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## RESEARCH ARTICLE

### Disposition of Adolescents toward Receiving Covid-19 Vaccinations in Villavicencio: Myths and Beliefs

César García Balaguera \*<sup>1</sup>, María Fernanda Alfonso Osorio<sup>2</sup>, María Paula Echavarría<sup>2</sup>, María Camila Pardo Garzón <sup>2</sup>

<sup>1</sup> Professor, Universidad Cooperativa de Colombia

<sup>2</sup> Researcher, Faculty of Medicine, Villavicencio Campus

\*Correspondence: [cesar.garcia@campusucc.edu.co](mailto:cesar.garcia@campusucc.edu.co)

#### ABSTRACT

Background: Global efforts regarding the COVID-19 pandemic have been focused on preventive activities, such as vaccination, since the disease is expected to become endemic. Adolescents were among the last population groups to be included in the vaccination program in Colombia, and adequate coverage has not yet been achieved in this group and in infants. Aims: It is important to understand their motivations to improve the willingness of this population to be vaccinated. Methods: A cross-sectional study was designed via an online survey in adolescents aged 14–19 years in Villavicencio Meta after validation of the survey and informed consent. The following options were provided for the question on vaccine disposition: willing, undecided, and unwilling. We described the disposition toward receiving COVID-19 vaccine using graphs and absolute and relative frequencies based on age group. A multinomial regression model was used to assess the relationship between our predictor variables and vaccine disposition in adolescents. Results: In this study, 288 adolescents were surveyed. The risk variables for unwillingness to be vaccinated were being male (odds ratio [OR] 2.18, 95% confidence interval [CI] 0.8–5.7,  $p = 0.62$ ), belonging to low social stratum (OR 2.29, 95% CI 0.9–5.88,  $p = 0.19$ ), having a monthly family income of less than 1 million Colombian pesos (250 USD) (OR 2.01, 95% CI 0.8–5.16,  $p = 0.19$ ), and having basic education (OR 2.59, 95% CI 0.33–20.14,  $p = 0.18$ ). Conclusions: Unproven myths and beliefs have a profound influence on adolescents, resulting in an unwillingness to get vaccinated. Social networks have a high influence on these behaviors, which affect vaccination coverage in adolescents and young people not only for COVID, but also for human papillomavirus, Tetanus and rubella. Therefore, innovative public health strategies must be designed to improve willingness to be vaccinated in this population group.

**Keywords:** COVID-19, vaccination, disposition, vaccine in adolescents, public health

## INTRODUCTION

With the evolution of the COVID-19 pandemic, global attention has been shifted to young people, especially those under 20 years of age, who have the lowest vaccination coverage. The disease has had a higher incidence in young populations in the last year, although lethality has not increased significantly.<sup>1</sup> Vaccination coverage in adolescents at the beginning of the pandemic was exceptionally low because priority was given to the older adult population and those with comorbidities. Although in high-income countries vaccination of young people and adolescents began early, this has not been the case in middle- and low-income countries. Hence, the challenge of achieving adequate coverage in these countries continues to remain.<sup>2-5</sup>

The adolescent group has been included in regular vaccination programs, especially for the prevention of human papillomavirus and tetanus. However, the COVID-19 vaccine has not been integrated into regular vaccination programs, and in many countries, coverage with these biologicals is quite low, particularly in low-income countries and populations.<sup>6,7</sup>

The strategy of bringing the vaccination program to schools has been highly effective in improving vaccination coverage for the regular program. However, this has not been the case for vaccines against COVID-19, where negative attitudes have been evidenced because of insecurity and fear of vaccines. Furthermore, nonauthorization by parents to vaccinate their children has been a key factor.<sup>8,9</sup>

The side effects of COVID-19 vaccines are mild in this population. Serious adverse effects are exceedingly rare, and there are already abundant data on their safety and the risk factors associated with serious post-vaccination effects. The most common are fever, pain in the area of application, headache, and general malaise. Among those requiring hospitalization, multisystemic inflammatory syndrome, anaphylaxis, myocarditis, and pericarditis have been described, but these are rare events.<sup>10-14</sup>

Parental and community decisions on the vaccination of children and adolescents have so far been hesitant, partly because the knowledge about the virus is recent. Lack of evidence on the safety of vaccines and the appearance of new variants, covariants, and strains whose behavior is still uncertain both in terms of clinical behavior and vaccine response to variants are other factors. Furthermore, there is still not much certainty about the duration of effectiveness of the vaccines and the need for boosters over time, in addition to political, economic, and cultural factors that hinder

the administration of COVID-19 vaccines. These factors should be analyzed by the scientific community to design effective strategies to improve the acceptance of COVID-19 vaccination.<sup>15,16</sup> This study aimed to estimate the disposition toward vaccination in the adolescent age range in Villavicencio, Meta, Colombia. The secondary objective was to examine the hypotheses that prior COVID-19 infection, socioeconomic status, conspiracy theories, myths, demographic factors, and social connectedness were associated with greater or lesser vaccine readiness among adolescents. (for this study, adolescents were between the ages of 12 and 19 years).

## MATERIALS AND METHODS

A cross-sectional study was designed using a previously validated online survey, which was conducted between February and March 2022. The survey inquired about the sociodemographic condition of the adolescent, social security affiliation, educational level, and COVID-19 general aspects. Moreover, as working hypotheses, subjective experiences with the disease, experiences with vaccination and beliefs, and myths and legends about COVID-19 were explored.

The disposition of adolescents toward vaccination was assessed with one question that contained three response options: Would you get vaccinated against COVID-19 with any of the vaccines currently offered?

- a. Yes (willing to)
- b. No (Unwilling)
- c. Thinking about it (Undecided)

Finally, we asked about their COVID-19 vaccination status, their perception of vaccines, myths and legends about the disease and vaccines, and their willingness to be vaccinated.

The study was conducted in 10 municipalities of the city of Villavicencio. Inclusion criteria were the following: adolescents aged  $\geq 14$  years, signing an informed consent form, and answering more than 80% of the questions of the survey. Exclusion criteria were not being 14 years old, not having cognitive or motor capacity to complete the survey, and being pregnant.

The project was approved by the subcommittee on bioethics in research of the Cooperative University of Colombia, bioethics concept no. BIO254, march 1, 2022. The right of withdrawal was explained and the possibility was given online to clarify doubts and ask open questions. Each participant signed the written informed consent form and received a copy of the form. The risk of participating in the survey was minimal according to Resolution No. 008430 of 1993, which

establishes the scientific, technical, and administrative standards for health research in Colombia.

We described the disposition toward the administration of the COVID-19 vaccine using graphs as well as absolute and relative frequencies based on age group. We used a multinomial regression model to assess the relationship between our predictor variables and vaccine disposition in adolescent respondents aged 14–19 years. The results from the multinomial model were expressed as odds ratios (OR) along with 95% confidence intervals (CI) and p-values.

## RESULTS

A total of 291 people between 14 and 19 years of age were surveyed; 3 people were excluded because they did not meet the age range. The sociodemographic characteristics of the 288 participants are described in Table No. 1. It was observed that 44.83% were male, 54.83% were female, and 0.34% were others. The average age was 16.4 years; 6.9% of the respondents were 14 years old, 76.2% were 15–17 years old, and 16.9% were 18–19 years old; 97.59% were single, 1.72% were in a union, and 0.69% were married.

Regarding the housing strata, with 1 being the stratum with the lowest income and 5 being the stratum with the highest income, stratum 1 accounted for 15.28%, stratum 2 for 22.92%, stratum 3 for 48.61%, stratum 4 for 9.38%, and stratum 5 for 3.82%. In terms of the income variable, minimum wage was earned by 45% of the respondents, less than one million pesos was earned by 36% of the respondents, and more than 3 million was earned by 10% of the respondents. The sole activity of 89.93% of the respondents was studying, 9.72% studied and worked, and 0.35% only worked. Furthermore, 17.01% stopped working or studying during the pandemic.

In relation to the level of studies, 89.9% received basic education, 9.72% were in the university, and 0.35% were not studying. Regarding social security affiliation, 46.88% were in the contributory system, 44.79% in the subsidized system, and 8.33% in the special system.

Persons under 17 years of age, married people, and those with low social status, low income, and low educational level were less willing to get vaccinated.

**Table No. 1** Sociodemographic variables

SOCIODEMOGRAPHIC VARIABLES			
Variable	Category	n	%
Age (years)	≥14	20	6,9
	15-17	221	76,2
	18-19	49	16,9
Sex	Female	159	54,83
	Male	130	44,83
	Others	1	0,34
Marital status	Single	283	97,59
	Married	2	0,69
	Free union	5	1,72
Housing strata	1	45	15,52
	2	66	22,76
	3	141	48,62
	4	27	9,31
	5	11	3,79
District in which they lived	1	15	4,67
	2	37	11,53
	3	22	6,85
	4	55	17,13

	5	74	23,05
	6	20	6,23
	7	46	14,33
	8	17	5,3
	9	17	5,3
	10	17	5,3
Monthly income level	Less than \$1'000,000; less than US\$250	105	36,21
	1–3 million pesos; US\$250–750	132	45,52
	3–5 million; US\$750–1 253	30	10,34
	More than US\$5 million; more than US\$1253	23	7,93
Educational level	School: elementary to middle school	261	90
	University	28	9,66
	None	1	0,34
Social security affiliation	Subsidized regime	130	44,83
	Contributory regime	136	46,9
	Special regime	24	8,28
Dropped out of school or work during the pandemic	Yes	49	16,9
	No	241	83,1

Source: own database

### Experiences with COVID-19

In the survey, 46.9% of the people denied having had COVID-19, 23% claimed to have had the disease and it was confirmed, and 16% could have had it but without a confirmatory test. Moreover, 63% considered that COVID-19 will not cause serious illness or death, 31% opined that it may cause moderate illness, and 6% thought that it may lead to tragic consequences.

The surveyed respondents, given their age range, reported that 80.3% did not have comorbidities, whereas 19.7% had comorbidities, such as being overweight (6%), asthma (4%), and others (3%). A total of 47% of the respondents believed that the vaccine is really important, 41% thought it is important, 3% said it is unimportant, and 7% of the participants did not know. Hence, it is vital to emphasize medical education on the importance of vaccination and break barriers of ignorance in children.

The survey revealed that the family members of 58.28% of the respondents have fallen ill due to COVID-19, and 27.24% claimed to have a family member who has been hospitalized for COVID-19 or has died from the disease.

### Experiences with vaccination

Regarding their disposition toward vaccination, 46.2% were very willing to get vaccinated, 14.5%

were quite willing to be vaccinated, 3.1% were unwilling to get vaccinated, 28.3% were neutral, and 1.72% were against vaccination.

If the vaccine was available today near their home, 48.62% would go immediately to get vaccinated, 6.9% would wait a little longer to decide, 30.69% would get vaccinated when they had time, 1.72% would leave it until the last moment to decide, 2.76% would never go, and 9.31% did not know.

A total of 85.17% of the respondents' parents agreed with vaccination, 8.28% had no opinion, 1.38% were not interested, and 1.38% expressed no interest on the subject. If family or friends were interested in getting vaccinated, 30% of the respondents would strongly encourage them, 40.69% would motivate them, 22.07% would not say or do anything, 0.69% would ask them not to waste their time getting vaccinated, 1.72% would suggest that they not get vaccinated, and 4.83% did not know what they would do.

When asked if they were vaccinated against COVID-19, 66.55% of the respondents said they have already been vaccinated, whereas 33.45% have not been vaccinated. Regarding fear of getting vaccinated, 88.97% were not afraid of vaccination, whereas 11.03% reported fear of vaccination. Of those who were not scared of vaccination, 86.55% planned to be vaccinated.

The findings showed that 97.93% of the relatives of the respondents have been vaccinated against COVID-19. Furthermore, 17.59% affirmed that being already vaccinated they will not get sick from COVID-19.

Regarding postvaccination symptoms, 35.52% reported such symptoms, the most frequent being

muscle pain, fever, and chills. At the time of the survey, 51.38% had been vaccinated with Pfizer, Moderna 7.59%, Janssen 3.10%, AstraZeneca 2.07%, and Sinovac 0.69%. A total of 33.79% reported one dose and 31.03% two doses.

**Table No. 2** Experiences with COVID-19 and vaccination

EXPERIENCES WITH COVID-19			
Variable	Category	n	%
Have you had COVID-19?	Yes	20	23
	No	221	46,9
	Do not know	49	16,1
Symptoms of COVID-19	Fever	62	21,3
	Cough	53	18,3
	Loss of smell and/or taste	58	20
Do you believe that if you develop COVID-19, the risk of it being serious or of you dying is:	Low	40	70,18
	Moderate	16	28,7
	High	1	1,75
Do you have any of the following diseases?	None	231	80.21
	Overweight	19	6.60
	Asthma	14	4.86
	Others	9	3.13
	Obesity	5	1.74
	Elevated blood sugar	3	1.04
	Renal disease	2	0.69
	Cardiac diseases	2	0.69
	High blood lipids	1	0.35
	Pregnancy	1	0.35
Do you think the COVID-19 vaccine is really important?	Really important	137	47,24
	Important	118	40,69
	Unimportant	8	2,07
	Do not know	21	7,24
Would you be willing to be vaccinated against COVID-19 with any of the vaccines available from the Colombian Ministry of Health?	Yes	234	80,69
	No	19	6,55
	I am thinking about it	37	12,76
My disposition toward receiving the COVID-19 vaccine is:	Extremely interested in getting it	134	46,21
	Quite interested in getting it	42	14,48
	Neutral	82	28,28
	Little interest in getting it	18	6,21
	I am against it	5	1,72
	I do not know	9	3,1
If the vaccine was available near your home, what would you do?	I would immediately go to get vaccinated	141	48,62
	I would get vaccinated when I have the time	89	30,69

	I would wait a little longer to decide	20	6,9
	I would leave it until the last minute to decide	5	1,72
	I would never go	8	2,76
	I do not know	27	9,31
What do your parents think about vaccination?	They agree	247	85,17
	Disagree	15	5,17
	No opinion on the matter	24	8,28
	They are not interested	4	1,38
If my family or friends were considering COVID-19 vaccination, what would I do?	Strongly encourage them	87	30
	Motivate them	118	40,69
	I would not say or do anything about it	64	22,07
	Tell them not to waste their time getting vaccinated	2	0,69
	Suggest them not to get vaccinated	5	1,72
	Do not know	14	4,83

### Beliefs, myths, and COVID-19 perceptions

When asked if they believe that COVID really exists, 95.5% said yes. To the question, "Do you believe that the virus was created by people in a laboratory to cause harm?" 50.69% said yes. Moreover, 53.79% believed that it was created to reduce the size of the world population, 35.8% believed that the virus was created to make money and make politics, 7.24% of the respondents believed that the vaccine was created to sterilize the population, and 12.76% believed that the vaccine has some component that undermines the welfare of the individual. In addition, 21.72% believed that the vaccine could cause alterations in coagulation, heart disease, infertility, and neurological disease.

Additionally, 16.21% believed that the vaccine can cause death slowly and 62.41% believed that after vaccination they could get sick with COVID-19. To the question, "do you consider that you can stop protecting yourself with measures such as face masks and avoiding crowds after vaccination?" 14.83% said yes. Moreover, 30.34% believed they will need more than two doses of the vaccine to be protected.

### Bivariate analysis

Results of the multinomial regression model, adjusted for multiple covariates, for the sociodemographic variables suggested that the

risk variables for not willing to be vaccinated included being male (OR 2.18, 95% CI 0.8–5.7,  $p = 0.62$ ), belonging to a low social stratum (OR 2.29, 95% CI 0.9–5.88,  $p = 0.19$ ), having a family income of less than 1 million Colombian pesos (250 USD) (OR 2.01, 95% CI 0.8–5.16,  $p = 0.19$ ), and having basic education (OR 2.59, 95% CI 0.33–20.14,  $p = 0.18$ ).

Regarding experiences with COVID-19, not knowing if they have had COVID-19, although they could have had it, was a risk factor for not being vaccinated in the undecided population (OR 4.07, 95% CI 1.12–14.8,  $p = 0.0005$ ). In connection to myths, beliefs, and perceptions about COVID-19 in the surveyed adolescents, the risk factors associated with not getting vaccinated were the nonexistence of COVID-19 (OR 7.09, 95% CI 1.62–31.02,  $p = 0.009$ ), believing that COVID-19 was created to make money and politics (OR 6.79 95% CI 2.35–19.59,  $p = 0.0005$ ), believing that the COVID-19 vaccine causes sterility (OR 5.38, 95% CI 1.52–18.93,  $p = 0.0016$ ), and believing that it can cause death in the medium or long term (OR 14.92, 95% CI 5.36–41.53,  $p = 0.00001$ ).



**Table No. 3** Multinomial analysis

DISPOSITION OF ADOLESCENTS TOWARD VACCINATION AGAINST COVID-19							
		WOULD NOT BE VACCINATED			UNDECIDED		
Variable	Risk factor	OR	CI	p	OR	CI	p
<b>Sociodemographic characteristics</b>							
Age	<15 Years	1,85	0,4-8,3	0,56	1,7	0,3-9,37	0,56
Sex	Male	2,18	0,8-5,7	0,19	2,69	0,85-8,49	0,19
Social stratum	Low Stratum	2,29	0,9-5,88	0,18	0,55	0,17-1,73	0,18
Income level	Less than \$1 million per month	2,01	0,8-5,16	0,19	0,57	0,18-1,75	0,19
Educational level	Basic education (high school)	2,59	0,33-20,14	0,18	0,5	0,03-8,91	0,18
Affiliation to Health Social Security	Subsidized regime (low income)	1,26	0,49-3,22	0,57	0,5	0,16-1,57	0,56
<b>Experiences in the face of COVID-19</b>							
Has had COVID-19	No	0,35	0,11-1,09	0,16	0,56	0,13-2,36	0,16
	Possible that I had it without diagnosis	0,82	0,27-2,49	0,19	4,07	1,12-14,8	0,005
Risk perception	Low	0,68	0,14-3,33	0,54	0,48	0,02-8,32	0,9
	Intermediate	1,73	0,54-5,51	0,54	1,08	0,28-4,18	0,9
Comorbidities	None	1,42	0,39-5,07	0,67	0,85	0,18-4,06	0,67
<b>Beliefs, myths, and perceptions about COVID-19</b>							
Does COVID-19 exist?	No	7,09	1,62-31,02	0,009	1,5	0,29-7,52	0,57
Created in a laboratory	Yes	1,95	0,74-5,12	0,25	0,75	0,23-2,43	0,75
Created to reduce population size	Yes	2,14	0,78-5,84	0,96	0,95	0,28-3,16	0,907
Created due to money and politics	Yes	6,79	2,35-19,59	0,0005	2	0,59-6,7	0,12
Designed for sterilization	Yes	5,38	1,52-18,93	0,00016	1,33	0,32-5,45	0,13
Has technologies designed to damage health	Yes	13,27	4,78-36,83	0,0007	3,33	1,02-10,79	0,0007
Causes health damage	Yes	2,65	0,98-7,14	0,46	0,91	0,29-2,88	0,46
Vaccine can lead to death	Yes	14,92	5,36-41,53	0,00004	3,89	1,207-12,56	0,00002
Can you get ill with COVID-19 after vaccination?	Yes	1,314	0,48-3,58	0,13	1,54	0,47-4,99	0,013

## DISCUSSION

The aim of this study was to estimate the prevalence of adolescent vaccination readiness and to examine the hypotheses that prior COVID-19 infection, socioeconomic status, mental health, social connectedness, and healthy behaviors were associated with vaccination readiness. greater or less willingness to the vaccine among adolescents. A high willingness of adolescents to get vaccinated was found and the regression model showed that the higher the beliefs in conspiracy theories and myths about vaccines and the virus, the lower the probability of getting vaccinated. The greater

perception of risk and severity of the disease induces a greater probability of being vaccinated, regardless of age and gender.

The results indicate that most of the adolescents surveyed are willing to be vaccinated against COVID-19; however, the group of undecided and anti-vaccine respondents represents almost 20% of those surveyed. Hence, it important to identify the variables associated with this behavior. The findings of the study suggest that being less than 18 years of age, male sex, low strata, and low educational level are the sociodemographic variables most associated with being anti-vaccine

or undecided. The results strongly imply that myths and beliefs have a profound influence on the low predisposition to be vaccinated in the population group of adolescents surveyed. Various myths and theories, such as the denial of the existence of COVID-19, that it was created to make money and politics, that it can cause sterility, that it contains technologies that damage health, and that it can cause death in the medium or long term, are quite accepted and are part of the motivations for being undecided about vaccination. This attitude calls for improving information, education, and communication strategies for adolescents as they are somehow very susceptible to the rumors and myths that circulate by word of mouth and social networks.

Better strategies are needed regarding informed consent. Hence, for adolescents to consent to COVID-19 vaccination, they must be able to understand the reason vaccination was recommended, including a broad explanation on the benefits of protecting themselves and others from contracting a disabling and potentially serious disease. Moreover, they need to understand in general terms the nature of the procedure; for example, that it would involve an injection in the arm that could cause pain at the injection site. In addition, healthcare professionals are required to inform those to be vaccinated of the risks for the average individual, which they are entitled to know.

We are in a transition phase of the pandemic and are moving toward an endemic phase owing to a decrease in the number of susceptible people, either because they have become ill or because of the effects of vaccination. However, the appearance of new strains, variants, and covariants implies that we must continue taking preventive measures in public health and, of course, vaccination continues to be fundamental. It is also evident that children and adolescent groups have been the last to be included in the vaccination plans and the coverage is still low. As of May 2022, in Colombia, it was below 35% for the second dose. It is, therefore, necessary to focus on the undecided and at-risk groups to reinforce vaccination efforts in these groups.

Information and communication strategies should be improved in the low stratum populations and in those with low educational level since these groups are dominated by the undecided and those not inclined to vaccination, thus generating high-risk conglomerates that need to be vaccinated.

Young and undecided schoolchildren spend a lot of time on social networks, so this channel is important in improving the knowledge and understanding about vaccination. In addition,

students who have had a previously confirmed COVID-19 infection or probable infection were more prone to choose not getting vaccinated or be undecided. Therefore, better information is needed to answer any questions regarding immunity in those who have had the disease. As we learn more about the range of immune responses after exposure to the virus, this knowledge is shared with younger populations. Hence, it should be made clear that reinfection is possible. Furthermore, our study indicates that misinformation, both online and offline, has a direct impact on confidence and the intention to get vaccinated, as reported by Loomba.<sup>17</sup> Schools should desirably include in their curriculum the study of the history of vaccines and their profound impact on primary prevention, thereby increasing the level of knowledge and acceptance.

The impact of myths on adolescents is extremely high and greatly compromises their decisions on health and self-care.<sup>18,19</sup> These decisions also tend to be contrary to the opinions of adults and are, therefore, a part of their attitude toward emancipation. However, the most serious aspect is that it puts their health and, in the case of COVID-19, the health of other population groups at elevated risk.<sup>20-22</sup> Their high dependence on social networks and the digital era generates greater difficulties in controlling. Hence, it is a priority to improve the role of the state in monitoring, controlling, and supervising the quality and veracity of health information, especially against conspiracy theories and myths that surround the COVID-19 pandemic.<sup>23-25</sup>

The proportions of the population willing to be vaccinated vary significantly around the world, and cultural and social contexts are the determinants.<sup>26-28</sup> However, some common strata features are observed, such as low-income strata or educational level and living in rural areas.<sup>29-31</sup> These coincide with our findings from the present study, which suggest that intersectoral interventions are needed to achieve effective changes in the behavior of people, especially in anti-vaccine groups and in those who are undecided about being vaccinated, contemplate perception of risk and beliefs in conspiracy theories.<sup>32-34</sup>

## Conclusions

The immediate future before COVID-19 is uncertain. The discovery of new strains and variants, changes in clinical behavior, limited knowledge about the duration of immunity achieved by available vaccines, anti-vaccine movements, and political and cultural contexts represent a great challenge for public health. Interventions and vaccination campaigns in the



immediate future must consider the acceptance of the COVID vaccine, emphasizing the severity of the disease, susceptibility and estimation of individual and family risk, the routes of administration of the vaccines, for example. the fear of needles, and address myths about the virus and vaccines as well as conspiracy theories.

It is important to allocate more resources to learn about people's perceptions of their health risks, generate systems of social participation and citizen action to protect their health and well-being, and strengthen primary health care. In this way, the levels of acceptability of preventive programs and, in this case, of vaccination programs can be improved.

One of the limitations of our study is the limited sample size. As quarantine was in full force at the time of our study, access to certain population groups was overly complicated. Moreover, questions regarding family perceptions or myths are susceptible to bias, especially because we could not guarantee the confidentiality of the survey.

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**Conflicts of Interest:** None declared

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