PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Effectiveness of different types and levels of social distancing measures: a scoping review of global evidence from earlier stage of COVID-19 pandemic
AUTHORS	Sun, Kai Sing; Lau, Terence See-Man; Yeoh, EK; Chung, Vincent; Leung, Yin Shan; Yam, Carrie; Hung, Chi-Tim

VERSION 1 – REVIEW

REVIEWER	Ahmed, Faruque Centers for Disease Control and Prevention
REVIEW RETURNED	15-Oct-2021

GENERAL COMMENTS	The authors state that they conducted a scoping review of the effectiveness of different types and levels of social distancing from the early to middle stages of the COVID-19 pandemic. My comments are provided below: Page 3, lines 17-18: It is stated that electronic databases were searched from the beginning of the pandemic till October 2020. However, this contradicts the statement on page 6 that the search period was from the inception of the databases to 30 September 2020. Page 3, lines 37-40: It is stated that the evidence was inconsistent for school closure and public transport restriction as a single type of intervention, and that the evidence was also very limited for workplace/business closures. However, this contradicts the findings of another systematic review that reported that during the first wave of the COVID-19 pandemic, school closing was the most effective non-pharmaceutical intervention, followed by workplace closing, business and venue closing and public event bans (Journal of Infection, 2021: 83(3), 281-293 (https://www.sciencedirect.com/science/article/pii/S0163445321003169#fig0002). Please provide an explanation of why the results differ. Page 5, lines 20-21: It is stated that the aim of the study was to assess the effectiveness of different types and levels of social distancing measures from early to middle stages of COVID-19 pandemic. However, the pandemic is still ongoing, and I am not sure whether the period up to September 2020 can be labelled as the middle stage. Page 6, lines 3-4: Please clarify the term “community quarantine.” Quarantine means isolation of persons exposed to COVID-19, but the literature sometimes uses the term quarantine to mean isolation of COVID-19 cases or lockdown. Page 6, lines 5-22: It is stated that modeling studies based on empirical data are included and that hypothetical models not based on empirical data are excluded. Please clarify the distinction between these two. My understanding is that most mathematical

	modeling studies use a combination of empirical data and assumptions as inputs. Page 7, lines 40-47: It is stated that 29 articles were eligible and 6 relevant articles were identified from the reference lists, and that a total of 34 studies were included in the review. Please clarify how you came to 34 studies from 35 articles. Also, on page 8, it is stated that there were actually 31 research studies and 3 reviews. Please try to use consistent language. Page 14, lines 14-19: It is stated that there was adequate empirical evidence for the effect of social distancing at the individual level, and that the evidence was also adequate for partial or full lockdown at the community level. However, the authors have not assessed the quality of the epidemiological/empirical and modeling studies, and they do not describe the system they used to categorize evidence as adequate, moderate, or limited. Page 15, lines 17-22: It is stated that social distancing measures was also affected by the contextual factors such as compliance, social belief and cultural factors, and that personal behaviors such as wearing masks and improving personal hygiene as well as implementing border control also played a key role. However, these factors are not presented in the Results section of the manuscript, and it seems to be outside the scope of the review. Page 16, bottom paragraph: The authors cite some studies on the effectiveness of facemasks. However, several systematic reviews on facemasks have been published. Table 2: It would be helpful to indicate the study design for the research articles, including identifying those that were based on modeling. Table 3: The evidence amount has been classified as adequate, moderate, or limited. However, the authors do not describe the system they used for such classifications. Note: The comments above are those of the reviewer and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

REVIEWER	Huang, Jing University of Pennsylvania, Biostatistics, Epidemiology and Informatics
REVIEW RETURNED	03-Nov-2021

GENERAL COMMENTS	The authors conducted a scoping review to evaluate the association between different types and levels of social distancing measures and COVID-19 transmission. Given the various types and levels of social distancing measures, the study design (scoping review) is appropriate. The manuscript does provide some useful summary information about the effect of social distancing, but I am concerned about the representativeness and significance of these findings. 1. It is not clear which time criteria was used to screen for literature. The title says “from early to middle stage of COVID-19 pandemic” but no specific time interval was provided in the inclusion and exclusion criteria. I also found the literature search incomplete, maybe related to the publish time of papers. The search key word should also include ‘SARS-CoV-2’ in addition to COVID-19 to

	include more articles. For example, the following papers were not included in the analysis: Nouvellet, P., Bhatia, S., Cori, A., Ainslie, K.E., Baguelin, M., Bhatt, S., Boonyasiri, A., Brazeau, N.F., Cattarino, L., Cooper, L.V. and Coupland, H., 2021. Reduction in mobility and COVID-19 transmission. *Nature communications*, *12*(1), pp.1-9. Rubin, D., Huang, J., Fisher, B.T., Gasparrini, A., Tam, V., Song, L., Wang, X., Kaufman, J., Fitzpatrick, K., Jain, A. and Griffis, H., 2020. Association of social distancing, population density, and temperature with the instantaneous reproduction number of SARS-CoV-2 in counties across the United States. *JAMA network open*, *3*(7), pp.e2016099-e2016099. 2. The summary of the results mixed social distancing measures with interventions, but I think they should be discussed separately or at least indicate which intervention is more likely to be related to which social distancing measures. 3. The effect of social distancing must change with population immunity, but the authors did not mention this matter. Since the study period is different for each study, and the population immunity is likely increasing over time (with more and more people infected or vaccinated), so it will be interesting to know whether the effect of social distancing declines as the degree of population immunity increases. 4. For school social distancing measures, only school closure was discussed. It would be more important and interesting to know the impact of other school social distancing measures without closing school, including the reduction of size, require of 6-ft vs 3-ft social distancing in school, reduction of sports activities etc.. 5. The current table 2 is ordered by study time. It would be easier to for reader to review if the results can be ordered by social distancing categories and the study time.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1 (Dr. Faruque Ahmed, Centers for Disease Control and Prevention)
Page 3, lines 17-18: It is stated that electronic databases were searched from the beginning of the pandemic till October 2020. However, this contradicts the statement on page 6 that the search period was from the inception of the databases to 30 September 2020.
Reply: We have amended the abstract to make it in line with the methods section of the main text that the search period was from the inception of the databases to 30 September 2020.

Page 3, lines 37-40: It is stated that the evidence was inconsistent for school closure and public transport restriction as a single type of intervention, and that the evidence was also very limited for workplace/business closures. However, this contradicts the findings of another systematic review that reported that during the first wave of the COVID-19 pandemic, school closing was the most effective non-pharmaceutical intervention, followed by workplace closing, business and venue closing and public event bans (Journal of Infection, 2021: 83(3), 281-293 (https://www.sciencedirect.com/science/article/pii/S0163445321003169#fig0002). Please provide an explanation of why the results differ.
Reply: The review period of the other systematic review mentioned was different from ours. Effectiveness of different non-pharmaceutical interventions was mainly determined by percentage of studies (including non-peer reviewed studies) reporting a particular measure as being effective, or most effective. However, there was no description of the basis of their ranking system. Our review focused on social distancing measures. Apart from a few studies, workplace and business closing were often included as partial/full lockdown as most studies did not access their separate effect from other measures.

Page 5, lines 20-21: It is stated that the aim of the study was to assess the effectiveness of different types and levels of social distancing measures from early to middle stages of COVID-19 pandemic. However, the pandemic is still ongoing, and I am not sure whether the period up to September 2020 can be labelled as the middle stage.
Reply: Thanks for your advice. We have amended this to state it as earlier stage of the pandemic, which was before mass vaccination.

Page 6, lines 3-4: Please clarify the term “community quarantine.” Quarantine means isolation of persons exposed to COVID-19, but the literature sometimes uses the term quarantine to mean isolation of COVID-19 cases or lockdown.
Reply: We use the term “community quarantine” as an alternative term for lockdown as the literature sometimes uses it. We have stated this more clearly that lockdown is also called “community quarantine” to restrict movement of population groups.

Page 6, lines 5-22: It is stated that modeling studies based on empirical data are included and that hypothetical models not based on empirical data are excluded. Please clarify the distinction between these two. My understanding is that most mathematical modeling studies use a combination of empirical data and assumptions as inputs.
Reply: We aim to review the evidence of the effect of social distancing measures. Modelling studies which estimated the effect based on retrospective and prospective study findings were included. We excluded those modelling studies for other objectives which aim to predict future trends of incidence. We have stated it more clearly that hypothetical/ stimulation models predicting future trends of incidence were excluded.

Page 7, lines 40-47: It is stated that 29 articles were eligible and 6 relevant articles were identified from the reference lists, and that a total of 34 studies were included in the review. Please clarify how you came to 34 studies from 35 articles. Also, on page 8, it is stated that there were actually 31 research studies and 3 reviews. Please try to use consistent language.
Reply: Thanks for noting this. We have amended the numbers as the followings:
We screened 1638 abstracts from our electronic search on the databases with 2 additional research reports being identified from governmental websites. Of the 120 full texts retrieved for further assessment, 35 articles fulfilled our eligibility criteria. In addition, 6 relevant studies were identified from the reference lists of the articles through backward searches. Hence, in total, 41 studies were included in this review. There were 38 research studies and 3 reviews.

Page 14, lines 14-19: It is stated that there was adequate empirical evidence for the effect of social distancing at the individual level, and that the evidence was also adequate for partial or full lockdown at the community level. However, the authors have not assessed the quality of the epidemiological/empirical and modeling studies, and they do not describe the system they used to categorize evidence as adequate, moderate, or limited.
Reply: This scoping review aims to provide an overview of the broad range and types of evidence of the effect of different social distancing measures and give an indication of the available evidence in terms of frequency and consistency. Aligning with recommendations from the Joanna Briggs Institute Scoping Review Methods Manual and PRISMA-ScR, we did not assess risk of bias of included studies as in a systematic review. We have amended the description as "there was adequate empirical evidence for the effect of social distancing at individual level, and for partial or full lockdown at community level. However, the evidence was moderate for school closure, and limited for workplace/business closures as a single type of intervention. There was no evidence for the separate effect of public transport restriction." The wordings adequate, moderate and limited are general terms to describe the relative evidence amount based on the five aspects of effectiveness indicators including 1) infectivity, 2) incidence, 3) mortality rate, 4) effect time, and 5) attendance shown in Table 3. Outcomes were mainly indicated by changes in Rt, incidence and mortality, along with indirect indicators such as daily contact frequency and travel distance. We have clarified this in the Discussion.

Page 15, lines 17-22: It is stated that social distancing measures was also affected by the contextual factors such as compliance, social belief and cultural factors, and that personal behaviors such as wearing masks and improving personal hygiene as well as implementing border control also played a key role. However, these factors are not presented in the Results section of the manuscript, and it seems to be outside the scope of the review.
Reply: We have excluded the discussion of other personal hygiene behaviors but kept the contextual factors including compliance, social belief and cultural factors which might affect the effectiveness of social distancing measures. These factors were addressed by some articles we reviewed. We mention them briefly in the Discussion as supplementary information.

Page 16, bottom paragraph: The authors cite some studies on the effectiveness of facemasks. However, several systematic reviews on facemasks have been published.
Reply: We have excluded the paragraph about facemasks in the Discussion.

Table 2: It would be helpful to indicate the study design for the research articles, including identifying those that were based on modeling.
Reply: Thanks for your helpful advice. We have added the study design of each research study in Table 2.

Table 3: The evidence amount has been classified as adequate, moderate, or limited. However, the authors do not describe the system they used for such classifications.
Reply: We classified the relative frequency and consistency of evidence based on the five aspects of effectiveness indicators including 1) infectivity, 2) incidence, 3) mortality rate, 4) effect time, and 5) attendance. Outcomes were mainly indicated by changes in Rt, incidence and mortality. Key findings are stated in Table 3. We have also added a footnote in Table 3 to clarify it is relative amount of evidence from the studies reviewed, without risk of bias assessment.

Reviewer: 2 (Dr. Jing Huang, University of Pennsylvania, The Children's Hospital of Philadelphia)
1. It is not clear which time criteria was used to screen for literature. The title says "from early to middle stage of COVID-19 pandemic" but no specific time interval was provided in the inclusion and exclusion criteria. I also found the literature search incomplete, maybe related to the publish time of

papers. The search key word should also include ‘SARS-CoV-2’ in addition to COVID-19 to include more articles. For example, the following papers were not included in the analysis:
Nouvellet, P., Bhatia, S., Cori, A., Ainslie, K.E., Baguelin, M., Bhatt, S., Boonyasiri, A., Brazeau, N.F.,Cattarino, L., Cooper, L.V. and Coupland, H., 2021. Reduction in mobility and COVID-19 transmission. Nature communications, 12(1), pp.1-9.
Rubin, D., Huang, J., Fisher, B.T., Gasparrini, A., Tam, V., Song, L., Wang, X., Kaufman, J., Fitzpatrick, K., Jain, A. and Griffis, H., 2020. Association of social distancing, population density, and temperature with the instantaneous reproduction number of SARS-CoV-2 in counties across the United States. JAMA network open, 3(7), pp.e2016099-e2016099.

Reply: The search period was from the inception of the databases (i.e. beginning of the COVID-19 pandemic) to 30 September 2020. We stated this in the Methods and have revised the term “early to middle stage” to “earlier stage”.
We have added the syntax "SARS-CoV-2*".m_titl. and (social distan* or physical distan*).ab. to search for articles using the keyword ‘SARS-CoV-2’ in addition to “COVID”. After removing duplications and irrelevant articles, we found 4 additional articles including the one (Rubin et al., 2020) mentioned by the reviewer. We have added them into the results.

2. The summary of the results mixed social distancing measures with interventions, but I think they should be discussed separately or at least indicate which intervention is more likely to be related to which social distancing measures.
Reply: The terms social distancing measures and interventions are used interchangeably by many studies, although technically their meanings might be a bit different. Social distancing (measure) is an intervention on the general public including students at schools. We classified different types of social distancing by sections.

3. The effect of social distancing must change with population immunity, but the authors did not mention this matter. Since the study period is different for each study, and the population immunity is likely increasing over time (with more and more people infected or vaccinated), so it will be interesting to know whether the effect of social distancing declines as the degree of population immunity increases.
Reply: The search period was till 30 September 2020. Vaccine was not yet ready by that time as most countries started to have mass vaccination programs after December 2020 (Ref: https://ourworldindata.org/covid-vaccinations). Reported number of cases per population was under 2.3% across countries. Including unreported asymptomatic cases, population immunity were unlikely to be significant that time. However, this study period may have an advantage to exclude the confounding effect of mass vaccination and population immunity to social distancing measures. Future studies may explore whether the effect of social distancing declines as the degree of population immunity increases. We have added this point in the discussion section regarding the knowledge gap for future research.

4. For school social distancing measures, only school closure was discussed. It would be more important and interesting to know the impact of other school social distancing measures without closing school, including the reduction of size, require of 6-ft vs 3-ft social distancing in school, reduction of sports activities etc..
Reply: We have searched for and added 3 articles about school social distancing measures:
“In other studies that focused on the various measures used in educational and children care center settings after reopening, results showed low incidence rate in these settings. There was a decreasing trend of both the average outbreak numbers and the cases per outbreak by school measures and it might be partially due to the extensive measures. Meanwhile, the specific impact of reduction of face-to-face attendance in classrooms was not assessed.

5. The current table 2 is ordered by study time. It would be easier to for reader to review if the results can be ordered by social distancing categories and the study time."

Reply: Table 2 is ordered by author name. We tried to re-order it by type of social distancing but found it not very feasible as many studies belong to multiple categories. Therefore we kept the original order.

VERSION 2 – REVIEW

REVIEWER	Ahmed, Faruque Centers for Disease Control and Prevention
REVIEW RETURNED	05-Jan-2022

GENERAL COMMENTS	My comments have been adequately addressed.