* 2018;36:4783-91.
8. Sankaranarayanan R, Bhatla N, Basu P. Current global status and impact of human papillomavirus vaccination: Implications for India. *Indian J Med Res* 2016;144:169-80.
9. Sankaranarayanan R, Prabhu PR, Pawlita M, Gheit T, Bhatla N, Muwonge R, *et al*. Immunogenicity and HPV infection after one, two, and three doses of quadrivalent HPV vaccine in girls in India: A multicentre prospective cohort study. *Lancet Oncol* 2016;17:67-77.
10. Dobson SR, McNeil S, Dionne M, Dawar M, Ogilvie G, Krajden M, *et al*. Immunogenicity of 2 doses of HPV vaccine in younger adolescents vs. 3 doses in young women: A randomized clinical trial. *JAMA* 2013;309:1793-802.
11. Phoolcharoen N, Kantathavorn N, Sricharunrat T, Saeloo S, Krongthong W. A population-based study of cervical cytology findings and human papillomavirus infection in a suburban area of Thailand. *Gynecol Oncol Rep* 2017;21:73-7.
12. Widdice LE, Unger ER, Panicker G, Hoagland R, Callahan ST, Jackson LA, *et al*. Antibody responses among adolescent females receiving two or three quadrivalent human papillomavirus vaccine doses at standard and prolonged intervals. *Vaccine* 2018;36:881-9.
13. Lamb F, Herweijer E, Ploner A, Uhnöo I, Sundström K, Sparén P, *et al*. Timing of two versus three doses of quadrivalent HPV vaccine and associated effectiveness against condyloma in Sweden: A nationwide cohort study. *BMJ Open* 2017;7:e015021.

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