Twitter Thread by Muge Cevik

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Concerns about outdoor transmission risk seem to be trending again. What is the risk of transmission outdoors and should we be more worried about outdoors with the new more-transmissible variant? ■(1/n)

The risk of transmission is complex and multi-dimensional. It depends on many factors: contact pattern (duration, proximity, activity), individual factors, environment (e.g. outdoor, indoor), socioeconomic factors, and mitigation measures in place. (2/n)(https://t.co/sn3rLXoFHQ\)

Table 1: Summary of factors associated with risk of transmission

Factors associated with risk of transmission	Lowest risk of transmission	Highest risk of transmission
Environmental factors		
Proximity	Always maintain >2m	Regular close interaction < 1m
Duration	A few minutes or less	Several hours
Occupant density	People spaced out, large space	People closely packed, small space
Shared air	Outdoors, well ventilated indoor	Indoors with poor ventilation, recirculated air
Environmental conditions	Normal indoor temperatures, humidity and fresh air	Low temperature, low humidity
Viral emission	Passive activity, face coverings	Aerobic activity, singing, loud talking, no face Coverings
Shared surfaces	Rarely touch shared surfaces, good cleaning	Regular touching shared surfaces, infrequent cleaning
Human factors		
Contact frequency	Case isolation, infrequent contact	Daily, regular contact
Networked	Contacts maintained within a small bubble	Shared space with multiple strangers
Hygiene behaviours	Regular hand hygiene, use of face coverings	Poor hand hygiene, no face coverings
Occupational factors	Small network, not public facing	Care/health sector, public facing, long working hours
Socio-economic factors	Work from home, able to isolate	Poverty, crowded housing, inability to isolate for both space and financial reasons

Transmission is facilitated by close proximity, prolonged contact, and frequency of contacts. So, the longer the time you spend with an infected person and the larger the gathering, the higher the risk is. (3/n) (https://t.co/h6KQ0pS9aM\)

Contact pattern

Cevik et. al. CID 2020 https://doi.org/10.1093/cid/ciaa1442

Proximity to index case: Risk increases with shorter distance (i.e. spouses, <2m interaction)

Duration of exposure: Risk increases with prolonged contact

Contact frequency: Risk increases with daily, regular contact

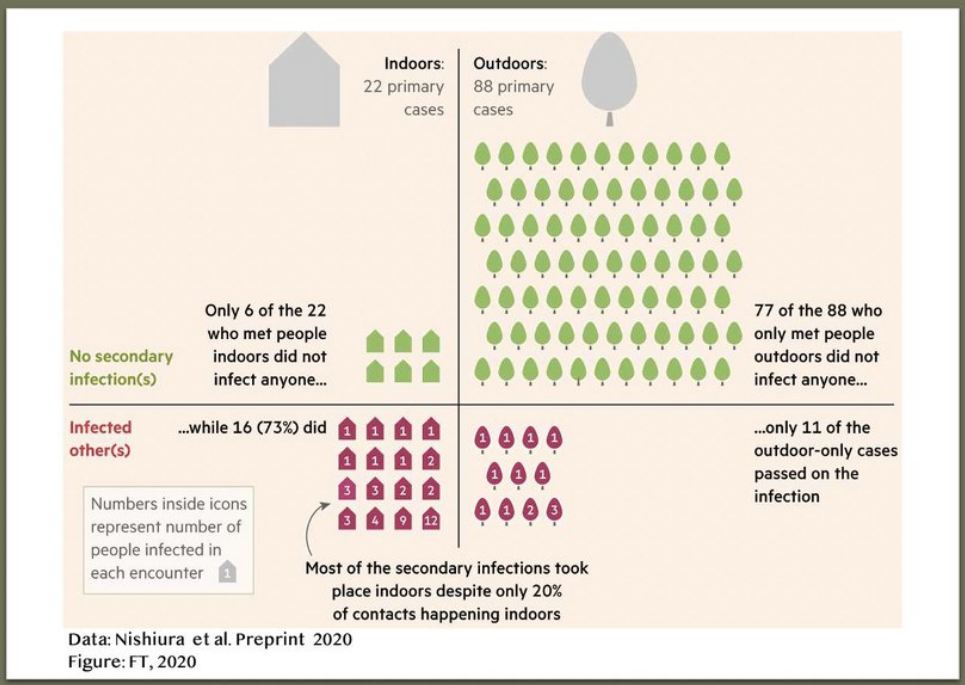
Activity: Dining, group activities, and singing & shouting increase viral emission

Crowding: more people = multiple infectious people

Network: Risk increases with having a large network, having multiple contacts

Time of contact: People are highly infectious 2 days before 5 days after symptom onset

But what is the likelihood of catching the virus outdoors? Contact tracing studies suggest that transmission risk is 20 times higher in indoor settings compared with outdoor environments. The risk is not zero but significantly lower. (4/n) (https://t.co/h6KQ0pAxMc\)



Transmission is more likely to occur indoors (>18x)

And we know that the majority of transmission (>90%) occurs indoors. Sharing the same sleeping space, frequent daily contact, engaging in group activities such as dining are high risk. So, the risk increases with longer & frequent exposure, close proximity, # of contacts. (5/n)

The small number of cases where outdoor transmission might have occurred were associated w/close interactions, particularly extended duration, or settings where people mixed indoors alongside an outdoor setting. (6/n) (https://t.co/Hxb0YiaGE7\) & (https://t.co/TsbAXX5EqJ\)

Therefore, outdoor risk is negligible unless it involves close interaction or you are in a crowded or semi-outdoor environment. For example, walking on the street with no f2f contact, or passing by a jogger, the risk is very low as the duration of interaction is brief. (7/n)

With the new variant, all interactions are higher-risk, but outdoor risk is still relatively low. Most importantly, given very high community prevalence, you are much more likely to encounter someone infected now than a few months ago. (8/n) https://t.co/6sN3EXk56n

> There are several reasons to think that the new UK #SARSCoV2 variant is an important one as it might be more contagious than other variants, but there are also some uncertainties. So much misinformation is being circulated, so this thread brings key data together. \U0001f9f5
>
> — Muge Cevik (@mugecevik) December 21, 2020

Of course, we still need to show respect to others and their personal space outdoors, even though it's low risk. But a recurring theme on social media and in the news is shaming people for spending time outside, when really this is one of the safer places. (9/n)

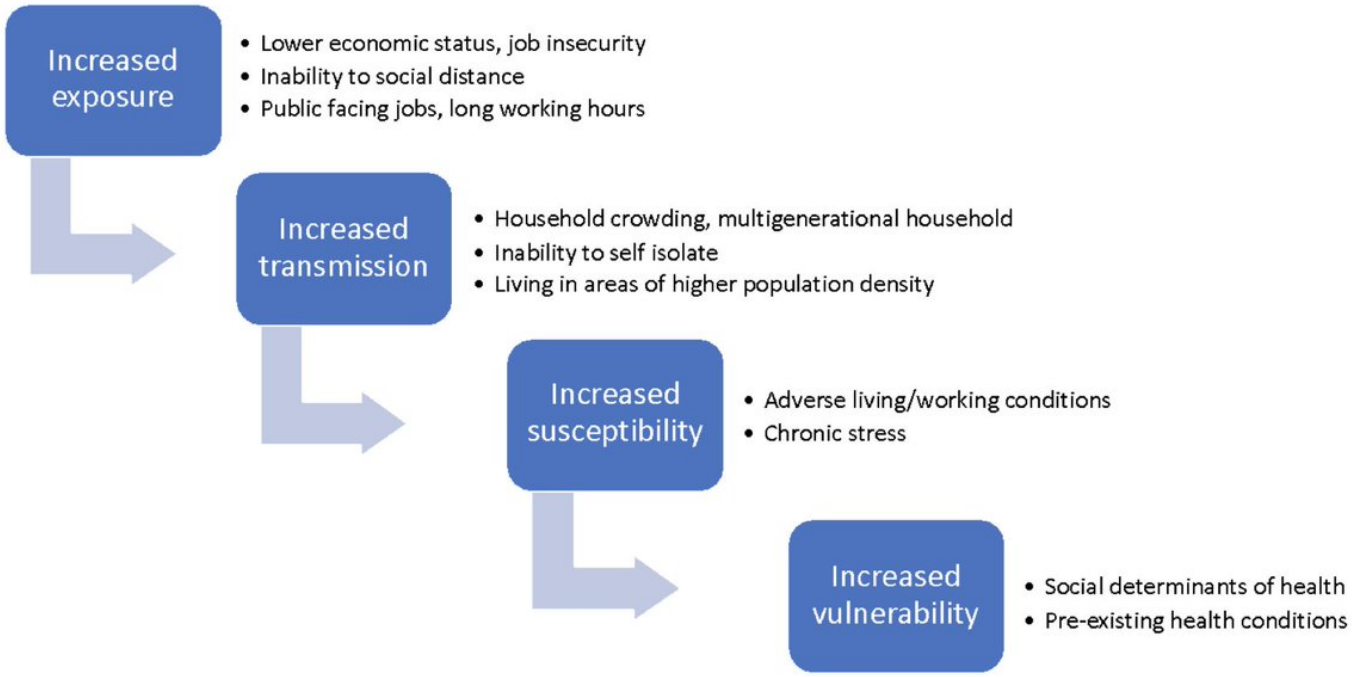
There are 4 main problems with concentrating on low-risk settings and restricting/shaming outdoor interactions.
1- These messages are quite harmful because people are confused about where the real risk is. Majority of transmission continues to happen in indoor settings. (10/n)

2- There's a delicate balance between preventing infections and increasing lockdown fatigue. People do not have unlimited energy, so we should ask them to be vigilant where it matters most, which is indoors, while giving them a break outdoors. (11/n)

3- We have to assume that not everyone will be able completely eliminate social interaction for extended periods of time, especially people who live alone, so restricting outdoor activity will likely result in some people gathering indoors, where the risk is higher. (12/n)

4- Focusing on low-risk settings diverts us away from addressing structural factors driving majority of transmission. Higher cumulative infection rates are observed among those working in low paid, public facing jobs & living in crowded households. (13/n) https://t.co/jFhX0H7I6l

Figure 3: Factors that link socioeconomic inequalities to higher risk of infection



> Socioeconomic factors and racial/ethnic disparities:
> Global figures suggest that COVID-19 pandemic is strongly shaped by structural inequities, adverse living and working conditions and structural racism that drive household and occupational risks. (14/n)
>
> — Muge Cevik (@mugecevik) September 21, 2020

So, I can't see how blanket "tougher" measures will help much now. Smarter response is urgently needed; making work places safer, invest in supportive measures for those who are disproportionately affected such as housing, income relief. (14/n) https://t.co/tv8IYHYoSq

For example, there is international consensus that those living in crowded households have 2-3x higher risk of infection. Housing in socioeconomically deprived areas is more likely to be overcrowded, increasing the risk of transmission. (15/n) (https://t.co/M94TSLQiRO\)

ONS infection survey

ONS reported analyses of household transmission in their 14/10/2020 report. The likelihood of a household contact becoming a secondary case varied according to the household size. The likelihood of becoming a secondary case decreased with smaller household size and the number of secondary cases increased with larger household size; in a 2 person household the likelihood of a secondary case was around 18% whilst in a 6 person household the likelihood of at least one secondary case was around 55%. This analysis is consistent with the hypothesis that large households act as amplifiers of infection, once there is an index case within the household. Housing in socioeconomically deprived areas is more likely to be overcrowded, increasing the risk of transmission within the household [2].

The Virus Watch Study

This study shows that of the 242 positive COVID-19 cases, 17% occurred in a one-person household and 83% in multi-person households. Of 149 multi-person households where at least one case was reported, 70% reported a single case, while 30% reported multiple cases within a two week period of one another [30].

While there's been a lot of emphasis on testing, we haven't emphasised isolation enough. One simple measure, financial & social support for isolation, could make a huge difference. Here I discussed ways to scale up isolation w/ @vcallier (16/n) https://t.co/6JkM2XPxGD

Individually, we need to avoid / spend as little time as possible in crowded poorly ventilated indoor settings & wear a mask indoors/transport. Spend time outdoors. Open windows. Maintain distance, wash hands and engage in shorter interactions. (17/n) https://t.co/ZBbP3hodVj

> Policymakers and health experts can help the public differentiate between lower-risk and higher-risk activities and environments and public health messages could convey a spectrum of risk to the public to support engagement in alternatives for safer interaction (26/n)
>
> — Muge Cevik (@mugecevik) September 21, 2020

If you are interested in understanding more about transmission dynamics and high risk settings, I suggest some additional reading material.

Here is a thread based on our article published in CID summarising international data on transmission. (18/n) https://t.co/hzDr7ySLLh

> Over the last 6 months, we've learned a lot about how SARS-CoV-2 spreads\U0001f9a0
>
> What does the evidence so far tell us about SARS-CoV-2 transmission dynamics, high-risk activities and environments? Thread \U0001f9f5 (1/n)https://t.co/zBRmgztnKf
>
> — Muge Cevik (@mugecevik) September 21, 2020

In this article, we summarised international and UK contact tracing data, looking at transmission associated with households, occupational settings, transport and social/leisure settings. (19/n)

https://t.co/M94TSLQiRO

This is a fantastic article by @B_resnick where we discussed 4 ways to think about Covid-19 risk: Distance, time, activity, environment. (20/n)
https://t.co/7TSetE1jvQ

In this interview, we discussed the key misunderstandings about transmission - BBC @sciencefocus (21/n)
https://t.co/sYBjPYpApQ

While blaming rule-breakers is satisfying & easy, "psychologising and individualising the issue of adherence, one disregards the structural factors which underlie the spread of infection." This is a great article by @ProfJohnDrury @ReicherStephen (22/n)

https://t.co/JohEZyMh9v

Further thoughts about outdoor risk, why shaming people for spending time outside is counterproductive, where we should be focusing right now. Discussed w/ Evan Davies @EvanHD @BBCRadio4 PM program - you can listen via link @ 5:20pm GMT today. (23/n)

https://t.co/tW4RrH6vMF

Need to be careful with car share b/c of close proximity of people in a confined space. Recommend avoiding car-share w/non-households, or if you have to take a short ride + open windows + use mask (but not zero risk). Tweet #19 for more details. (24/n)
https://t.co/4grt613fio

> This is a really useful set of tweets. Can you add advice re car sharing? I hear people sharing cars to get to outdoor beauty spots to exercise and feel they dont understand the risk of the car journey
>
> — sue strachan (she/her) \U0001f499 (@sue_strachan) January 12, 2021