

Retract The Lancet's (and WHO funded) published study on mask wearing – Criticism of “Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and Covid-19: a systematic review and meta-analyses”

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It has been drilled into our heads by the media and by politicians over the past six months that wearing masks to prevent the spread of Covid is based on “the science.” But is that really true? Or is the so-called science supportive of masks really pseudo-science or junk science?

A little while ago, I started to write a post on the case against masks. It seemed natural to start by examining the scientific support for widespread mask wearing. I began with what seemed to be the most widely cited (as least in the media) pro-mask article, published in the prestigious medical journal, The Lancet (June 27, 2020 issue), and funded by the World Health Organization (WHO). This is an article entitled “Physical distance, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis” authored by Chu et al. and is a meta-analysis of previously published articles on SARS, MERS and Covid-19 respiratory viruses.

This study (henceforth referred to as the “Lancet study” or “Lancet meta-study”) concludes that mask-wearing as well as physical distancing and eye protection in both public and healthcare settings would result in a large reduction in the risk of Covid infection (though the authors judge the certainty of the effectiveness of both mask wearing and eye protection as “low.”

I read and analyzed each of the 29 studies referenced by the Lancet on the topic of mask wearing (I ignored the studies that focused on physical distancing and eye protection). What I found was shocking. In short, the Lancet meta-study should properly be considered junk science based on junk science that even if true, has no relevance to widespread community mask wearing. Based on my own analysis, I believe the Lancet study should be retracted.

Poor quality of the underlying studies

Let's start by discussing the poor quality of the underlying studies. A number of the studies are non-peer reviewed and unpublished. Not a single study was based on a randomized control trial. All are observational studies based on questionnaires or interviews.

Because of the nature of observational studies, all of these articles suffer from bias. The most obvious type of bias is recall bias. As stated above, these observational studies are based on questionnaires or interviews given in most cases months (and in one study more than a year) after events took place. To quote from one study, “We encountered difficulty in our study with obtaining precise exposure history from subjects, some of whom had tended more than one patient, and all of whom had imperfect recall of an extremely stressful period” (Teleman).

Even more important than recall bias, however, are the psychological biases to which nearly all of us are prone. The first of which is telling an interviewer what they want to hear. For example, “not only was it difficult for respondents to recall behaviors during specific periods within the previous 2 months, but respondents may have been concerned that results could be used to evaluate their performance” (Ha). It is distinctly possible that healthcare workers who are trained to wear masks might feel pressure to disclose to interviewers that they wore masks even if they did not. Obviously, this acts to overstate mask wearing. An additional type of bias is to project one’s historical actions on whether or not the subject became infected. In other words, healthcare workers that subsequently got sick are more likely to say they did not wear masks (“If I got sick I must have forgotten to wear a mask”) and healthcare workers who did not get sick are more likely to say they did wear mask (“I didn’t get sick so I must have always worn a mask”). Together these biases render questionnaire-based studies like these much less reliable, to the point of uselessness.

In addition to biases, nearly all of these studies suffer from what is known in statistics as multicollinearity, when there exists significant correlation between two or more independent variables. Most of these studies claim that mask wearing is protective. However, there is likely a strong correlation among healthcare workers between say, mask wearing and glove wearing or mask wearing and gown wearing or mask wearing and hand washing. In these instances, it is impossible to determine whether, say, mask wearing is the protective factor or hand washing. Moreover, it is highly likely that subjects (and especially healthcare workers) who voluntarily wore masks when not required are excessively cautious and take other preventative precautions. Similarly, those subjects not wearing masks (either when required or not required) might take fewer precautions and/or more risks when interacting with symptomatic patients. For instance, in one very small study (Kim & Jung), the only one of nine healthcare workers exposed who got sick was a security guard (almost certainly less trained in medical precautions than doctors and nurses).

This problem of multicollinearity is compounded by the fact that most of these 29 studies reflect univariate analyses. That is, they make no attempt to separate the effect of masks from other potentially protective measures (i.e. other PPE, handwashing, face touching, etc.) using regression analysis. Lastly, the Lancet meta-study, as we will see in the next section, takes only the univariate data from these 29 studies even for the handful of studies that do perform multivariate analysis.

Poor quality of the meta-study

The Lancet meta-study examines the 29 individual studies, and for each study calculates how many exposed people who wore face masks were infected with SARS/MERS/COVID and compared those figures to how many exposed people who did not wear face masks were infected. As we have discussed, the Lancet study is a textbook example of “garbage in, garbage out.” But it gets worse.

The first problem with the meta-study itself is that it is riddled with data errors. Specifically, the authors miscalculated the figures and make one or more errors interpreting the data for at least eight of the studies (Scales, Heinzerling, Reynolds, Seto, Alraddadi, Peck, Burke, Ha) (details below). Four of the studies may have contained data errors as I was unable to replicate the Lancet’s summary data (Pei, Ki, Kim & Choi, Lau). Six of the studies reflected exceptionally weak, biased or poor design and should not have been included (Kim & Jung, Nishiyama, Loeb, Wang & Pan, Wu, Tuan). At least four of the studies showed results that were not statistically significant regarding masks (Yin, Heinzerling, Nishiura, Alraddadi). Finally, for two of the studies I was not able to access more than 1 page abstract so I could not verify the quality of study or data (Yin, Park)

Even more importantly, an additional eight of the studies should not have been included in the Lancet meta-study because they did not reflect a true comparison of the Mask Group vs. the No Mask Group (Liu, Wang & Huang, Ho, Teleman, Wilder-Smith, Kim & Choi, Ryu, Pek). Most of these eight studies compared only a full PPE group with a not-full PPE group, rather than a mask group with a non-mask group. For instance, a healthcare worker in the not-full PPE group might still have been wearing a mask but no gown or glove or goggles.

The third problem with the meta-study is the various inconsistencies from study to study. In some studies, the mask group represents healthcare workers who “always” wore masks while in other studies the Mask Group reflects mask wearing “sometimes” or “most of the time.” Correspondingly, the No Mask Group could reflect “never” wearing masks or “sometimes” wearing masks. Another glaring inconsistency from study to study is what is considered a positive case. Some studies consider positive cases only if the subject tested positive with a PCR or serology testing regardless of the exposed subject having symptoms (including fever). Other studies do the opposite and consider a positive case if the subject was exposed to a patient and was symptomatic regardless of whether or not they were tested for the virus. Moreover, a few studies tested subjects for antibodies weeks or months after the events, and thus almost certainly undercounted cases.

Finally, there is the question of the six studies that had zero positive cases in both the Mask and Non-Mask groups. Convention says to ignore these studies in a meta-study, which is what the Lancet authors do. However, this decision seems questionable given that some of the studies which were included also had very few positive cases. For instance, one study (Kim, Jung) had only one positive case (out of 9 subjects) and seven other studies had fewer than 10 positive cases (Scales, Park, Heinzerling, Loeb, Ho, Ki, Tuan).

Following is a table summarizing the 29 studies (studies are listed in order of Lancet Table on P. 1981, Figure 4). Full details of my analysis of each study are further below.

1	Scales	incorrect data
2	Liu	should not include, not mask vs. no mask
3	Pei	cannot replicate data
4	Yin	cannot verify data
5	Park	small study, unclear results, not statistically significant
6	Kim, Jung	tiny study, obvious flaws
7	Heinzerling	incorrect data, not statistically significant
8	Nishiura	not statistically significant
9	Nishiyama	weak study, questionnaire long after event
10	Reynolds	incorrect data
11	Loeb	Very small, weak study
12	Wang, Pan	weak study
13	Seto	incorrect data
14	Wang, Huang	should not include, not mask vs. no mask
15	Alraddadi	incorrect data, not statistically significant
16	Ho	should not include, not mask vs. no mask
17	Teleman	should not include, not mask vs. no mask (only N95 vs non-N95)
18	Wilder-Smith	should not include, not mask vs. no mask (only N95 vs non-N95), and redundant data with Teleman
19	Ki	cannot replicate data
20	Kim, Choi	cannot replicate data, should not include, not mask vs. no mask
21	Hall	zero positive cases so not included in Lancet summary
22	Ryu	zero positive cases so not included in Lancet summary, should not include, not mask vs. no mask (full PPE vs. not full PPE)
23	Park	zero positive cases so not included in Lancet summary
24	Peck	incorrect data, should not include because not mask vs. no mask, zero positive cases so not included in Lancet summary
25	Burke	incorrect data, zero positive cases so not included in Lancet summary

26	Ha	incorrect data, zero positive cases so not included in Lancet summary
27	Lau	cannot replicate data
28	Wu	weak study, high possibility of bias
29	Tuan	weak study

Irrelevance of the meta-study to community mask-wearing

We have already established that the Lancet meta-study is weak science based on weak science. But even if it were a quality meta-study of quality studies, its conclusions would still be irrelevant to the matter of the effectiveness of widespread mask wearing among the general public.

Every single one of the 29 studies is a study of whether the mask wearer or non-mask wearer got sick (or was virus positive) having being exposed to symptomatic carriers. Nearly all of these studies (27/29) examined healthcare workers (or in one case, visitors) in a healthcare settings (i.e. hospitals). Moreover, the majority of interactions between the study subjects (mask wearers or non-mask wearers) and the infected index patients occurred with extended contact in close indoor quarters.

However, this study has been used by politicians, health officials and the media to justify widespread mask wearing by the asymptomatic general public, often outdoors, in order to protect not the wearer of the mask but others (“source control”). Not a single study detailed in the Lancet meta-study discusses whether masks protect the general population from asymptomatic spread. Moreover, nearly all of the subjects of the 29 studies were healthcare workers, trained to correctly wear masks and provided with clean masks which they presumably did not reuse and disposed of properly. It is simply nonsensical and unscientific to extrapolate studies of the protectiveness of masks wearing protecting the wearer to studies of masks on the carrier protecting the general population, untrained in proper mask wearing and who reuse dirty masks for days or weeks on end, and constantly fiddle with them. Moreover, at least two studies (Wilder-Smith, Peck) note the fact that asymptomatic spread seems to be limited or nonexistent, further weakening the case for widespread mask wearing.

Conclusion

I believe the Lancet meta-study should be retracted. It is riddled with data errors and contains studies that should not have been included. Most of the rest of the studies included are very small, of exceptionally poor design, or report weak and statistically insignificant results. In summary, the Lancet study shows, at best, weak and circumstantial evidence that masks (most notably, properly fitted N95 masks) may be protective of healthcare workers exposed to symptomatic coronavirus patients in a healthcare setting (in close quarters for extended contact). But even if the science was valid, this meta-study has no relevancy whatsoever to widespread mask wearing by the general public and should not be used to justify mandated masks.

The remainder of this article summarizes my finding for each of the 29 studies pertaining to masks that are listed in the Lancet meta-study (in the same order of Lancet Table on P. 1981, Figure 4):

1. Scales et al. 2003

- Lancet Assumption:
 - Face Mask Group: 3/16 (**positive/total**)
 - No Face Mask Group: 4/15 (**positive/total**)
- SARS study in Toronto of 31 healthcare workers who had direct exposure to a single symptomatic patient; data via questionnaire
- Lancet data appears incorrect – should have included 6 total positive cases, not 7 (6 probable, 1 suspected); Corrected data is FM Group: 3/13, No FM Group: 3/18
- No Mask group includes healthcare workers who “sometimes” wore mask
- “SARS developed in one healthcare worker despite the fact that the worker wore an N-95 mask, gown and gloves.”
- “Our study involved a small number of cases, and definitive conclusions cannot be drawn from a report of this size.”
- This was a small study that showed no statistically significant difference between the mask and no mask groups.

2. Liu et al. 2009

- Lancet Assumption:
 - Face Mask Group: 8/123
 - No Face Mask Group: 43/345
- SARS study in Beijing among hospital healthcare workers exposed to symptomatic patients; data via questionnaire
- Cannot replicate Lancet figures
- Lancet misrepresents the data – seems to have taken 12-layer group as the mask group and the non-12 layer group as the non-mask group when the non-12 layer group includes 16-layer, N95 and disposable masks
- Interestingly, this study showed no statistical significance for the effectiveness of N95 masks versus other types
- “Another possible bias is that the case group attributed their infection to some high risky performance (e.g. performing intubation) and less efficient protection (wearing only one layer of mask while attending patients), while the control group did the opposite.”
- Study concludes multilayer masks helpful but those people might be OCD and use other precautions
- This study, as I understand it, should not have been included because there is no data on NO masks, only on different types of masks

3. Pei et al. 2006

- Lancet Assumption:
Face Mask Group: 11/98
No Face Mask Group: 61/115
- SARS study of healthcare workers in China in hospitals; data via questionnaire
- Cannot replicate Lancet data
- Face mask event in Lancet summary represents double 12 layer cotton masks but NOT general cotton masks; if both types used then FM event should be 86/328
- No data given on no mask so no idea where Lancet got 61/115, however seems implausible since article states that “98% of healthcare workers wore masks...”
- “In multivariate analysis the masks as factor didn’t enter logistic regression model...”

4. Yin et al. 2004

- Lancet Assumption:
Face Mask Group: 46/202
No Face Mask Group: 31/55
- SARS study of healthcare workers in Guangdong, China caring for severe SARS patients; data via questionnaire
- Cannot find full study in English; only have abstract so cannot verify data

5. Park et al. 2016

- Lancet Assumption:
Face Mask Group: 3/24
No Face Mask Group: 2/4
- MERS study among Korean hospital of healthcare workers and patients who interacted with single symptomatic MERS patient
- 1 page summary only; no full text so cannot verify quality of study or data
- Only 1 out of 5 positive cases were confirmed; 4 were probable
- Unclear if not wearing surgical masks means no mask or means other type of mask
- Mask results not statistically significant

6. Kim, Jung et al. 2016

- Lancet Assumption:
Face Mask Group: 0/7
No Face Mask Group: 1/2
- MERS study of healthcare workers exposed to a single symptomatic patient in South Korea
- Single healthcare worker who got sick was security guard, not a doctor or nurse and the study discusses fact that security guard possibly contracted MERS elsewhere
- This is a tiny “study” that is limited relevancy

7. Heinzerling et al. 2020

- Lancet Assumption:
Face Mask Group: 0/31
No Face Mask Group: 3/6
- Covid-19 study in California of healthcare workers exposed to a single symptomatic patient; data via interview
- Lancet completely misinterprets data; correct figures are:
Face Mask Group: 0/3
No Face Mask Group: 3/34
- Of 3 positive cases in the no-face mask group, 1 individual wore face masks “most of the time”
- 121 healthcare workers were exposed and 43 had symptoms (including fever, cough, shortness of breath, or sore throat), but only 3 tested positive with PCR tests
- Study assumes that 40 w/ symptoms were Covid negative but that seems unlikely especially given February 2020 timeframe
- No data on the mask use of the 121 exposed (43 with symptoms) as there was no Covid testing for non-symptomatic patients
- In addition to “recall bias”, and “the low number of cases which limit the ability to detect statistically significant differences,” “additional infections might have occurred among asymptomatic exposed HCP who were not tested...”
- This study reflects very weak science
- Mask results not statistically significant

8. Nishiura et al. 2005

- Lancet Assumption:
Face Mask Group: 8/43
No Face Mask Group: 17/72
- SARS study at Vietnam hospital of healthcare workers and relatives exposed to confirmed cases; data based on survey conducted 1 year after onset of epidemic
- Minimal difference in % positive from Face Mask Group vs % positive from No Face Mask Group (19% vs 24%) – not statistically significant
- “Put simply, the use of masks alone was shown to be insufficient to contain the epidemic.”
- Significant bias and limitation to the study: “mask usages...is vulnerable to recall bias,” “...the estimates of the protective effect of masks...may include the effects of other concomitant changes...”

9. Nishiyama et al. 2008

- Lancet Assumption:
Face Mask Group: 17/61
No Face Mask Group: 14/18
- SARS study at 3 Vietnam hospitals of people exposed to SARS patients; data by questionnaire survey 7 months after epidemic for 1 hospital and 14 months for other 2 hospitals
- Lancet ignores “sometimes” mask use data

- Very simplistic study – no discussion of other prevention measures (e.g. gloves, gowns) except handwashing
- Limited information in “short communication,” not full scientific study

10. Reynolds et al. 2006

- Lancet Assumption:
 - Face Mask Group: 8/42
 - No Face Mask Group: 14/25
- SARS study in Vietnam hospital of healthcare workers exposed to single patient; data via questionnaire
- Study reports two different types of activity: 1) exposed healthcare workers who “talked to or touched index patient without mask” and 2) “came within 1 meter of index patient without mask”
- Lancet used latter group, which shows somewhat stronger pro-mask results
- However, If one “touched” as patient, they must have been within 1 meter, so it appears correct interpretation should have used the other set which is weaker and shows non-statistically significant results (data shown for “talked to or touched”):
 - Face Mask Group: 15/51
 - No Face Mask Group: 7/16
- No analysis of other types of PPE use
- Significant bias and limitations, including, “small sample size,” inability to assess “duration, or the intensity of potential exposure,” “selection bias favoring enrollment of persons with less opportunity for direct contact with the index patient.”
- Very simplistic and poorly designed study

11. Loeb et al. 2004

- Lancet Assumption:
 - Face Mask Group: 3/23
 - No Face Mask Group: 5/9
- SARS study in Toronto hospital of nurses exposed to symptomatic patients; data via interview
- 5/9 No Mask Group is “non consistently wearing mask”, not necessarily wearing no masks
- 2/16 SARS positive individuals always wore N95 mask and 1/4 SARS positive individuals always wore surgical mask
- “Difference for SARS infection for nurses who consistently wore N95 masks and those who consistently wore surgical masks was not significant.”
- Small weak study, for example, single nurse with the most number of shifts (most exposure by far to index patient) had “inconsistent” use of N95 mask (and was included in No Face Mask Group)

12. Wang, Pan et al. 2020

- Lancet Assumption:
 Face Mask Group: 0/278
 No Face Mask Group: 10/215
- Covid-19 study of healthcare workers in hospital in Wuhan, China
- Mask group equals “wore N95 respirators, and disinfected and cleaned their hands frequently”
- No mask group equals “wore no medical masks, and disinfected and cleaned hands only occasionally”
- Data does not differentiate between the effects of mask wearing and cleaning hands
- What is meant by “medical masks” – might healthcare workers have worn non-N95 masks?
- Other data table shows as strong department effect: respiratory, ICU, infectious disease departments had zero positive cases, hepatobiliary pancreatic surgery, trauma and microsurgery, urology had all of the positive cases so the difference might be type of interaction, not masks (8/10 in one department: hepatobiliary pancreatic surgery)
- “A randomized clinical trial has reported that the N95 respirators vs medical masks resulted in no significant difference in the incidence of laboratory confirmed influenza.”
- This is a very weak study that should not have been included because it does not clearly define the mask group and no mask group as properly mask vs. no mask

13. Seto et al. 2003

- Lancet Assumption:
 Face Mask Group: 0/51
 No Face Mask Group: 13/203
- SARS study in Hong Kong hospitals of healthcare workers exposed to symptomatic patients; data via questionnaire
- Lancet seems to have misinterpreted data
- 0/51 is for surgical masks only; if we use all masks (including 2 layered paper masks, surgical and N95) then the FM = 2/169 and No FM = 11/85

14. Wang, Huang et al. 2020

- Lancet Assumption:
 Face Mask Group: 1/1286
 No Face Mask Group: 119/4036
- Covid-19 study of healthcare workers in China in neurosurgery departments in 107 hospitals; data via questionnaire or telephone interviews

- Lancet completely misinterprets data – conflated masks/no masks with Level 1 (119/4036) vs Level 2 (1/1286) protection
 - Level 1 includes surgical masks: “Level 1 protection: white coat, disposable hat, disposable isolation clothing, disposable gloves and disposable surgical mask (replace them every 4 h or when they are wet or contaminated)”
 - Level 2 includes N95 or higher masks, goggles, gloves, etc.: “Level 2 protection: disposable hat, medical protective mask (N95 or higher standard), goggles (anti-fog) or protective mask (anti-fog), medical protective clothing or white coats covered by medical protective clothing, disposable gloves and disposable shoe covers”
- This is level 1 vs level 2 study, not mask vs no mask study
- Proper data based on study’s Table 1 shows Face Mask group had 95 positive cases (out of 120 infected staff) and No Face Mask group had 25 cases (out of 120 infected staff); no data given on mask use for non-infected individuals
- Study also ignored 300 symptomatic healthcare workers who tested negative for Covid-19
- Significant limitations to study: “the variables of the study are relatively simple,” “protective measures adopted by the medical staff members were not fixed but changed over time. Therefore, the analysis based on protective measures might be affected by time bias.” “respondents’ descriptions might be inconsistent with the facts, which could affect the reliability of the results,” “some cases had uncertain documentation of the exposure history, and recall bias might exist...”
- Study should not have been included as not correctly mask vs no-mask

15. Alraddadi et al. 2016

- Lancet Assumption:
 - Face Mask Group: 6/116
 - No Face Mask Group: 12/101
- MERS study of healthcare workers in Saudi Arabian hospital (2 cohorts exposed to patients – explain); data via questionnaire
- Lancet misinterprets data: figures of mask group (6/116) and non-mask group (12/101) is for N95 masks, not all masks!
- Should have used the data labeled, “Covering of nose and mouth with medical mask or N95 respirator), in which case data would be:
 - Face Mask Group: 11/151
 - No Face Mask Group: 7/66
- Not statistically significant if we use correct data
- Study also does not take into account other PPE (gloves, gown, eye protection)
- The No Face Mask group “sometimes” work masks
- Study ignores symptomatic but negative tested healthcare workers: “most uninfected reported illness”

16. Ho et al. 2004

- Lancet Assumption:
Face Mask Group: 2/62
No Face Mask Group: 2/10
- SARS study of healthcare workers in hospital in Singapore; data via questionnaire
- Data is for “protected” vs. “unprotected” – no mention of masks specifically, only “full PPE” (likely “N95 masks, gowns and gloves”)
- Data shows only 4 positive cases and 72 total when there were actually 8 positive and 112 total healthcare workers exposed to symptomatic patients
- 55 healthcare workers actually were exposed and had some symptoms but only 8 tested positive
- This study should not be included because not specifically for masks

17. Teleman et al. 2004

- Lancet Assumption:
Face Mask Group: 3/26
No Face Mask Group: 33/60
- SARS study of healthcare workers at hospital in Singapore; data via telephone interview questionnaire
- Study only measures if N95 is worn – other group is not necessarily no-masks (likely wore surgical mask)
- Study should not have been included

18. Wilder-Smith et al. 2005

- Lancet Assumption:
Face Mask Group: 6/27
No Face Mask Group: 39/71
- SARS study of healthcare workers in Singapore hospital; data via telephone interview questionnaire
- Appears to be same data as previous study (Teleman et al) – should not include both studies (same Singapore hospital – Tock Seng Hospital)
- Data is for N95 masks vs no N95 masks, not no masks
- Should be 80 study participants, not 98
- Study should be excluded for two reasons: redundant data with previous study (Teleman) and study is not reflective of masks vs no mask
- “Based on our data in Singapore, transmission from asymptomatic patients appears to play no or only a minor role” (remember, the point of mask mandates is to protect wearer against asymptomatic individuals)

19. Ki et al. 2019

- Lancet Assumption:
Face Mask Group: 0/218
No Face Mask Group: 6/230

- MERS study from hospital in South Korea of hospital healthcare workers and patients exposed to a single symptomatic patient; data via video data and interview
- Possible bias because patients who are less likely to wear masks than healthcare workers are also less likely to maintain other safe behaviors
- Hand washing seems more important than masks especially since 2/11 patients had no direct contact with index patient – don't touch face which regular (non healthcare-trained) people seem to do with masks on
- Study gives data on % people who wore surgical masks but no data if infected patients wore or did not wear masks
- Study data shows 4 positive patients with mask data (Table 2 of study) while Lancet states there are 6 – no idea where Lancet data comes from
- Cannot replicate Lancet data

20. Kim, Choi et al. 2016

- Lancet Assumption:
 - Face Mask Group: 1/444
 - No Face Mask Group: 16/308
- MERS study of healthcare workers in South Korean hospitals with direct contact with MERS patients; data via questionnaire survey
- Cannot replicate data; study says at least 2 cases wore N95 and were infected (Lancet says only 1)
- “Appropriate PPE was defined as use of all of the following: (a) N95 respirator or powered air-purifying respirator (PAPR), (b) isolation gown (coverall), (c) goggles or face shield and (d) gloves). If any part of the PPE was missing, it was considered to be exposure without appropriate PPE.”
- This is a study of full PPE (described above) vs. non-full PPE, not mask vs. no-mask. Hence, study should not be included

21. Hall et al. 2004

- Lancet Assumption:
 - Face Mask Group: 0/42
 - No Face Mask Group: 0/6
- MERS study of healthcare workers in one hospital in Saudi Arabia of healthcare workers exposed to a single patient; data via questionnaire
- Nobody got sick – 0 cases, though some had symptoms and tested negative
- Typical recall bias, since questionnaire was 4 months after event
- 87% of healthcare workers wore surgical masks, though not necessarily 100% compliance
- 33% of healthcare workers used N95
- Study not included in Lancet summary data due to zero positive cases in both groups

22. Ryu et al. 2019

- Lancet Assumption:
Face Mask Group: 0/24
No Face Mask Group: 0/10
- MERS study in South Korea of people exposed to MERS patients; data via interview, 7 months after events
- No differentiation between PPE (gown, N95 mask, glasses, gloves) and only masks
- 1 person had fever and wore full PPE but wasn't tested for MERS at the time
- Face mask group (24 people) is Grade 3 and Grade 4 = Full PPE
- Non-face mask group (10 people) is Grade 1 and Grade 2 = without full PPE (but could include mask)
- Significant study limitations: bias as questionnaire was 7 months after event; also study might have "missed some mild or asymptomatic cases," "serological tests were performed several months post-exposure, pre-existing MERS antibodies may have decreased or disappeared in the interval, potentially leading to underestimation," "number of participants was relatively small and may not be representative or generalizable."
- Study should not be included because Grade 1 and 2 versus Grade 3 and 4 is not mask/no-mask
- Study not included in Lancet summary data due to zero positive cases in both groups.

23. Park et al. 2004

- Lancet Assumption
Face Mask Group: 0/60
No Face Mask Group: 0/45
- SARS study in United States of healthcare workers exposed to SARS patients in 8 healthcare facilities; data via questionnaire
- 17 healthcare workers developed symptoms but zero tested positive
- Study not included in Lancet data due to zero positive cases in both groups

24. Peck et al. 2004

- Lancet Assumption
Face Mask Group: 0/13
No Face Mask Group: 0/19
- SARS study in United States of people exposed to single SARS patient; study comparing individuals exposed pre-diagnosis to the index patient and post-diagnosis; data via questionnaire
- Of pre-diagnosis contacts, 11/26 contacts had symptoms but all tested negative for SARS; pre-diagnosis contacts included household contacts
- Cannot replicate Lancet figures
- Correct data as per study's Table:
Face Mask Group: 0/26
No Face Mask Group: 0/30
- Not mask vs. no-mask but Full PPE (N95 respirator, gown, gloves worn "every interaction") vs. not-full PPE – study should not be included

- “To date, no asymptomatic SARS-CoV infection or transmission before onset of symptoms has been definitively documented.”
- Study not included in Lancet data due to zero positive cases in both groups

25. Burke et al. 2020

- Lancet Assumption:
 - Face Mask Group: 0/64
 - No Face Mask Group: 0/13
- Covid-19 study in United States of close contacts of positive cases; data via interview
- Lancet has incorrect data (76, not 77 total individuals in study’s data table). Correct data should be:
 - Face Mask Group: 0/63
 - No Face Mask Group: 0/13
- 25/163 healthcare workers had suspected Covid, but these were not apparently among the 76 with interview data
- Study not included in Lancet data due to zero positive cases in both groups

26. Ha et al. 2004

- Lancet Assumption
 - Face Mask Group: 0/61
 - No Face Mask Group: 0/1
- SARS study of healthcare workers in one hospital in Vietnam exposed to SARS patients; data via questionnaire
- ~23% of healthcare workers had symptoms but zero tested positive for SARS
- While “all 62 SARS ward workers reported wearing masks during the outbreak,” “only 56 reported ‘always’ or ‘usually’ using a mask while in SARS patients’ rooms.” (after first week of patient care). Hence correct data should be:
 - Face Mask Group: 0/56
 - No Face Mask Group: 0/6
- Study limitations include, “subject to recall and reporting bias, because not only was it difficult for respondents to recall behaviors during specific periods within the previous 2 months, but respondents may have been concerned that results could be used to evaluate their performance. ***Estimates of SARS exposures and the frequency of personal protective equipment use among SARS ward workers are therefore probably inflated.***”
- Study not included in Lancet data due to zero positive cases in both groups

27. Lau et al. 2004

- Lancet Assumption
 - Face Mask Group: 12/89
 - No Face Mask Group: 25/98
- SARS study of household members exposed to SARS patients in Hong Kong; data via telephone interview/questionnaire
- Cannot replicate Lancet’s data

- This study is listed in the Lancet article as a study in a “Non-health-care setting” (meaning, a study of mask-wearing in the community, not healthcare setting). However, this is not correct. While the study analyzes family members of SARS patients (non-healthcare workers), the mask data is of those family members during hospital visits. Therefore, the study should more correctly be listed as a “health-care setting.”
- Of all the Lancet mask studies, this is the only one that has any data on mask wearing by symptomatic patients, rather than mask wearing by the non-infected. Study only reports during a hospital visit whether neither visitor nor patient was wearing a mask, both were wearing masks, or one was wearing mask (no reporting is made between whether the SARS patient or the visitor is the one wearing a mask).
- 128 cases with data, 32 visited, 8 both had masks, 7 with one wearing mask, 17 no masks
- 2121 controls with data, 242 visited, 85 both masks, 76 with one wearing mask, 81 no masks
- Study limitations: “no way to confirm that the probable secondary infection of household members actually came from the index patient. Nosocomial infections, rather than secondary infections, may also have occurred in some of the household members during hospital visits to the index patient, but it is not possible to distinguish the two scenarios.” “The case definition of SARS coronavirus was nonspecific...it is possible that some of the cases were in fact pneumonia rather than SARS.”

28. Wu et al. 2004

- Lancet Assumption:
 Face Mask Group: 25/146
 No Face Mask Group: 69/229
- SARS study of community cases and control group in Beijing; control group had no close contact with SARS patients; data via questionnaire
- No face mask group includes people that “sometimes” wore face masks
- Study limitations include low participation rate, recall bias, “those who agreed to participate may have self-selected for unknown reasons that could have biased our findings. For instance, several patients responding to the open-ended comment section mentioned that they were certain their illness was not ‘SARS’”
- Figures dependent on the number of the control group, which is totally the choice of the study.
- Confirmed cases equals people with symptoms, not serology testing (many other studies are the opposite – only positive if tested positive even if symptoms)

29. Tuan et al. 2007

- Lancet Assumption:
 Face Mask Group: 0/9
 No Face Mask Group: 7/154
- SARS study in Vietnam of household and community contacts exposed to SARS patients; data via questionnaire/interview

- Face Mask Group cases is defined as wearing mask “sometimes/most times” (not necessarily always) and the No Face Mask Group is defined as “Never” wearing a mask. This is inconsistent with nearly all other studies in Lancet
- Very simplistic univariate analysis
- “There have been no conclusive reports of transmission occurring from SARS cases in the pre-symptomatic phase and we also found no evidence of transmission occurring prior to onset of symptoms.”