

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Profile and healthcare utilization patterns of adolescent frequent attenders in Singapore primary care: A retrospective study
AUTHORS	Koh, Jeremy Wei-Mei; Tan, Ngiap Chuan; Choo, Jeremy Wei Song; Chen, Helen; Koh, Yi Ling Eileen; Ang, Angelina Su Yin; Marimuttu, Vicknesan Jeyan; Wu, Ryan Song Lian; Sung, Sharon Cohan; Ng, Chirk Jenn

VERSION 1 - REVIEW

REVIEWER NAME	Satomi, Eriko
REVIEWER AFFILIATION	National Cancer Center Japan, Palliative medicine
REVIEWER CONFLICT OF INTEREST	none
DATE REVIEW RETURNED	02-Nov-2023

GENERAL COMMENTS	<p>This paper is an observational, backward-looking study of the utilization of AYA patients in primary care practices in Singapore and is the first valuable survey to capture the actual situation. The following information is provided by the authors.</p> <p>The definition of FA is four or more times per year, but four times may not be considered frequent, especially for younger AYAs and during infectious disease epidemics.</p> <p>Does FA include visits by appointment? Are foreign patients included?</p> <p>As the author states, the frequency of visits to medical facilities may be higher during the COVID epidemic than during normal times. It is stated that only psychiatric diagnosis is related to diagnoses and that psychiatric factors may be behind FA. However, it may be necessary to confirm and discuss the names of the infectious diseases and the frequency of consultations in order to understand the real situation.</p>
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REVIEWER NAME	Tsao, Henry
REVIEWER AFFILIATION	University of Queensland
REVIEWER CONFLICT OF INTEREST	I have no conflict of interest or competing interests
DATE REVIEW RETURNED	04-Dec-2023

GENERAL COMMENTS	I thank the authors for their work and commend them for the quality of the work. Overall I found the manuscript well-written and logical, with good discussion of the significant aspects of the findings. I have
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	<p>only several minor comments which I hope will provide clarity to some issues:</p> <ol style="list-style-type: none"> 1. Under “study design and settings”: I note that of the 23 public outpatient polyclinics, only 8 were included for the study. Perhaps it is my lack of knowledge of the public medical system in Singapore, but if the patient attended practice A, could they perhaps then goto practice B next time etc... I assume the authors also looked across multiple clinics for the same patient and included these in their presentation numbers? Further to this, was there a reason why the other 15 polyclinics were not included, assuming that they are on the same digital system? 2. During covid, many primary healthcare clinics, at least in my country, started doing telehealth visits as opposed to face-to-face sessions. Would it be possible to clarify whether FA’s accessed face-to-face consults vs telehealth consults, especially as pre-covid studies presumably would have been almost all face-to-face consults? 3. Under “Clinical presentation profile”, the authors mentioned that Mondays had the highest overall patient attendances. Could the authors perhaps include a sentence here about opening hours of these clinics, given that they only open on Saturday mornings and polyclinics were closed on Sunday? This information was not evidence until figure 2. 4. In the discussion under “Socio-demographic profile”, the authors argue that all males around age 18-20 were required to serve two years of military service, and thus some of these patients may have presented for medical certificates of leave. This could confound the findings of no difference between genders in FA’s. Is it possible (and I understand if it is not possible) for the authors to assess whether consults for this age range (18-19 years) showed greater proportion of consults for medical or leave certificates? 5. On page 18 where the authors discuss the frequency of addictive medication prescription, it is probably not surprising (and clinical appropriate) that addictive medication such as opioids and benzodiazepines were scarcely prescribed for patients in this age group. It would be good include a sentence in the discussion about this.
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REVIEWER NAME	Ang, Ian
REVIEWER AFFILIATION	National University Singapore Saw Swee Hock School of Public Health
REVIEWER CONFLICT OF INTEREST	I declare that there are no competing interests.
DATE REVIEW RETURNED	22-Jan-2024

GENERAL COMMENTS	<p>Overall, the aim of this study is interesting and meaningful. However, the study suffers from unclear presentation (and potentially wrong use) of the statistical analysis methods, resulting in limited (and inaccurate) interpretation of the results. There are major rectifications required to salvage the analysis and interpretation of the results presented. I would strongly advise the co-authors with stronger statistics background to more closely review the methods and results sections, and/or for the authors to engage a statistician to support the work.</p> <p>Major Points:</p>
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1. Lines 124 to 150 – The authors need to majorly expand on this section of the Methods. The key information on how the data is processed and aggregated is not captured. For example, it was mentioned in the results that “FAs presented less frequently for psychiatric complaints compared to non-FAs (OR=0.83, 95%CI=0.74-0.93, $p<.001$)”. However, there was no explanation of what frequency data was used, especially since it came in the results section explaining a binary Yes-No outcome of “visits with any psychiatric diagnosis”. Was this frequency derived from the proportion of psychiatric-related visits out of the total number of visits within each individual? Or was this based on the proportion out of all the visits with the FA and non-FA groups?

2. Lines 146 – The authors have wrongly used the term “multivariate” when they mean “multivariable”. Same issue in line 164, and line 146 is also missing the term “logistic”.

3. Lines 146 to 147 – Same as Point 1 above, the list of the factors in this regression model need to be explained here or in the “data variables” section above, especially if not all factors listed in the “data variables” section were used. For example, based on the results, the distribution of the day of the week and the distribution of months were analysed with the univariate analysis. How would this be included in the multivariable logistic regression model?

4. Lines 144 to 149 – I would strongly suggest that if the key model for the study is focused on the multivariable logistic regression, it should not rely on univariate analysis significance levels for inclusion. In the multivariable logistic regression model, the dependent variable / outcome of interest is the FA status, while factors such as gender, ethnicity, etc are the independent variables fitted in the model together. However, with the univariate analysis, if I understood correctly, the reverse was done, with the dependent variable / outcome of interest being factors such as gender or ethnicity, and FA being the independent grouping variable of comparison. The dependent variable / outcome of interest has flipped in the two sets of analyses.

5. Line 148 – The authors used “or”, which would mean that there were factors that were not found to be statistically significant but still included because they were deemed to be of significance from the literature. If so, which would be these factors, and why was this decision made?

6. Table 1 – Percentages of gender, ethnicity and financial support should be calculated within Non-FA and within FA group. E.g. 2520 Males is 50.4% of 4993.

7. Line 160 – Please clarify if the top 10th percentile was of all clinic attendees across all age groups, or of all clinic attendees in the adolescent age band of 10-19 years old.

Minor Points:

8. Line 94 – For accuracy, currently there are already 25 polyclinics in Singapore, but at the time of this study for 2021, the number was at 20. Stating 23 would not be fully accurate of the situation currently nor during the study period of interest.

	<p>9. Line 103 – The official name of CIRB is spelled with British spelling of “Centralised”.</p> <p>10. Lines 126 to 131 – For the international readers of BMJ Open that would not be familiar with MediFund and CHAS, perhaps more explanations could be provided on the Singapore context of financial schemes in the background section in the Introduction section. This would allow the audience readers to assess the strength or limitation of using these two items as proxy for SES. Note that CHAS cannot be applied directly by adolescents, and have to be applied by the family on behalf of the household.</p> <p>11. Line 127 – The official name of MediFund should be spelt with capitalisation of the letter “F”.</p> <p>12. Line 189 (Table 3) – Acronym of “MC” for medical certificate not explained (even though mentioned Line 337, and varies from term used in Line 136).</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer #1:

- 1) The following information is provided by the authors. The definition of FA is four or more times per year, but four times may not be considered frequent, especially for younger AYAs and during infectious disease epidemics.

The definition of frequent attendance can vary based on the healthcare setting and the healthcare utilization profile of the study population. While a cut-off of 4 visits might appear low at first glance, this top 10th percentile of attendees accounted for 42.5% of all clinic visits in our study population. Our study period (2021) coincided with the peak of the COVID-19 pandemic and does include presentations related to the pandemic. We recognise that the patterns of presentation and healthcare utilization may vary from those in non-pandemic periods and have addressed this in the “Strengths and limitations” section of the manuscript (lines 43-45 and 363-369).

- 2) Does FA include visits by appointment?

Yes. We included all patients who presented to the polyclinics including those who had visits by appointment. This is now specified under the “Definition of FAs” subheading of the “Methods” section (lines 79-80).

- 3) Are foreign patients included?

Yes. We included all patients who presented to the polyclinics including foreign patients. This is now specified under the “Population” subheading of the “Methods” section (lines 114-115).

- 4) As the author states, the frequency of visits to medical facilities may be higher during the COVID epidemic than during normal times. It is stated that only psychiatric diagnosis is related to diagnoses and that psychiatric factors may be behind FA. However, it may be necessary to

confirm and discuss the names of the infectious diseases and the frequency of consultations in order to understand the real situation.

While we recognize that presentations for infectious diseases and respiratory illnesses may have surged during the pandemic, we did not specifically investigate these disease categories in our analysis as they were not among the predetermined hypotheses for our study. Given the well-documented association between frequent attendance and psychiatric illness in existing literature, our analysis aimed to elucidate presentation patterns related to psychiatric conditions. We thank the reviewers for highlighting this point and have now included this as an additional limitation (lines 369-372).

- Shukla D, Faber E, Sick B. Defining and Characterizing Frequent Attenders: Systematic Literature Review and Recommendations. *J Patient Cent Res Rev.* 2020;7:255–64.

Reviewer #2:

- 1) Under “study design and settings”: I note that of the 23 public outpatient polyclinics, only 8 were included for the study. Perhaps it is my lack of knowledge of the public medical system in Singapore, but if the patient attended practice A, could they perhaps then go to practice B next time etc... I assume the authors also looked across multiple clinics for the same patient and included these in their presentation numbers? Further to this, was there a reason why the other 15 polyclinics were not included, assuming that they are on the same digital system?

The 23 public outpatient polyclinics in Singapore are organised into three separate clusters: SingHealth (our study cluster), National University Polyclinics, and the National Healthcare Group. Currently, each cluster maintains its own electronic records, which are not accessible to the others. Therefore, our study utilized data exclusively from the SingHealth cluster.

We concur with reviewer #2's insightful observation regarding this limitation. Patients who seek care at polyclinics belonging to other clusters are not represented in our results. Furthermore, patients are free to seek care at numerous private general practice clinics, the data from which is also unavailable to us. We have previously reported this in the "Definition of FA" subheading of the "Discussion" section (lines 331-336). However, it is important to note that our data does account for patients who visited different clinics within the SingHealth cluster.

- 2) During covid, many primary healthcare clinics, at least in my country, started doing telehealth visits as opposed to face-to-face sessions. Would it be possible to clarify whether FA's accessed face-to-face consults vs telehealth consults, especially as pre-covid studies presumably would have been almost all face-to-face consults?

Our study included all patient encounters including face to face visits as well as teleconsultations. We have specified this under the “Population” subheading of the “Methods” section (lines 113-114). During the COVID-19 pandemic in Singapore, polyclinics remained open despite lockdown measures. Efforts were made to increase telehealth consultations for chronic conditions among vulnerable populations (such as the elderly) with the aim of reducing public exposure. However, patients with flu-like symptoms still required face-to-face consultations due to mandatory COVID-19 nasal swab testing. Consequently, most consultations with adolescents were conducted in person.

- 3) Under “Clinical presentation profile”, the authors mentioned that Mondays had the highest overall patient attendances. Could the authors perhaps include a sentence here about opening hours of these clinics, given that they only open on Saturday mornings and polyclinics were closed on Sunday? This information was not evidence until figure 2.

We thank the reviewer for highlighting this. We have added information on the clinics operating hours under the “Study design and setting” subheading under the “Methods” section (lines 100-102).

- 4) In the discussion under “Socio-demographic profile”, the authors argue that all males around age 18-20 were required to serve two years of military service, and thus some of these patients may have presented for medical certificates of leave. This could confound the findings of no difference between genders in FA’s. Is it possible (and I understand if it is not possible) for the authors to assess whether consults for this age range (18-19 years) showed greater proportion of consults for medical or leave certificates?

Medical leave certificates are issued at the discretion of the consulting physician, based on their clinical judgment of the patient’s medical condition. However, our available data does not allow us to distinguish between patients in this age group who presented with genuine medical conditions and those who may have presented solely to obtain medical leave certificates.

- 5) On page 18 where the authors discuss the frequency of addictive medication prescription, it is probably not surprising (and clinical appropriate) that addictive medication such as opioids and benzodiazepines were scarcely prescribed for patients in this age group. It would be good include a sentence in the discussion about this.

We have expanded on the discussion regarding this issue as suggested under the “healthcare utilisation patterns” subsection of the “discussion” section (lines 314-318).

Reviewer #3:

Major Points:

- 1) Lines 124 to 150 – The authors need to majorly expand on this section of the Methods. The key information on how the data is processed and aggregated is not captured. For example, it was mentioned in the results that “FAs presented less frequently for psychiatric complaints compared to non-FAs (OR=0.83, 95%CI=0.74-0.93, $p<.001$)”. However, there was no explanation of what frequency data was used, especially since it came in the results section explaining a binary Yes-No outcome of “visits with any psychiatric diagnosis”. Was this frequency derived from the proportion of psychiatric-related visits out of the total number of visits within each individual? Or was this based on the proportion out of all the visits with the FA and non-FA groups?

The frequencies in Table 2 represent the proportion of psychiatry-related visits in both the frequent attender and non-frequent attender groups, calculated as a ratio to the total number of clinic visits in each group. To further clarify, 1.8% of all clinic visits in the non-frequent attender group were for psychiatric conditions, compared to 1.6% of all clinic visits in the frequent attender group. The calculation of the above odds ratio was based on these values.

We have revised the methods section (lines 151-160) and added footnotes in the tables where data was aggregated to explain the methods of aggregation (lines 171, 208-211).

- 2) Lines 146 – The authors have wrongly used the term “multivariate” when they mean “multivariable”. Same issue in line 164, and line 146 is also missing the term “logistic”.

We thank the reviewer for highlighting this. This error has been amended in the manuscript.

- 3) Lines 146 to 147 – Same as Point 1 above, the list of the factors in this regression model need to be explained here or in the “data variables” section above, especially if not all factors listed in the “data variables” section were used. For example, based on the results, the distribution of the day of the week and the distribution of months were analysed with the univariate analysis. How would this be included in the multivariable logistic regression model?

The multivariable regression model only includes the factors listed in Table 1 (age, gender, ethnicity, and financial support). The analysis of the distribution of weekdays and months was purely descriptive, aimed at understanding the presentation patterns of the study population. We did not intend to look at this analytically as a predictor of frequent attendance. We have amended the methods section on data variables and listed the variables included in the multivariable regression model (lines 156-158).

- 4) Lines 144 to 149 – I would strongly suggest that if the key model for the study is focused on the multivariable logistic regression, it should not rely on univariate analysis significance levels for inclusion. In the multivariable logistic regression model, the dependent variable / outcome of interest is the FA status, while factors such as gender, ethnicity, etc are the independent variables fitted in the model together. However, with the univariate analysis, if I understood correctly, the reverse was done, with the dependent variable / outcome of interest being factors such as gender or ethnicity, and FA being the independent grouping variable of comparison. The dependent variable / outcome of interest has flipped in the two sets of analyses.

We agree with reviewer 3 that the decision on which variables to include in the logistic regression model should not solely rely on the statistical significance of the univariate analysis.

We want to clarify that our primary outcome of interest for the multivariable logistic regression analysis has always been frequent attendance as indicated in Table 1 where we aimed to identify the socio-demographic factors that were associated with FA. For Tables 2 and 3, the outcomes of interest were the clinical presentation and the healthcare utilization variables. In this case, FA serves as the independent variable in the univariate analysis.

- 5) Line 148 – The authors used “or”, which would mean that there were factors that were not found to be statistically significant but still included because they were deemed to be of significance from the literature. If so, which would be these factors, and why was this decision made?

As depicted in table 1, the factors demonstrating statistical significance in the univariate analysis include age, ethnicity, and financial support. Despite gender not showing statistically significant in the univariate analysis, we chose to include it in our logistic regression model based on the consistent finding in current literature that female gender is significantly associated with frequent attendance.

- Kekkonen VK, Kivimäki P, Valtonen H, Tolmunen T, Lehto SM, Hintikka J, et al. Psychosocial problems in adolescents associated with frequent health care use. *Fam Pract.* 2015;32:305–10.
- Nordin JD, Solberg LI, Parker ED. Adolescent primary care visit patterns. *Ann Fam Med.* 2010;8:511–6.

- 6) Table 1 – Percentages of gender, ethnicity and financial support should be calculated within Non-FA and within FA group. E.g. 2520 Males is 50.4% of 4993.

We thank the reviewer for highlighting this. This error has been amended in the manuscript.

- 7) Line 160 – Please clarify if the top 10th percentile was of all clinic attendees across all age groups, or of all clinic attendees in the adolescent age band of 10-19 years old.

The top 10th percentile was for all clinic attendees in the adolescent group of 10-19 years old. We have amended the term to “top 10th percentile of adolescent clinic attendees” to decrease ambiguity (line 173).

Minor Points:

- 8) Line 94 – For accuracy, currently there are already 25 polyclinics in Singapore, but at the time of this study for 2021, the number was at 20. Stating 23 would not be fully accurate of the situation currently nor during the study period of interest.

We thank the reviewer for highlighting this. We have amended the number of polyclinics to 22, which was the official number as of the end of our study on 1st January 2022 (lines 92-94) . The following polyclinics opened after our study period at the following time periods:

- Eunost polyclinic - June 2022
- Tampines North polyclinic - Sept 2023
- Sembawang polyclinic - Nov 2023

- 9) Line 103 – The official name of CIRB is spelled with British spelling of “Centralised”.

We thank the reviewer for highlighting this. This error has been amended in the manuscript (line 105).

- 10) Lines 126 to 131 – For the international readers of BMJ Open that would not be familiar with MediFund and CHAS, perhaps more explanations could be provided on the Singapore context of financial schemes in the background section in the Introduction section. This would allow the audience readers to assess the strength or limitation of using these two items as proxy for SES. Note that CHAS cannot be applied directly by adolescents, and have to be applied by the family on behalf of the household.

We have added further explanation to these financial schemes under the “data variables” section of the “methods” as suggested (lines 138-140). The limitations of using these financial schemes as a surrogate for financial status are also already highlighted in the “strengths and limitations” section of the manuscript (lines 352-355).

- 11) Line 127 – The official name of MediFund should be spelt with capitalisation of the letter “F”.

We thank the reviewer for highlighting this. This error has been amended in the manuscript (line 134).

12) Line 189 (Table 3) – Acronym of “MC” for medical certificate not explained (even though mentioned Line 337, and varies from term used in Line 136.

We have standardized the term to “medical leave certification” throughout the manuscript for greater consistency.

VERSION 2 - REVIEW

REVIEWER NAME	Tsao, Henry
REVIEWER AFFILIATION	University of Queensland
REVIEWER CONFLICT OF INTEREST	I have no competing interest to declare
DATE REVIEW RETURNED	08-May-2024

GENERAL COMMENTS	I thank the authors for their responses to my queries. I have no further comments to add.
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REVIEWER NAME	Ang, Ian
REVIEWER AFFILIATION	National University Singapore Saw Swee Hock School of Public Health
REVIEWER CONFLICT OF INTEREST	No competing interests.
DATE REVIEW RETURNED	09-May-2024

GENERAL COMMENTS	<p>I commend the effort in addressing all three reviewers’ comments. The paper still has some clarifications with regards to the statistical analysis approach used. For a study with multiple analyses of existing already collected data, it is crucial for the description of the analysis approach and statistics be more detailed and clearer.</p> <p>Major Points:</p> <ol style="list-style-type: none"> 1. Lines 154-156: The authors have clarified that the use of the Chi-square and Mann-Whitney U test were rightfully not used for inclusion of demographic factors. It is then redundant (and incorrect) that then they are run for the demographic variables when the demographic variables are already used in the logistic regression analyses as independent variables being tested as predictors of dependent variables FA/Non-FA (see below). Additionally, no presentation of these tests for the demographic variable were included in the results. 2. Lines 156-158 and Table 1 – The authors have improved but still need to further detail the analysis approach in the method section with consistent terms. If I were to guess, they first ran a set of single-variable binary logistic regression analyses for each demographic variable, and then one final analysis for the multivariable logistic regression with one model including all the demographic variables. The purpose of the set of logistic regression is to identify demographic factors that are predictors of FA. This is
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	<p>different from the Chi-square and Mann-Whitney U test, which is to identify differences in the healthcare utilisation outcomes between FA and non-FA. There is a directionality difference and also different in purpose, and so this all needs to be spelled out. Since this analysis precedes the results using the Chi-square and Mann-Whitney U test, the order of presentation should also switch to before the lines in 154-156.</p> <p>3. Lines 146-147 and Table 3: It is unclear what the analyses for the section on “prescription of potential addictive medication” is. What is the base pool in use? All prescriptions?</p> <p>4. Lines 202 to 227 and Tables 2 & 3: Why are odds ratios generated instead of presenting the Chi-square and Mann-Whitney U tests results? The authors will have to confirm that the results presented are from the Chi-square and Mann-Whitney U test with focus on differences between FA and non-FA, as indicated in the methods section and the response to Reviewer 3 point #4 earlier.</p>
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VERSION 2 – AUTHOR RESPONSE

Reviewer: 3

Dr. Ian Ang, National University Health System

Comments to the Author:

I commend the effort in addressing all three reviewers’ comments. The paper still has some clarifications with regards to the statistical analysis approach used. For a study with multiple analyses of existing already collected data, it is crucial for the description of the analysis approach and statistics be more detailed and clearer.

Major Points:

1. Lines 154-156: The authors have clarified that the use of the Chi-square and Mann-Whitney U test were rightfully not used for inclusion of demographic factors. It is then redundant (and incorrect) that then they are run for the demographic variables when the demographic variables are already used in the logistic regression analyses as independent variables being tested as predictors of dependent variables FA/Non-FA (see below). Additionally, no presentation of these tests for the demographic variable were included in the results.

Thank you for the clarification. The authors agree and have amended the statistical analysis section accordingly.

2. Lines 156-158 and Table 1 – The authors have improved but still need to further detail the analysis approach in the method section with consistent terms. If I were to guess, they first ran a set of single-variable binary logistic regression analyses for each demographic variable, and then one final

analysis for the multivariable logistic regression with one model including all the demographic variables. The purpose of the set of logistic regression is to identify demographic factors that are predictors of FA. This is different from the Chi-square and Mann-Whitney U test, which is to identify differences in the healthcare utilisation outcomes between FA and non-FA. There is a directionality difference and also different in purpose, and so this all needs to be spelled out. Since this analysis precedes the results using the Chi-square and Mann-Whitney U test, the order of presentation should also switch to before the lines in 154-156.

The authors agree and have switched the order of the statements in the amended statistical analysis section.

3. Lines 146-147 and Table 3: It is unclear what the analyses for the section on “prescription of potential addictive medication” is. What is the base pool in use? All prescriptions?

The base pool is all adolescents, not prescriptions. For example, among all adolescents, 10.7% were prescribed Dextromethorphan. This explanation can also be found in the footnotes for table 3. Chi-square test was used for this section, since both FA and prescriptions are categorical.

4. Lines 202 to 227 and Tables 2 & 3: Why are odds ratios generated instead of presenting the Chi-square and Mann-Whitney U tests results? The authors will have to confirm that the results presented are from the Chi-square and Mann-Whitney U test with focus on differences between FA and non-FA, as indicated in the methods section and the response to Reviewer 3 point #4 earlier.

The authors have noted the directionality difference. We have removed the crude odds ratios for Tables 2 and 3, since FA is not the outcome of interest here. The sections that referenced these values have been amended accordingly.

VERSION 3 - REVIEW

REVIEWER NAME	Ang, Ian
REVIEWER AFFILIATION	National University Singapore Saw Swee Hock School of Public Health
REVIEWER CONFLICT OF INTEREST	No competing interests.
DATE REVIEW RETURNED	01-Aug-2024

GENERAL COMMENTS	Great work by the authors for further improving the clarity of this paper in the methods and results section. This would help ensure the readers understand the study approach, and allow the authors to present a clear backing of their findings and interpretations from this work.
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