COVID-19

Weekly Science Review
September 19-25

This weekly science review is a snapshot of the new and emerging scientific evidence related to COVID-19 during the period specified. It is a review of important topics and articles, not a guide for policy or program implementation. The findings captured are subject to change as new information is made available. We welcome comments and feedback at **covid19-eiu@vitalstrategies.org**.

IN-DEPTH

COVID-19 vaccine prioritization in the U.S.

Main message: With the initial rollout of a COVID-19 vaccine anticipated in the coming months, groups are suggesting frameworks for allocating vaccines to priority populations based on ethical principles until vaccines are more widely available for the population at-large. In general, with principles of fairness, equity and justice in mind, the first doses of vaccine should be allocated to people who are most at risk of being exposed to SARS-CoV-2, the virus that causes COVID-19, (e.g., front-line health care personnel), those most likely to spread the disease to vulnerable people (e.g., nursing home workers) and those who are at highest risk of serious illness or death if they become ill (e.g., elderly people or those with underlying health conditions). The aim of any framework should be to promote the common good through public health; the framework should be guided by ethical principles and by scientific data on efficacy and safety.

With a decision about authorization or approval of a COVID-19 vaccine possibly only weeks away, several organizations have taken on the important task of aiding policymakers in determining an ethical, equitable and effective framework for how to allocate vaccines in the United States. Although it is expected that there will be enough vaccine (possibly from different vaccine manufacturers) to deliver to the entire U.S. population at some point in 2021 and onward, an allocation framework is necessary to determine who should be prioritized to receive the first available doses when supply may be limited. It's also important to note that we do not yet know if one or more vaccines will be safe and effective, whether vaccines will be equally effective for all groups (e.g., some vaccines may be less effective in the elderly, as occurs with other vaccines), and how long immunity will last.

So far, domestic allocation frameworks have been released by National Academies of Science, Engineering and Medicine (NASEM), as well as the Johns Hopkins Center for Health Security (JHCHS). Along with phase 3 clinical trial data on safety and efficacy in specific populations, this guidance will be taken into consideration by the Advisory Committee on Immunization Practices (ACIP), an independent advisory group made up of health experts who will then develop recommendations on how to use and allocate new COVID-19 vaccines

in the general population. These recommendations will be given to the director of the U.S. Centers for Disease Control and Prevention (CDC), who may accept them as official federal guidance for vaccine use and allocation.

National Academies of Science, Engineering and Medicine: Preliminary Framework for Equitable Allocation of COVID-19 Vaccine (2020)

The NASEM document is a discussion draft that was released on Sept. 1, 2020, specifically calling for stakeholder groups and members of the public to comment and provide input for further deliberations prior to the release of a final report. It first reviews prior experience in the U.S. with mass vaccination campaigns such as during the 2009 H1N1 influenza pandemic, and then establishes guiding principles on how to approach vaccine allocation during this current pandemic. Guiding foundational principles that are further elaborated on in the document are as follows: maximization of benefit, equal regard, mitigation of health inequities, fairness, evidence-based action and transparency.

The group then establishes risk-based criteria for how vaccines should be allocated after defining ranked tiers of prioritization and phases for allocation. The four criteria considered for estimating risk include risk of acquiring infection, and, if infected, risk of severe morbidity and mortality, risk of negative social impact, and risk of transmitting disease to others. Taking groups at higher risk into consideration, and also accounting for mitigating factors that could reduce risk, they develop their phased allocation criteria. With foundational principles and risk in mind, the following draft allocation phases are recommended by NASEM:

Table 1: Applying allocation criteria to specific population groups

Phases	Population Group	Estimate % of US population)	Criterion 1: Risk of Acquiring Infection	Criterion 2: Risk of Severe Morbidity and Mortality	Criterion 3: Risk of Negative Societal Impact	Criterion 4: Risk of Transmitting Infection to Others	Mitigating Factors for Consideration
1a	High-risk workers in health care (5%)	5%	High	Medium	High	High	High risk of acquiring infection due to no choice in setting but may have access to personal protective equipment. Essential to protecting the health care system.
1a	First responders		High	Medium	High	High	High risk of acquiring infection due to no choice in setting but may have access to personal protective equipment. Essential to protecting the health care system.
1b	People with significant comorbid conditions	10%	Medium	High	Medium	Low	High risk of severe morbidity and mortality but may be able to socially distance and isolate.
1b	Older adults in congregate or overcrowded settings		High	High	Low	Low	High risk of infection due to lack of choice in setting.
2	Critical risk workers – part 1 as defined in NASEM document	30-35%	High	Medium	High	Medium	High risk of acquiring infection due to no choice in setting but may have access to personal protective equipment.

Phases	Population Group	Estimate % of US population)	Criterion 1: Risk of Acquiring Infection	Criterion 2: Risk of Severe Morbidity and Mortality	Criterion 3: Risk of Negative Societal Impact	Criterion 4: Risk of Transmitting Infection to Others	Mitigating Factors for Consideration
2	Teachers and school staff		High	Medium	High	High	High risk of loss to an essential service but there are alternative choices such as online schooling (lower grades should be given priority).
2	People with moderate comorbid conditions		Medium	Medium	Medium	Low	Moderate risk of severe morbidity and mortality, but may be able to socially distance and isolate.
2	All older adults		Medium	High	Low	Low	High risk of severe morbidity and mortality, but may be able to socially distance and isolate.
2	People in homeless shelters of group homes		High	High	Low	High	High risk of acquiring infection due to no choice in setting.
2	Incarcerated/ detained people and staff		High	Medium	Low	Medium	High risk of acquiring infection due to no choice in setting.
3	Young adults	40-45%	High	Low	Medium	High	Low risk of severe morbidity and mortality, but may be able to socially distance/ isolate/close bars etc.
3	Children		Medium	Low	Medium	High	Low risk of severe morbidity and mortality.
3	Critical risk workers – part 2 as defined in NASEM document		Medium	Low	Medium	Low	Moderate risk of infection due to lack of choice in setting.

Adapted from Draft Table 2 – Applying the Allocation Criteria to Specific Population Groups, National Academies of Science, Engineering and Medicine.

It is not necessary that these phases occur in sequence, and depending on the availability of vaccine supply, phases 1 and 2 may occur simultaneously. Phase 3 is expected to start once there is additional data on specific populations such as children and greater availability of vaccines. Phase 4, which is not included in the special populations table, refers to anyone in the general population who did not receive a vaccine during the prior three phases. It is estimated that about 85% to 95% of the U.S. population would be vaccinated during phases 1-3 over the course of 12-18 months once initial vaccine doses are available. **In its draft document**, NASEM provides further justification and rationale for this prioritization, and also estimates the amount of vaccine necessary to cover each of these populations.

NASEM emphasizes that ensuring equity should be a crosscutting consideration in each phase of allocation, and should take into account **social vulnerability as defined by the CDC**.

Johns Hopkins Center for Health Security: Interim Framework for COVID-19 Vaccine Allocation and Distribution in the United States

The document released by the Johns Hopkins Center for Health Security on Aug. 19 has a similar approach to the allocation framework as NASEM. It aims to promote public health as a common good through ethical principles of fairness, equity, and recognition of racial and ethnic disparities, and by considering the role of workers in essential sectors who pave the path toward normalizing social and economic activity. The Center emphasizes that this allocation framework is relevant when COVID-19 vaccine supply is scarce. Though it aims to maximize overall benefits to the entire population as a part of this process, it focuses on justice, fairness and the advancement of social equity. Another point emphasized in this framework is promoting legitimacy and trust by respecting a diversity of views from across the U.S. population.

This framework also ranks priority groups into tiers with the goal of first allocating vaccines to people essential to sustaining the ongoing COVID-19 response, those at greatest risk of a poor outcome if they become infected, and workers in the most essential sectors, including food supply workers, public transportation workers and teachers. The next tier includes people involved in other aspects of health care, those who may have limitations in access to care, and those who play a supporting role in essential sectors that are not included in the first tier. Additional factors to consider include how effective a vaccine may be in a particular special population, how each special population may be integrated into the larger community, whether or not it is feasible to reach a special population with enough vaccination to reduce transmission, and if prioritizing one group over another may result in more effective vaccination and slowing of transmission overall. On this point, **some groups have modeled allocation and prioritization in a way that would reduce transmission and deaths most efficiently** by targeting those who play the largest role in transmission (by their analysis, adults 29-49 years) and those who are most at risk for death (by their analysis, adults over 60 years).

Table 2: COVID-19 vaccine priority group comparison

Group	Johns Hopkins Center for Health Security	National Academies of Science, Engineering and Medicine
Health care personnel	Tier 1: Front-line health care personnel including long term care facility providers; emergency medical services staff Tier 2: Health care personnel and staff with direct contact with non-COVID patients; pharmacy workers	Phase 1a: Front-line health care personnel including long term care facility providers; emergency medical services staff Phase 2: Other health care personnel
Other essential workers	Tier 1: Public transport, food supply workers, **teachers and school workers**. Workers necessary for pandemic support: e.g. vaccine manufacturers; public health workers/support Tier 2: Front-line infrastructure; warehouse/delivery/ postal; deployed military; **police and fire**; TSA and border security; high-density or high-contact jobs	Phase 1a: **Police, fire** Phase 2: Critical infrastructure at risk of exposure; **teachers and school staff** including child care workers
Underlying medical conditions	Tier 1: Those with elevated risk of serious disease; members of social groups experiencing disproportionately high fatality rates	Phase 1b: Significantly higher risk (>= 2 CDC designated conditions) Phase 2: Moderately higher risk (1 CDC condition)
Adults >= 65 years of age	Tier: Adults >= 65 years including those living with or providing care to them	Phase 1b: Older adults in congregate settings Phase 2: All older adults not in Phase 1

Adapted from Oliver S, Overview of Vaccine Equity and Prioritization Frameworks. Advisory Committee on Immunization Practices presentation slides Sept. 22, 2020. Bold marking indicates difference in ranking between two allocation frameworks.

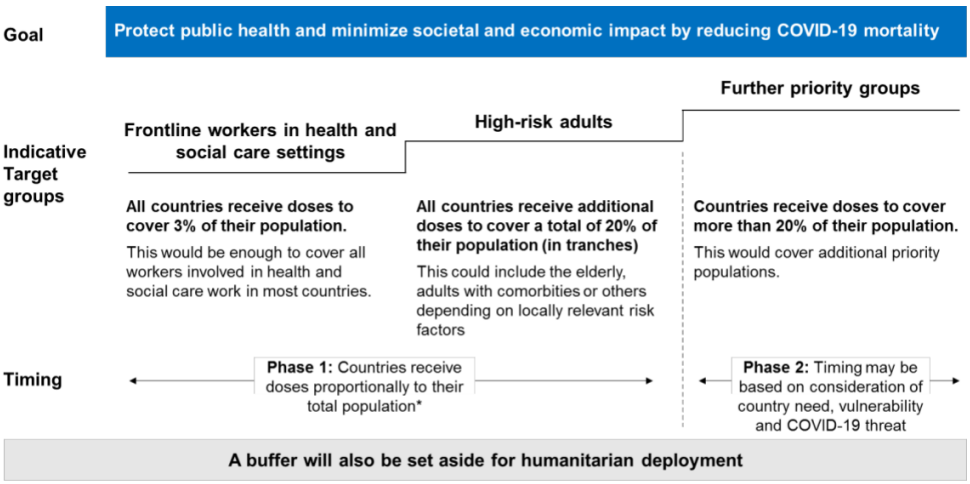
Both groups agree that there should be a national strategy to guide state and local health departments on how to implement vaccine allocation. Many unknowns have yet to be revealed, including preliminary safety and efficacy data from ongoing phase 3 trials that will guide the refining of these frameworks and provide the Advisory Committee on Immunization Practices with the evidence base that it needs to make formal recommendations for vaccine allocation. Transparency in this process will be key to gaining the public's trust and confidence in any new vaccine strategy.

COVID-19 vaccine prioritization on the global scale: the COVAX Facility

Countries the world over face shared concerns about the mounting toll of COVID-19 cases and deaths as well as the compounding economic burden of the pandemic. The rapid spread of SARS-CoV-2, the virus that causes COVID-19, in under a year, shows that no country will be safe until all are. In an effort to address the global challenge of vaccine development, manufacture and supply, the World Health Organization (WHO), along with the Coalition for Epidemic Preparedness Innovations (CEPI) and Gavi, the Vaccine Alliance, has launched the **COVAX Facility**, with a specific goal to produce two billion doses of COVID-19 vaccine and

distribute them equitably and fairly in 2021. COVAX aims to bring together expertise and resources across public, private and philanthropic sectors to support a portfolio of 19 vaccine candidates. As of Sept. 21, 2020, **156 countries (with more than 60% of the world's population) have committed to participate** in the facility's innovative collective fundraising and pooled financing. The COVAX Facility is the vaccines pillar of the **Access to COVID-19 Tools (ACT) Accelerator**, and catalyzing development and ramping up production of proven vaccines are key elements of the facility. But the COVAX partners have recognized that even with this support, initial supplies of the first vaccines that prove effective will be limited. They have also deliberately prioritized ensuring that COVID-19 vaccines are equitably available and deployed to end the acute phase of the pandemic by the end of 2021.Earlier this month, WHO released a working version of its proposal "**Fair allocation mechanism for COVID-19 vaccines through the COVAX Facility**." The proposal calls for each country to receive enough doses to cover 20% of its population in Phase 1 of distribution, starting with an initial tranche sufficient for 3% as soon as a proven vaccine can be recommended. The 20% figure is intended to assure national health officials that they can cover high-priority groups and begin to have an impact on the epidemic. As production capacity and supplies increase, the second phase will allocate additional doses to allow countries to expand coverage progressively. In the event that supply remains severely constrained during Phase 2, allocations may be prioritized to countries depending on a transparent assessment of their need, vulnerability and COVID-19 threat level. These allocation decisions will be overseen by an Independent Allocation Validation Group and managed by WHO and Gavi through a Joint Allocation Task Force.

Figure 1: Two phases of allocation with indicative target groups as outlined in the World Health Organization's "Fair allocation mechanism for COVID-19 vaccines through the COVAX Facility."



*The fundamental principle applies that all countries receive doses at the same rate to the extent possible, notwithstanding likely practical limitations to be further worked out (e.g. minimum delivery volumes)

WHO's global policies on immunizations and vaccines are supported by the **Strategic Advisory Group of Experts (SAGE) on Immunization**. SAGE has endorsed a "**Values Framework for the Allocation and Prioritization of COVID-19 Vaccination**" to guide decision-making both between and within countries. With an overall goal of deploying COVID-19 vaccines as a global public good and contributing to equitable protection of all the world's people, the framework lays out 12 specific objectives organized around six core principles (see table below). The objectives will be refined based on the specific properties of an effective vaccine or vaccines. National officials will have autonomy and flexibility to decide which groups to target as sequential shipments arrive. But the framework proposes that all countries prioritize people at significant risk of being infected (including front-line health workers, other essential workers unable to physically distance, and groups living in high-density settings and multigenerational housing) and people at high risk of severe or fatal disease (such as older adults, people with comorbidities, and people in sociodemographic

groups that are at higher risk). In addition, the facility also calls for the creation of a reserve or buffer stock to be set aside for humanitarian situations, deployments and other emergencies.

Table 3: World Health Organization Strategic Advisory Group of Experts on Immunization "Values Framework for the Allocation and Prioritization of COVID-19 Vaccination"

Goal Statement

COVID-19 vaccines must be a global public good. The overarching goal is for COVID-19 vaccines to contribute significantly to the equitable protection and promotion of human well-being among all people of the world.

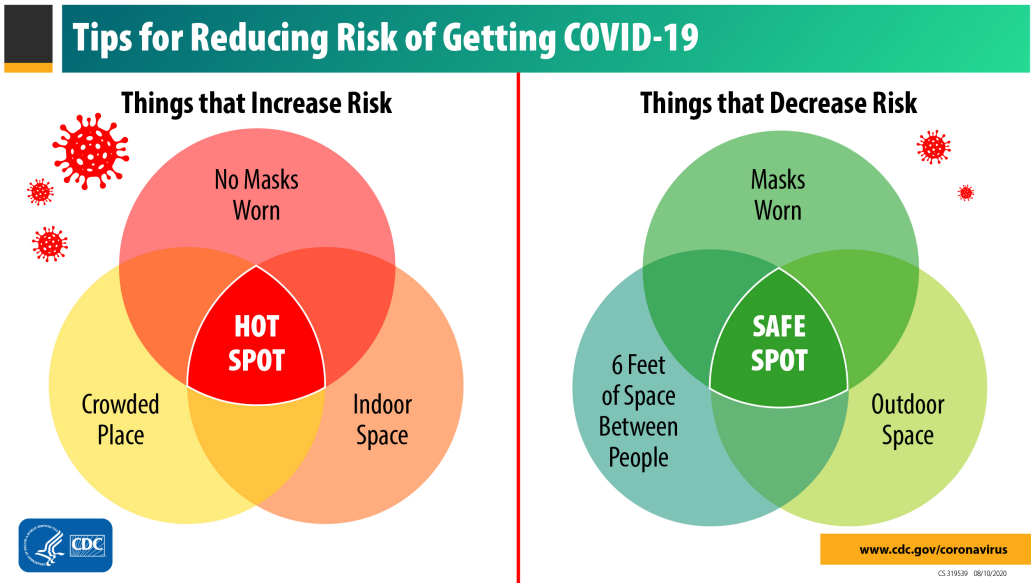
Principles	Objectives
Human Well-Being	• Reduce deaths and disease burden from the COVID-19 pandemic; • Reduce societal and economic disruption by containing transmission, reducing severe disease and death, or a combination of these strategies; • Protect the continuing functioning of essential services, including health services.
Equal Respect	• Treat the interests of all individuals and groups with equal consideration as allocation and priority-setting decisions are being taken and implemented; • Offer a meaningful opportunity to be vaccinated to all individuals and groups who qualify under prioritization criteria.
Global Equity	• Ensure that vaccine allocation takes into account the special epidemic risks and needs of all countries; particularly low-and middle-income countries; • Ensure that all countries commit to meeting the needs of people living in countries that cannot secure vaccine for their populations on their own, particularly low- and middle-income countries.
National Equity	• Ensure that vaccine prioritization within countries takes into account the vulnerabilities, risks and needs of groups who, because of underlying societal, geographic or biomedical factors, are at risk of experiencing greater burdens from the COVID-19 pandemic; • Develop the immunization delivery systems and infrastructure required to ensure COVID-19 vaccines access to priority populations and take proactive action to ensure equal access to everyone who qualifies under a priority group, particularly socially disadvantaged populations.
Reciprocity	• Protect those who bear significant additional risks and burdens of COVID-19 to safeguard the welfare of others, including health and other essential workers.
Legitimacy	• Engage all countries in a transparent consultation process for determining what scientific, public health, and values criteria should be used to make decisions about vaccine allocation between countries; • Employ best available scientific evidence, expertise, and significant engagement with relevant stakeholders for vaccine prioritization between various groups within each country, using transparent, accountable, unbiased processes, to engender deserved trust in prioritization decisions.

FAQ

How can you be inside safely during cold weather?

One adaptation that many people have made this summer to keep safe from COVID-19 is to move social activities outdoors. This includes informal gatherings with friends and family, outdoor rather than indoor dining at restaurants, and even outdoor organized events. As summer turns to fall and temperatures drop across the Northern Hemisphere, many people are wondering whether social activities can continue indoors in the colder months.

With COVID-19, all activities that involve interaction with other people exist on a continuum of risk. Being outdoors is one of the three key things that **CDC identifies as reducing risk**, along with wearing masks and being more than six feet apart (see figure below). Outdoors is safer than indoors because there is greater air circulation and any virus that is expelled will likely be diluted very quickly. Indoor spaces are of greater concern given the evidence that SARS-COV-2 virus can be transmitted by **aerosol particles** that linger in the air, potentially wafting more than six feet from an infected person. While most transmission appears to occur through larger respiratory droplets when people are closer than ssix feet, it does make sense to take precautions.



As covered in a previous **science review**, indoor spaces can be made safer through the proper use of heating, ventilating and air conditioning (HVAC) systems with HEPA filters or other appropriate air filtration devices (see **guidance from the EPA**). In addition, in cities like New York, older buildings erected after the 1918 flu were actually designed so that the steam heat systems could keep rooms warm **even with windows open**. What has seemed like a design flaw to generations of New Yorkers forced to keep their windows open even in the dead of winter could be a benefit today.

Although socializing with others indoors will always be less safe than outdoors, it can be made safer by adhering to the **three Ws**: wear a mask, wash your hands, watch your distance (> six feet). Further, reducing the number of people together as well as the length of time can also be protective. Finally, it's important to consider the rate of community transmission. When the number of cases in the community and the percent of COVID-19 tests that come back positive are **high**, it is likely best to avoid being indoors with people outside of your household, regardless of precautions.

Weekly Research Highlights

Note: US CDC also publishes a COVID-19 Science Update

COVID-19 Contact Tracing in Two Counties — North Carolina, June–July 2020

(MMWR, Sept. 25)

Main message: In this study assessing local COVID-19 contact tracing implementation in North Carolina, a significant proportion of people diagnosed with COVID-19 did not report contacts or did not cooperate with contact tracing efforts. These proportions are higher than those reported from other infectious disease contact tracing efforts prior to the COVID-19 pandemic. This suggests that there may be limitations to contact tracing via telephone and that people may under-report contacts due to a social desirability bias or to avoid subjecting contacts to quarantine control measures.

- In June, Mecklenburg County (estimated population 1,110,356) confirmed 7,116 new COVID-19 cases. Among new cases, 5,514 (77%) were reached for case investigation and, of those, 2,624 (48%) reported no contacts. Among 13,401 reported contacts, 3,331 (25%) could not be reached by phone after three days of attempts and 255 (2%) declined monitoring by the health department after being reached.
- From June 15 to July 12, Randolph County (estimated population 143,667) confirmed 589 new COVID-19 cases. Among new cases, 584 (99%) were reached for case investigation and of those, 202 (35%) reported no contacts. Among 1,146 reported contacts, 544 (47%) could not be reached by phone after three days of attempts and 50 (4%) declined monitoring by the health department after being reached.
- In total, among new COVID-19 cases, 9,815 (73%) reported contacts in Mecklenburg County and 552 (48%) reported contacts in Randolph County were reached, assessed for current symptoms, counseled to quarantine, and monitored daily by the health department.
- The median interval between specimen collection and contact notification was six days in both counties.
- High caseload during the study period may have affected contact tracing success rates and information about why people had so few contacts or why contacts were not reachable was not available.

Changing Age Distribution of the COVID-19 Pandemic — United States, May–August 2020

(MMWR early release, Sept. 23)

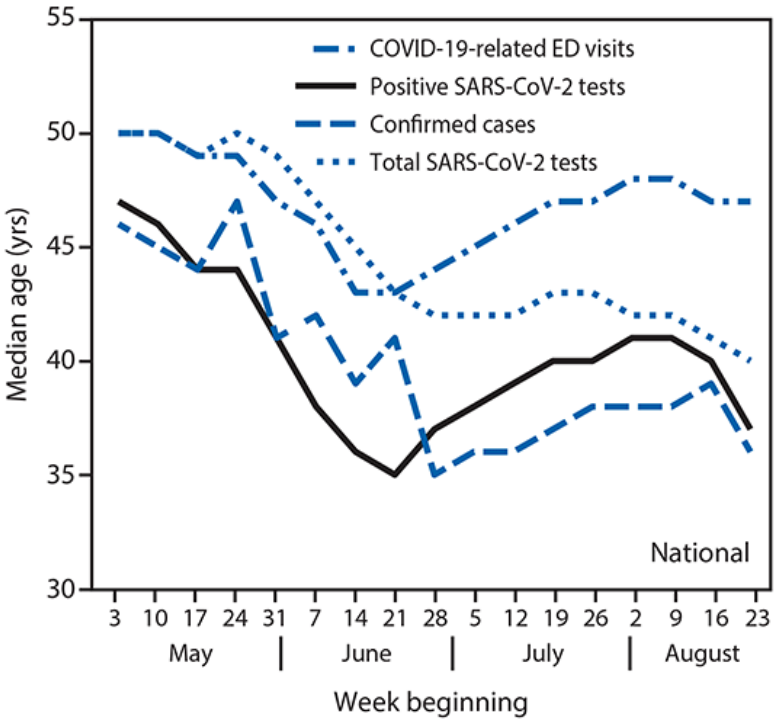
Main message: Analysis of age trends among those diagnosed with COVID-19 across the U.S. during May–August shows that median age has fallen over time. The timing of increases in test positivity rates in different age groups suggests that the increased prevalence of SARS-CoV-2 infection among young adults contributes to community transmission of COVID-19, including to people at higher risk for severe illness.

- CDC examined the changing age distribution of the COVID-19 pandemic in the United States during May–August by assessing three indicators: 1) COVID-19-like illness-related visits to emergency departments; 2) positive PCR test results for SARS-CoV-2; and 3) confirmed COVID-19 cases.
- The national incidence of confirmed COVID-19 per 100,000 persons was 185 in May, 316 in July and 275 in August. During May–July, incidence increased among persons in all age groups <80 years, with the largest increases in persons aged <30 years. During June–

August, incidence was highest among persons aged 20–29 years, who accounted for the largest proportion of total cases (>20%).

- Overall national median age trend lines for all three indicators followed similar patterns:

FIGURE 2. Weekly median age of persons with COVID-19–like illness-related emergency department (ED) visits, positive SARS-CoV-2 reverse transcription–polymerase chain reaction (RT-PCR) test results, and confirmed COVID-19 cases, and of persons for whom all SARS-CoV-2 RT-PCR tests were conducted — United States, May 3–August 29, 2020



- In the southern U.S, in June, increases in test positivity rates among people aged 20–39 years preceded a rise in test positivity rates among those aged ≥60 years.
- The decline in median age of people being tested lagged behind the decline in median age of those with positive test results, suggesting that observed age shifts were not merely the result of changes in test availability or uptake, but rather, that infection patterns drove testing result patterns. Case report data underestimate true incidence. Analyzing data at a regional level and in 20-year age groups could mask local differences and changes among smaller age cohorts (e.g. among university students).

Suggested citation: Cash-Goldwasser S, Kardooni S, Kachur SP, Cobb L, Bradford E and Shahpar C. Weekly COVID-19 Science Review September 19-25. Resolve to Save Lives. 2020 September 30. Available from **https://preventepidemics.org/coronavirus/weekly-science-review/**