

### ASSOCIATION OF THE PERCEIVED SEVERITY OF THE HUMAN PAPILLOMAVIRUS WITH THE PREVENTIVE INTENTION OF HPV INFECTION IN MALE ADOLESCENTS: A CROSS-SECTIONAL SURVEY

Hae Won Kim<sup>1,2</sup>, Seong Eun Kim<sup>3</sup>, Hye Young Ahn<sup>4</sup>, Eun Ju Lee<sup>5</sup>, Jung Lim Lee<sup>6</sup>, Saem Yi Kang<sup>1</sup>, Seo Yun Kim<sup>1</sup>, Young Jin Lee<sup>1</sup>, Youngji Kim<sup>7</sup>

<sup>1</sup>College of Nursing, Seoul National University, Seoul, Republic of Korea

<sup>2</sup>College of Nursing, the Research Institute of Nursing Science, Seoul National University, Seoul, Republic of Korea

<sup>3</sup>College of Nursing, Woosuk University, Wanju-gun, Jeollabuk-do, Republic of Korea

<sup>4</sup>College of Nursing, Eulji University, Daejeon, Republic of Korea

<sup>5</sup>Department of Nursing, Inha University, Incheon, Republic of Korea

<sup>6</sup>Department of Nursing, Woosong University, Daejeon, Republic of Korea

<sup>7</sup>Department of Nursing, College of Nursing and Health, Kongju National University, Gongju-si, Chungcheongnam-do, Republic of Korea

**Corresponding Author:** Dr. Youngji Kim: [superdr1@hanmail.net](mailto:superdr1@hanmail.net)

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#### ABSTRACT

##### Background and objective

The human papillomavirus (HPV) infection is usually asymptomatic, may affect both sexes, and is easily transmitted. Providing male adolescents with information about HPV prevention before sexually active state is important. This study was designed to gain a better understanding of the perceptions on HPV severity, knowledge on ways to prevent HPV infection, and influencing factors toward preventive measures in male adolescents.

##### Materials and methods

A self-administered questionnaire was completed by students aged 13–17 years from six schools in Seoul and the surrounding metropolitan area, from October to December 2014. A total of 615 male adolescents participated in this cross-sectional survey.

## Results

Only 58 (9.5%) boys had heard of HPV. They perceived HPV infection as a disease more severe in girls. Perceptions of HPV as a sexually transmitted infection (STI) in boys (adjusted odds ratio [AOR] 1.79, 95% confidence interval [CI]: 1.00–3.19,  $p < 0.05$ ) and a cause of cancer in girls (AOR=2.69, 95% CI=1.26–5.84,  $p < 0.05$ ) were associated with the intention to maintain monogamous sexual relationships. Alcohol consumption was associated with the intention of postponing sexual intercourse (AOR=0.53, 95% CI=0.34–0.82,  $p < 0.01$ ) and having a sister was associated with the intention of being vaccinated against HPV (AOR=1.48, 95% CI=1.03–2.13,  $p < 0.05$ ).

## Conclusions

Increasing awareness on the severity of HPV affected the intentions of male adolescents to prevent HPV infection. Efforts should be made to maximize awareness of HPV as a causative agent of cancer and a common STI in both boys and girls. Education materials on the influence of HPV infection and steps to be taken for proactive prevention should be included in school health subjects. Special consideration should be given for the preventive vaccination of male adolescents nationwide.

*Key Words:* adolescent health; papillomaviridae; severity; intention; sexually transmitted diseases; HPV

## INTRODUCTION

An effective strategy to prevent human papillomavirus (HPV) among adolescents requires integrative education that addresses healthy sexual behaviors, personal and cultural beliefs on HPV, and its relationship with cancer.<sup>1</sup> The awareness that HPV is a common sexually transmitted infection (STI) in both sexes has increased the importance of providing men with information about HPV prevention.<sup>2,3</sup> The role of men in preventing HPV has been addressed, particularly from the perspectives of gender equality and partnership relations.<sup>2-4</sup> However, men are less likely to hear about HPV or even be aware of its link with cancer, including cervical cancer in women.<sup>2,5,6</sup> HPV prevention first requires an understanding of HPV.<sup>7</sup> Unfortunately, no formal education on HPV is provided in the school curriculum in Korea, resulting in very poor understanding of HPV among Korean boys.<sup>3,8</sup> HPV vaccination is one of the most important preventive modalities for both male (henceforth “boys”) and female adolescents (henceforth “girls”).<sup>6,9,10</sup> Ideally, adolescents should be vaccinated before they become sexually active and exposed to HPV. However,

expanding HPV vaccination to boys has been controversial from a cost–benefit perspective in developed countries.<sup>11</sup> According to a recent study, the vaccination rate for Korean male students was only 2.4% in 2016,<sup>12</sup> which is much lower than the rate of 56.5% reported in American boys,<sup>13</sup> confirming the very limited HPV vaccination of adolescents in Korea.<sup>3,14</sup> These previous studies illustrate that Korean boys should be informed that HPV is a common STI among adolescents regardless of gender and that boys need to have a better understanding of HPV infection and the effective methods to prevent its dissemination.

Health behaviors are affected by personal beliefs and perceptions about a disease, and the perceived severity of a particular illness is one of the main constructs of the health belief model.<sup>15</sup> The perception of the severity of HPV may be crucial in motivating preventive actions, so the presence of personal fear about HPV, or considering HPV infection a serious disease, might facilitate taking precautions aimed at preventing HPV infection.<sup>16</sup> Intention is considered a proxy measure of real behaviors in HPV prevention among adolescents.<sup>3,17</sup> Previous studies have found that

the perceived severity of HPV among boys affects their intention to receive the HPV vaccine.<sup>2,14,17</sup> Based on these previous studies, it can be assumed that the perception of the severity of HPV could be associated with the intentions to prevent or lower the risk of HPV in Korean boys, not only to protect their own health, but also as an altruistic intention toward women and girls.<sup>3,17,18</sup> In the preliminary report, the simple associations were observed between the perceptions of HPV severity and intentions to prevent HPV.<sup>19</sup>

In this study, we aimed to investigate not only vaccination intention, but also the intentions to use condoms, delay sexual intercourse, and monogamy as measure in preventing HPV infection in boys. We also assessed boys' perceptions about the severity of HPV in both genders, and examined their intentions to prevent HPV infection and the factors influencing their intentions.

## METHODS

### *Participants and Procedure*

A predesigned questionnaire-based survey was conducted, and participants aged 13–17 years were recruited from October to December 2014. Written informed consent was obtained from the participants with the permission from parents. Boys in the third grade were excluded because of preparation for higher school entrance examination. Six schools in six regions were contacted using a snowball method, and the principal and health teacher at each school confirmed willingness to participate. Two of the schools were located in Seoul and the surrounding metropolitan area, and four were located in other administrative regions in Korea.

The sample size was calculated using the following formula<sup>20</sup>:  $n_a = [Z_{\alpha/2}^2 / \log^2(1 - RP)] \times [1/X + 1/Y]$ , where  $X = 1/\rho_p(1 - \rho_p)k$  and  $Y = 1/\rho_a(1 - \rho_a)$ .  $Z_{\alpha/2}$  is the critical value of normal distribution at  $\alpha/2$  (for a confidence level of 95%,  $\alpha$  is 0.05, and the critical value is 1.96). We assumed that relative precision at

22% based on a previous study.<sup>21</sup>  $\rho_p$  is the prevalence of the intention to be vaccinated in the present group (44%) because the result of the previous study revealed that  $\rho_a$  was the prevalence of the intention to be vaccinated (22%), the minimum odds ratio for HPV awareness was 1.26 for the intention to vaccinate against HPV among Korean male university students,<sup>2</sup> and  $k$  is the ratio of presences to absences in the sample ( $n_p/n_{a=1}$ ). Based on an alpha value of 0.05 and a beta value of 0.8 and assuming a drop-out rate of 10%, the final number of students required was estimated to be 754. Then, after considering the ratio of the total number of the students across the included regions, the minimum and maximum numbers of students in the six schools were designated as 40 and 240, respectively.

### *Ethical Consideration*

A description of the research was sent to the school principals and teachers, and, once they had provided their agreement, an advertisement for recruiting study participants was placed on the boards at the school. Students who expressed an interest in participating in the study were given a description of the research protocol by the health teacher and were then required to obtain written permission from their parents. The participants were informed of the study aims and methods, including the possibility of withdrawing during the survey, and they signed an informed consent form. They were not provided with any financial incentive to participate. The research ethics committee of Seoul National University approved the study protocol (IRB number: 1410/001-005).

The structured questionnaire was developed based on previous researches on HPV infection,<sup>3,7,17</sup> and assessed by three experts in STI research, HPV research, and sex education. The questionnaire was then pilot-tested on 15 students aged 15–17 years. Minor modifications were made based on the feedbacks from the experts and the pilot project to produce the final version of the questionnaire.

The first part of the questionnaire consisted of the perception of HPV severity and the intention of prevention of HPV. The severity of HPV was assessed by four items, which were “HPV is severe as an STI and a cause of cancer in men, boys, women, and girls.” The intention of the boys to prevent HPV infection was assessed in relation to active behaviors (the strict use of condoms, vaccinating against HPV) versus passive behaviors (postponing sexual intercourse and maintaining a strictly monogamous sexual relationship). The students responded to statements related to the above factors on a 5-point Likert scale: 1 (not at all), 2 (disagree), 3 (don’t know), 4 (agree), and 5 (very much agree). The second part of the questionnaire involved items related to sociodemographic factors, including age, grade, history of sexual intercourse, smoking, alcohol consumption, previous history of STIs, whether they had a sister, experience of HPV education, and whether they had heard of HPV and HPV vaccine.

The health teachers at six schools provided written explanations of the research proposal to the students who visited and read the research ad entries posted in each school, and were given written permission forms to be filled by the parents. The questionnaire form, which included questions on their sexual behaviors, was provided in an envelope to maintain the privacy of each participant. The students were allowed to complete the questionnaire at home or in a private area, and after sealing the envelope they returned the completed questionnaire to a health teacher, which were then retrieved by the researchers.

### **Data Analysis**

Data were analyzed using descriptive analyses (frequency, means, proportions, and SDs) with the  $\chi^2$  test applied to determine the associations between dependent and independent variables. The perceptions of the participants were compared using the Wilcoxon signed-rank test. To

identify the factors influencing the intention to prevent HPV infection (dependent variable), sociodemographic criteria and perceptions on the severity of HPV with significant associations ( $p < 0.05$ ) were included in an adjusted logistic regression model to calculate adjusted odds ratios (AORs) and 95% confidence intervals (95% CIs). The participants’ response to the intention to prevent HPV infection was categorized into the no-intention group for responses of “not at all,” “no,” and “don’t know,” and was given a value of 0. A response of “yes” or “very much” was assigned a value of 1.

Among the independent variables, age was categorized into 13–15 and 16 or 17 years, and the following demographic variables and HPV-related characteristics were scored as 0 and 1 for “no” and “yes” responses, respectively: sexual intercourse, smoking, alcohol consumption, history of an STI, having a sister, history of previous HPV education, having heard of HPV, having heard about the HPV vaccine, and been vaccinated against HPV. The categorizations were also converted into dichotomous scales for the perception of the seriousness of HPV infection as an STI and as a cause of cancer: scores of 1–3 for responses of “not at all,” “disagree,” and “don’t know” were categorized as a “0,” and scores of 4 and 5 for responses of “agree” and “very much agree,” respectively, were categorized as a “1.” All statistical procedures were performed using SPSS statistics software (version 20; IBM, Armonk, NY, USA).

### **RESULTS**

The participants comprised 754 students attending schools located in several locations in Korea. Of the 754 students who received questionnaires, 52 did not provide an adequately completed student consent form, and 87 did not have appropriate parental permission. Therefore, the study analysis was based on a final cohort of 615 participants.

The mean age in the participants was  $15.06 \pm 1.12$  years (mean  $\pm$  SD; range=13–17 years). The middle and high school students comprised 42.0% (n=258) and 58.0% (n=357) of the 615 participants, respectively.

Among the students included 2.3% had sexual intercourse (n=14), 21.7% had smoked (n=133), 30.6% had consumed alcohol (n=187), 0.3% had a history of STI (n=2), and 46.4% had sisters (n=284). With regard to HPV awareness, 5.9% (n=36) of the students had received HPV education, 9.5% (n=570) had heard of HPV, 13.2% (n=81) had heard of the HPV vaccine, and 1.6% (n=10) had been vaccinated against HPV (Table 1).

#### ***Boys' Intentions to Prevent HPV Infection and the Perceived Severity of HPV Infection in Both Genders***

Upon analyzing the responses on boys' intentions on the prevention of HPV infection,  $3.83 \pm 0.87$  opted for vaccination (mean  $\pm$  SD, range 1–15),  $3.81 \pm 0.95$  mentioned they will use a condom,  $3.37 \pm 1.11$  went for monogamous sexual relationships, and  $3.12 \pm 1.10$  intended to postpone sexual intercourse (Table 1). Data presented in Table 2 indicate that boys perceived HPV infection to be more serious as an STI ( $Z = -8.15$ ,  $p < 0.001$ ) and as a cause of cancer ( $Z = -7.98$ ,  $p < 0.001$ ) in girls and not in boys (Table 2).

#### ***Factors Influencing Boys' Intention to Prevent HPV Infection for Themselves and Girls***

With regard to the factors influencing boys' intention to prevent HPV infection, having a sister (AOR=1.48, 95% CI=1.03–2.13,  $p < 0.05$ ) was associated with the vaccinating against HPV. Consuming alcohol (AOR=0.53, 95% CI=0.34–0.82,  $p < 0.01$ ) was associated with the postponing sexual intercourse. The perceptions that HPV is severe in boys (AOR=1.79, 95% CI=1.00–3.19,  $p < 0.05$ ) and is a cause of cancer in girls (AOR=2.69, 95% CI=1.24–5.84,  $p < 0.05$ ) were associated with the maintaining monogamous sexual relationships (Table 3).

## **DISCUSSION**

This study aimed to investigate boys' perception of HPV infection and to identify its relationship with the intention to prevent it in boys. School-based studies on HPV perception are very few. This study revealed that greater perception on the severity of HPV infection was associated with a greater intention to prevent HPV infection in male adolescents. Previous studies had mainly focused on men who have sex with men<sup>22</sup> or were more acceptable of the vaccine.<sup>10,23</sup> However, the results from the current study emphasize the importance of increasing awareness on HPV infection in boys before they become sexually active.

Boys in this study perceived that HPV infection was more severe in girls than in boys. Perceptions on the severity of HPV infection as an STI in boys and as a cause of cancer in girls (i.e., not a cancer carcinogenic in male men and boys) were significantly associated with the intention to maintain a monogamous sexual relationship, but not strong enough to increase proactive preventive measures such as using condoms or vaccination. Previous study showed that the willingness for HPV vaccination in middle/high school students was reportedly 70.2% in females versus 29.7% in males.<sup>24</sup> Healthcare providers should develop interventions to increase HPV vaccination as a preventive measure in boys.

Boys should also be informed about the possibility of developing male cancers caused by HPV based on reports on a rise in HPV-related noncervical cancers, emphasizing that HPV infection does not affect women only<sup>25</sup>. HPV infection is highly prevalent in sexually active men and risky to men's health, causing condyloma and oropharyngeal cancer.<sup>26</sup> Our study revealed that Korean boys received little HPV-related education. Hence, their level of awareness of HPV infection was low and most had never heard of HPV vaccines and were not vaccinated. Therefore,



**TABLE 1** General and HPV-Related Characteristics (n=615; Missing Values Excluded)

Characteristics	Categories	n (%) or mean±SD
Age (years)		15.06±1.12
	13	37 (6.0)
	14	212 (34.5)
	15	87 (14.1)
	16	236 (38.4)
	17	43 (7.0)
Grade	Second grade in middle school	258 (42.0)
	First grade in high school	341 (55.4)
	Second grade in high school	16 (2.6)
Sexual intercourse (n=611)	Yes	14 (2.3)
	No	597 (97.7)
Smoking (n=612)	Yes	133 (21.7)
	No	479 (78.3)
Alcohol consumption (n=613)	Yes	187 (30.6)
	No	425 (69.4)
Previous history of STI (n=612)	Yes	2 (0.3)
	No	610 (99.7)
Having a sister (n=612)	Yes	284 (46.4)
	No	328 (53.6)
Experience of HPV education (n=606)	Yes	36 (5.9)
	No	570 (94.1)
Had heard of HPV (n=613)	Yes	58 (9.5)
	No	555 (90.5)
Had heard of the HPV vaccine	Yes	81 (13.2)
	No	534 (86.8)
Had been vaccinated against HPV (n=610)	Yes	10 (1.6)
	No	600 (98.4)
Intentions to prevent HPV infection (minimum, 1; maximum, 5)	I will strictly use condoms	3.81±0.95
	I will get vaccinated against HPV <sup>a</sup>	3.83±0.87
	I will postpone my sexual intercourse <sup>b</sup>	3.12±1.01
	I will maintain a monogamous sexual relationship	3.37±1.11

HPV=human papillomavirus, STI=sexually transmitted infection.

<sup>a</sup>Indicates those who are not vaccinated.

<sup>b</sup>Indicates those with no previous activity.

**TABLE 2** Boys' Perceptions of the Severity of HPV Infection in Either Gender (n=615; Missing Values Excluded)

Perceptions of HPV	Categories	About themselves		About girls		Z (p)
		n (%)	mean±SD	n (%)	M±SD	
I think the risk of getting an STI caused by HPV is severe	Not at all (1)	63 (10.3)	3.25±1.05	31 (5.0)	3.54±0.99	-8.15 (<0.001)
	Disagree (2)	23 (3.7)		14 (2.3)		
	Don't know (3)	291 (47.4)		275 (44.8)		
	Agree (4)	169 (27.5)		178 (29.0)		
	Very much agree (5)	68 (11.1)		116 (18.9)		
I think the risk of getting cancer caused by HPV is severe	Not at all (1)	62 (10.1)	3.31±1.06	35 (5.7)	3.57±1.00	-7.98 (<0.001)
	Disagree (2)	17 (2.8)		7 (1.1)		
	Don't know (3)	284 (46.3)		267 (43.5)		
	Agree (4)	174 (28.3)		183 (29.8)		
	Very much agree (5)	77 (12.5)		122 (19.9)		

STI=sexually transmitted infection.

sex-related education should include the health threats of HPV infection in both genders, and provide clear information on methods of transmission and preventive measures.

In this study, HPV prevention measures were divided into four categories: using condoms, vaccinating against HPV, postponing sexual intercourse, and maintaining a monogamous sexual relationship. Recognition of the severity of HPV infection was associated with the intention to engage in passive preventive behaviors such as monogamous relationships. On the contrary, the perception of severity of infection in boys did not significantly affect their intention to engage in proactive preventive behaviors such as vaccination and condom use. Healthcare professionals have reported that economic support, physician recommendation for vaccination, and parents' attitudes and concerns act as facilitators in encouraging adolescents to undergo HPV vaccination.<sup>27,28</sup> Continuous effort will be needed to find solutions to increase vaccination rates such as including the

vaccine in the mandatory national immunization program and provide parental education.

In this study, a significant factor for vaccination, which is a major preventive measure of HPV infection, was having a sister. We expected that having a sister would affect boys' knowledge of HPV vaccination. In a study of 768 male and female adolescents with sisters, vaccination rates in adolescents with sisters who were not vaccinated with HPV were lower than in those with sisters who were HPV vaccinated.<sup>29</sup> It can be inferred that the vaccination rate is influenced by the presence of at least one other HPV-vaccinated member in the family, rather than whether or not the adolescent has sisters.

Interestingly, the score for the intention of the boys in this study to be vaccinated ranked first among the four methods of HPV prevention, indicating that Korean boys showed a relatively high acceptance of the HPV vaccine. Therefore, it is necessary that healthcare providers establish effective strategies in schools or the community to emphasize

**TABLE 3** Factors Influencing Boys' Intention to Prevent HPV Infection

	Intention to strictly use condoms	Intention to be vaccinated against HPV (among those who are not vaccinated)	Intention to postpone sexual intercourse (among those with no previous sexual activity)	Intention to maintain monogamous sexual relationships
Adjusted odds ratio (95% confidence interval)				
<b>General characteristics</b>				
Age (ref., 13–15 years)	1.42 (0.80–1.64)	1.27 (0.88–1.84)	–	–
Smoking (ref., no)	1.47 (0.88–2.46)	–	–	–
Alcohol consumption (ref., no)	1.04 (0.66–1.64)	–	0.53 (0.34–0.82)**	–
Having a sister (ref., no)	–	1.48 (1.03–2.13)*	–	–
Had heard of HPV (ref., no)	–	2.15 (0.97–4.74)	–	–
Had heard of the HPV vaccine (ref., no)	–	1.29 (0.68–2.42)	–	–
HPV perceptions (ref., not at all/disagree/don't know)				–
HPV is severe as an STI in boys	1.30 (0.70–2.42)	1.31 (0.67–2.55)	1.34 (0.71–2.51)	1.79 (1.00–3.19)*
HPV is severe as a cause of cancer in boys	1.26 (0.66–2.41)	1.21 (0.60–2.42)	0.83 (0.43–1.61)	0.74 (0.40–1.38)
HPV is severe as an STI in girls	1.98 (0.92–4.26)	1.49 (0.64–3.48)	1.35 (0.59–3.12)	1.29 (0.61–2.71)
HPV is severe as a cause of cancer in girls	1.38 (0.63–3.03)	2.10 (0.88–4.99)	2.17 (0.91–5.18)	2.69 (1.24–5.84)*

HPV=human papillomavirus; ref.=reference value; STI=sexually transmitted infection.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

the importance of HPV vaccination in boys, and to increase the vaccination rate of male students. In the United States, until 2006, only female adolescents were vaccinated against HPV; from 2011, the program expanded to include HPV vaccination for both genders. In 2016, 65.1% of female and over 56.5% of male adolescents had received at least one dose of the vaccine.<sup>13</sup> In Korea, 49.9% of 12-year-old female adolescents have received their first dose of HPV vaccination through the national immunization program from June 2016 to February 2017.<sup>30</sup> However, the rate of HPV vaccination among the

Korean boys included in this study was very low (1.6%,  $n=10$ ), which is consistent with the 1.3% vaccination rate reported previously in Korean boys.<sup>8</sup> To effectively increase the rate of vaccination, it is necessary to include the boys in the national mandatory immunization program for HPV.

With regard to the sociodemographic characteristics, it was found that alcohol consumption interfered with the intention of boys to delay sexual intercourse. As delaying intercourse is one way to prevent HPV, it is desirable to educate boys not to drink alcohol.



This study had some limitations. The intentions of the participants were mostly influenced by their parents, but we did not measure the intention of parents on HPV vaccination. Second, the sample distribution across the regions was not representative of the total population, and the students were aged from 13 to 18 years (mean, 15 years), which might interfere with the generalizability of the obtained results. However, the characteristics of smoking, consuming alcohol, and sexual intercourse of our cohort were similar to those in the national survey involving adolescents aged 12–15 years in 2015.<sup>31</sup>

A strength of the study was that we found there is a feminization of HPV infection in male adolescents. Based on the study results, we consider that a comprehensive approach, that includes perceived benefit, perceived barrier, and self-efficacy, is necessary to prevent HPV infection in boys. Undoubtedly, the most effective way to prevent HPV in both genders is HPV vaccination. In May 2016, the Korean government announced a national mandatory HPV vaccination program only for girls. We observed higher intention to be vaccinated against HPV among Korean boys in this study. Hence, benefits and the necessity of vaccinating the boys against HPV should be introduced to the parents who are the key to willingly pay for the vaccination of their adolescent boys. Meanwhile, the boys had a higher intention to prevent HPV infection when informed that HPV is a common STI and a cause of certain cancers in both genders. Several studies have shown a positive association between knowledge and the acceptance of HPV vaccination.<sup>32</sup> Based on the results of a systematic review regarding HPV vaccine acceptance in adolescent boys, interventions aiming to educate boys and their parents were the most effective in increasing the coverage for HPV vaccination.<sup>33</sup> Thus, it is crucial to target parents and adolescent males by providing effective educational interventions on HPV prevalence, vaccine, disease, and related

cancers to promote the acceptance of HPV vaccine among this population.

To further understand the pure effect of HPV education on perceptions and intentions among boys, future experimental studies should be designed.

## CONCLUSIONS

This study identified that male adolescents perceived HPV infection to be more severe in girls than in boys, indicating a feminization of HPV infection. To increase intention to prevent HPV infection in male adolescents, it would be beneficial to increase the awareness in boys on the risks of HPV infection in both genders. Healthcare providers should develop the newer educational methods to increase vaccine acceptance in adolescent males.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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