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PROFESSOR: So now that we understand the types of droplets that are emitted by different types of respiration, and their evolution in the environment as a function of humidity and other factors.

Let's talk about the different ways that transmission can actually occur between two individuals of a respiratory pathogen.

So the first is contact transmission through so-called fomites.

These are residues of those infectious droplets that had been emitted by breathing, which can build up on surfaces such as tables, floors, even on people's clothing, on their hands, from the breathing of an infected person.

And then as a central person touches those surfaces and then touches their eyes or touches their nose.

And in various ways gets the pathogen into their body.

So that is not likely to be the dominant mode of transmission for COVID-19, as the evidence is building up of other modes of transmission.

Nevertheless, it is still recommended to be disinfecting and washing surfaces to protect against this potential mode of transmission.

Another mode of transmission is through large ballistic drops.

So these are the droplets we talked about at the beginning, some of which are large enough to sediment to the ground.

Others of which will eventually settle, but which can be transferred by the momentum of a cough, or a sneeze, or some violent exhalatory event to another person.

And that other person can directly breathe in those droplets.

So this is especially important when dealing with symptomatic individuals.

On the other hand, for COVID-19, it's well established that the majority of transmissions are, in fact, asymptomatic.

So people are not coughing or sneezing, and yet are still managing to transmit this highly infectious virus.

Which brings us then to the third mode of transmission, which is through aerosol droplets.

These are the droplets which do not settle quickly on the timescale of occupancy of the room, or a ventilation, or other factors that remove those droplets, such as deactivation.

And those droplets are emitted even in normal respiration/ normal breathing.

So just simply the puffs of breathing, speaking-- put those aerosol droplets in the air and then they're carried by air currents in the room, which we will analyze in greater detail later in this course, and essentially fill the room.

And as a first approximation, those droplets are spread throughout the room, and is a well mixed space of air.

And within that context, there are still two modes of transmission we can talk about.

If people are not wearing any masks or face covering, then those puffs of respiration can be directly impinging upon a susceptible person, who then can breathe them in.

And those aerosols will be at a higher concentration than the background ambient air of the well mixed room.

And we refer to that as short-range aerosol transmission.

And we will return to that in the last part of the course.

But what we're going to focus on first is long-range airborne transmission.

So these are the droplets that end up in the air.

They become well mixed throughout the space.

And anyone in the room, even very far away, can breathe those droplets in and, over time, can inhale an infectious dose and become infected.

It's important to recognize the role of face coverings, especially in the context of these respiratory droplet transmission modes.

So whether it's a mask or a face shield, those facial coverings can essentially eliminate short-range aerosol transmission.

Of course, they also completely eliminate large drop emission because the droplets don't make it through those ballistic protections if you will.

And even the momentum generated in the air from the breathing is largely eliminated by shields or masks.

On the other hand, these small aerosol droplets can pass through masks.

They certainly can pass around face shields or even plastic shields that you see in various public spaces these days.

And those droplets then are quickly spread around the room and we're left with the airborne mode of transmission.

We will see later, there is an important distinction between a mask and a shield, however.

While both of them blocked the momentum of the fluid that leads to puffs and respiratory jets and plumes of transfer, they do provide, in the case of the mask, additionally filtration, which can actually block many of the droplets-- not necessarily all, but a significant fraction.

And that will be an important aspect of understanding how to make spaces safe from airborne transmission.