Facemasks and SARS-CoV-2 case fatality rate

by

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Abstract

The importance of facemasks during COVID-19 pandemic has been a controversial topic, hampered in part by lack of empirical evidence. However, a large number of countries worldwide has already issued mask mandates. Here I show, that mask mandates in Kansas counties during the summer of 2020 actually increased case fatality rate significantly compared to Kansas counties without mask mandates, with a risk ratio of over 1.6 for death *with and by* SARS-CoV-2. After correcting for death *with* SARS-CoV-2, I find that the case fatality rate *by* SARS-CoV-2 is as low as 0.093% in Kansas counties without mask mandates, but 0.579% in Kansas counties with mask mandates, resulting in a highly significant risk ratio of 6.3.

As a sidenote, I find that facemasks did not reduce but slightly increase infection rates.

Why this happens and the possible connection between long-term effects associated with SARS-CoV-2 and facemasks are explained in theory herein by the 'foegen effect', which describes the deep reinhalation of pure virions that were caught in the facemasks as droplets.

These findings have immediate implications for the handling of SARS-CoV-2 worldwide.

Introduction

The SARS-CoV-2 pandemic has caused many countries in the world to issue mask mandates, partly because there is a common concept that the severity of the infection is dependent on the number of virions transmitted, and that masks reduce that number and thus the severity of infections is reduced. This would result in a lower case fatality rate.

During summer 2020, 24 Kansas counties and at least 8 cities had issued a mask mandate, the other 81 did not.

The study by Van Dyke et al.[1] tries to address that issue by analyzing data from Kansas counties. However, case fatality rate (CFR) was not calculated at all. In addition, data until October is available now. As July 3rd was the day of issuing of mask mandate, I chose August 1st as starting

date and October 15th as ending point as I had proof of mask mandates up to that point.

I analyzed case fatality rate as described below. The analysis showed a highly significant increase in CFR in the mask group, and that increase can only be attributed to death *by* SARS-COV-2, not death *by and with* SARS-CoV-2. (Since all other respiratory infections have basically disappeared [2], that increase can be attributed solely to death *by* SARS-CoV-2*).*

So in order to calculate the relative risk (RR), I had to distinguish between death *by* and death *with* SARS-COV-2.

To calculate death *with*, I used Kansas "Covid 19 place of death" data which was available from Februar 1st to December 12th and total Kansas deaths by place of death for 2019.

Since Covid-19 is (supposed to be) a completely new virus, death *by* SARS-CoV-2 has to exceed last years data (in whichever place of death). So I calculated for Kansas the number of death *by* SARS-CoV-2 and *with* SARS-CoV-2, using the percentage to calculate the final relative risk of mask mandates and thus (indirectly) facemasks.

Method

I collected the data listed under sources and analyzed it using LibreOffice Calc 4.1.

I checked all counties without mask mandates that had known cities with mask mandates for the percentage of the county population that was represented by that city (or cities). If the city's population was within +/-20% of half of the county's population (that is, between 30% and 70%), the county was left out. Therefore, I excluded Labette (Parsons) and Cowley (Winfield) counties. If the city's population was over 70%, I counted the county as having mask mandate, which meant Lyon (Emporia), Ellis (Hays) and Riley (Manhattan) counties were switched to mask mandate

counties (MMC).

If the city's population was under 30%, the county remained in its group (Miami county with Osawatomie and Paola, Marion county with Marion) (noMMC).

The crude death rate (CDR) represents age and pre-existing illness in the underlying population. Both affect natural resistance and thus CFR *by* SARS-CoV-2 as well as death *with* SARS-CoV-2, so both groups need to have almost the same CDR to be comparable. Comparison of raw CDR showed that it ranged from 575.8 to 2010.1 between Kansas' counties.

I then modified the CDR of each county for 2019 by reducing deaths from sources that would clearly not be COVID-19 related to prevent statistical anomalies when comparing CDR (accumulations of deaths from other causes that are not related to older age and pre-existing illness). These were pregnancy complications, birth defects, conditions of perinatal period (early infancy), sudden infant death syndrome, motor vehicle accidents, all other accidents and adverse effects, suicide, homicide, and other external causes.

This modified CDR (mCDR) of the counties was then population-weighted and summed up to calculate the mCDR of MMC vs. noMMC.

The initial result showed huge differences (22,72% for 103 counties) with lower mCDR in MMC, so I used a lower mCDR boundary for MMC and an upper mCDR boundary for noMMC to reduce this difference while at the same time trying to keep the percentage of Kansas population covered as big as possible. I found that with mCDR boundary of >800 for MMC and <1,350 for noMMC the difference in mCDR became 0.05% so I settled for his boundary. These boundaries eliminated 31 counties (mostly small counties from noMMC) and 41.3% of the population (mostly from MMC).

I calculated Kansas data with August 1st 2020 as starting date. I calculated the number of death for

Kansas groups as the average of death differences between August 8th and October 22nd, August 15th and October 29th as well as August 22nd and November 5th. This way, infections and deaths both span 11 weeks. I chose to focus on 14 days after testing after referring to [3].

The Covid-19 Place of Death data set contains data from February 1st to December 12th, so I reduced the amount of death for each place in 2019 by a linear factor (315/365) to match the amount of days covered. I then calculated the difference between both. If 2020 data had less deaths in a specific location, all deaths associated with COVID-19 were counted as *with* SARS-COV-2. If a location had more death in 2020, deaths were counted as death *by*, but not more than the difference of the totals (see Table 1).

Using this method, I found that 34.8% of deaths were *by* SARS-COV-2, and 65.2% were *with*.

I then added the deaths by and with SARS-COV-2 in MMC and noMMC, and multiplied with 34.8% to calculate the number of total deaths in both groups *by* SARS-COV-2.

I then calculated the number of deaths in MMC by masks by subtracting the product of the CFR of the noMMC and the number of infected of MMC from the deaths of MMC.

I then distributed the difference of the last two calculated numbers (deaths by SARS-COV-2 and deaths by masks) to both groups, depending on their share of total infected. The I added the deaths by masks to the MMC's value.

Finally, using a fourfold table, I calculated case fatality rates for MMC and noMMC *by* SARS-CoV-2, also calculating chi^2 (α=0.05), RR and 95%CI.

Results

Data from Kansas resulted in a CFR *with and by* SARS-CoV-2 of 0.83% for noMMC and of 1.31% for MMC (RR 1.6, p=0.0001).

After correcting for death with SARS-COV-2, I calculated a CFR *by* SARS-COV-2 of 0.093% for

noMMC and 0.579% for MMC. The risk ratio for the mask mandate is 6.3 [95%CI 3.4-7.6, $p<0.00001$].

Discussion

The mask mandates have increased the risk of dying by 6.3 or 530% in counties with mask mandates. This number may still be underestimated, as population aging from 2019 to 2020 was not factored in, also better methods of treatment are now available for SARS-COV-2 then in the beginning of the pandemic, and unfortunately the available data for calculating death with SARS-COV-2 also covered the beginning of the pandemic.

The explanation for this is probably that virions that are breezed or coughed out in droplets are stopped in the facemask tissue, and after (quick [4]) evaporation of the droplets, pure virions are reinhaled from a very short distance when breathing in. For further reference, I refer to this as the 'foegen effect' as I could not find this effect described earlier.

By the 'foegen effect' the virions are not only spreading to other areas (like the olfactory nerve, causing loss of smell) but also (because of their smaller size) deeper into the respiratory tract [also 8]. They bypass the bronchia and are inhaled deep into the alveoli, where they cause a pneumonia instead of a bronchitis, which would rather be typical for a virus infection. They also bypass the wall of multilayer squamous epithelium that they cannot pass in vitro [5] and most likely also cannot pass in vivo. So the only propable way to enter the blood vessels for the virions is through the alveoli.

The 'foegen effect' also increases overall viral load, because virus reproduction in vivo is exponential compared to the linear [6] droplet reduction caused by the mask, so the number of exhaled or coughed out virions quickly exceeds those of non-mask patients. This can be proven by comparing infection rates which already derive from the data above, using no boundaries: Infection

rate 1.81% in noMMC and 1.95% in MMC ($Chi^2<0.0001$, RR 1.08).

The 'foegen effect' is also supported by studies [7,8] comparing (ventilation) masks to alternatives for acute respiratory distress syndrome (ARDS), where the direct obstruction of the exhalatory pathway is the only difference in treatment.

The existence of the 'foegen effect' is also supported by the observation that a lot of medical personal in Italy was dying during the "first wave" [9] – they were working many hours, despite being ill, and with facemasks. They probably were using "better" masks than just a chirurgical face mask (FFP2, FFP3) – however, masks with a higher droplet filtering effect probably cause an even stronger 'foegen effect'.

Another very important point to consider is that the long term effects that have been described in association with COVID-19 may all be a direct cause of the 'foegen effect': With the virus entering alveoli and blood, and not being restricted to the upper respiratory tract and bronchi (as explained above), it can cause damage by initiating (auto)immune reaction in most organs.

Concerning the proposed consequences of the 'foegen effect' – they impy that SARS-CoV-2 might be a rather usual member of the Coronavirus familiy whose case fatality rate has been severely increased by mask mandates, causing up to then rarely-known long-term effects in the process.

However, since ethical principles prevent clinical studies to prove the 'foegen effect' in vivo, and wearing a mask is unblindable, further proving the 'foegen effect' may be impossible, especially considering that [8] was stopped because results for the mask group were so much worse.

References

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Data Sources

→ Starting Dates and Mask mandates at Start: [1]

→ Counties and Cities with Mask mandates (October 15th): https://www.khi.org/policy/article/20-25

→ Population of Cities: http://en.wikipedia.org/ (entry for each city).

→ Population of Counties: http://www.usafacts.org

→ Daily Cases by Counties: http://www.usafacts.org

→ Daily Deaths by Counties: http://www.usafacts.org

→ crude death rate by Counties 2019, Number of Death by County 2019 for pregnancy complications, birth defects, conditions of perinatal period (early infancy), sudden infant death syndrome (SIDS), motor vehicle accidents, all other accidents and adverse effects, suicide, homicide, and other external causes : http://kic.kdheks.gov/death_new.php

→ COVID-19 Death Counts by Place of Death and State: Provisional COVID-19 Death Counts by Place of Death and State, https://data.cdc.gov/NCHS/

→ 2019 Death Counts by Place of Death and State:

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Declaration of conflicts of interest:

The author and his family live in a country with mask mandates (Germany). As a general practitioner, the author has to wear masks at work. No financial conflicts of interests are declared.