

Meta Analysis: The Effect of Age and Gender on Face Mask Use during COVID-19 Pandemic

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) is a world health problem in early 2020. The first case of COVID-19 was found in Wuhan China, the use of masks is intended to control the transmission of the virus to others and as a preventive measure, namely by providing protection to users who do not infected with viral exposure. The purpose of this study was to estimate the extent of adherence to wearing masks in the elderly and women through a meta-analysis of the primary study which was carried out by the previous authors.

Subjects and Method: This study was a meta-analysis with the following PICO, PICO. Population: general population, intervention: age (older > 46) and gender (female), comparison: age (young 12 - 45 years) and gender (male), outcome: use of masks. The articles used in this study were obtained from three databases, namely Google Scholar, Pubmed, and Science Direct. With keywords such as: “mask and COVID-19 transmission”, “mask or COVID-19 transmission”. The articles included are full-text English with an observational study design from 2020 to 2022. Article selection was carried out using PRISMA flow diagram. Articles were analyzed using the Review Manager 5.3 application.

Results: A total of 9 case studies from Europe, America and Asia were selected for systematic review and meta-analysis. The results showed that people over 46 years of age were 1.54 times more likely to use a mask than those under 45 years old (aOR= 1.54; 95% CI= 0.83 to 2.85; p= 0.170) and women were 1.12 times more likely to use a mask than men. -male (aOR= 1.12; 95% CI= 0.78 to 1.61; p= 0.550).

Conclusion: Older age and women are more likely to wear masks.

Keywords: wearing mask, gender, age, COVID-19

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BACKGROUND

Coronavirus disease 2019 (COVID-19) is a global health problem in early 2020. The first case of COVID-19 was found in Wuhan

on December 31, 2019, China with an unknown etiology. COVID-19 cases are increasing quite rapidly, this disease has spread to various countries in less than a

month (Kemenkes RI, 2020). The World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern (PHEIC) on January 30, 2020 (WHO, 2020). Indonesia recorded the first 2 cases of COVID-19 since March 2, 2020, March 11, 2020, WHO declared COVID-19 as a pandemic on March 11, 2020 (Ministry of Health, Republic of Indonesia, 2020). The etiology of COVID-19 is Severe Acute Syndrome Coronavirus 2 (SARS CoV-2) which was discovered on January 10, 2020. This virus belongs to the coronavirus family, a virus similar to the cause of the SARS outbreak in 2002 to 2004, namely Sarbecovirus (Kemenkes RI, 2020).

COVID-19 is transmitted to infected people by coughing, sneezing, talking, and touching their eyes, nose, or mouth (Susilo et al, 2020). Infected droplets have the potential to contaminate goods or surfaces (Kemenkes RI, 2020). Recent research by Wang and Du stated that transmission through aerosols can occur if there is exposure to aerosols with high concentrations in a closed place (Wang and Du, 2020). The spread of COVID-19 can be prevented by early detection, isolation and carrying out basic protection such as maintaining a minimum distance of 2 meters, increasing hand washing and wearing masks when in crowded areas or at risk of transmission (Howard et al., 2020; Susilo et al., 2020). Wearing a mask aims as a control, namely preventing infected users from transmitting the virus to others and as a preventive measure, namely by providing protection to uninfected users against virus exposure (WHO, 2020). Masks are personal protective equipment due to the spread of

respiratory infections from airborne pathogens, droplets and body fluids (Hu et al., 2020). The recommended masks consist of medical masks, cloth masks and N95 masks (MacIntyre et al., 2015; Health, 2020). The Center for Disease Control and Prevention (CDC) recommends everyone to wear a cloth mask when in crowded places because most individuals with COVID-19 who do not show symptoms can still transmit the virus (CDC, 2020).

The government must improve conditions in Indonesia in order to maintain productivity while still following health protocols (Pinasti, 2020). Indonesia has entered the new normal, namely the period of handling COVID-19 (Ministry of Health, 2020). Individuals can continue their activities, work, and worship with new habits. The first effort is for the government to announce the Main Protocol for Handling COVID-19 Transmission Cases on March 6, 2020 (Permenkes RI, 2020). This protocol is intended to serve as a core guideline in breaking the chain of transmission of COVID-19 and therefore must be implemented or enforced by every disciplined individual, which includes the use of soap or hand sanitizer for hand hygiene, physical distancing and the use of face masks (Ministry of Health, 2020). COVID-19 strikes all ages. Thus, there is a need for awareness and understanding of discipline in the implementation of public health protocols. This will reduce the spread of COVID-19 (Wiranti et al., 2020).

This disease motivates health care providers to promote clean and healthy lifestyles. The public must understand the efforts to spread and prevent COVID-19 in order to minimize the number of COVID-19

patients in Indonesia. Based on the explanation of the background above, the researcher is interested in conducting a meta-analysis to see the effectiveness of the use of masks in preventing the spread of COVID-19 with the title "Meta-analysis: Effect of Age and Gender on the Use of Masks During the COVID-19 Pandemic".

SUBJECTS AND METHOD

1. Study Design

This research is a systematic research and meta-analysis. The articles used in this study were obtained from several databases, namely PubMed, Google Scholar, and Science Direct and obtained from online libraries from various campuses. Key words include: "mask and COVID-19 transmission", "mask or COVID-19 transmission".

2. Inclusion Criteria

The inclusion criteria are: Full paper with observational study research method, in English, the intervention given is old age and women, research subjects are the general public in the age range of 12-70 years, one of the outcomes analyzed is the use of masks.

3. Exclusion Criteria

The exclusion criteria in this research article were: Research conducted with RCT studies and articles published before 2020.

4. Operational Definition of Variables

The article search was carried out by considering the eligibility criteria determined using the PICO model. Population: general population, intervention: age (older > 46) and gender (female), comparison: age (young 12 to 45 years) and gender (male), outcome: use of masks.

5. Study Instruments

The study was guided by the PRISMA flow chart and quality assessment using JBI Critical Appraisal Tools:

- a. Are the criteria for inclusion in the sample clearly defined?
- b. Are the research subjects and settings described in detail?
- c. Is exposure measured in a valid and reliable way?
- d. What are the objective, standard criteria used for the measurement of the condition?
- e. Were confounding factors identified?
- f. Are strategies for dealing with confounding stated?
- g. Are results measured in a valid and reliable way?
- h. Was appropriate statistical analysis used?

6. Data Analysis

The data in the study were analyzed using the Review Manager application (RevMan 5.3). Forest plots and funnel plots were used to determine the size of the relationship and heterogeneity of the data. The fixed effects model is used for homogeneous data, while the random effects model is used for heterogeneous data across studies.

RESULTS

The article search process is carried out by searching the journal databases which include MEDLINE/PubMed, Google Scholar, ProQuest, Science Direct and Springer Link. The keywords used in the search process were "wearing mask" AND "age" AND "gender" AND "COVID-19". The initial search process found 1886 articles, after which the articles were screened to detect duplicate articles. The screening process

found 466 articles. The results of the process of deleting duplicated articles obtained 1420 articles of which 915 met the

requirements for further full-text review. A total of 505 articles were excluded because they did not meet the inclusion criteria.

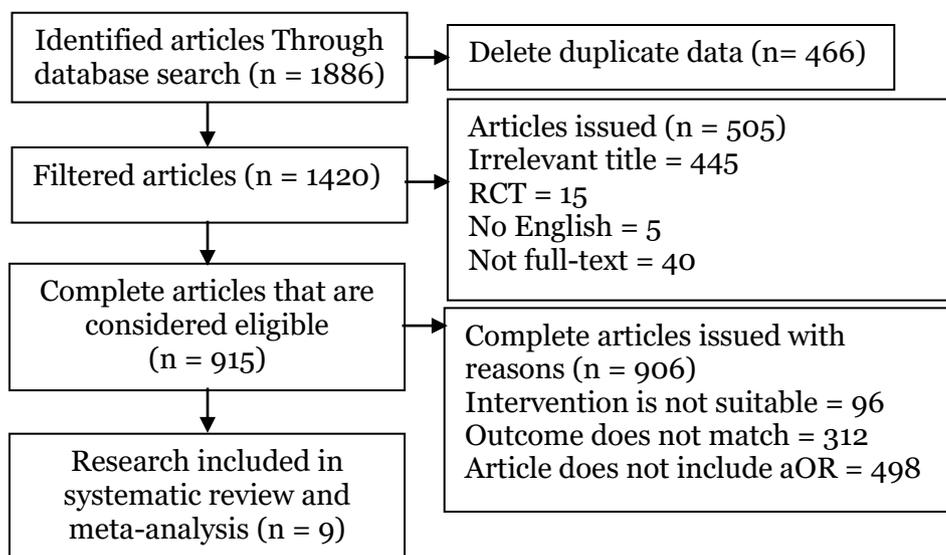


Figure 1. PRISMA Flowchart



Figure 2. Map of study area

Table 1. Description of the primary studies included in the meta-analysis primary studies

Author (year)	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (95% CI)	
								Gender	Age
Haischer et al. (2020)	United States of America	Cross Sectional	9,935	Shoppers entering the shop	Women and Older Age	Boys and Younger Age	Use of Mask	1.47 (1.31 to 1.65)	3.434 (2.81 to 4.19)
Haischer et al. (2021)	United States of America	Cross Sectional	12,236	Shoppers entering the shop	Women and Older Age	Boys and Younger Age	Use of Mask	1.54 (1.36 to 1.74)	1.23 (1.03 to 1.47)
Lam et al. (2021)	United States of America	Cross Sectional	1,984	General public	Women and Older Age	Boys and Younger Age	Use of masks	1.60 (1.30 to 1.97)	0.70 (0.40 to 1.22)
Rahmini et al. (2021)	Iran	Cross Sectional	10,440	Pedestrian	Women and Older Age	Boys and Younger Age	Use of Mask	0.39 (0.36 to 0.43)	0.41 (0.35 to 0.48)
Deschanvres et al. (2021)	French	Cross Sectional	3,354	General public	Women and Older Age	Boys and Younger Age	Use of Mask	0.86 (0.82 to 0.90)	1.75 (1.37 to 2.24)
Sinicrope et al. (2021)	United States of America	Cross Sectional	7,786	SEMN residents	Women and Older Age	Boys and Younger Age	Use of Mask	1.05 (0.87 to 1.27)	3.28 (1.44 to 7.47)
Ayed et al. (2022)	Saudi Arabia	Cross Sectional	1,059	General public	Women and Older Age	Boys and Younger Age	Use of Mask	1.65 (1.23 to 2.21)	2.05 (0.99 to 4.24)
Doungngern et al. (2020)	Thailand	Cross Sectional	1,716	SRRT contact track record	Women and Older Age	Boys and Younger Age	Use of Mask	0.83 (0.47 to 1.47)	1.65 (0.91 to 2.99)
Souliotis et al. (2020)	Greece	Cross Sectional	1,205	General public	Women and Older Age	Boys and Younger Age	Use of Mask	1.59 (1.11 to 2.28)	2.52 (1.15 to 5.52)

Table 2. Study Quality Research

No	Indicators	Publication (Author and Year)								
		Haischer et al. (2020)	Haischer et al. (2021)	Lam et al. (2021)	Rahmini et al. (2021)	Deschannvres et al. (2021)	Sinicrope et al. (2021)	Ayed et al. (2022)	Doungngern et al. (2020)	Souliotis et al. (2020)
1	Are the criteria for inclusion in the sample clearly defined?	1	1	1	1	1	1	1	1	1
2	Are the research subjects and settings described in detail?	1	1	1	1	1	1	1	1	1
3	Is exposure measured in a valid and reliable way?	1	1	1	1	1	1	1	1	1
4	What are the objective, standard criteria used for the measurement of the condition?	1	1	1	1	1	1	1	1	1
5	Were confounding factors identified?	1	1	1	1	1	1	1	1	1
6	Are strategies for dealing with confounding stated?	1	1	1	1	1	1	1	1	1
7	Are results measured in a valid and reliable way?	1	1	1	1	1	1	1	1	1
8	Was appropriate statistical analysis used?	1	1	1	1	1	1	1	1	1
Total		8	8	8	8	8	8	8	8	8

Note: 1=Yes, 0=No

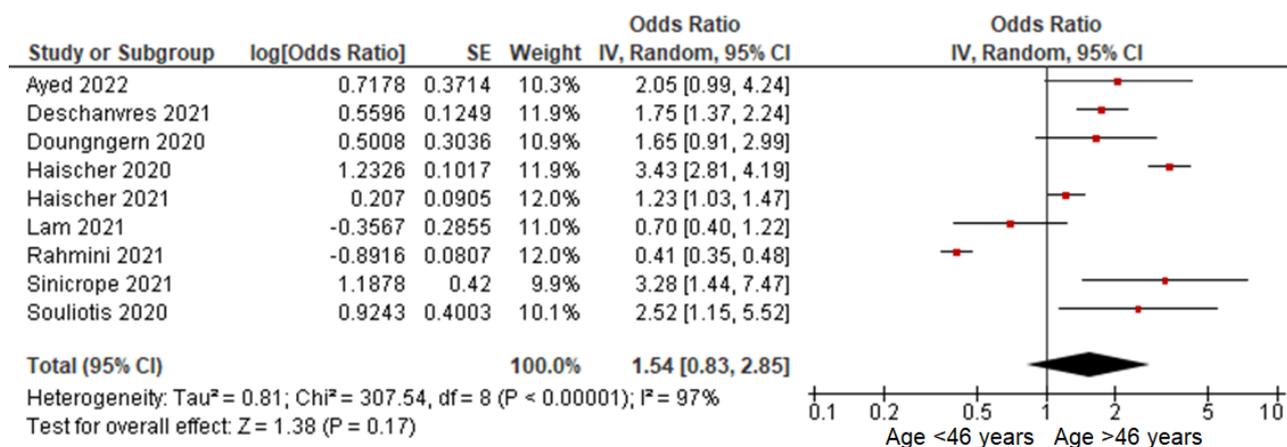


Figure 3. Forest plot the effect of age on the use of masks during the COVID-19 pandemic

The forest plot in Figure 3 shows that there is an effect of age on the likelihood of people wearing masks, but this effect is not statistically significant. People over 46 years of age were 1.54 times more likely to use a mask than those under 45 years old (aOR= 1.54, 95% CI= 0.83 to 2.85; p=

0.170). The forest plots also showed high heterogeneity in the estimated effect between the primary studies of this meta-analysis (I²= 97%; p<0.001). Thus, the average estimated effect of the 9 primary studies in this meta-analysis was calculated using a random effects model.

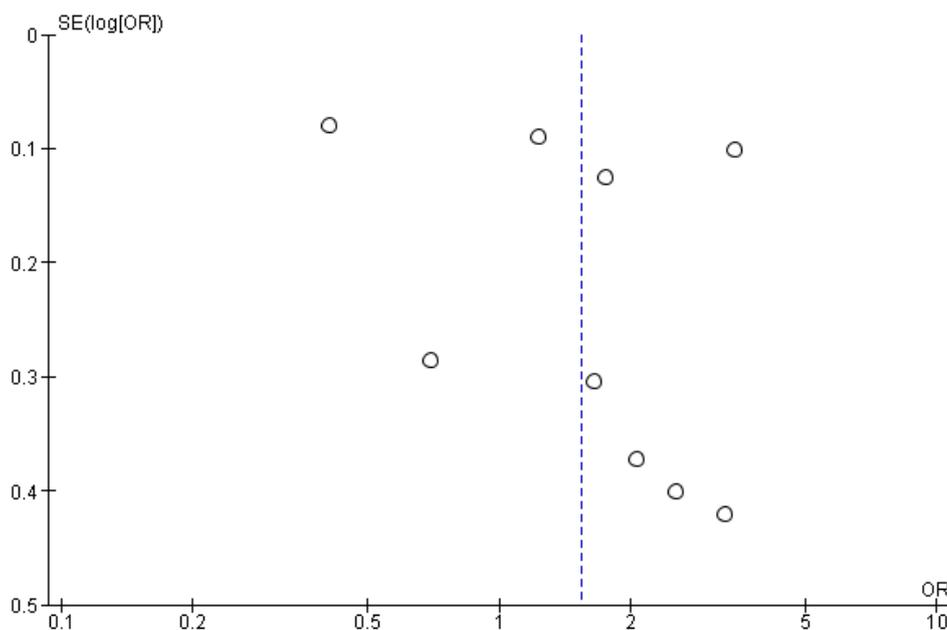


Figure 4. Funnel plot of the effect of age on the use of masks during the COVID-19 pandemic

The funnel plot in Figure 4 shows the asymmetric distribution of the estimated effect across the primary studies. The distribution of effects is more located on the right of the estimated average vertical line than on the left. Due to the unequal distribution of high effect estimates between primary studies the Forest meta plot also showed hetero-

geneity in this analysis ($I^2 = 97\%$; $p < 0.001$). Thus, the average effect estimate for the 9 funnel plot studies is on the right side where the estimated effect is the same as the diamond in the forest plot, so the publication bias tends to overestimate the actual effect.

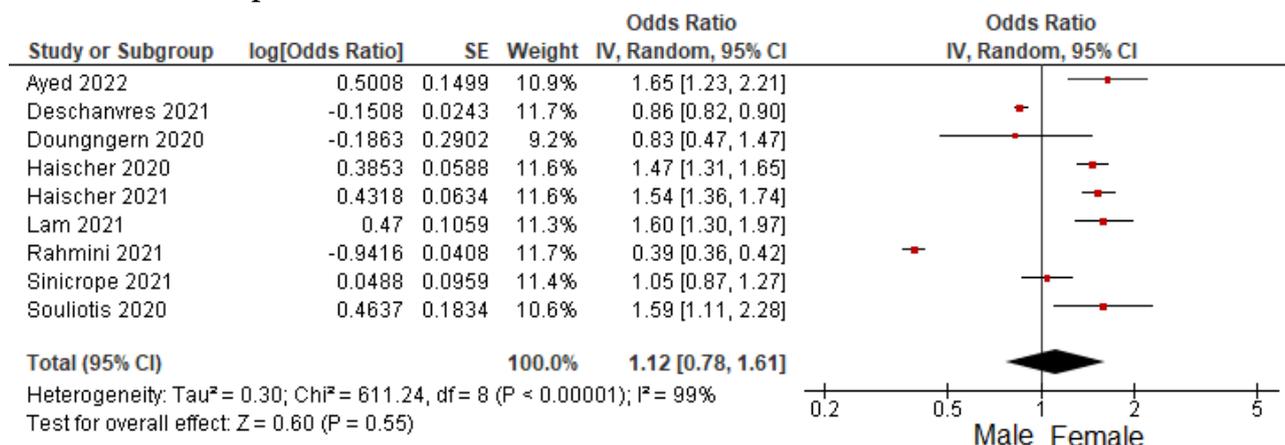


Figure 5. Forest plot of the effect of gender on the use of masks during the COVID-19 pandemic

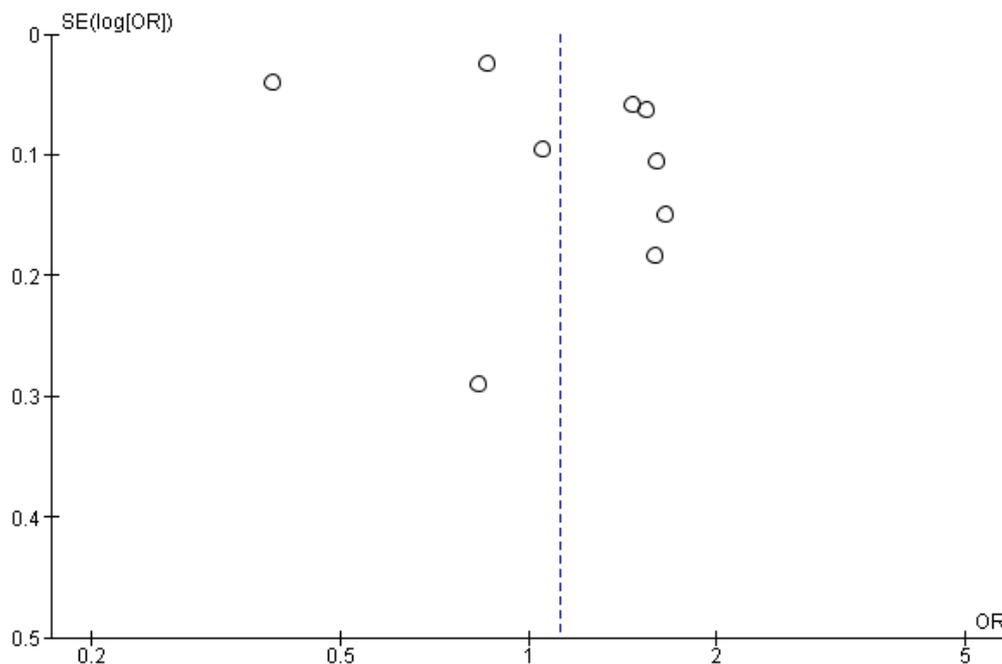


Figure 6. Funnel plot of the effect of gender on the use of masks during the COVID-19 pandemic

The forest plot in Figure 5 shows that there is an effect of gender on the likelihood of people wearing masks, but this effect is not statistically significant. Women were 1.12 times more likely to use masks than men (aOR= 1.12, 95% CI= 0.78 to 1.61; p= 0.550). The forest plot also showed a high heterogeneity in the estimated effect between the primary studies of this meta-analysis ($I^2= 99\%$; $p < 0.001$).

Thus, the average estimated effect of the 9 primary studies in this meta-analysis was calculated using a random effects model approach.

The funnel plot in Figure 6 shows that the distribution of the estimated effect is more or less balanced on the right and left of the estimated average vertical line. Thus, this funnel plot does not indicate any publication bias in this meta-analysis.

DISCUSSION

This study is a systematic review and meta-analysis that addresses the theme of the effect of age and gender on the use of masks during the COVID-19 pandemic. The primary studies involved in this research are studies conducted in various countries, ethnicities and races so that conclusions can be obtained that can be applied in general as a basis for intervention.

The results of the systematic study and meta-analysis in this research are presented in the form of forest plots and funnel plots. The forest plot is a graphical representation of the results of the meta-analysis that includes information related to combining the results of the primary study. There is a line on the right side of the forest plot representing each study carried out by the meta-analysis according to its

weighting. The forest plot provides an overview of the information from each of the studies examined in the meta-analysis as well as estimates of the overall results (Murti, 2018). Funnel plot is a diagram that illustrates the possibility of publication bias. The funnel plot also shows the relationship between the effect size of the study and the sample size or standard error of the effect size of each study studied (Murti, 2018). The bias shown by the funnel plot can be seen by assessing the asymmetry of the study (the number of points on the right and left sides) compared to the standard error and the imbalance in the number of studies on the right and left sides (Murti, 2018).

The results of the meta-analysis in this study related to the theme of the effect of age and gender on the use of masks during the COVID-19 pandemic with a sample size ranging from 49,715 participants from 9 observational study articles showing that there was an influence of age and gender on the use of masks during the COVID-19 pandemic. The results of the forest plot show that there is an effect of age on the likelihood of people wearing masks, but this effect is not statistically significant. People over 46 years of age were 1.54 times more likely to use a mask than those under 45 years and women were 1.12 times more likely to use a mask than men.

This result is supported by Haicher et al. (2020) which states that women wear masks more often than men because women are more likely to protect themselves and others by wearing masks because they handle most of the caregiving in the family and older people wear masks.

masks more than middle-aged and young people because older adults are at higher risk for more severe cases of COVID-19.

The findings of this study are supported by Rahmini et al. (2021) that the prevalence of the use of face masks in women was significantly higher than men (60.2% vs 38.7%, $p < 0.001$). This can happen because in general women pay more attention to their health status and behave in a healthy manner. The highest prevalence of the use of masks is also in the age group 70 years and over (71.7%). Our results show that the prevalence of face mask use increases with age. Similar findings were reported among the elderly in Japan (aged 60-69) and Australia (aged 65-74), the percentages of using face masks were 43.6 and >60%, respectively. This may be due to the perceived higher risk of morbidity and mortality from COVID-19 in higher age groups.

Based on this description, we can see that the meta-analysis carried out by the researchers is in line with several studies related to the effect of age and gender on the use of masks during the COVID-19 pandemic. Therefore, older people are more likely to use masks than young people and women are more likely to use masks than men.

AUTHOR CONTRIBUTION

Indah Adhitama Chrisnanda is the main researcher who selects the topic, searches for and collects research data. Hanung Prasetya dan Bhisma Murti analyzed data and reviewed research documents.

CONFLICT OF INTEREST

There is no conflict of interest.

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