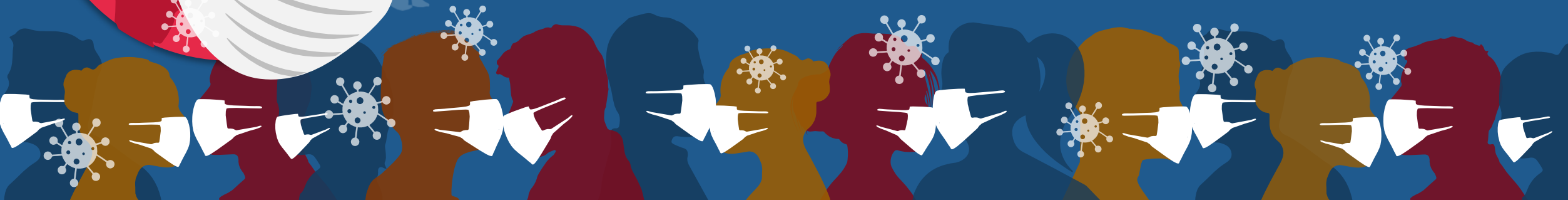


# The Proposed Regressional Etiology of COVID-19 infection and Propagation in the Childhood and Adolescence

Dr.Sanaa Jassim Kadhim





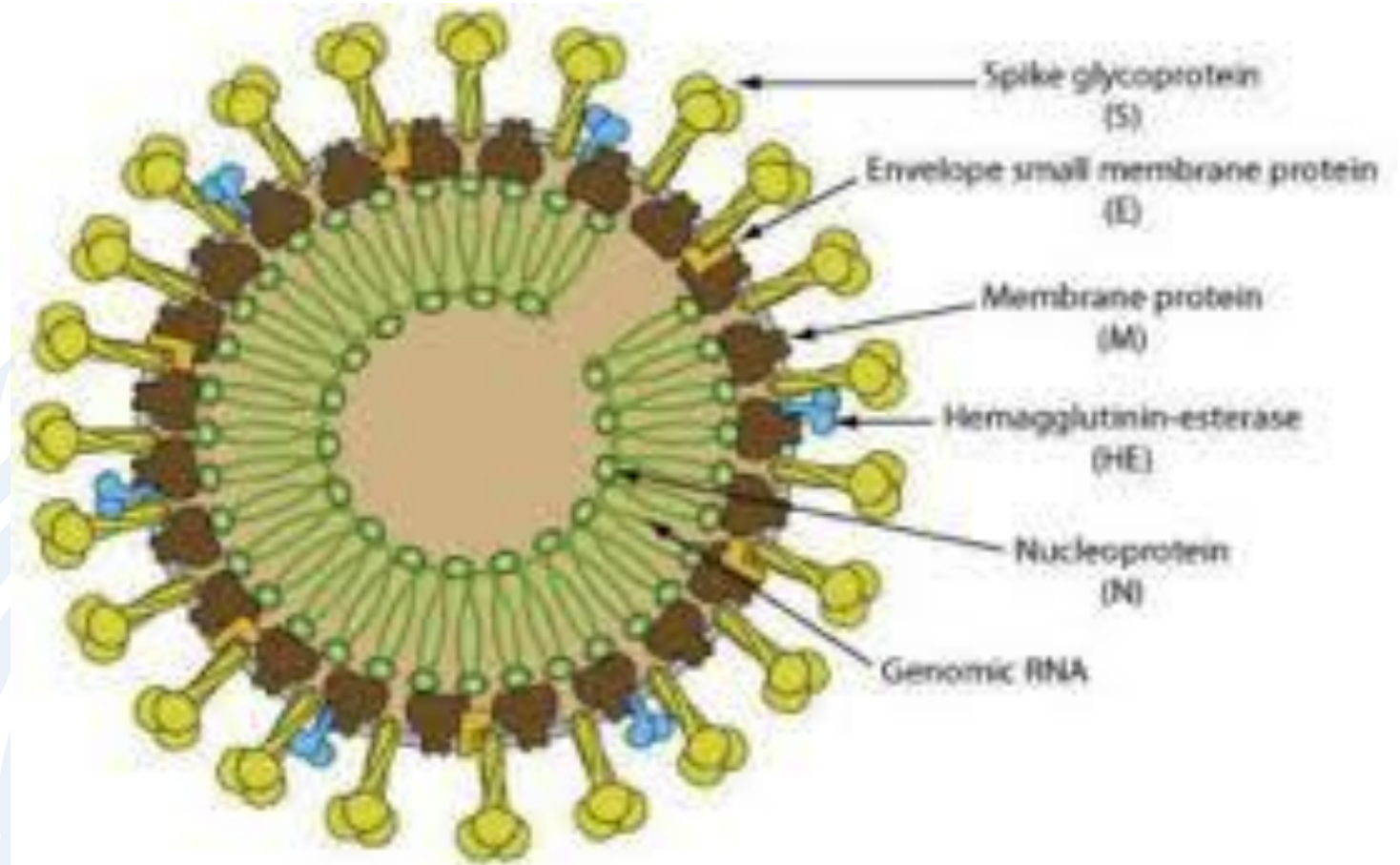
## **What is Coronaviruses?**

***Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered coronavirus causes coronavirus disease COVID-19.***

## What is COVID-19?

**COVID-19 is the infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019. COVID-19 is now a pandemic affecting many countries globally.**





# What are symptoms of COVID-19?

COVID-19

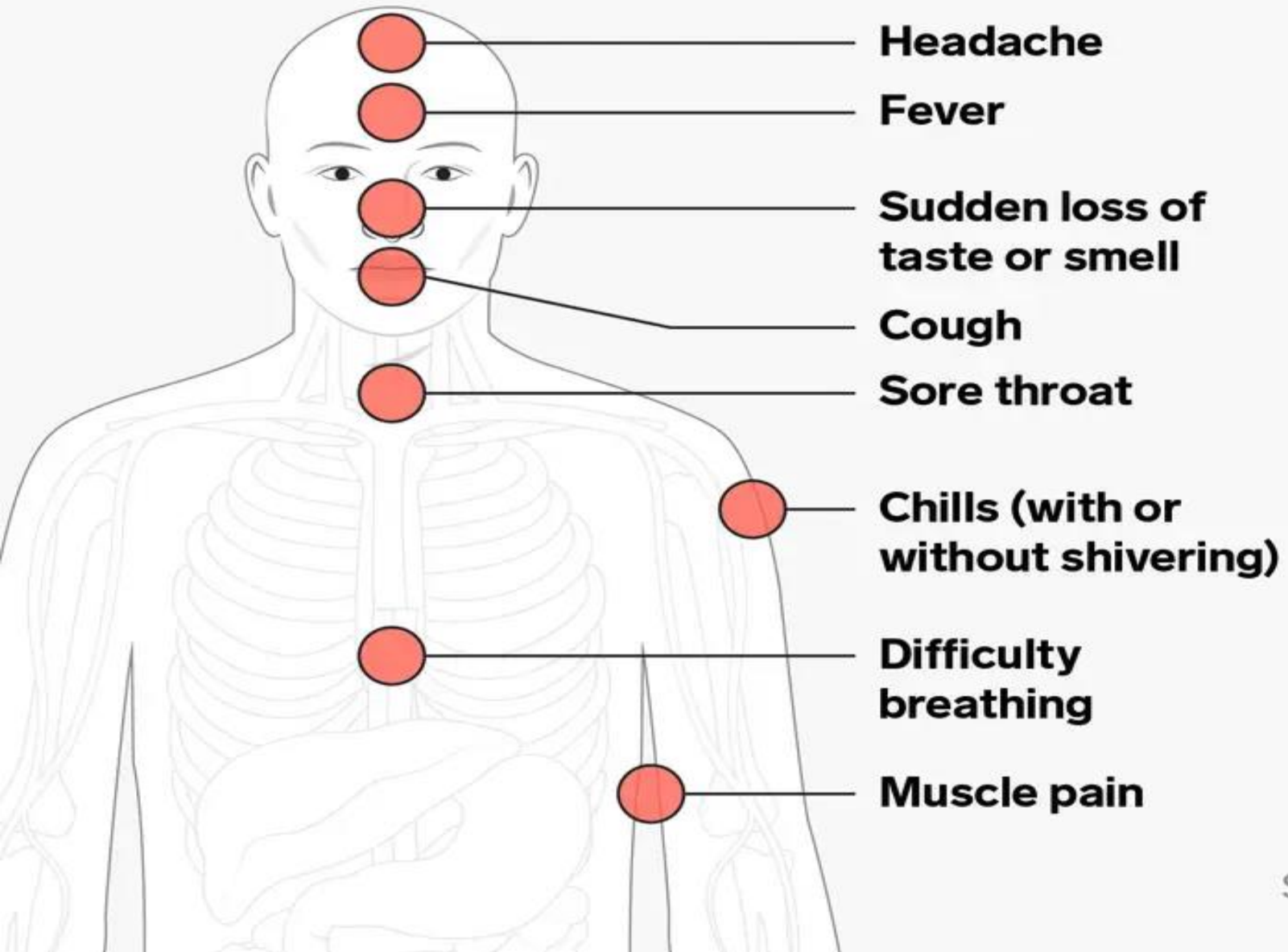
The most common symptoms of COVID-19 are fever, dry cough, and tiredness. Other symptoms that are less common and may affect some patients include aches and pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell or a rash on skin or discoloration of fingers or toes. These symptoms are usually mild and begin gradually. Some people become infected but only have very mild symptoms.



Most people (about 80%) recover from the disease without needing hospital treatment. Around 1 out of every 5 people who gets COVID-19 becomes seriously ill and develops difficulty breathing. Older people, and those with underlying medical problems like high blood pressure, heart and lung problems, diabetes, or cancer, are at higher risk of developing serious illness. However, anyone can catch COVID-19 and become seriously ill. People of all ages who experience fever and/or cough associated with difficulty breathing/shortness of breath, chest pain/pressure, or loss of speech or movement should seek medical attention immediately. If possible, it is recommended to call the health care provider or facility first, so the patient can be directed to the right clinic.



# Coronavirus symptoms



## **EMERGENCY WARNING SIGNS:**

- Trouble breathing
- Persistent pain or pressure in the chest
- Sudden confusion or inability to wake up
- Bluish lips or face

# Coronavirus in children

COVID-19

**Children can get coronavirus (COVID-19), but they seem to get it less often than adults and it's usually less serious.**



# Symptoms of coronavirus in children

COVID-19

**The main symptoms of coronavirus are:**

- **a high temperature**
- **a new, continuous cough – this means coughing a lot, for more than an hour, or 3 or more coughing episodes in 24 hours**
- **a loss or change to sense of smell or taste – this means they cannot smell or taste anything, or things smell or taste different to normal**







Data from China suggest that pediatric coronavirus disease 2019 (COVID-19) cases might be less severe than cases in adults and that children (persons aged <18 years) might experience different symptoms than adults.



In description of pediatric U.S. COVID-19 cases, relatively few children with COVID-19 are hospitalized, and fewer children than adults experience fever, cough, or shortness of breath. Severe outcomes have been reported in children, including three deaths.



Data from the Netherlands also confirms the current understanding: that children play a minor role in the spread of the novel coronavirus. The virus is mainly spread between adults and from adult family members to children. The spread of COVID-19 among children or from children to adults is less common.



Pediatric COVID-19 patients might not have fever or cough. Social distancing and everyday preventive behaviors remain important for all age groups because patients with less serious illness and those without symptoms likely play an important role in disease transmission.



# Why the coronavirus appears to affect children differently than it affects adults is one of the great mysteries of the current pandemic?

COVID-19

research was published at 20 June in the journal Nature. It uses mathematical models to examine coronavirus data from six countries — China, South Korea, Italy, Japan, Singapore and Canada. The results are similar to an April study from the U.S. Centers for Disease Control and Prevention, which found that while kids under age 18 make up 22% of the U.S. population, they've accounted for fewer than 2% of reported cases.



# One of the big questions in this pandemic is why countries in Africa haven't been hit harder the disease?

COVID-19

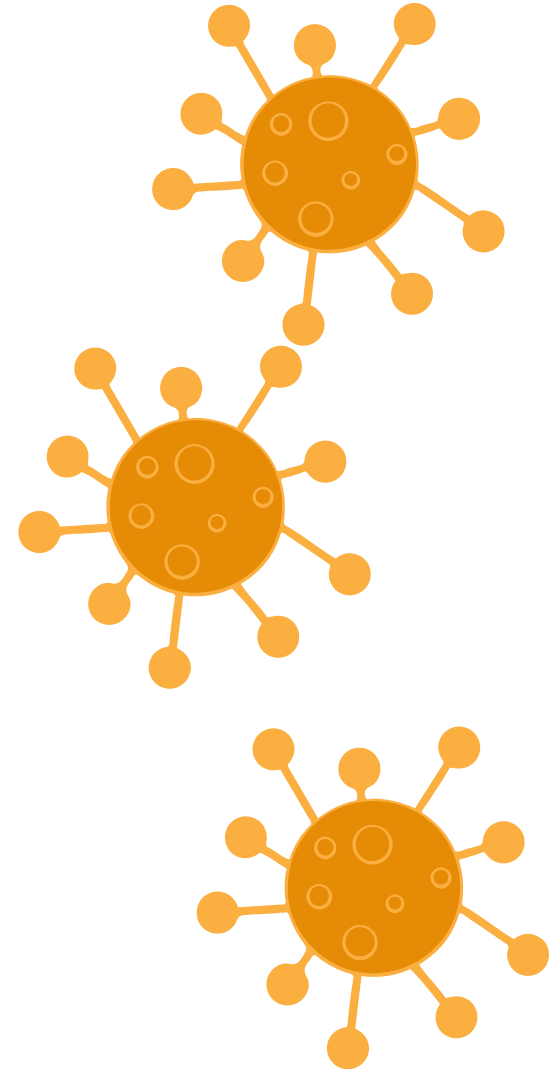
The median age in Africa is 20; while in Europe, it's 43.

If younger people are less susceptible to the disease, does that mean countries with younger citizens may have less intense outbreaks?

transmission among kids needs to be better understood so officials can make plans for appropriate precautions when reopening schools.

And there are other questions. Should kids be allowed to visit their grandparents? Or is it the middle-aged people who pose a greater risk to the elderly?

Indeed, perhaps the most critical unknown: What role do youngsters have in the spread of COVID-19?



**Megan Culler Freeman, a virologist and pediatrician at University of Pittsburgh School of Medicine, says kids are major spreaders of many other respiratory diseases.**

**COVID-19**

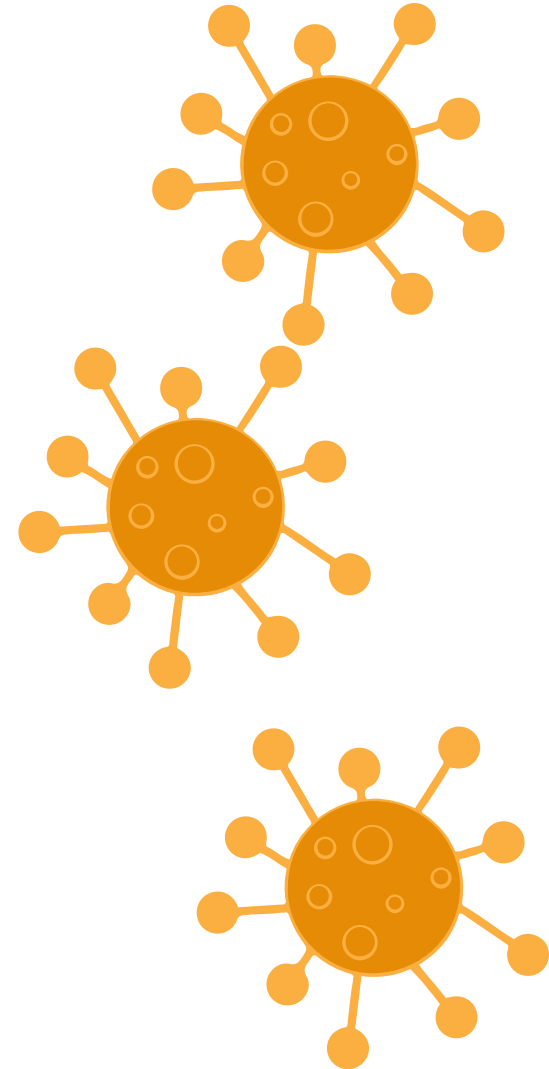
The kids are going to day care, they're going to school, especially the younger ones [who] aren't necessarily as polite with their coughs and sneezes," Freeman says. "So it's really easy for those diseases to spread."

Freeman, who studied coronaviruses for her Ph.D., says children are clearly susceptible to the other known coronaviruses that circulate each year during cold and flu season. Yet something different is happening with this new one.

There are a couple of hypotheses as to why, Freeman says. One is that kids get a milder form of the disease. If they aren't showing symptoms, they may never get tested. And thus those infections aren't counted.

Freeman adds there's also some research showing that the receptors in human cells that the coronavirus latches on to are less developed in younger people.

But both Eggo and Freeman say it's still unclear exactly why children are less at risk to the virus, why so few cases have been detected in kids and whether that trend will continue.






**It does seem that kids are less affected than adults. But I think their role in community spread is still somewhat untested," she says. Around the world from Abuja to Aruba to Arkansas, schools were shut down in the early stages of the outbreaks. "So we don't know how things are going to change if that variable is back in play."**

**Some countries have started to reopen schools, but that is mainly in places like Hong Kong and New Zealand, where transmission levels are incredibly low.**


**If schools reopen in places where transmission levels remain high, it may give a clearer picture, Freeman says, of how much transmission is driven by children.**

# COVID-19 & Children: Rapid Research Response Agenda




Estimating the impact of COVID-19 on violence prevalence

**CHILD PROTECTION**



Rapid review  
Evidence assessment  
Systematic review


Rapid research review of pandemics and child protection




Insights from school closure: parental engagement; broadcast media

**EDUCATION**

Equitable continuation of learning




Epidemiology of COVID-19 among children and adolescents



Research on the social and economic impacts of COVID-19

**SOCIAL PROTECTION**

Lessons on providing assistive technology to persons with disability in crises



Review of emerging evidence on mental health among children and adolescents in the context of COVID-19




Children's experiences and responses to COVID-19

**CHILD WELL-BEING**




Review of emerging evidence on social impacts of COVID-19 on children, families, and communities



Children's online engagement during COVID-19

**CHILDREN ONLINE**

The importance of children's internet access during COVID-19



COVID-19 and Children Open Evidence Database

What are the key issues from their perspective?

What are children's experiences and responses to COVID-19??

How has it affected them?



+ Our new Leading Minds Online: Coronavirus & Children webinar series visit: [unicef-irc.org/events](http://unicef-irc.org/events)

EVIDENCE SYNTHESIS

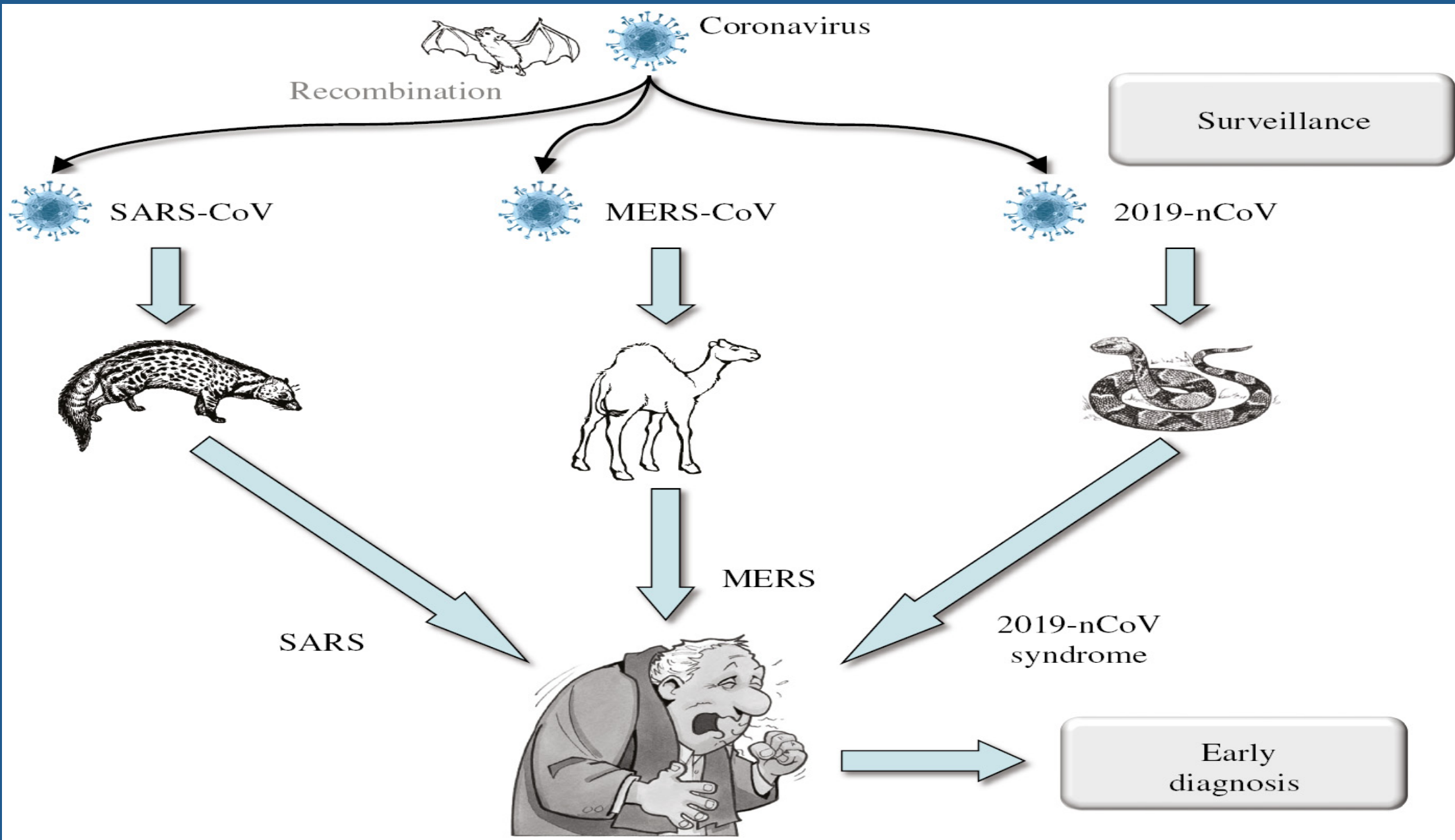
ETHICS

Ethical considerations for COVID-19 evidence generation involving children

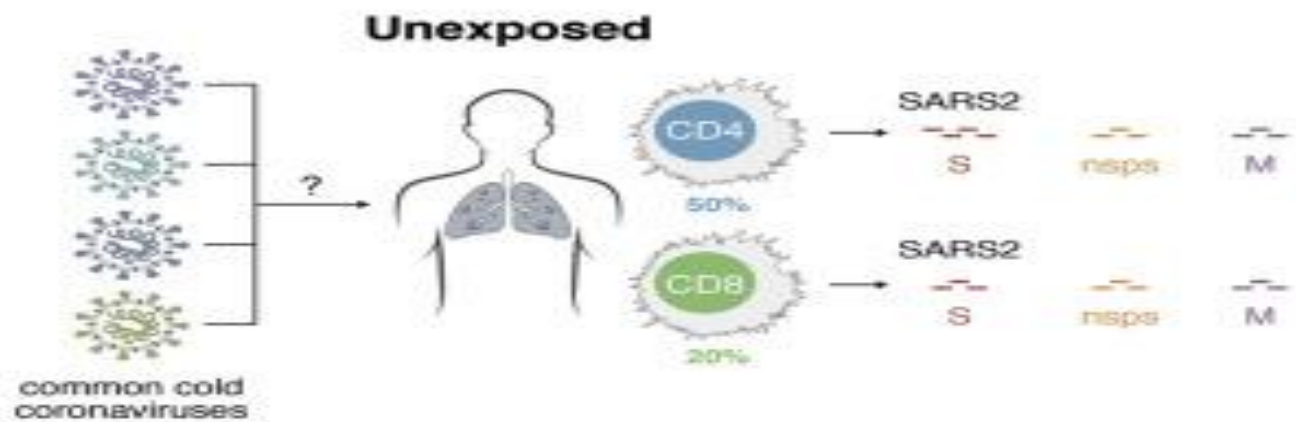
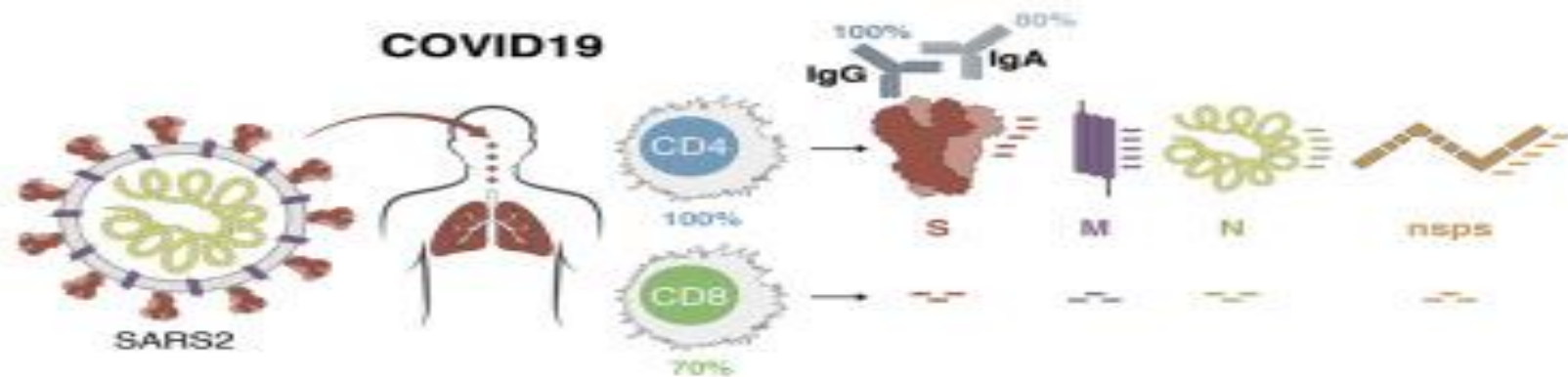
# Why the Coronavirus Hits Kids and Adults So Differently?

COVID-19

Immune systems change with age, becoming weaker or stronger in different ways. An adult's body might be better armed against familiar threats, but more inflexible against novel ones. The two human viruses most closely related to the coronavirus that causes COVID-19 are the ones behind SARS and MERS—both also coronaviruses, a large family that infects many animal species. SARS likely jumped from bats to civet cats to humans in 2002, and MERS from camels to humans in 2012. Both have a much higher fatality rate than COVID-19 and neither exploded into a pandemic on the current scale, giving us smaller numbers from which to draw conclusions. Still, they too seemed to have largely spared children.







**Like COVID-19, SARS and MERS were caused by viruses entirely new to humans, and adult immune systems are unused to dealing with entirely new viruses. By and large, the ones that sicken adults year after year are altered versions of viruses they've encountered before, such as seasonal flu. Children, on the other hand, are constantly dealing with viruses that are not necessarily novel but are novel to them. "Everything an infant sees, or a young child sees, is new," says Donna Farber, an immunologist at Columbia University. Thus, their immune system is primed to fight new pathogens in a number of ways.**

Babies are born, for example, with a complete repertoire of immune cells called T cells. Every T cell has a unique receptor, and taken together, the pool of millions of T cells can recognize virtually any hypothetical pathogen. As the child begins encountering pathogens, though, their immune system winnows this diverse repertoire. It keeps the T cells involved in fighting off pathogens as a pre-stocked arsenal of “memory T cells,” should those pathogens appear again, but it begins losing the others. This is why adults are able to mount a rapid immune response to previously encountered pathogens, but also why they might have trouble fighting a new one. Diseases such as rubella and chicken pox are also, for various reasons, more severe in adults than in children. The pattern with seasonal flu is different, Farber says, but that may be because immunity against previous strains of the flu offer some crossover protection in adults.

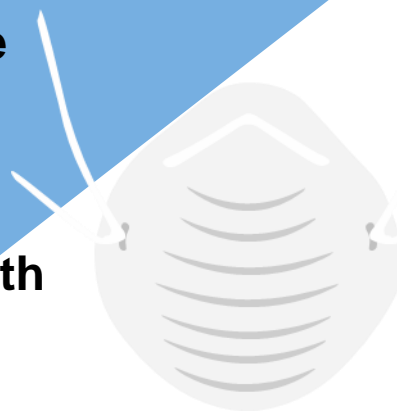


# PANDEMIC

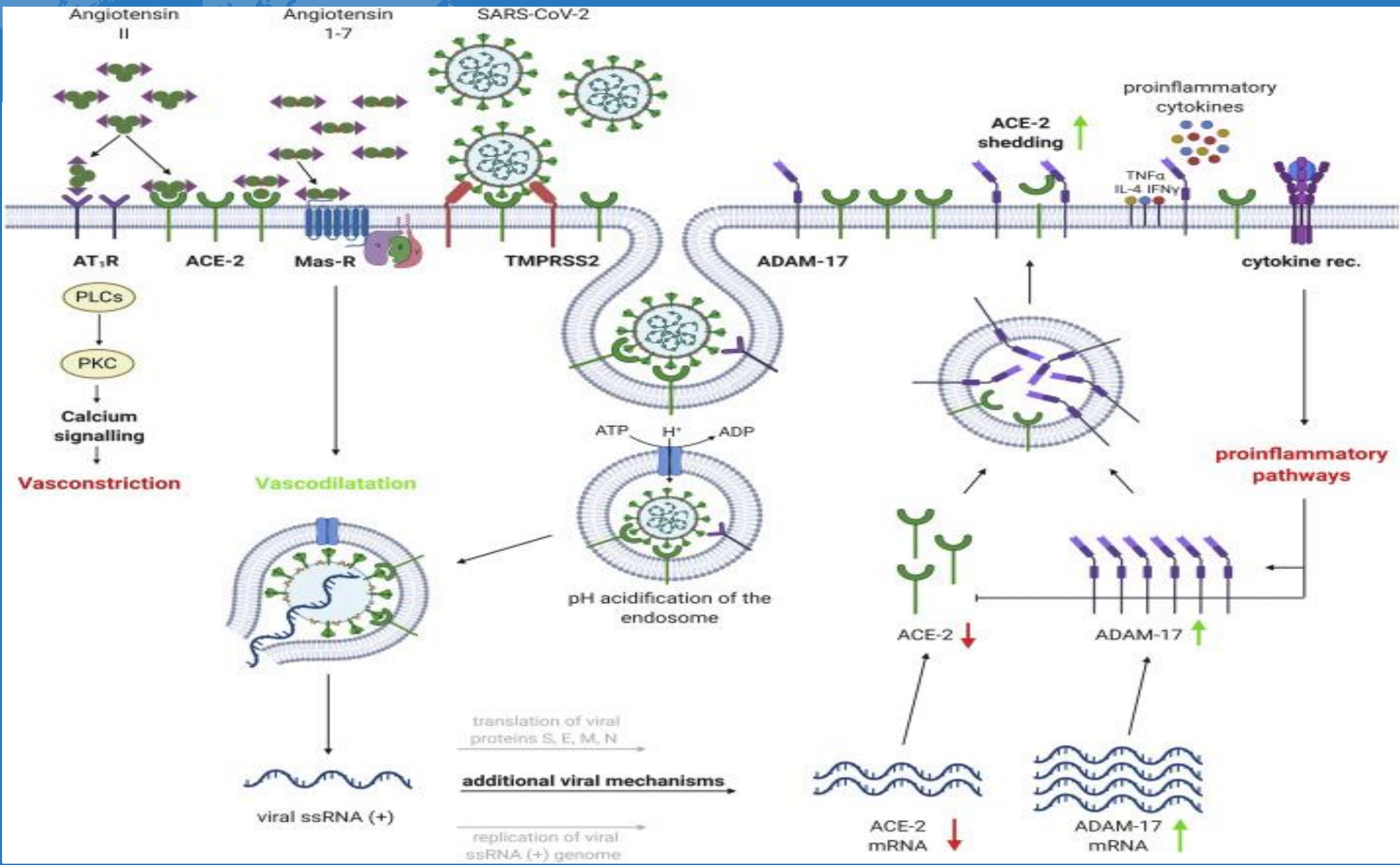
## COVID-19

### What is the ACE2 receptor, how is it connected to coronavirus?

In this issue of JAMA, Bunyavanich et al identify a possible factor that may be related to lower rates of SARS-CoV-2 infection in children. The authors evaluated gene expression in nasal epithelial samples collected as part of a study involving patients with asthma from 2015 to 2018. The nasal epithelium is one of the first sites of infection with SARS-CoV-2, and the investigators probed for the expression of the cell surface enzyme angiotensin-converting enzyme 2 (ACE2), which has been proven to bind to SARS-CoV-2 spike protein and promote internalization of the virus into human cells. Among a cohort of 305 patients aged 4 to 60 years, older children (10-17 years old; n = 185), young adults (18-24 years old; n = 46), and adults ( $\geq 25$  years old; n = 29) all had higher expression of ACE2 in the nasal epithelium compared with younger children (4-9 years old; n = 45), and ACE2 expression was higher with each subsequent age group after adjusting for sex and asthma.

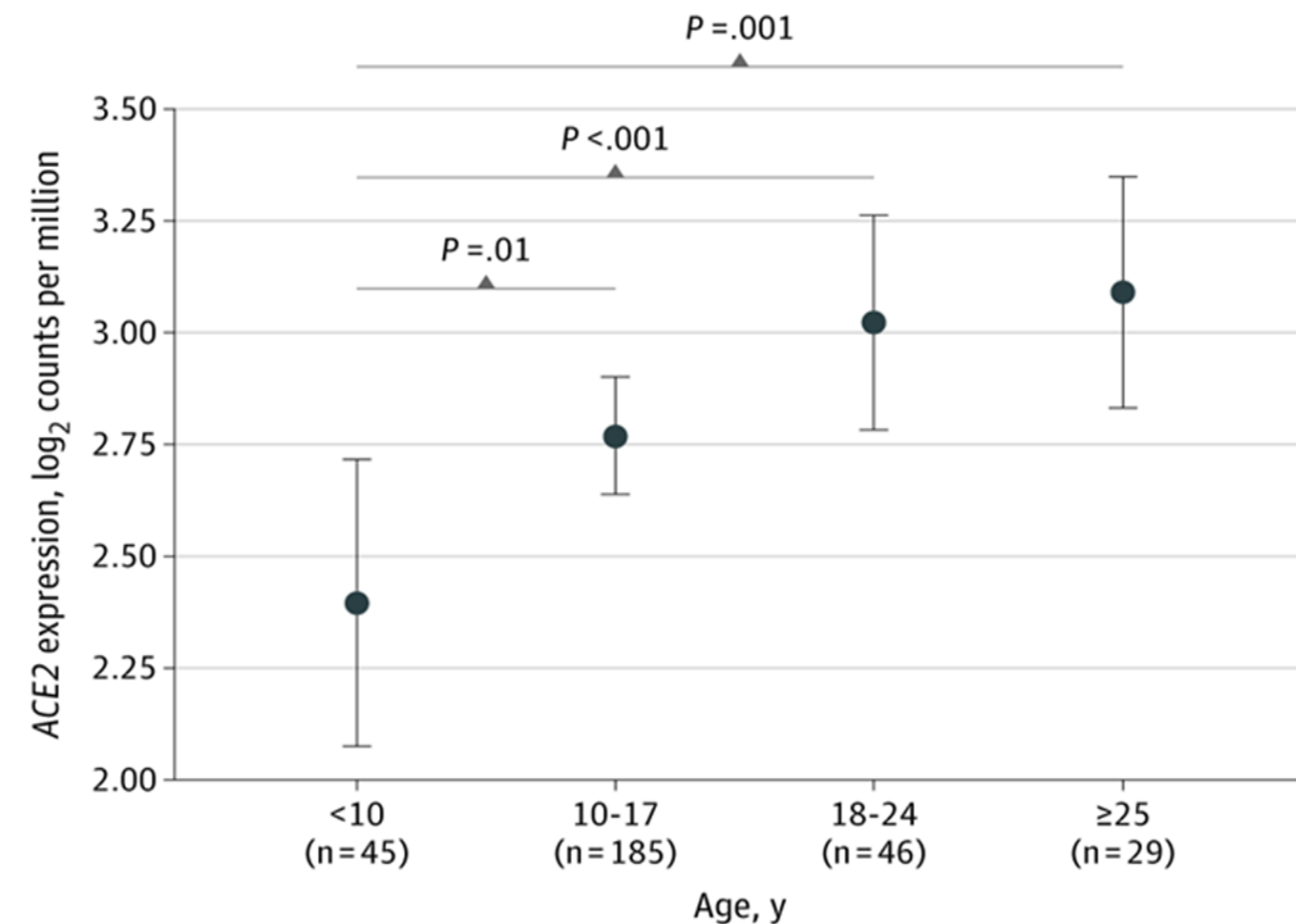


# COVID-19



# Infographic Style

COVID-19



Children account for less than 2% of identified cases of coronavirus disease 2019 (COVID-19) the cohort of 305 individuals aged 4 to 60 years . It is hypothesized that the lower risk among children is due to differential expression of angiotensin-converting enzyme 2 (ACE2), the receptor that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) uses for host entry.<sup>4</sup> We investigated ACE2 gene expression in the nasal epithelium of children and adults.

The study found age-dependent ACE2 gene expression in nasal epithelium (Figure). ACE2 gene expression was lowest (mean log<sub>2</sub> counts per million, 2.40; 95% CI, 2.07-2.72) in younger children (n = 45) and increased with age, with mean log<sub>2</sub> counts per million of 2.77 (95% CI, 2.64-2.90) for older children (n = 185), 3.02 (95% CI, 2.78-3.26) for young adults (n = 46), and 3.09 (95% CI, 2.83-3.35) for adults (n = 29).

A new study called Human Epidemiology and Response to SARS-CoV-2 (HEROS), funded by the National Institute of Allergy and Infectious Diseases, is designed to prospectively follow 6000 children to determine risk factors for development of COVID-19. Data from this study could help identify whether the lower ACE2 expression identified by Bunyavanich et al correlates with lower rates of SARS-CoV-2 infection, and could serve to support the possibility that decreasing ACE2 expression in the nasal epithelium may be a potential therapeutic approach to mitigate transmission of COVID-19.

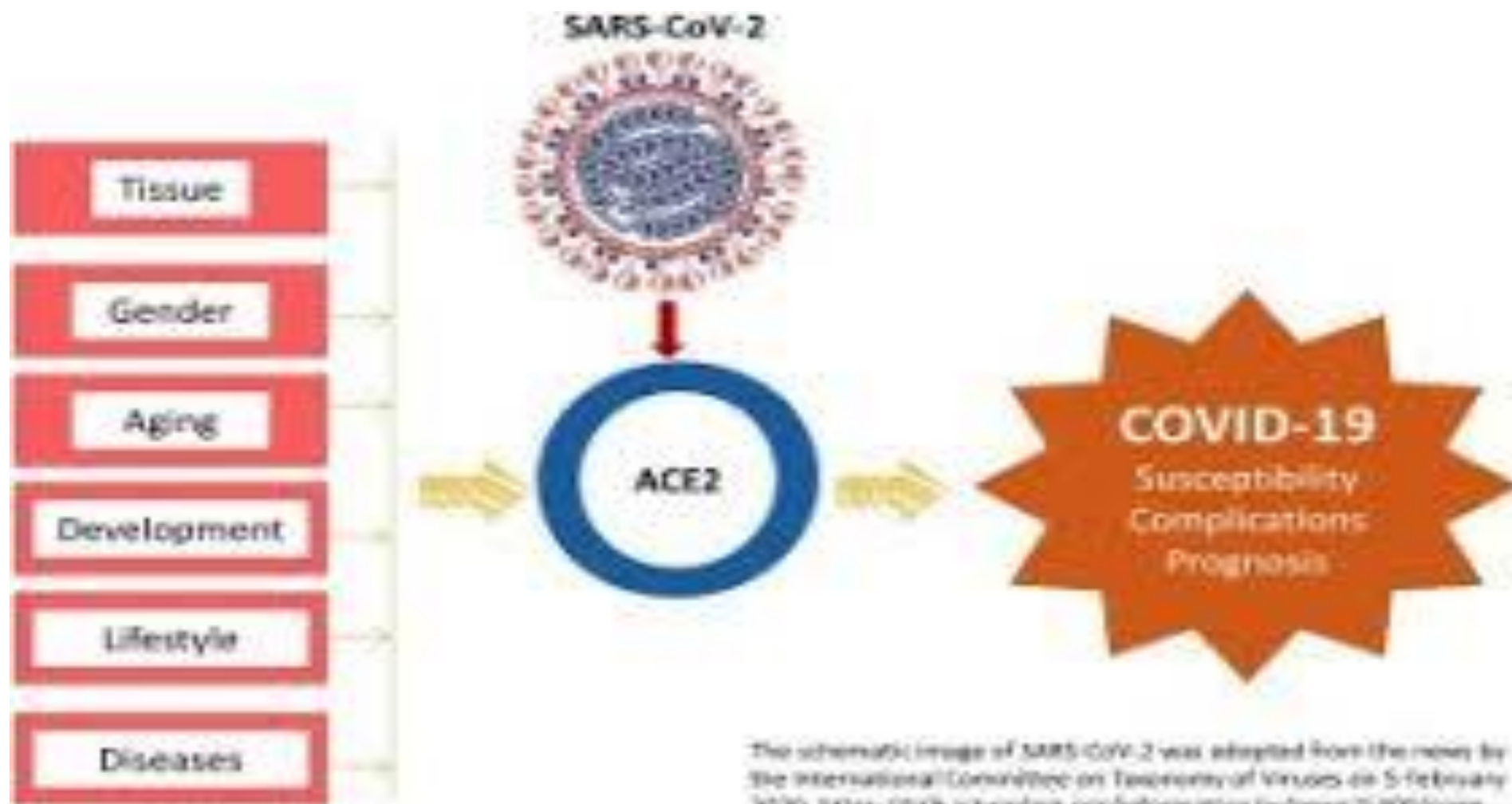


Preliminary evidence suggests that having an allergic condition paradoxically may reduce a person's susceptibility to SARS-CoV-2 infection and severe COVID-19 disease. An Institute of Allergy and Infectious Diseases (NIAID) funded study recently examined upper and lower airway cells for the expression of ACE2, the gene that codes for the receptor that the coronavirus uses to infect cells. ACE2 expression is necessary for a cell to make this receptor, but additional steps also are involved. In both children and adults, respiratory allergy, asthma and controlled allergen exposure were associated with significantly reduced ACE2 expression. The expression of ACE2 was lowest in people with high levels of both asthma and sensitivity to allergens.



The HEROS study will further clarify whether reduced ACE2 gene expression in airway cells of children with allergic diseases correlates with a lower rate of SARS-CoV-2 infection and COVID-19.





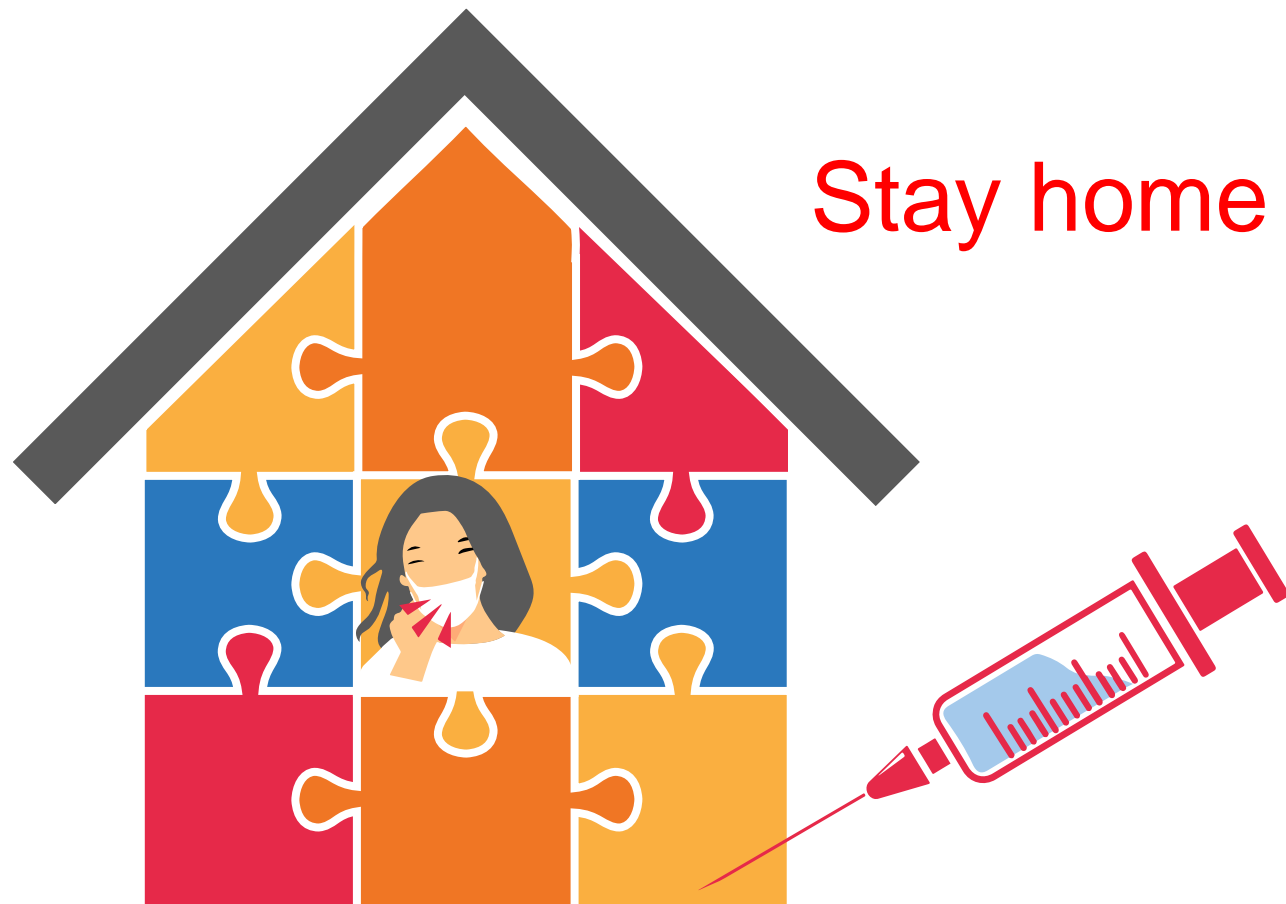
The schematic image of SARS-CoV-2 was adopted from the news by the International Committee on Taxonomy of Viruses on 5 February 2020, <https://talk.ictvonline.org/information/tw/news/5190/page>



**Must  
have**



very small percentage of children—usually with underlying health conditions—can get very sick right after contracting COVID-19.



Stay home

Stay safe

**PANDEMIC**

COVID-19

“

THANK YOU

”



COVID-19

**PANDEMIC**