**Detailed look at studies cited in e-mail from Alberta Health:**

First the five studies cited as evidence that "Masks have been deemed effective in studies on suppressing transmission of other respiratory viruses":

1. Jefferson et al.
   The newest version is available here:
   https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD006207.pub5/full
   In this newer version they have reported the results related to masks in two categories – in both cases, the evidence suggests that there was little to no impact of masks/respirators (see quotes below).
   **Medical/surgical masks compared to no masks**
   "There is low certainty evidence from nine trials (3507 participants) that wearing a mask may make little or no difference to the outcome of influenza-like illness (ILI) compared to not wearing a mask (risk ratio (RR) 0.99, 95% confidence interval (CI) 0.82 to 1.18. There is moderate certainty evidence that wearing a mask probably makes little or no difference to the outcome of laboratory-confirmed influenza compared to not wearing a mask (RR 0.91, 95% CI 0.66 to 1.26; 6 trials; 3005 participants)."
   **N95/P2 respirators compared to medical/surgical masks**
   "There is uncertainty over the effects of N95/P2 respirators when compared with medical/surgical masks on the outcomes of clinical respiratory illness (RR 0.70, 95% CI 0.45 to 1.10; very low-certainty evidence; 3 trials; 7779 participants) and ILI (RR 0.82, 95% CI 0.66 to 1.03; low-certainty evidence; 5 trials; 8407 participants)." "The use of a N95/P2 respirator compared to a medical/surgical mask probably makes little or no difference for the objective and more precise outcome of laboratory-confirmed influenza infection (RR 1.10, 95% CI 0.90 to 1.34; moderate-certainty evidence; 5 trials; 8407 participants)."

2. Suess et al.
   This study looked at household members (i.e. those potentially in repeated prolonged close contact situations) of symptomatic influenza infected patients and the use of surgical masks and hand sanitizer within the household. Although it was initially an RCT, the results of this study were not significant. The authors were able to obtain a significant result by combining the mask (M) and mask plus hand hygiene (MH) groups and confining the analysis to those subjects who reported that they wore the masks (and for those in the MH group, also sanitized their hands regularly) within the first 36 hours of the index patient becoming ill and adjusting for 4 potential confounders (age, sex, time spent at home and timely therapy of the index patient), 2 of which (sex and timely therapy of the index patient) were not significantly related to the variable of interest (influenza infection) individually. They do not show the significance of these variables in the multivariate model, so it is not clear whether they were significant or not and what impact including them in the model may have had. Not only is this study not relevant to widespread masking of asymptomatic individuals in public settings, the evidence (for reduced household transmission from symptomatic patients with these interventions) was quite weak. See the quotes on the mask intervention and the results below.
   "We asked all participants of the MH and M groups to wear masks at all times when the index patient and/or any other household member with respiratory symptoms were together in one room with healthy household members. Facemasks were to be changed regularly during the day and not to be worn during the night or outside the household."
   "In intention-to-treat analysis there was no statistically significant effect of the M and MH interventions on secondary infections." "When analysing only households where intervention was implemented within 36 h after symptom onset of the index case, secondary infection in the pooled M

and MH groups was significantly lower compared to the control group (adjusted odds ratio 0.16, 95% CI, 0.03-0.92)."

3. Cowling et al.
This study is very similar to the previous one (Suess et al.) in that it was originally an RCT looking at (surgical) mask use and hand hygiene (in this case although they had a hand hygiene only group, they did not have a mask only group) within households with a symptomatic influenza infected family member. As in the previous study, the results were not significant for the overall analysis, so the authors then considered the subgroup for which the interventions were reported to have been applied within 36 hours of symptom onset of the index patient. While the authors state that "Although our results suggest a benefit of hand hygiene and facemasks in combination if applied early, our study cannot precisely distinguish the relative contributions of the 2 interventions.", looking at their data it appears that masks did not contribute to the decrease in infection and in fact may have actually had a detrimental effect. First, looking at the secondary attack rate data (Table 3 below), it is evident that the hand hygiene was the more important factor in reducing infection and that in the case of clinical infection (not lab confirmed), adding masks to hand hygiene actually resulted in increased rates of infection.

*Table 3.* **Secondary Attack Ratios of RT-PCR–Confirmed Influenza Virus Infection and Clinical Influenza**

| Interval Between Symptom Onset and Intervention | Determination of Influenza* | Control Group (*n* = 279) | | Hand Hygiene Group (*n* = 257) | | Facemask Plus Hand Hygiene (*n* = 258) | | *P* Value† |
|---|---|---|---|---|---|---|---|---|
| | | Cases, *n* | SAR (95% CI), %‡ | Cases, *n* | SAR (95% CI), %‡ | Cases, *n* | SAR (95% CI), %‡ | |
| Any | RT-PCR confirmed | 28 | 10 (6–14) | 14 | 5 (3–9) | 18 | 7 (4–11) | 0.22 |
| | Clinical definition 1 | 53 | 19 (14–24) | 42 | 16 (12–21) | 55 | 21 (16–27) | 0.40 |
| | Clinical definition 2 | 14 | 5 (2–8) | 9 | 4 (2–6) | 18 | 7 (4–11) | 0.28 |
| ≤36 h§ | RT-PCR confirmed | 22 | 12 (7–18) | 7 | 5 (1–11) | 6 | 4 (1–7) | 0.040 |
| | Clinical definition 1 | 42 | 23 (16–30) | 14 | 11 (5–17) | 27 | 18 (12–24) | 0.032 |
| | Clinical definition 2 | 12 | 7 (3–11) | 5 | 4 (1–7) | 11 | 7 (3–12) | 0.52 |

RT-PCR = reverse-transcription polymerase chain reaction; SAR = secondary attack ratio.
* "Clinical definition 1" is at least 2 of the following: temperature ≥37.8 °C, cough, headache, sore throat, and myalgia. "Clinical definition 2" is temperature ≥37.8 °C, plus cough or sore throat.
† For difference among the 3 groups by the Pearson chi-square test, adjusted for within-household correlations of 0.12 for the RT-PCR–confirmed secondary attack ratios and 0.04 and 0.07 for the clinical influenza secondary attack ratios.
‡ The secondary attack ratio at the individual level was defined as the proportion of household contacts of an index case that subsequently became infected with influenza. The CIs were calculated by using a cluster bootstrap method (20).
§ Based on 183 patients in the control group, 130 in the hand hygiene group, and 149 in the facemask plus hand hygiene group.

Also, the fact that there was no significant difference between the facemasks plus hand hygiene group and the hand hygiene only group, combined with the fact that the odds ratios for the facemasks plus hand hygiene group were higher than those for the hand hygiene only group for both clinical definitions of influenza infection (Table 5 below) and for all composite definitions (Appendix Table 7 below), suggests that hand hygiene played a bigger role and masks may have actually reduced the beneficial effect of hand hygiene on respiratory infection rates.

*Table 5.* **Risk for Influenza Virus Infection When the Intervention Was Applied Within 36 Hours of Symptom Onset in the Index Patient***

| Characteristic | Participants, *n* | Odds Ratio (95% CI)† | | |
|---|---|---|---|---|
| | | RT-PCR–Confirmed Influenza | Clinical Influenza‡ | |
| | | | Definition 1 | Definition 2 |
| **Study group** | | | | |
| Control | 183 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Hand hygiene | 130 | 0.46 (0.15–1.43) | 0.46 (0.22–0.96) | 0.64 (0.20–2.02) |
| Facemask plus hand hygiene | 149 | 0.33 (0.13–0.87) | 0.86 (0.48–1.53) | 1.45 (0.49–4.24) |
| **Contact characteristics** | | | | |
| Age | | | | |
| Adult (≥16 y) | 386 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Child (6–15 y) | 51 | 3.02 (1.16–7.85) | 2.09 (1.01–4.32) | 7.57 (2.79–20.6) |
| Child (≤5 y) | 25 | 2.45 (0.75–8.01) | 2.16 (0.87–5.34) | 7.20 (1.92–27.0) |
| Sex | | | | |
| Female | 283 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Male | 179 | 0.68 (0.30–1.53) | 0.40 (0.23–0.70) | 0.36 (0.12–1.06) |
| Vaccination status | | | | |
| No influenza vaccination in the past 12 mo | 401 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Influenza vaccination in the past 12 mo | 61 | 0.40 (0.12–1.33) | 1.33 (0.71–2.49) | 1.10 (0.31–3.91) |
| **Index patient characteristics** | | | | |
| Age | | | | |
| Adult (≥16 y) | 39 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Child (6–15 y) | 85 | 1.17 (0.33–4.23) | 1.57 (0.66–3.74) | 0.79 (0.20–3.19) |
| Child (≤5 y) | 30 | 1.55 (0.37–6.45) | 2.26 (0.86–5.95) | 2.36 (0.46–12.3) |
| Sex | | | | |
| Female | 82 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Male | 72 | 0.97 (0.44–2.14) | 1.18 (0.71–1.98) | 0.56 (0.24–1.30) |
| Antiviral status | | | | |
| Not prescribed antiviral | 109 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Prescribed antiviral | 45 | 0.81 (0.32–2.04) | 0.76 (0.42–1.38) | 0.66 (0.21–2.06) |

RT-PCR = reverse-transcription polymerase chain reaction.
* Based on 462 household contacts in 154 analyzed households.
† Adjusted for intervention group; age, sex, and vaccination history of the contact; and age, sex, and antiviral use of the index patient.
‡ "Clinical definition 1" is at least 2 of the following: temperature ≥37.8 °C, cough, headache, sore throat, and myalgia. "Clinical definition 2" is temperature ≥37.8 °C, plus cough or sore throat.

*Appendix Table 7.* **Risk for Influenza Virus Infection When the Intervention Was Applied Within 36 Hours of Symptom Onset in the Index Patient, Using a Composite Definition of Infection***

| Characteristic | Participants, *n* | Odds Ratio (95% CI)† | | | |
|---|---|---|---|---|---|
| | | RT-PCR–Confirmed Influenza or Clinical Influenza (Definition 1)‡ | RT-PCR–Confirmed Influenza and Clinical Influenza (Definition 1)‡ | RT-PCR–Confirmed Influenza or Clinical Influenza (Definition 2)‡ | RT-PCR–Confirmed Influenza and Clinical Influenza (Definition 2)‡ |
| **Study group** | | | | | |
| Control | 183 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Hand hygiene | 130 | 0.50 (0.25–1.01) | 0.34 (0.08–1.34) | 0.54 (0.20–1.51) | 0.43 (0.11–1.65) |
| Facemask plus hand hygiene | 149 | 0.75 (0.43–1.34) | 0.40 (0.13–1.24) | 0.70 (0.31–1.57) | 0.64 (0.17–2.40) |
| **Contact characteristics** | | | | | |
| Age | | | | | |
| Adult (≥16 y) | 386 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Child (6–15 y) | 51 | 1.65 (0.82–3.34) | 6.31 (2.13–18.8) | 3.18 (1.38–7.36) | 11.1 (3.08–40.1) |
| Child (≤5 y) | 25 | 1.62 (0.68–3.87) | 5.19 (1.44–18.8) | 2.64 (0.85–8.13) | 9.44 (2.29–39.0) |
| Sex | | | | | |
| Female | 283 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Male | 179 | 0.50 (0.30–0.84) | 0.37 (0.13–1.03) | 0.54 (0.26–1.11) | 0.48 (0.13–1.74) |
| Vaccination status | | | | | |
| No influenza vaccination in the past 12 mo | 401 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Influenza vaccination in the past 12 mo | 61 | 1.10 (0.58–2.06) | 0.65 (0.19–2.26) | 0.72 (0.27–1.89) | 0.46 (0.05–4.15) |
| **Index patient characteristics** | | | | | |
| Age | | | | | |
| Adult (≥16 y) | 39 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Child (6–15 y) | 85 | 1.76 (0.78–3.96) | 0.79 (0.16–3.83) | 1.19 (0.36–3.87) | 0.58 (0.12–2.81) |
| Child (≤5 y) | 30 | 2.12 (0.84–5.35) | 1.73 (0.29–10.4) | 1.81 (0.48–6.77) | 1.92 (0.31–11.9) |
| Sex | | | | | |
| Female | 82 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Male | 72 | 1.26 (0.76–2.10) | 0.72 (0.29–1.81) | 0.73 (0.36–1.51) | 0.88 (0.31–2.46) |
| Antiviral status | | | | | |
| Not prescribed antiviral | 109 | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Prescribed antiviral | 45 | 0.82 (0.47–1.41) | 0.69 (0.20–2.32) | 0.75 (0.32–1.75) | 0.65 (0.16–2.59) |

RT-PCR = reverse-transcription polymerase chain reaction.
* Based on 462 household contacts in 154 households.
† Adjusted for intervention group; age, sex, and vaccination history of the contact; and age, sex, and antiviral use of the index patient.
‡ "Clinical definition 1" is at least 2 of the following: temperature ≥37.8 °C, cough, headache, sore throat, and myalgia. "Clinical definition 2" is temperature ≥37.8 °C, plus cough or sore throat.

4. Stockwell et al.
   This is a study on surgical masks for coughing (symptomatic) cystic fibrosis patients with chronic pseudomonas aeruginosa infection (a bacterial infection) and is not relevant to widespread cloth masking of healthy (asymptomatic) individuals for respiratory virus infections.

5. Dharmadhikari et al.
   Similarly, this is a study examining surgical masks for symptomatic patients with tuberculosis (another bacterial infection) in a hospital setting, again not relevant to widespread cloth masking of healthy (asymptomatic) individuals for respiratory virus infections.

Next, the four studies that consider the use of masks for Covid-19 – three related to masks mandates and one on household transmission:

1. Lyu and Wehby
   This study is a simple case of 'correlation does not equal causation' and in fact the data suggests that the direction of causation was reverse to what the authors concluded – that mandates tended to be considered and implemented in states with much higher rates of cases, nearer to the natural peak of the curve, so that cases influenced the timing of the mandate rather than the reverse. In particular, somehow the results suggested that there was a drop in cases in the first five days after a mandate was announced (in some cases this was prior to the actual implementation of the mandate). If an intervention were to have an impact on this virus, it would be expected to occur 7-10 days after it was implemented due to the incubation period of the virus, not prior to implementation. Considering that the counties with state mask mandates in this study had more than five times the per capita cases as those without state mask mandates (277.7 per million compared to 55.4 per million) two weeks into the two month analysis (as indicated in the supplementary appendix of the study), it is likely that this (the state being further along in the curve leading to the introduction of a mask mandate) was the case. Since this study covered only a two month period and the various states were at different places in the natural progression of the virus during this timeframe, it can not capture any actual impact of mask mandates. For example, this study took place before states that implemented mask mandates earlier in their respected curves (such as California) saw massive increases in cases in the weeks following the mandates.

2. Leffler et al.
   This study does not appear to be a peer-reviewed published article and for good reason – it is of extremely poor quality. In particular, it does not provide evidence that mask wearing norms and policies are related to mortality from Covid-19 for two main reasons. First, there are so many missing confounders for the various regions – such as comorbidities other than obesity (for example asthma, COPD, high blood pressure, autoimmune disorders...), social customs/norms (like how far apart the people in that particular region tend to stand, how they tend to greet one another, whether they tend to live in multi-generational homes, or whether older persons tend to live in long term care facilities...), rates of pollution, interventions, exercise or diet variables, rates of vitamin C intake, vitamin D levels, etc. – that could dramatically affect the results of the models. For example, if those countries that tended to adopt masks earlier also tended to have widespread use of anti-parasitic drugs (like hydroxychloroquine or ivermectin that are proving to also have antiviral activity and be beneficial against Covid-19), or if they tended to be countries with more tropical climates where respiratory viruses do not thrive, then that could have been the reason for the lower mortality and the masks just

looked to be related to mortality because of their correlation with these other variables that were not controlled for in the model. Second, these authors chose to include/retain variables in their multivariate models that were not significant – this makes the models invalid and any interpretation of variables within the model meaningless. The problem with having insignificant variables in the model, is that variables included in a multivariate model can impact not only the value of the coefficients (and potentially change the direction of the relationship), but also the significance, of the other variables in the model. All of the multivariate models that they presented included multiple insignificant variables which can cause other variables (such as mask wearing) to appear significant when they are not or even to appear to reduce mortality when they actually increase it, and can make interpreting the model impossible. Additionally, it seems that the authors did not know how to interpret coefficients in a multiple regression model – they can not be interpreted independently of the other variables in the model.

3. Mitze et al.
   This paper also does not appear to be a peer reviewed published article, but rather a discussion paper. It looks at one particular city (Jena) in Germany, and estimates that introducing a mask mandate resulted in lower cases (than would have occurred had a mandate not been introduced). However, in the appendix of this paper, the authors include the results for four additional cities in Germany (using the same analysis) that do not provide as dramatic results and one of which even suggests that the mask mandate led to an increase in cases. Just like the previous two studies, there is a potential for unknown influences that are not included in the model to be responsible for the changes in case rates and thus confound the results. For example, this article suggests that there may have been a strong quarantine implemented at the same time as the mask mandate in Jena (https://www.mdr.de/thueringen/ost-thueringen/jena/corona-jena-seit-einer-woche-keine-neuinfektion-100.html).

4. Wang et al.
   This last study was a retrospective cohort study that looked at family members in contact with a symptomatic Covid-19 patient within their household, and thus does not provide evidence for widespread masking of asymptomatic individuals in public settings. The variables were constructed from self-reported past behaviors of the study members, leaving room for plenty of bias, and only a few were included/controlled for in the only multivariate model that they included in their analysis. In order to study masks, they used a binary variable to indicate the number of family members (either none, or one or more) wearing masks at home before the primary case's illness onset date. This variable has a lot of potential confounders (that were not included in their multivariate model) that could account for the apparent effect of masks on secondary infection rates. It is not clear why they only show one multivariate model and whether different models (with different combinations of variables) could have done a better job in explaining the variance in the data. It is also not clear whether the authors understand the importance of considering correlations between potential independent variables, as they do not discuss this, show the correlations in their paper, or provide alternate multivariate models (with different combinations of variables). It also appears that they do not understand how to properly interpret the variables within a multivariate model as they do not describe the adjusted odds ratios appropriately – they interpret them independently rather than in the context of which variables are being controlled for.