



# Descriptive analysis of cervical cytology coverage in Brazil: a study from 2018 to 2023

*Análise descritiva do indicador de cobertura do exame de citopatológico no Brasil: um estudo de 2018 a 2023*

*Análisis descriptivo de la cobertura de citología cervical en Brasil: in estudio de 2018 a 2023*

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## ABSTRACT

**Objectives:** To analyze the coverage of the indicator "proportion of women undergoing cervical cytology collection" in Primary Health Care within the Previne Brasil program. **Method:** Ecological study based on publicly available data regarding the proportion of women who underwent cervical cytology collection in primary health care across different regions of Brazil from 2018 to 2023. Descriptive statistical analysis was performed using relative and absolute frequencies with R software. **Results:** Cervical cytology coverage in Brazil increased from 10% to 27% during the study period across all regions. The South and Northeast regions showed coverage rates above the national average. Coverage increased in 2018 and 2019, followed by a decline during the pandemic, with recovery observed in 2021. **Conclusion and implications to practice:** Despite the increase in coverage from 2018 to 2023, the 40% target was not achieved. The current screening model seems insufficient to reach women in the recommended age group. Differentiated actions, including financing strategies, are needed to enhance team productivity and improve service quality.

**Keywords:** Primary Health Care; Cervical Cancer; Human Papillomavirus; Screening Programs; Pap Smear Test.

## RESUMO

**Objetivos:** Analisar a cobertura do indicador "proporção de mulheres com coleta de citopatológico" na Atenção Primária à Saúde no âmbito do programa Previne Brasil. **Método:** Estudo ecológico baseado em dados de acesso público, sobre a proporção de mulheres que realizaram coleta de citopatológico na atenção primária, nas diferentes regiões do Brasil, no período de 2018 a 2023. Foi realizada análise estatística descritiva com frequência relativa e absoluta no software R. **Resultados:** A cobertura de coleta de citopatológico no Brasil aumentou de 10% para 27% no período analisado, em todas as regiões. As regiões Sul e Nordeste apresentaram índices superiores à média nacional. Observou-se crescimento na cobertura em 2018 e 2019, seguido por uma queda durante a pandemia, com retomada em 2021. **Conclusão e implicações para a prática:** Apesar do aumento na cobertura entre 2018 e 2023, a meta de 40% não foi alcançada. O modelo de rastreamento atual parece não abranger adequadamente as mulheres na faixa etária recomendada. São necessárias ações diferenciadas, incluindo estratégias de financiamento, para aumentar a produtividade das equipes e melhorar a qualidade dos serviços.

**Palavras-chave:** Atenção Primária à Saúde; Câncer de Colo do Útero; Papilomavirus Humano; Programas de Rastreamento; Teste de Papanicolaou.

## RESUMEN

**Objetivos:** Analizar la cobertura del indicador "proporción de mujeres que se someten a la recolección de citología cervical" en la Atención Primaria de Salud en el marco del programa Previne Brasil. **Método:** Estudio ecológico basado en datos públicos sobre la proporción de mujeres que realizaron la recolección de citología cervical en la atención primaria de salud en diferentes regiones de Brasil entre 2018 y 2023. Se realizó un análisis estadístico descriptivo utilizando frecuencias relativas y absolutas con el software R. **Resultados:** La cobertura de citología cervical en Brasil aumentó del 10% al 27% durante el período estudiado en todas las regiones. Las regiones Sur y Nordeste mostraron tasas de cobertura superiores a la media nacional. La cobertura creció en 2018 y 2019, seguida de una disminución durante la pandemia, con recuperación observada en 2021. **Conclusión e implicaciones a la práctica:** A pesar del aumento en la cobertura entre 2018 y 2023, no se alcanzó la meta del 40%. El modelo de detección actual parece insuficiente para llegar a las mujeres en el grupo de edad recomendado. Se necesitan acciones diferenciadas, incluidas estrategias de financiamiento, para mejorar la productividad de los equipos y la calidad de los servicios.

**Palabras clave:** Atención Primaria de Salud; Câncer de Cuello Uterino; Virus del Papiloma Humano; Programas de Detección; Prueba de Papanicolaou.

## INTRODUCTION

Cervical cancer (CC) is the fourth most common cancer among women, with 661,044 new cases and 348,186 deaths reported globally in 2022.<sup>1</sup> However, in developing countries, CC is the second most common cancer, with approximately 85% of cases concentrated in low- and middle-income countries.<sup>2</sup>

In the Americas, CC is the third most common malignant neoplasm among women, with about 50% of those diagnosed succumbing to the disease.<sup>3</sup> In 2020, 74,800 new cases were reported among women aged 20 to 85 years. Within the same group, there were 37,700 deaths, and projections estimate this number will rise to 87,400 new cases by 2030.<sup>3</sup> In Brazil, CC is the third most prevalent cancer among women, with an estimated 17,010 new cases annually during the 2023–2025 period.<sup>4</sup> In 2021, the mortality rate was 4.5 deaths per 100,000 women, with higher concentrations in the North and Northeast regions.<sup>5</sup>

CC is caused by a persistent infection with the human papillomavirus (HPV), which is transmitted through direct contact with contaminated mucous membranes or skin, primarily via sexual contact (oral-genital, genital-genital, or manual-genital) or vertical transmission. HPV infection is common and, in most cases, asymptomatic, often resolved spontaneously. Diagnosis can be made through molecular biology tests.<sup>4,6</sup>

CC is considered preventable and controllable through HPV vaccination, effective screening, or treatment of precursor lesions.<sup>2,4</sup> Cytology test, commonly known as the Pap smear, is one of the primary screening methods used to identify cellular abnormalities in the cervix. Cytology test is widely used in developing countries due to its low cost.<sup>7</sup> In Brazil, screening is recommended for women or individuals with a cervix aged 25 to 64 years who have been sexually active.<sup>8</sup> In 2024, molecular tests were approved for incorporation into the Brazilian Unified Health System (SUS).<sup>9</sup>

In 2020, the World Health Organization (WHO) proposed a global strategy to accelerate the elimination of CC by 2030. This strategy includes HPV vaccination for 90% of girls by age 15, molecular testing for 70% of women aged 35 to 45, and treatment for 90% of women diagnosed with precursor lesions or CC.<sup>4,5,7</sup>

Actions conducted in Primary Health Care (PHC) have been crucial in reaching eligible women for vaccination, screening, detection of precursor lesions, and early diagnosis of CC. Additionally, PHC facilitates educational initiatives, awareness campaigns, and community mobilization efforts.<sup>8,10</sup>

To enhance and improve the funding of PHC, expand access, and increase population coverage in CC screening—aligned with the principles of SUS and promoting equity in public resource distribution while optimizing available technologies—Previne Brasil was created. Approved through Ordinance No. 2,979, dated November 12, 2019, Previne Brasil included the evaluation of indicators derived from the e-SUS PHC system and the Basic Health Care Information System (SISAB). To receive funding, municipalities were required to meet the agreed-upon indicator

targets.<sup>11,12</sup> However, this program was repealed by Ordinance No. 3,493 on April 10, 2024.<sup>13</sup>

Because of the importance of CC screening, this study aimed to analyze the coverage of the indicator “proportion of women undergoing cytology testing” within PHC under Previne Brasil from 2018 to 2023. As a contribution, the study evaluates the performance coverage of this indicator, providing support for planning actions and assessing the proposed PHC funding model.

## METHOD

This is an ecological study<sup>14,15</sup> in which the units of analysis were the different geographic regions of Brazil, using aggregated data extracted from public health information databases. The performance indicator evaluated was the “proportion of women undergoing cytology testing in PHC,” as part of Previne Brasil, for the period between 2018 and 2023. This indicator measures the proportion of women aged 25 to 64 who received PHC services and underwent at least one cytology test within a three-year interval, in line with national guidelines.<sup>8</sup> The target for this indicator was set at 40%, considering team performance and the limitations identified in each city.<sup>16</sup>

Although Previne Brasil was established in 2019, we analyzed data collected since 2018 to enable a comparative analysis of coverage before and after its implementation. Furthermore, according to Ordinance GM/MS No. 102, issued in January 2022, Article 6-A, the indicator analyzed in this study was only considered for evaluating the percentage of actual achievement starting from the second quarter of 2022.<sup>17</sup>

Data analyzed were publicly available and obtained from official databases of the Ministry of Health, including SISAB and the e-Gestor Atenção Básica system. Analyses covered data from the first quarter of 2018 to the third quarter of 2023. Data collection was conducted in February 2024 by a public health nurse and master’s student.

To extract data, the SISAB portal was accessed. On the homepage, the “Performance Indicators” option was selected. Then, query filters were applied, selecting the indicator “proportion of women undergoing cytology testing in PHC,” the visualization levels (Brazil, Region, and States), the time periods (all from 2022 onward), and considering only approved teams.

The “e-Gestor Atenção Básica” system was also accessed, where a similar procedure was performed. On the homepage, the “Performance Indicators” option was selected, followed by the data panel. The same filters were applied for the query. This portal provided data starting from the first quarter of 2018.

For data analysis, the cytology test collection was considered the dependent variable, while the independent variables were the regions and states of Brazil. Data underwent descriptive statistical analysis by using absolute and relative frequencies, with the assistance of R software (version 4.3.2). This research was not submitted to an Research Ethics Committee, as it exclusively used publicly available data.

## RESULTS

From 2018 to 2023, no region in Brazil achieved the 40% target for cytology test coverage in PHC (Figure 1). However, national coverage increased from 10% in the first quarter of 2018 to 27% in the third quarter of 2023.

The South and Northeast regions stood out during the 2018–2023 period, with coverage rates above the national average. In contrast, the Southeast and Central-West regions recorded coverage percentages below the national average during the analyzed period. The North region had coverage rates above the national average in 2019. However, in 2021 and 2022, these rates fell below average, though a growth trend was observed in 2023.

The Brazilian regions exhibited patterns similar to the national trend, with growth or stable coverage rates between 2018 and 2019. However, from 2020 to the second quarter of 2021, all regions experienced a decline or stability in coverage rates, indicating that the performance of cytology tests was adversely affected during the COVID-19 pandemic.

There was significant variability in cytology test coverage among Brazilian regions. In the first quarter of 2018, the states of Amapá, Bahia, Espírito Santo, Goiás, Maranhão, Pará, Pernambuco, Paraná, Rio de Janeiro, Roraima, Sergipe, São Paulo, and Distrito Federal reported indicator rates equal to or below 10%. These areas showed gradual growth in their rates over the years (Figure 2).

Although no state reached the 40% target during any year of the study period, Alagoas and Amazonas showed values close to the target, with coverage rates of up to 39% in the third quarter of 2023. In contrast, the lowest coverage rates during

the same period were recorded in Distrito Federal (17%) and Rondônia (19%) (Figure 2).

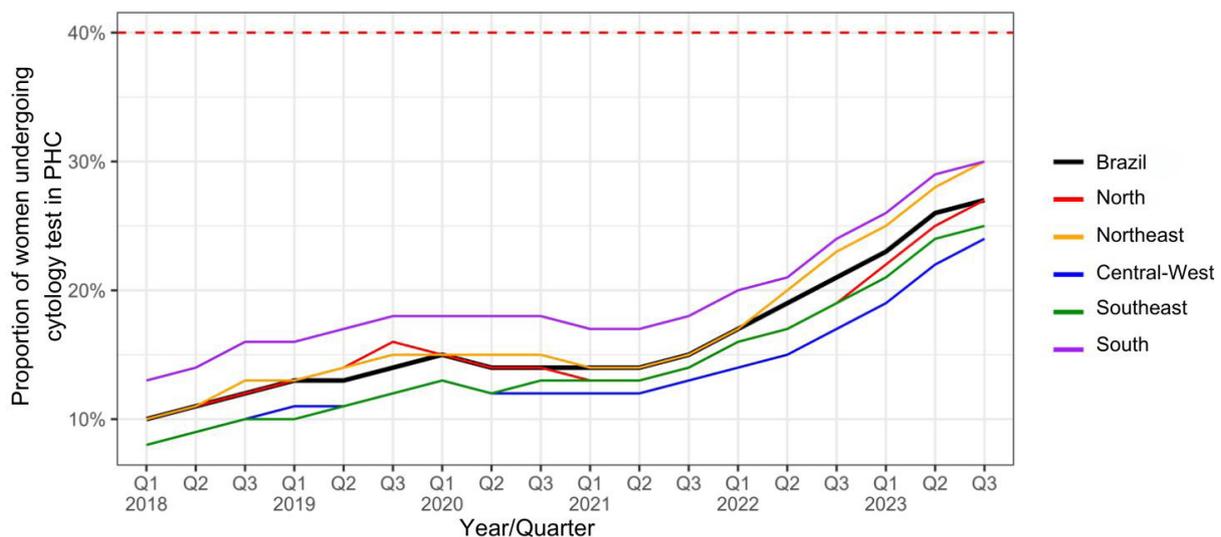
Table 1 presents the growth rates of Previnhe Brasil indicator across quarters from 2018 to 2023. Each row corresponds to a specific quarter, while columns display growth rates compared to the previous quarter. By analyzing growth rates in cytology test coverage, a rising trend was observed from 2018 until the first quarter of 2020, with a maximum growth of 10% compared to the previous quarter. However, in the second quarter of 2020, a national decline in the indicator was noted, followed by stability with no growth until the second quarter of 2021 (Table 1). Growth in coverage resumed from the third quarter of 2021 onward.

## DISCUSSION

The results of this study highlight the progression of the indicator measuring the proportion of women undergoing cytology testing in PHC, driven by Previnhe Brasil. Between 2018 and 2023, the indicator showed slow and modest growth, reflecting the unique characteristics and specificities of each region and state in Brazil. Additionally, data reveals the significant impact of the COVID-19 pandemic on CC screening efforts.

The coverage rate for cytology testing in all regions of Brazil remained below the target until the financial incentives from Previnhe Brasil began. Despite the creation and implementation of several global<sup>4,5,7</sup> and national<sup>8,9,16</sup> policies and strategies aimed at encouraging women to undergo testing, data showed that the performance of health care systems fell short of expectations.

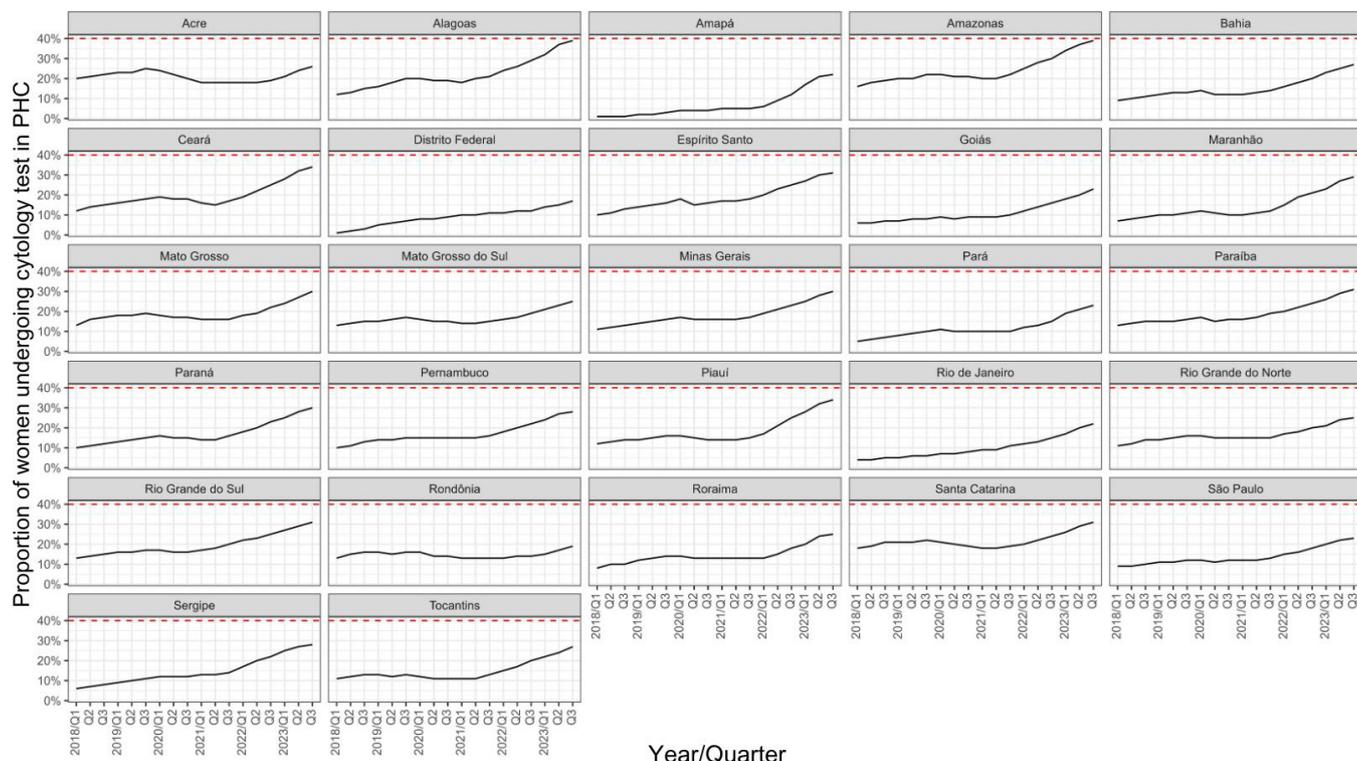
During the study period, disparities in cytology testing coverage rates were observed among the regions of Brazil. These findings are consistent with other national studies that



**Figure 1.** Distribution of the indicator “Proportion of women undergoing cytology testing in Primary Health Care” by major regions of Brazil, 2018 to 2023. Q1 = First quarter; Q2 = Second quarter; Q3 = Third quarter. Source: SISAB and e-Gestor Atenção Básica system.

### Cervical cytology test coverage indicator in Brazil

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**Figure 2.** Distribution of the indicator “Proportion of women undergoing cytology testing in Primary Health Care” in Brazilian states, 2018 to 2023. Q1 = First quarter; Q2 = Second quarter; Q3 = Third quarter. Source: SISAB and e-Gestor Atenção Básica system, 2024.

**Table 1.** Percentage variation in the coverage of the indicator “Proportion of women undergoing cytology testing in Primary Health Care” across quarters in major regions of Brazil, 2018 to 2023.

Period	Brazil	North	Northeast	Central-West	Southeast	South
Q1/2018*						
Q2/2018	10	10	10	12.5	12.5	7.7
Q3/2018	9.1	9.1	18.2	11.1	11.1	14.3
Q1/2019	8.3	8.3	0	10	0	0
Q2/2019	0	7.7	7.7	0	10	6.3
Q3/2019	7.7	14.3	7.1	9.1	9.1	5.9
Q1/2020	7.1	-6.3	0	8.3	8.3	0
Q2/2020	-6.7	-6.7	0	-7.7	-7.7	0
Q3/2020	0	0	0	0	8.3	0
Q1/2021	0	-7.1	-6.7	0	0	-5.6
Q2/2021	0	0	0	0	0	0
Q3/2021	7.1	7.7	7.1	8.3	7.7	5.9
Q1/2022	13.3	14.3	13.3	7.7	14.3	11.1
Q2/2022	11.8	6.3	17.6	7.1	6.3	5
Q3/2022	10.5	11.8	15	13.3	11.8	14.3
Q1/2023	9.5	15.8	8.7	11.8	10.5	8.3
Q2/2023	13	13.6	12	15.8	14.3	11.5
Q3/2023	3.8	8	7.1	9.1	4.2	3.4

\* Q1/2018: reference period for evaluating growth rates in subsequent quarters. Q1 = First quarter; Q2 = Second quarter; Q3 = Third quarter. Source: SISAB and e-Gestor Atenção Básica system, 2024.

have reported higher coverage rates in the South region,<sup>18</sup> while the North and Northeast regions had lower percentages of test performance<sup>18,19</sup> and higher CC incidence rates.<sup>5</sup> However, the present study revealed a trend of increasing cytology test coverage in the North and Northeast regions, reaching the national average.

These regional inequalities may reflect barriers to accessing PHC for cytology testing.<sup>5,10,19</sup> The vast territorial expanse and challenging access to remote areas, such as the Amazon region and rural zones, combined with population dispersion, poor infrastructure, or the absence of health units near households, restrict both the mobility of health care workers and the ability of women to access services.<sup>10,20</sup> Additionally, linguistic and cultural barriers, particularly in Indigenous communities, further complicate access to health care.<sup>10</sup> Other contributing factors include lack of access to information, fear, pain during the procedure, embarrassment, and the absence of trust and rapport with health care workers.<sup>10,19,21</sup>

The impact of the COVID-19 pandemic declared by WHO in March 2020 cannot be overlooked. The pandemic required a reorganization of health services, leading to the reduction or suspension of CC screening.<sup>5</sup> This situation negatively affected the productivity rates of health care teams, as CC screening was classified as an elective procedure.<sup>22</sup> This was reflected in declines in the indicator across several Brazilian states.

A similar situation was observed even in developed countries, such as England,<sup>23</sup> Massachusetts in the United States,<sup>24</sup> and Ontario in Canada.<sup>25</sup> However, there was a gradual recovery in screening rates as conditions began to normalize and health restrictions were eased.<sup>26</sup>

A reduction in mortality has been observed in countries that have implemented organized CC screening programs.<sup>27</sup> In Brazil, however, the incidence and mortality rates for CC have stabilized.<sup>27</sup> This is possibly due to the adoption of an opportunistic screening strategy, low cytology test coverage, late-stage detection of lesions, and significant delays in diagnosis and treatment initiation.<sup>28,29</sup>

For a screening program to be well-structured, it is essential to ensure access to cytology testing for women and other individuals with a cervix, maintain the quality of actions performed, and achieve coverage targets through population mobilization. Equally important is training professionals to perform the procedure correctly, continuously monitoring and managing activities, and qualifying laboratories to analyze collected samples. To effectively reduce mortality rates, accurate diagnoses and provide prompt and effective treatment of lesions before they reach the invasive stage should be ensured.<sup>28,29</sup>

To increase cytology test coverage, it is essential to expand and enhance service availability by adopting strategies such as the use of mobile units for test administration.<sup>10</sup> In addition, the extension and increased flexibility of the hours of operation of primary health care units (UBS), as outlined in the Saúde na Hora program implemented in 2019, has the potential to improve the engagement and adherence among the target population.<sup>30</sup>

Previne Brasil contributed to expanding the availability of services in PHC. However, municipalities face chronic financial

shortages, limiting their ability to invest in improving health unit infrastructure, hiring skilled health care workers, and acquiring the necessary materials for adequate population care.<sup>29,31</sup> The most affected municipalities are those with already weakened health care networks, serving low-income populations. These areas require greater investment to ensure universal access to health care and improve the quality of services provided.<sup>31</sup>

CC prevention aligns with the Sustainable Development Goals (SDGs), specifically those related to health (SDG-3) and gender equality (SDG-5).<sup>3</sup> The implementation of public policies aimed at reducing regional inequalities while considering the cultural, social, economic, and educational diversity of Brazil is crucial.<sup>5</sup> These actions must be coordinated to ensure that all individuals within the target population have access to a health care system that promotes the prevention of sexually transmitted infections, sexual health, increased HPV vaccination coverage, appropriate screening and treatment, and palliative care.<sup>3,5</sup> Expanding CC screening services in remote, rural, and vulnerable populations should be prioritized by strengthening PHC.<sup>5</sup> Furthermore, health care workers need to be trained to better meet the needs of women and others with CC, especially those from vulnerable groups.

## CONCLUSION AND IMPLICATIONS TO PRACTICE

The CC screening target of 40%, established by the Brazilian Ministry of Health, was not achieved at the national level. However, a progressive increase in coverage rates was observed between 2018 and 2023, despite a decline in cytology testing during the pandemic period.

Data highlight the complexity involved in CC screening and monitoring. The current screening model is not effectively reaching women and individuals with a cervix within the target age group, as reflected by coverage rates below the goal. Therefore, financial and other incentives are essential to ensure success in preventing this disease, focusing on increasing team productivity and improving the quality of services provided.

This study has some limitations, such as the use of secondary data, which may include recording errors, underreporting, or inconsistencies. Additionally, the relatively short analysis period may have influenced the assessment of cytology test coverage.

This study has practical implications by highlighting the proportion of women who underwent cytology testing in PHC in Brazil, enabling comparisons across different scenarios. Additionally, it contributes to the planning and monitoring of health promotion and prevention actions. Finally, the data presented may raise awareness among managers to develop strategies that improve this indicator, strengthen health care teams, and ultimately enhance the quality of life for women.

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## DATA AVAILABILITY RESEARCH

The contents underlying the research text are included in the article.

## CONFLICT OF INTEREST

No conflict of interest.

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