

Social Epistemology of Scientific Disagreements: an Introduction

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July 20, 2026

Ruhr University Bochum

Introduction

Hello :)

Introduction

The Aerosol Controversy

What does this case illustrate?

Higher-Order Evidence

Inquisitive Reasons

What will you learn in this course?

The Aerosol Controversy



World Health Organization (WHO)

@WHO

...

FACT: [#COVID19](#) is NOT airborne.

The [#coronavirus](#) is mainly transmitted through droplets generated when an infected person coughs, sneezes or speaks.

To protect yourself:

- keep 1m distance from others
- disinfect surfaces frequently
- wash/rub your
- avoid touching your

FACT CHECK: COVID-19 is NOT airborne

The virus that causes COVID-19 is mainly transmitted through droplets generated when an infected person coughs, sneezes, or speaks. [These droplets are too heavy to hang in the air. They quickly fall on floors or surfaces.](#)

You can be infected by breathing in the virus if you are within 1 metre of a person who has COVID-19, or by touching a contaminated surface and then touching your eyes, nose or mouth before washing your hands.

To protect yourself, keep at least 1 metre distance from others and disinfect surfaces that are touched frequently. Regularly clean your hands thoroughly and avoid touching your eyes, mouth, and nose.



World Health Organization

March 28 2020



This message spreading on social media is incorrect. Help stop misinformation. Verify the facts before sharing.

[#Coronavirus](#) [#COVID19](#)

PAHO/WHO and 6 others

7:44 PM · Mar 28, 2020 · Twitter Web App

39.4K Retweets 4,334 Quote Tweets 44.1K Likes Tip

[nature](#) > [news feature](#) > article

NEWS FEATURE | 06 April 2022

Why the WHO took two years to say COVID is airborne

Early in the pandemic, the World Health Organization stated that SARS-CoV-2 was not transmitted through the air. That mistake and the prolonged process of correcting it sowed confusion and raises questions about what will happen in the next pandemic.

[Dyani Lewis](#)

Three methods of COVID-19 transmission

Early discussions in the pandemic: three methods of transmission:

1. Droplet: droplets are expelled from infected individuals and enter the systems of others
 - masks and social distancing
2. Fomite: non-infected persons come into direct contact with contaminated surfaces
 - wiping down potentially contaminated surfaces and avoiding close contact
3. Aerosol: infectious particles linger in the air and enter systems of others.
 - different kinds of masking, ensuring sufficient ventilation, etc.

Aerosol transmission:

- A less significant focus of concern
- Because of difficulties with obtaining **direct evidence** by culturing the virus from (possibly contaminated) air particles.

More general background:

A decades long **mistaken** view on aerosols as necessarily smaller than five microns.

MEGAN MOLTENI

BACKCHANNEL 05.13.2021 06:00 AM

The 60-Year-Old Scientific Screwup That Helped Covid Kill

All pandemic long, scientists brawled over how the virus spreads. *Droplets! No, aerosols!* At the heart of the fight was a teensy error with huge consequences.

Los Angeles Times

Latest: COVID-19 | Virus tracker | Hospitalizations | Vaccines | Newsletter



WORLD & NATION

A choir decided to go ahead with rehearsal. Now dozens of members have COVID-19 and two are dead



Skagit Valley Chorale members Mark Backlund and his wife, Ruth Backlund, sing choir music Friday at their home in Anacortes, Wash., while convalescing from COVID-19. (Karen Ducey / For The Times)

BY RICHARD READ
MARCH 29, 2020 7:34 PM PT

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<https://www.latimes.com/world-nation/story/2020-03-29/coronavirus-choir-outbreak>

Fact check: COVID-19 is not airborne

COVID-19 02 April 2020



The World Health Organization has moved to dispel the myth that COVID-19 is an airborne virus. This and many more myths about COVID-19 virus are spreading in South Africa and globally.

<https://www.discovery.co.za/corporate/covid19-fact-check-covid-19-is-not-airborne>

[nature](#) > [news feature](#) > [article](#)

NEWS FEATURE • 08 JULY 2020 • UPDATE [23 JULY 2020](#)

Mounting evidence suggests coronavirus is airborne – but health advice has not caught up

Governments are starting to change policies amid concerns that tiny droplets can carry SARS-CoV-2. And after months of denying the importance of this, the World Health Organization is reconsidering its stance.

239 “infectious-disease physicians, epidemiologists, engineers and aerosol scientists” published commentary indicating their conviction that aerosol transmission was a real threat and urging the WHO to explore it further.

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Volume 71, Issue 9
1 November 2020

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It Is Time to Address Airborne Transmission of Coronavirus Disease 2019 (COVID-19) FREE

Lidia Morawska ✉, Donald K Milton

Clinical Infectious Diseases, Volume 71, Issue 9, 1 November 2020, Pages 2311–2313, <https://doi.org/10.1093/cid/ciaa939>

Published: 06 July 2020 **Article history ▼**

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Keywords: [airborne transmission](#), [airborne infection spread](#), [coronavirus](#), [COVID-19](#), [SARS-CoV-2 virus](#)

Issue Section: [INVITED COMMENTARY](#)

- These experts disagreed with the WHO
- WHO responded by acknowledging that aerosols couldn't be ruled out, especially in poorly ventilated places
- But it stuck to the up-to-6-feet (1.5 m) rule, advising people to wear masks indoors only if they couldn't keep that distance.

- These experts disagreed with the WHO
- WHO responded by acknowledging that aerosols couldn't be ruled out, especially in poorly ventilated places
- But it stuck to the up-to-6-feet (1.5 m) rule, advising people to wear masks indoors only if they couldn't keep that distance.

What was the general reception of the
commentary?

LIVESCIENCE

 Space Health Planet Earth Animals Archaeology

TRENDING 'Quantum supremacy' record Maya underground structure

[Health](#) > [Viruses, Infections & Disease](#) > [Coronavirus](#)

Is the coronavirus airborne? Evidence is scant, infectious disease experts say

News

 By [Joshua A. Krisch](#) published July 8, 2020

A recent letter signed by 239 researchers claims that the novel coronavirus causing COVID-19 can spread through airborne microdroplets. Whether that matters is up for debate.



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But epidemiologists and infectious disease experts are wary of the limited evidence for airborne transmission, and concerned that recent media reports on this letter will do more harm than good. "It is a shame that they felt the need to publish," Paul Hunter, a professor at the University of East Anglia in the United Kingdom and a member of WHO's infection prevention committee, told Live Science. What's more, even if COVID-19 can spread via the airborne route, it's likely this happens only in limited circumstances and doesn't require additional precautions in most cases, experts said.

"Given the ample evidence that reducing droplet transmission works [to reduce COVID-19 spread], throwing other things into the mix only confuses people and undermines the World Health Organization at a critical time," Hunter said.

<https://www.livescience.com/coronavirus-airborne-transmission-debate.html>

Part of the confusion may stem from the fact that many of the signatories of the open letter are not infectious disease experts, but experts in fluid mechanics and the study of aerosols. And, while they understand how particles move through the air, their understanding of how those particles fuel disease spread, and the implications of this spread, may prove to have more academic significance than practical value in the midst of a global pandemic, according to Hunter. "Most of them are chemists, engineers, owners of ventilation companies," Hunter said. "They do not have a broad understanding of disease transmission mechanisms ... this issue is more nuanced than many of them realize."

- Experts on relevant issues are dismissed as epistemic trespassers

Did the WHO members have the relevant expertise?

The WHO's position on prevention of COVID-19 up to early 2021 was based largely on advice from its Infection Prevention and Control Research and Development Expert Group for COVID-19 (IPCRDEG-C19). Most members of that committee are hospital clinicians with specialist training in infectious diseases; they were also strong adherents to the tenets of evidence-based medicine, which is based on empiricist assumptions and reluctant to consider types of evidence beyond randomised controlled trials, as its briefing document on guideline development attests (source A20, Table 1). As public health professor Raina MacIntyre described in a blog (source A15, Table 1), these committee members are experts in topics such as wound management—for which droplet spread is predominant and handwashing is an effective intervention. A leading member of the IPCRDEG's Secretariat recently led an international handwashing campaign “*to consistently improve hand hygiene practices as a whole-of-society approach to stop the spread of SARS-CoV-2*” (source A18, Table 1²⁹).

You focused only on the WHO, but what about other public health institutions?

CDC changing recommendations

The screenshot shows the CDC website's 'Coronavirus Disease 2019 (COVID-19)' section. The header includes the CDC logo, the text 'Centers for Disease Control and Prevention', and the tagline 'CDC 24/7: Saving Lives, Protecting People™'. A search bar and a 'Coronavirus' dropdown menu are visible. Below the header, a teal banner reads 'Coronavirus Disease 2019 (COVID-19)'. A navigation bar contains links for 'Your Health', 'Community, Work & School', 'Healthcare Workers & Labs', 'Health Depts', 'Cases & Data', and 'More'. The 'Your Health' section is expanded, showing a list of topics: 'Symptoms', 'Testing', 'Prevent Getting Sick', 'If You Are Sick', and 'Daily Life & Going Out'. The 'How COVID-19 Spreads' article is displayed, updated on June 16, 2020. The article text states: 'COVID-19 is thought to spread mainly through close contact from person-to-person. Some people without symptoms may be able to spread the virus. We are still learning about how the virus spreads and the severity of illness it causes.' The phrase 'mainly through close contact from person-to-person' is highlighted in yellow. Social media sharing icons for Facebook, Twitter, LinkedIn, and others are present. The article title 'Person-to-person spread' is also visible.

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Search Coronavirus

Advanced Search

Coronavirus Disease 2019 (COVID-19)

Your Health Community, Work & School Healthcare Workers & Labs Health Depts Cases & Data More

How COVID-19 Spreads

Updated June 16, 2020 Other Languages Print Page

COVID-19 is thought to spread mainly through close contact from person-to-person. Some people without symptoms may be able to spread the virus. We are still learning about how the virus spreads and the severity of illness it causes.

Person-to-person spread

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>

How COVID-19 Spreads

Updated Sept. 18, 2020

Languages ▾

Print



COVID-19 is thought to spread mainly through close contact from person to person, including between people who are physically near each other (within about 6 feet). People who are infected but do not show symptoms can spread the virus to others. We are still learning about how the virus spreads and the severity of illness it causes.

COVID-19 most commonly spreads

- Between people who are in close contact with one another (within about 6 feet).
- Through respiratory **droplets or small particles, such as those in aerosols, produced when an infected person coughs, sneezes, sings, talks, or breathes.**
 - These **particles can be inhaled** into the nose, mouth, airways, and lungs and cause infection. **This is thought to be the main way the virus spreads.**
 - Droplets can also land on surfaces and objects and be transferred by touch. A person may get COVID-19 by **touching the surface or object that has the virus on it** and then touching their own mouth, nose, or eyes. Spread from touching surfaces is not thought to be the main way the virus spreads.
- It is possible that **COVID-19 may spread through the droplets and airborne particles that are formed when a person who has COVID-19 coughs, sneezes, sings, talks, or breathes.** There is growing evidence that droplets and airborne particles can remain suspended in the air and be breathed in by others, and travel distances beyond 6 feet (for example, during choir practice, in restaurants, or in fitness classes). In general, indoor environments without good ventilation increase this risk.

How COVID-19 Spreads

Updated Sept. 21, 2020

Languages ▾

Print



A draft version of proposed changes to these recommendations was posted in error to the agency's official website. CDC is currently updating its recommendations regarding airborne transmission of SARS-CoV-2 (the virus that causes COVID-19). Once this process has been completed, the update language will be posted.

COVID-19 is thought to spread mainly through close contact from person-to-person. Some people without symptoms may be able to spread the virus. We are still learning about how the virus spreads and the severity of illness it causes.

Person-to-person spread

The virus is thought to spread mainly from person-to-person.

- Between people who are in close contact with one another (within about 6 feet).
- Through respiratory droplets produced when an infected person coughs, sneezes, or talks.
- These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.
- COVID-19 may be spread by people who are not showing symptoms.

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>

How COVID-19 Spreads

Updated Oct. 5, 2020

Languages ▾

Print



COVID-19 is thought to spread **mainly through close contact from person to person**, including between people who are physically near each other (within about 6 feet). People who are infected but do not show symptoms can also spread the virus to others. We are still learning about how the virus spreads and the severity of illness it causes.

COVID-19 spreads very easily from person to person

How easily a virus spreads from person to person can vary. The virus that causes COVID-19 appears to spread more efficiently than influenza but not as efficiently as measles, which is among the most contagious viruses known to affect people.

COVID-19 most commonly spreads during close contact

- People who are physically near (within 6 feet) a person with COVID-19 or have direct contact with that person are at greatest risk of infection.
- When people with COVID-19 cough, sneeze, sing, talk, or breathe they **produce respiratory droplets**. These droplets can range in size from larger droplets (some of which are visible) to smaller droplets. Small droplets can also form particles when they dry very quickly in the airstream.

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>

COVID-19 can sometimes be spread by airborne transmission

- Some infections can be spread by exposure to virus in small droplets and particles that can linger in the air for minutes to hours. These viruses may be able to infect people who are further than 6 feet away from the person who is infected or after that person has left the space.
- This kind of spread is referred to as **airborne transmission** and is an important way that infections like tuberculosis, measles, and chicken pox are spread.
- There is evidence that under certain conditions, people with COVID-19 seem to have infected others who were more than 6 feet away. These transmissions occurred within enclosed spaces that had inadequate ventilation. Sometimes the infected person was breathing heavily, for example while singing or exercising.
 - Under these circumstances, scientists believe that the amount of infectious smaller droplet and particles produced by the people with COVID-19 became concentrated enough to spread the virus to other people. The people who were infected were in the same space during the same time or shortly after the person with COVID-19 had left.
- Available data indicate that it is much more common for the virus that causes COVID-19 to spread through close contact with a person who has COVID-19 than through airborne transmission.^[1]

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>

What does this case illustrate?

What are the challenges of scientific disagreements?

What socio-epistemic questions does it raise?

What does this case illustrate?

Higher-Order Evidence

Higher-order evidence

- Higher-order Evidence (HOE): "evidence which bears on a believer's rational capacities, epistemic performance, or evidential situation." (Horowitz, 2022)

Debated in the epistemology of peer disagreement

Feldman, 2005, Kelly, 2010, Christensen, 2010, LasonenAarnio, 2014, Skipper and Steglich-Petersen, 2019, Whiting, 2020, Dorst, 2020, etc.

- $\text{HOE} \implies (\text{FOE} \implies A)$ (higher-order support)
- $\text{HOE} \implies (\text{FOE} \not\implies A)$ (higher-order defeat)

Higher-order evidence

For example: peer disagreement

- I have good reasons to consider theory T the best account of a given domain of phenomena.
 - A peer disagrees: we've exchanged our reasons and I still believe I am right and you are wrong.
 - The fact that my peer disagrees indicates that I might be wrong after all
-
- FOE: evidence for T as the best theory in the given domain.
 - HOE: not everyone agrees, hence I might be wrong. (Hence: I should lower my confidence in my view on T)

239 “infectious-disease physicians, epidemiologists, engineers and aerosol scientists” published commentary indicating their conviction that aerosol transmission was a real threat and urging the WHO to explore it further.

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- But it stuck to the up-to-6-feet (1.5 m) rule, advising people to wear masks indoors only if they couldn't keep that distance.

The published commentary, signed by scientists

- not itself direct evidence for aerosol transmission
- however: it is evidence pertaining to the epistemic status of all the hypotheses of COVID-19 transmission, indicating that WHO could be wrong after all.

When should we take HOE into account?

Friedman and Šešelja, 2023

Desiderata for scientifically relevant HOE

- Relevant expertise
 - Good acquisition
 - Diversity
 - Scope
-
- HOE based on expert disagreement, which was scientifically relevant
 - Failed to be taken into account by the WHO

What does this case illustrate?

Inquisitive Reasons

Inquisitive Reasons (Fleisher, 2022)

R is an **inquisitive reason** to perform an act ϕ iff R favors ϕ -ing in virtue of the fact that ϕ -ing is likely to promote successful inquiry (and to promote it in the right kind of way).

- I.e., reasons that concern promoting successful inquiry.
- That is: reasons a hypothesis is worthy of pursuit
- Non-evidential epistemic reasons
 - Epistemic: because they promote successful inquiry
 - They might not increase the probability of the truth of H

Inquisitive reasons

Two types of inquisitive reasons: promise and social

Promise reasons:

Features of a theory (or hypothesis) which favor pursuing it because this pursuit will promote successful inquiry.

For example: testability, heuristic analogies, etc.

Social inquisitive reasons:

Features of the social context of inquiry that favor pursuing a theory (or hypothesis) because doing so will promote successful collective inquiry.

For example: promoting division of labor and productive debate, avoiding premature consensus

Why are inquisitive reasons important for expert judgment?

- Assessing whether a scientific claim should be accepted for the purposes of policy guidance requires:
 - sensitivity to the evidence in favor of that claim,
 - but also: sensitivity to the field of research that has produced the claim.
- Inquisitive reasons **in favor of a rival theory** are informative of **potential defeaters** of the dominant theory
- Inquisitive reasons in favor of the aerosol hypothesis were informative of the dominant view on the COVID-19 transmission

The WHO failed to take inquisitive reasons
into account prior to July 2020

The pursuitworthiness of the aerosol hypothesis

Inquisitive reasons early in the pandemic

Analogy with the predecessor of COVID-19: SARS-CoV-1

SARS-CoV-1 spreads in the air (Morawska and Cao, 2020)

Analogy with other viral infections

(Morawska and Cao, 2020)

- Norwalk-like virus between school children
- influenza A/H5N1 virus between ferrets
- the WHO review of evidence from 2009: viral infectious diseases can be transmitted by aerosols

The pursuitworthiness of the aerosol hypothesis

Heuristic resource: direction for further inquiry

- The virus was found in aerosols in laboratory conditions (Van Doremalen et al., 2020).
- Attempts at culturing non-lab samples had been unsuccessful.
- But other experimental designs were possible, and were suggested by scientists.

Testability

Inquiring into the aerosol hypothesis was feasible given the variety of methods, providing this research line with a programmatic character.

But aren't HOE and inquisitive reasons
already well-understood in scientific
practice?

Lack of understanding of inquis. reasons and HOE

Krisch, 2020

The screenshot shows the top portion of a Live Science website. The header is dark blue with the 'LIVE SCIENCE' logo in white and orange. To the right of the logo are social media icons for Facebook, Twitter, and Instagram. Below the header is an orange navigation bar with a home icon and links to 'Space', 'Health', 'Planet Earth', 'Animals', and 'Archaeology'. Underneath this is a grey 'TRENDING' section with two items: ''Quantum supremacy' record' and 'Maya underground structure'. The main content area has a breadcrumb trail: 'Health > Viruses, Infections & Disease > Coronavirus'. The article title is 'Is the coronavirus airborne? Evidence is scant, infectious disease experts say'. Below the title is an orange 'News' tag and the byline 'By Joshua A. Krisch published July 8, 2020'. The first paragraph of the article is visible, discussing a letter signed by 239 researchers. At the bottom of the article preview are social sharing icons for Facebook, Twitter, Reddit, Pinterest, Facebook Messenger, and Email.

LIVE SCIENCE

Space Health Planet Earth Animals Archaeology

TRENDING 'Quantum supremacy' record Maya underground structure

Health > Viruses, Infections & Disease > Coronavirus

Is the coronavirus airborne? Evidence is scant, infectious disease experts say

News By Joshua A. Krisch published July 8, 2020

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Inquisitive reasons and HOE – not considered relevant.

What will you learn in this course?

1. Lecture 1: Introduction to the Social Epistemology of Scientific Disagreements
2. Lecture 2: Rational Disagreement and Epistemic Tolerance
3. Lecture 3: Simulating Science: Agent-Based Models and Collective Inquiry
4. Lecture 4: Agent-Based Models of Scientific Disagreements – Part I
5. Lecture 5: Agent-Based Models of Scientific Disagreements – Part II

Homework:

Find an example of a scientific disagreement and consider the following questions

- What was the disagreement about?
- How has each side reacted to the disagreement?
- Were these reactions justified, and why do you think so?

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