COVID-19 Infection Control Lessons Learned: Moving Forward from an Informed Perspective

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September 24, 2021

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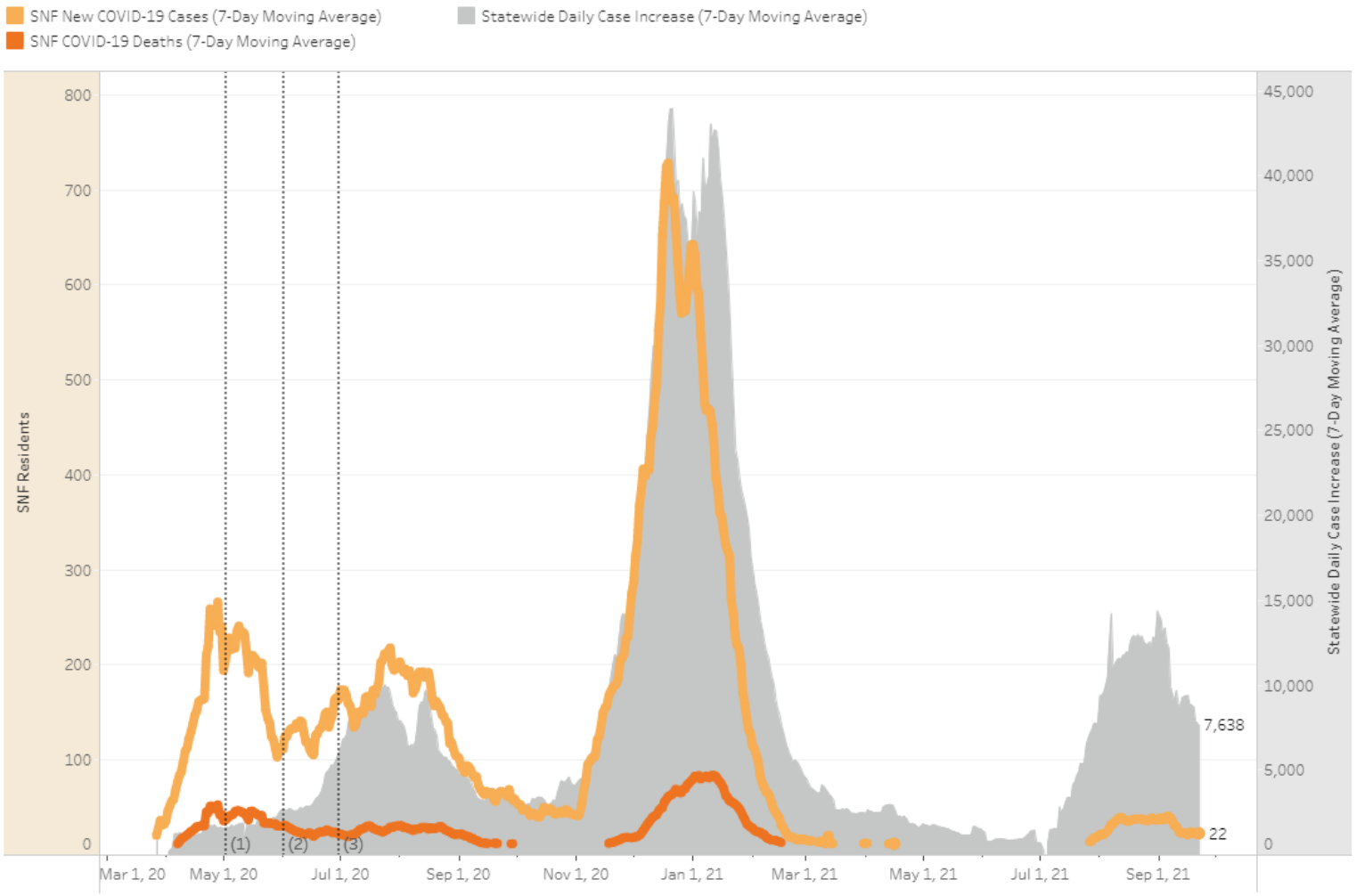
California Department of Public Health

Objectives

- Review role of Public Health
- Review of some major infection control lessons learned
  - Mode(s) of transmission of SARS-CoV-2
  - Role of ventilation in mitigation
  - Role of masks
  - Role of infection preventionists
    - CLABSIs and MDRO infections increased during the pandemic
- Communication: new lessons and old lessons re-learned
- Discuss suggestions for moving forward

COVID-19 SKILLED NURSING FACILITIES TRENDS



(1) May 2-Predictive analytics are initiated.
(2) June 1-Mitigation plans are due from all SNFs, and baseline COVID-19 testing is initiated.
(3) June 30-Baseline testing is completed.

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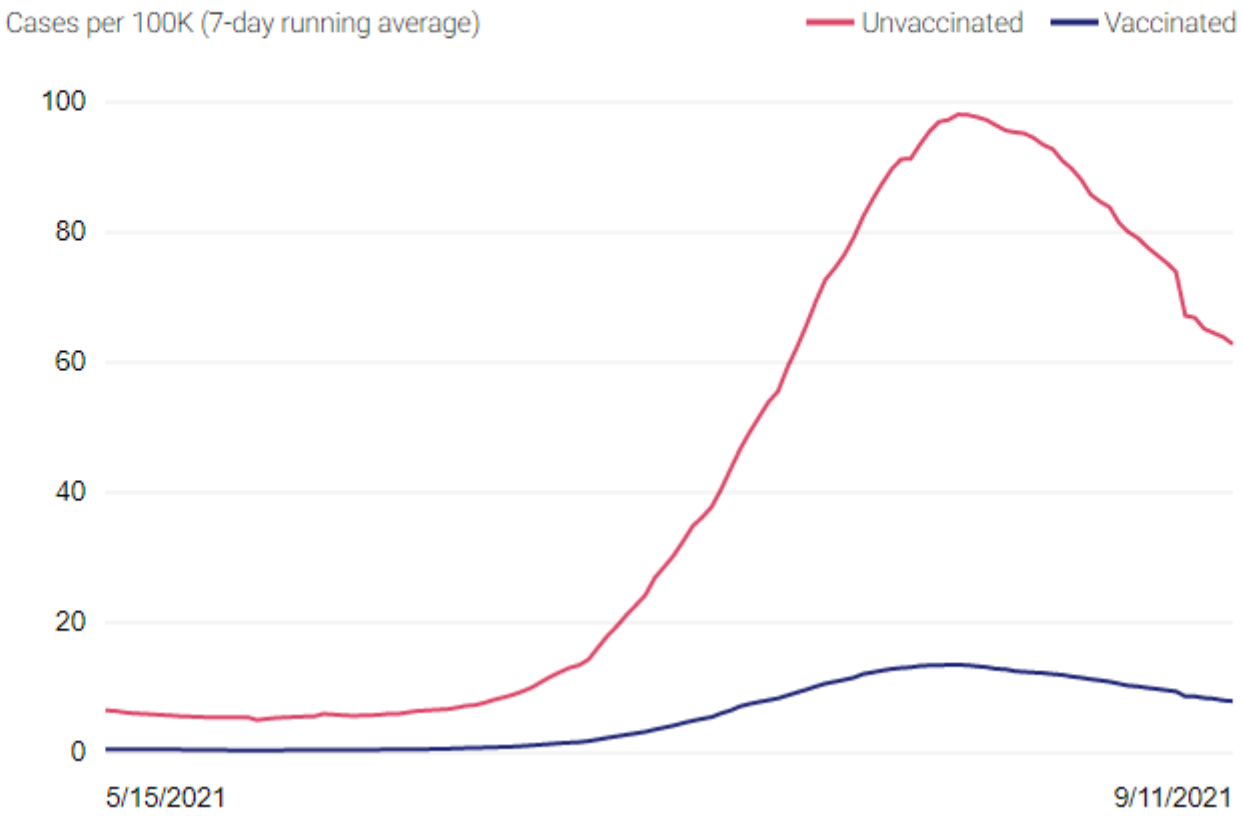
From September 5, 2021 to September 11, 2021, unvaccinated people were **7.9 times more likely** to get COVID-19 than fully vaccinated people.



69.1% of eligible Californians fully vaccinated

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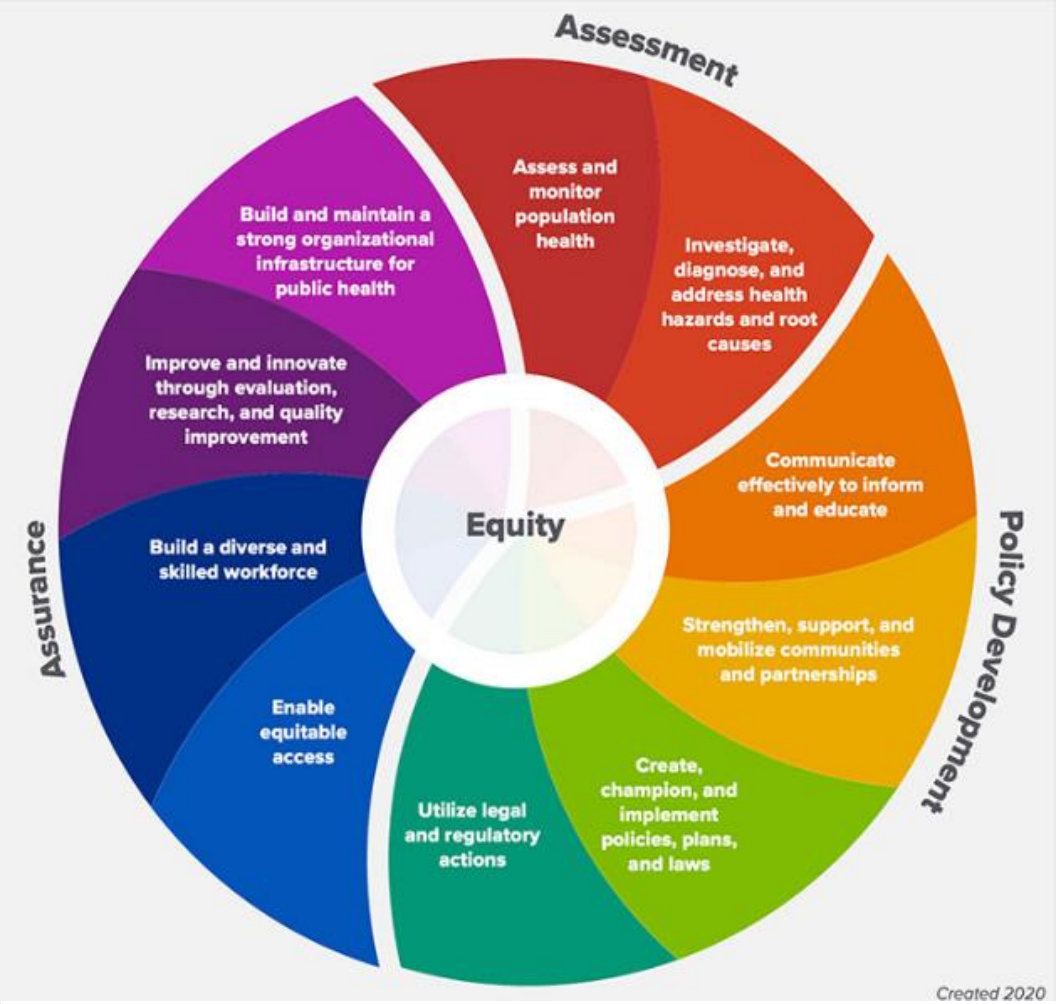
The ten essential public health services



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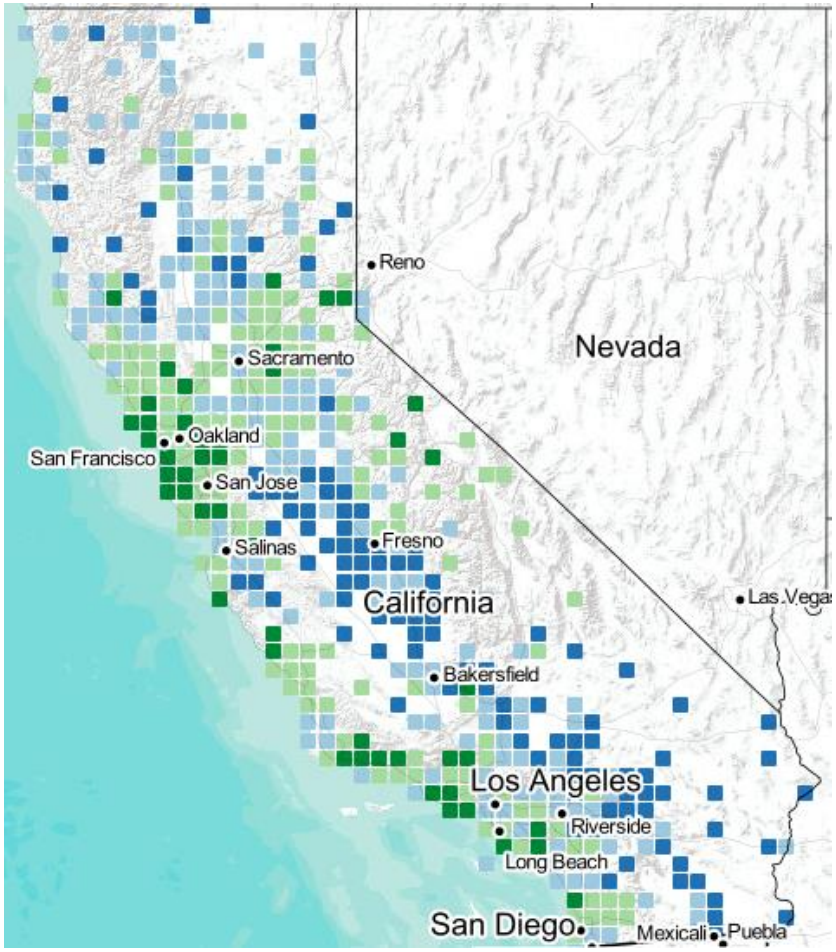
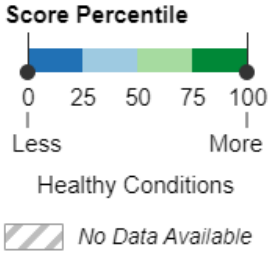
What is public health?

- The science of protecting and improving the health of people and their communities, by promoting healthy lifestyles, researching disease and injury prevention, and detecting, preventing and responding to infectious diseases. Overall, public health is concerned with protecting the health of entire populations, as small as a local neighborhood, or as large as an entire country or region of the world.
- During the pandemic, public health was responsible for resource allocation, (e.g., PPE, testing, treatment modalities, vaccine) outbreak investigation, development of guidance, data analysis and dissemination
  - Responsible for the continuum of care, the community, addressing disparities
  - Partnership with community spokespeople
- Seriously under-resourced

Healthy Places Index (HPI)



25 community characteristics combined into a single indexed HPI Score developed by the Public Health Alliance of Southern California (Alliance) in partnership with the Virginia Commonwealth University's Center on Society



https://healthyplacesindex.org/about/

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Rapid expansion of workforce, influences

- Clinical care of a new disease in vulnerable populations affected by a new easily transmissible infectious agent
- Rapid scientific advances
  - Application of scientific discoveries: need for expanding testing capacity, delivery of treatment modalities, vaccine
- Information technology to manage large volumes of data and to make rapidly changing conditions known across the state
- Contact Tracing
- Assessment of diverse community needs
- Diversity of policies and practices from state to state
- Economics
- Politics

The layered approach to preventing exposures to SARS-CoV-2

- Hand hygiene
- Physical distancing
- Wearing face masks for source control and protection
- Improvements in ventilation in buildings
- Vaccination

www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html (update 6/2/21)

MODES OF TRANSMISSION OF SARS-COV-2

Traditional concepts

- Droplet
- Contact
  - Indirect
    - Fomite: low risk; not the main route of transmission
  - Direct
- Aerosol/airborne associated with aerosol generating procedures (AGPs)

Proposed classification of aerosol transmission 2004

- Obligate
  - Under natural conditions, infection is initiated only through aerosols deposited in the distal lung
  - Tuberculosis
- Preferential
  - Naturally initiate through multiple routes, but are predominantly transmitted by aerosols deposited in distal airways
  - Measles, smallpox
- Opportunistic
  - Transmitted by airborne aerosols under certain unusual conditions

Roy CJ and Milton DK. NEJM 2004; 350:1710

Respiratory droplets and aerosols

- Important characteristics
  - While most aerosols are < 5 µm, 100 µm is the largest particle size that is suspended in air and transmitted 1-2 m and can be inhaled
  - Number and viral load of aerosols produced through various expiratory activities are much higher than those of droplet, >100:1 when speaking, >20:1 when coughing

What we have learned

We need a better understanding of the transmission pathway of respiratory viruses

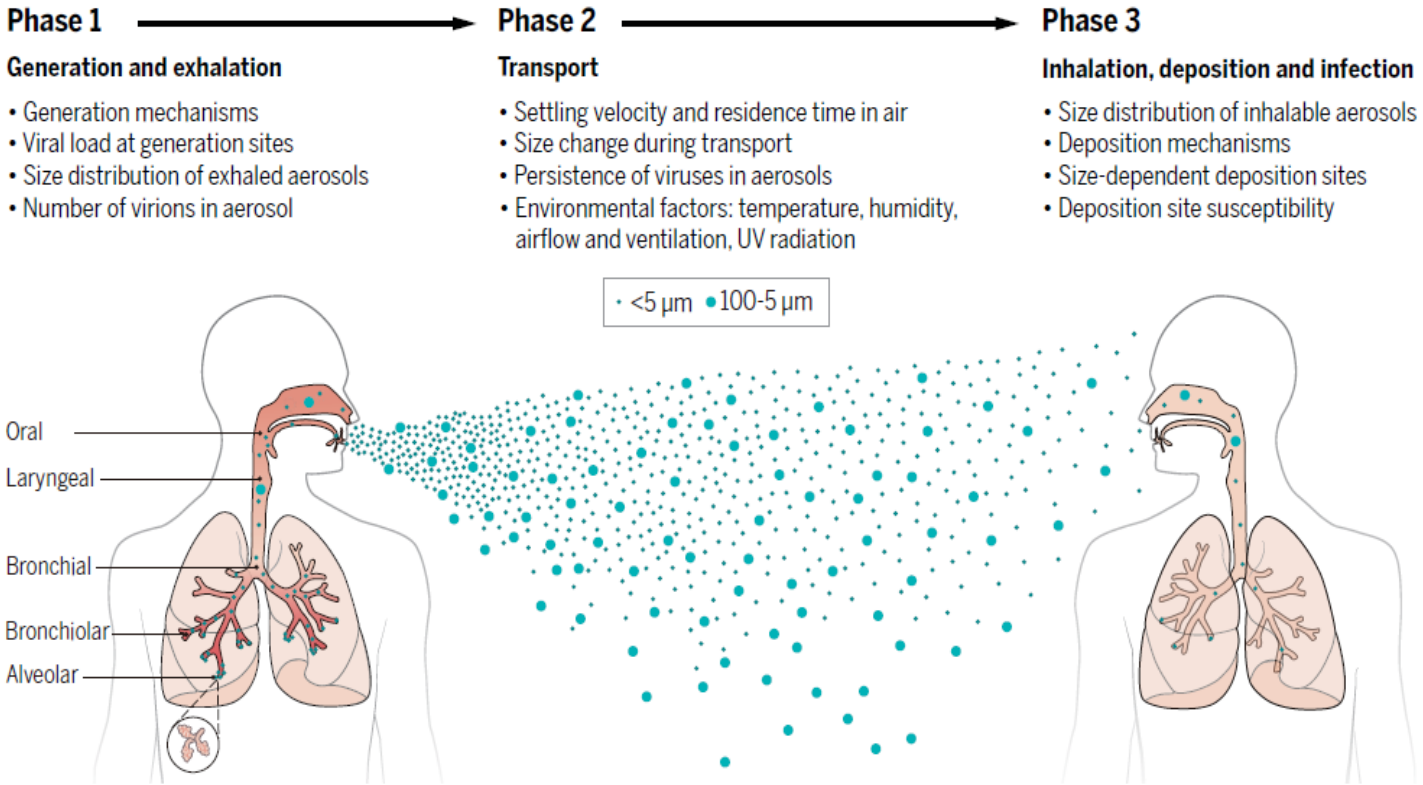

Fig. 1. Airborne transmission of respiratory viruses. Phases involved in the airborne transmission of virus-laden aerosols include (i) generation and exhalation; (ii) transport; and (iii) inhalation, deposition, and infection. Each phase is influenced by a combination of aerodynamic, anatomical, and environmental factors. (The sizes of virus-containing aerosols are not to scale.)

Wang CC. Science.8.27.2021. DOI: 10.1126/science.abd9149

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Evidence to support transmission of SARS-CoV-2 via aerosol/airborne route

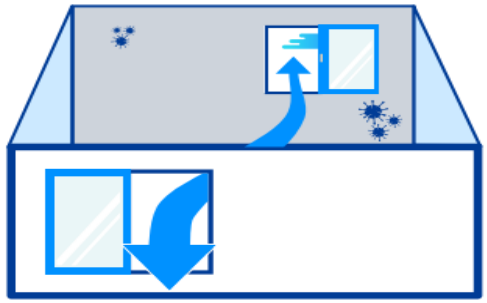
- Strong effect of ventilation on transmission
  - Only aerosols affected by changes in ventilation
- Difference between indoor and outdoor transmission for aerosols
- Transmission despite use of masks and eye protection
- High frequency of indoor super spreader events
- Animal experiments
- Airflow simulation studies

Tools to Improve Ventilation

COVID-19 & Indoor Air Quality Ventilation Tips

Wondering how you can improve indoor air quality to reduce COVID-19 transmission? Here are some simple things to consider. California employers are also required to review the **CDPH Interim Guidance for Ventilation, Filtration, and Air Quality in Indoor Environments** and become more familiar with these strategies to improve ventilation in their business under the updated **Cal/OSHA COVID-19 Prevention Emergency Temporary Standard**.

Reduce Risk by Improving Indoor Air Quality
Since indoor air quality can play a key role in the transmission of airborne viruses, Californians should follow these tips to improve their indoor air quality. In general, being outdoors is safer than being indoors when it comes to COVID-19 transmission. In poorly-ventilated indoor environments, exhaled virus particles can remain airborne and "build up," where they can be inhaled and infect others. Good ventilation helps reduce virus accumulation and transmission. Californians can improve indoor air quality by **opening doors and windows, using fans to bring fresh air inside, optimizing mechanical ventilation (or HVAC) systems**, and **using portable air cleaning devices**.



Open Doors and Windows, Use Fans to Bring Fresh Air Inside

--www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/COVID-19/Indoor-Air-Quality-Ventilation-Tips--en.pdf
--www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html

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Tools to improve ventilation

- Increase introduction of outdoor air
  - Open windows or doors
- Maintain HVAC system
  - Rebalance, change filters, optimal merv rating of filters
- Turn off any demand-controlled ventilation (DCV) controls that reduce air supply based on occupancy or temperature
- Improve central air filtration
- Ensure restroom exhaust fans are functional and operating at full capacity when the building is occupied.
- Inspect and maintain exhaust ventilation systems in areas such as kitchens, cooking areas, etc.

www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html
Updated 2/26/21

Tools to improve ventilation

- Use portable high-efficiency particulate air (HEPA) fan/filtration systems to enhance air cleaning (especially in higher risk areas
- Generate clean-to-less-clean air movement by evaluating and repositioning as necessary, the supply louvers, exhaust air grilles, and/or damper settings.
- Use of fans
  - Minimize flow directly across one person to another
    - Avoid the use of the high-speed settings
    - Use ceiling fans at low velocity and potentially in the reverse-flow direction (so that air is pulled up toward the ceiling)
    - Direct the fan discharge towards an unoccupied corner and wall spaces or up above the occupied zone.

www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html

Consider this: A paradigm shift to allign transmission routes with mechanisms

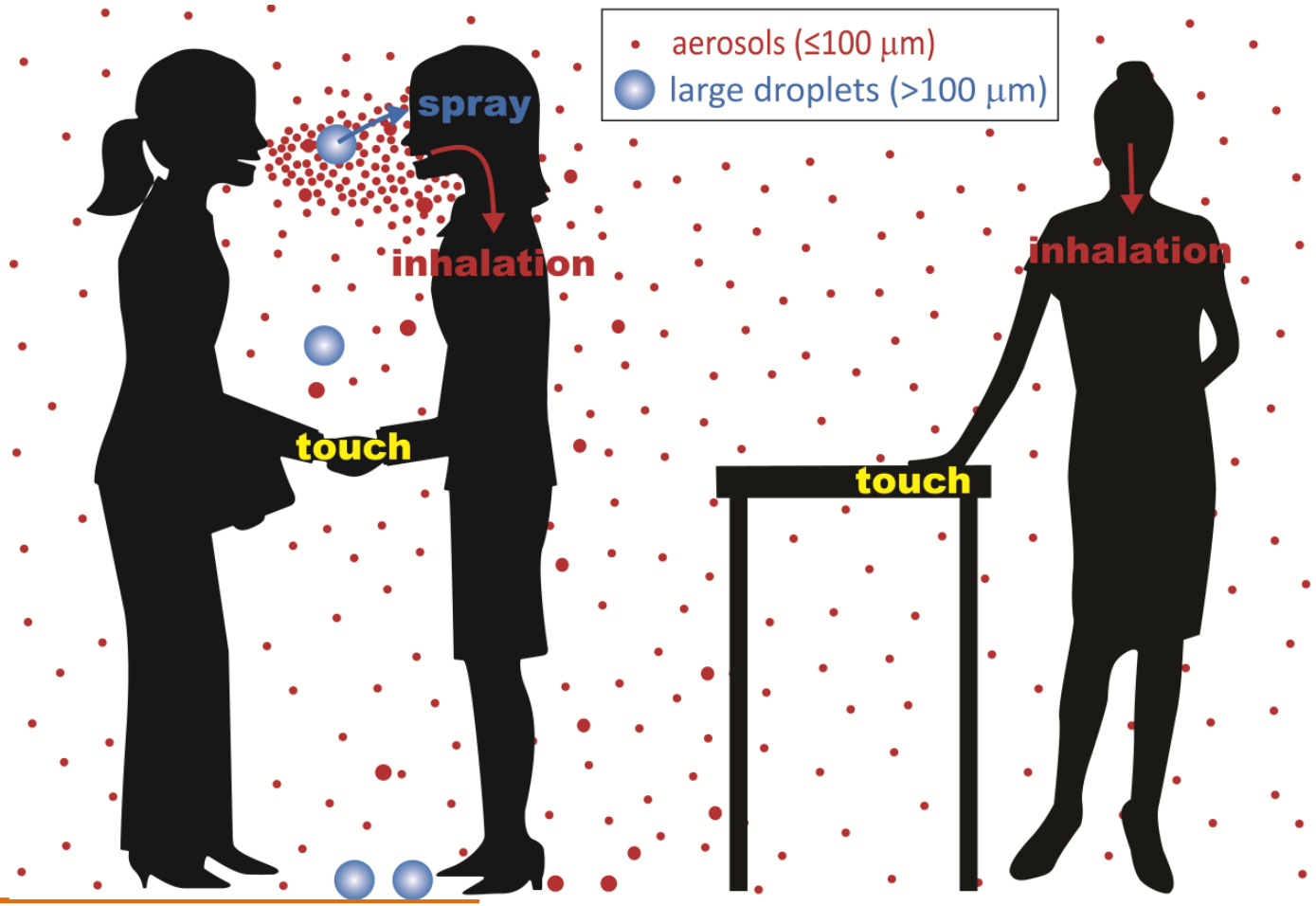
- **3 major routes of transmission**
  - **Inhalation**
    - Pathogens carried by aerosols can be directly **inhaled** into the respiratory tract and deposited at various sites, depending on the size of the aerosol.
    - Aerosols are most concentrated close to the point of release (an infected person), and the smaller ones can remain floating in the air for minutes to hours and can be carried long distances on local air currents.
    - Transmission can occur at any distance and is more likely when people are in close proximity.

Marr L.C. ahead of print. Clinical Infect Dis. 8.20.2021
https://academic.oup.com/cid/advance-article-abstract/doi/10.1093/cid/ciab722/

Paradigm Shift (cont'd)

- **Spray**
  - Pathogens in large droplets may land directly onto external mucous membranes.
  - Large droplets follow semi-ballistic trajectories and settle to the ground within a few seconds.
  - Usually, they do not travel farther than 1-2 meters, although a sneeze can propel them farther .
- **Touch**
  - A susceptible individual transfers a pathogen, usually by hand, to their mucous membranes. This may occur, for example, if the individual shakes hands with an infected person who wiped their nose or touches a contaminated object.

3 major routes of transmission



ROLE OF MASKS, FACE COVERINGS

When Do You Need Your Mask in California?

MASKS ARE RECOMMENDED for everyone in indoor public places
Due to rising COVID-19 cases and hospitalizations, California recommends everyone wear masks in indoor public places (such as grocery stores and movie theaters) regardless of vaccination status.

MASKS ARE REQUIRED for everyone who is not fully vaccinated in indoor public places
People who are not fully vaccinated[1] must wear masks in all indoor public places (such as grocery stores and movie theaters) and should wear masks in outdoor crowded settings when a region is experiencing high COVID transmission.

MASKS ARE REQUIRED for everyone in specific places like hospitals and public transit
Everyone must wear a mask on public transit (airports, planes, trains, buses, stations) and in healthcare settings, K-12 schools and childcare settings, correctional facilities, cooling centers, and shelters.

BUSINESSES MAY ASK you to wear a mask or show vaccination status
Businesses and event venues may require customers to wear masks or show vaccine status.

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Use of masks/face coverings to reduce SARS-CoV-2 transmission

- Early in the pandemic: uncertainty about the role of masks
- Many studies demonstrate benefit to reduce transmission in community and in healthcare settings with no adverse health effects for wearers
- Two functions
  - Source control to block exhaled virus
    - 80% blockage of respiratory droplets and aerosols
    - Especially important for asymptomatic or presymptomatic, unvaccinated
  - Filtration for wearer protection
    - Especially important for immunocompromised hosts

www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/masking-science-sars-cov2.html (update 5/7/21)
https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/guidance-for-face-coverings.aspx (update 7/28/21)

Impact of facemasks as source control and protection of wearer

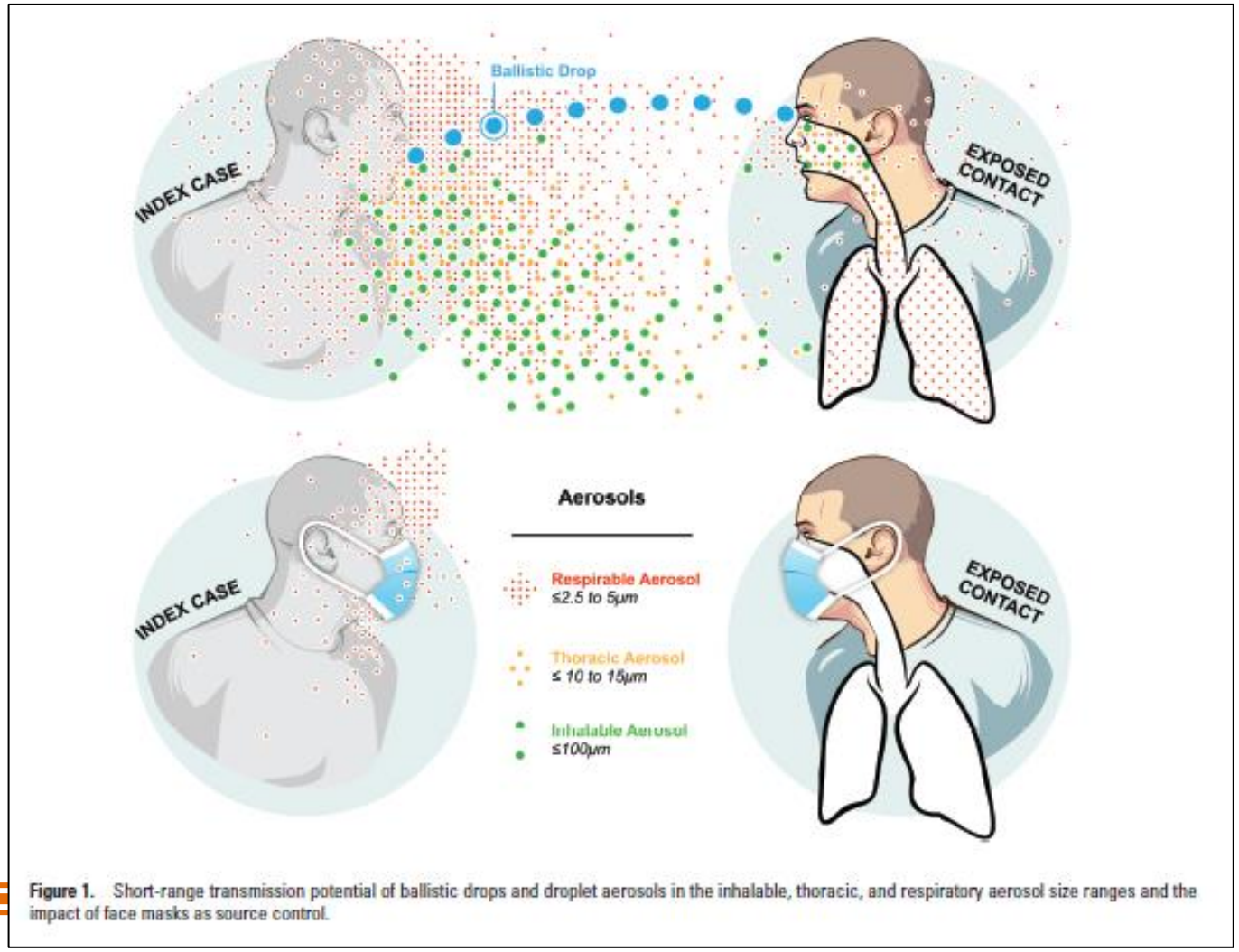


Figure 1. Short-range transmission potential of ballistic drops and droplet aerosols in the inhalable, thoracic, and respiratory aerosol size ranges and the impact of face masks as source control.

Milton DK. J Pediatr Infect Dis Soc; 2020; 413-15.

Characteristics of masks to enhance function

- Good fit and good filtration most important
- Characteristics of good cloth masks
  - Two layers of tightly woven cotton with a third layer of non-woven fabric. The third layer could be a mask filter insert, or a synthetic fabric such as polypropylene.
  - Nose wires to reduce gaps from the nose.
  - Adjustable ear loops or straps that go around the head to reduce gaps from the face.

Masking/respirators

- Double masking
  - Do not layer > 2 masks
  - Do not wear 2 procedure masks or a procedure mask over a KN95 or N95
- KN95 for source control, but not for protection of wearer
- N95 with exhalation valve acceptable
- Beware of counterfeit respirators and recalls
  - AFL 21-37: BYD recall

ROLE OF INFECTION PREVENTIONISTS (IPS)

Infection preventionist challenges

- Maintaining credibility with staff when recommendations were changing and sometimes conflicting
- PPE supply and training in proper use
- IP involvement in planning and policy making
- COVID-19 outbreak investigations
- Emotional support of staff
- Unique challenges in LTCFs
  - Baseline infection control deficiencies
  - Absence of respiratory protection programs
  - Inadequate ventilation
- Recognition of importance of IPs in LTCF
  - California mandate for 1 full time IP in each SNF as of 1/1/2021 and defining training and responsibilities (AFL 20-84, 20-85)

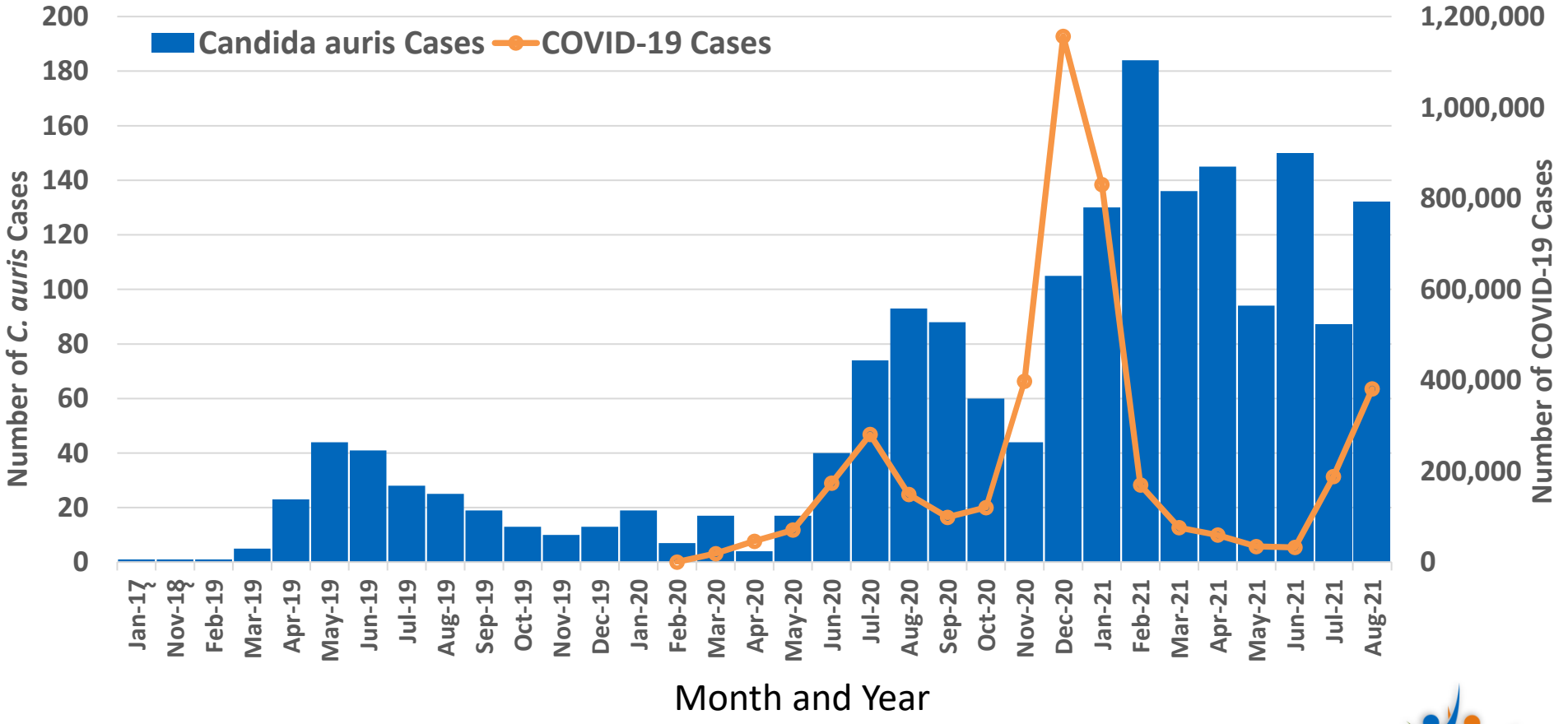
Rebmann T. AJIC 2021; 49: 1093-98

Infection preventionist challenges (cont'd.)

- Report of NHSN HAI data in ACH 2020
  - Significant increases in HAI SIRs during the pandemic
    - CLABSIs: 46% CAUTI: 19% VAE: 45%
    - MRSA bacteremia: 34%
  - Decreases in SSI, CDI
  - Contributing factors
    - Staff shortages, re-assignment to unfamiliar areas, extended use and re-use of PPE, increased patient acuity, focus of IP staff on COVID-19 related infection control
- California: resurgence of *C. auris* after initial outbreaks in 2019 had been controlled

Weiner-Lastinger LM. doi:10.1017/ice.2021.362; Palmore TN. doi:10.1017/ice.2021.377

C. auris and COVID-19 Cases in CA through August 2021



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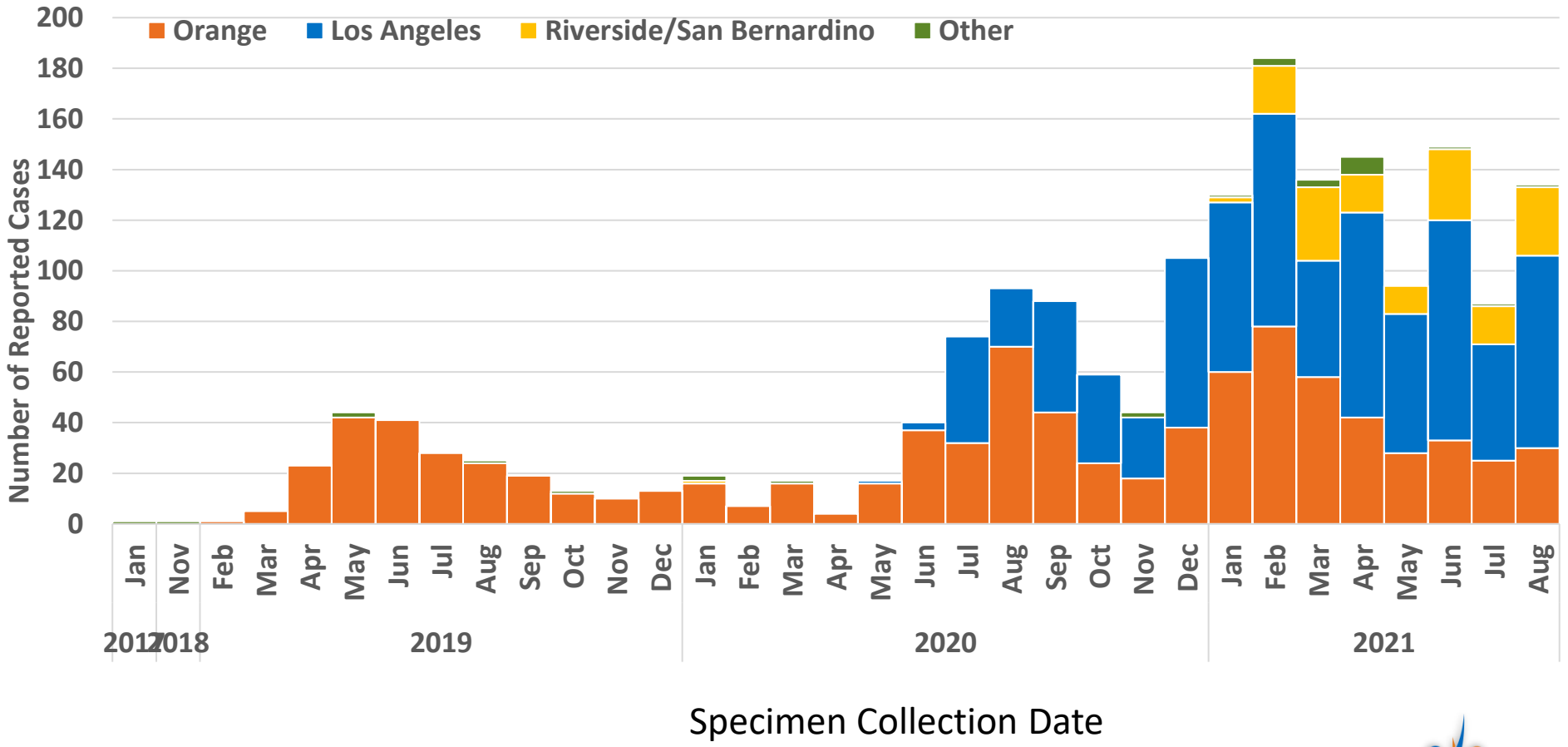
C. auris Cases Reported by LHJ through August 2021 (N=1849)



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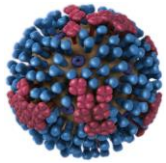
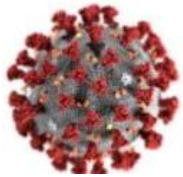
COVID-19 AND CO-CIRCULATION OF OTHER RESPIRATORY VIRUSES

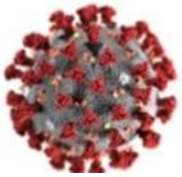




What will be different this flu season?

- Influenza seasons vary in severity from year to year, based on the characteristics of the circulating influenza virus strains and how well the vaccine matches the circulating strains
  - 1982-83 through 2017-18: Peak flu activity in the U.S. in January or later in 75% of flu seasons and in February in 58% in February or later
- Co-circulation of influenza and SARS-CoV-2 viruses has been documented
- Frequency, severity, risk factors, interactions unpredictable
  - Concern about predominance of **A(H3N2)** in the southern hemisphere 2021

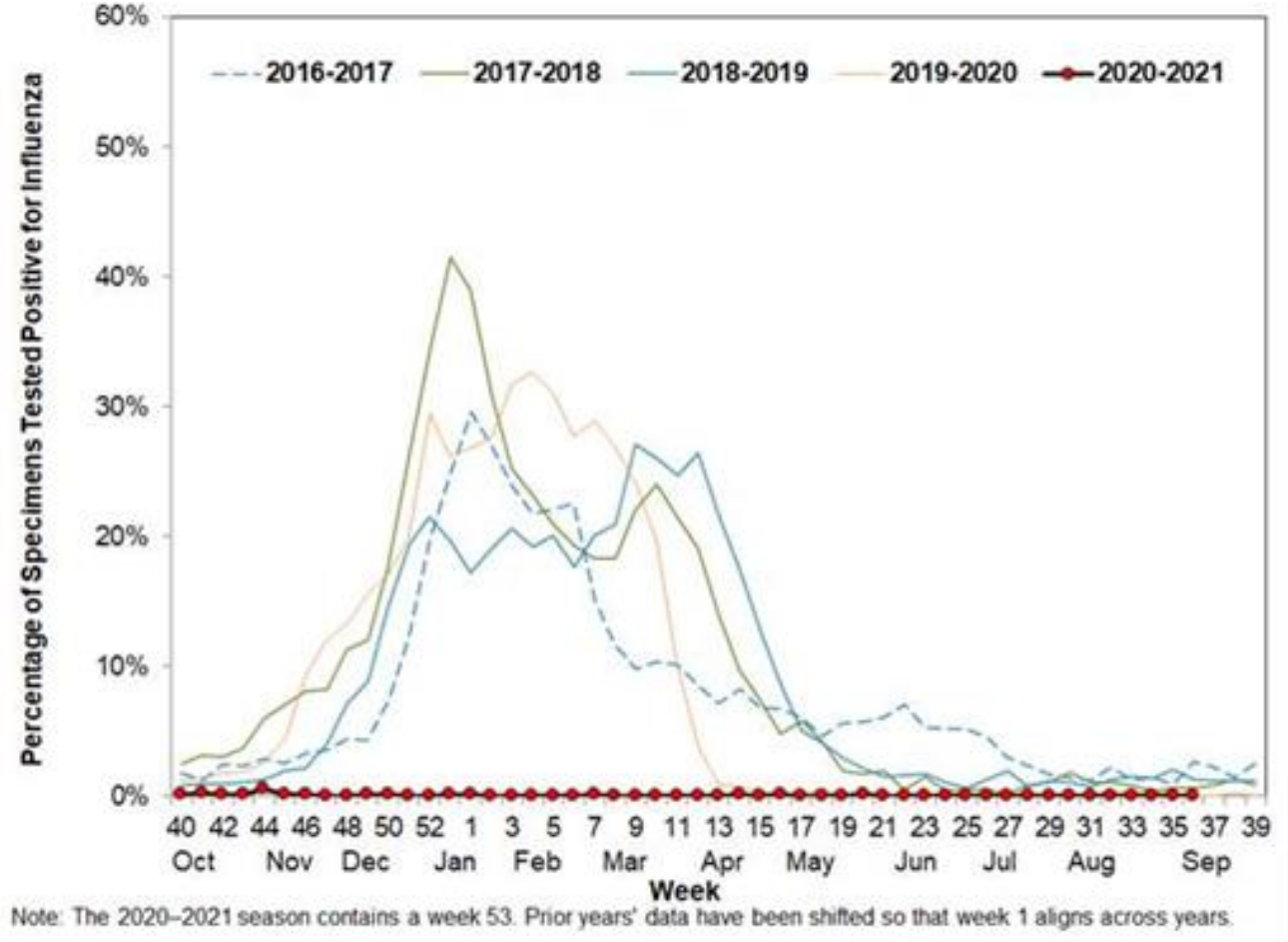
Patterns of co-circulation of influenza and SARS-CoV-2 vary in different geographic locations



- **China**: Co-infection with influenza and SARS-CoV-2 at the beginning of the pandemic was common
- **England:** Risk of death in patients with co-infection was 6 times greater than among those who tested negative for both influenza and SARS-CoV-2 and 2.3 times greater than in those with COVID-19 only
- **Southern hemisphere**(Australia, Chile, South Africa)**:** Very minimal circulation of influenza viruses was reported while SARS-CoV-2 was predominant during the 2020 influenza season

Yue H. Journal of Medical Virology, June 12, 2020, https://doi.org/10.1002/jmv.26163
Stowe J. MedRxiv preprint doi: https://doi.org/10.1101/2020.09.18.20189647. September 18, 2020.
MMWR 2020; 69 (37): 1305-9. September 18, 2020

Percentage of Specimens Tested Positive for Influenza in California (2016-2021)



Note: The 2020–2021 season contains a week 53. Prior years' data have been shifted so that week 1 aligns across years.

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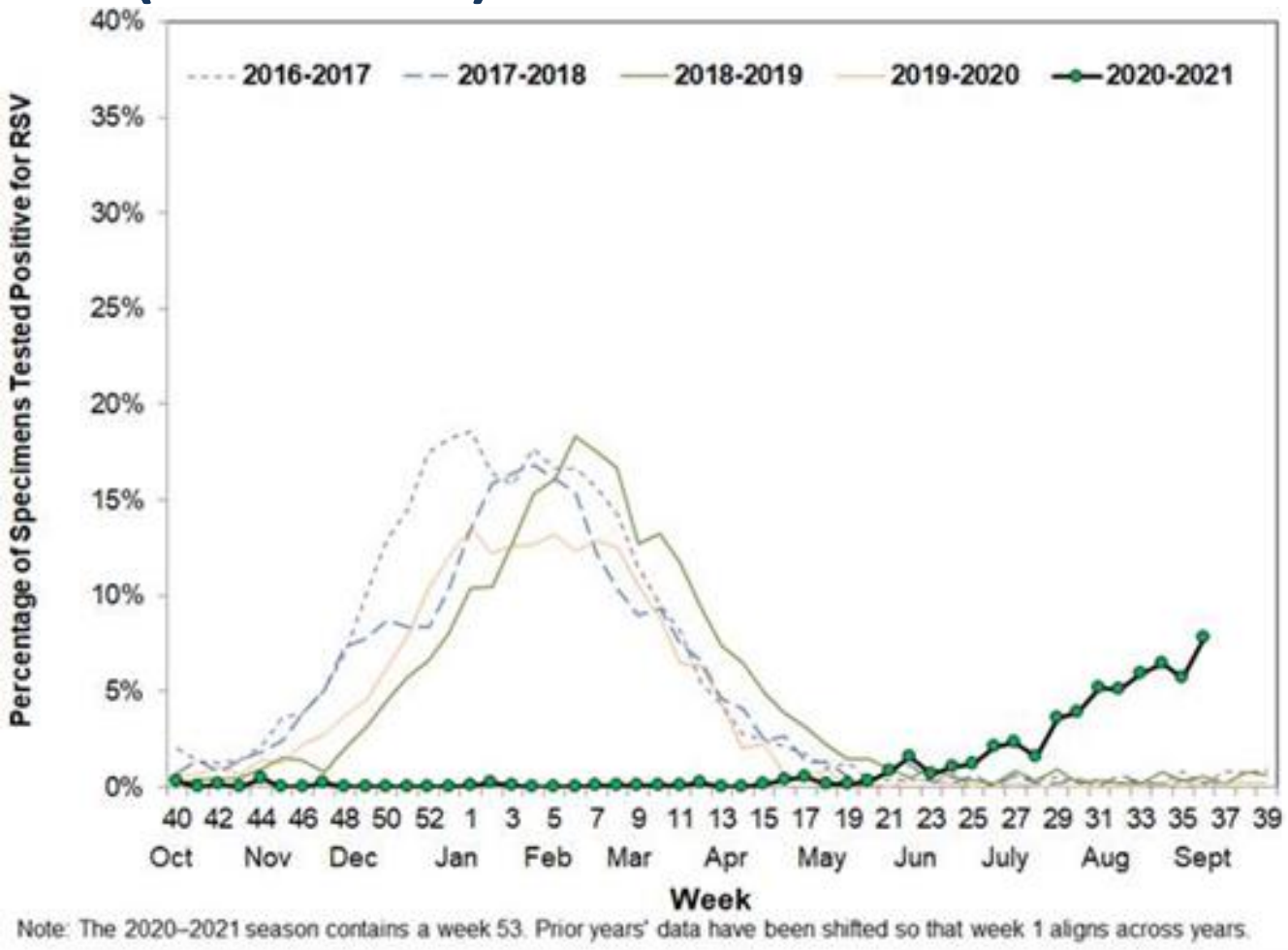
Percentage of Specimens Tested Positive for RSV in California (2016-2021)



8/18/21: CAHAN notification, palivizumab recommended
9/11/21: RSV 7.8% pos

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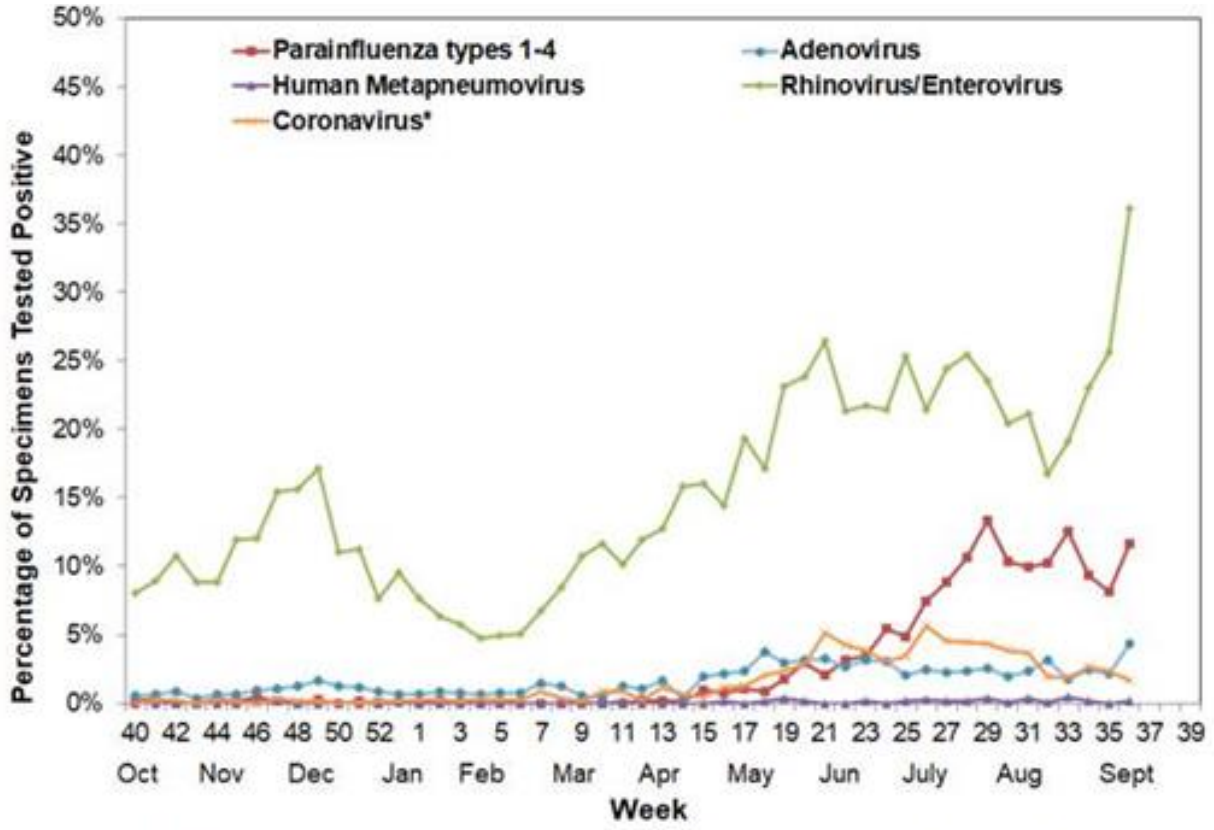
Percentage of Specimens Tested Positive for Other Respiratory Viruses in California (2020-2021)



*Coronaviruses identified include common human coronaviruses 229E, NL63, OC43, and HKU1 and do NOT include SARS-CoV-2.

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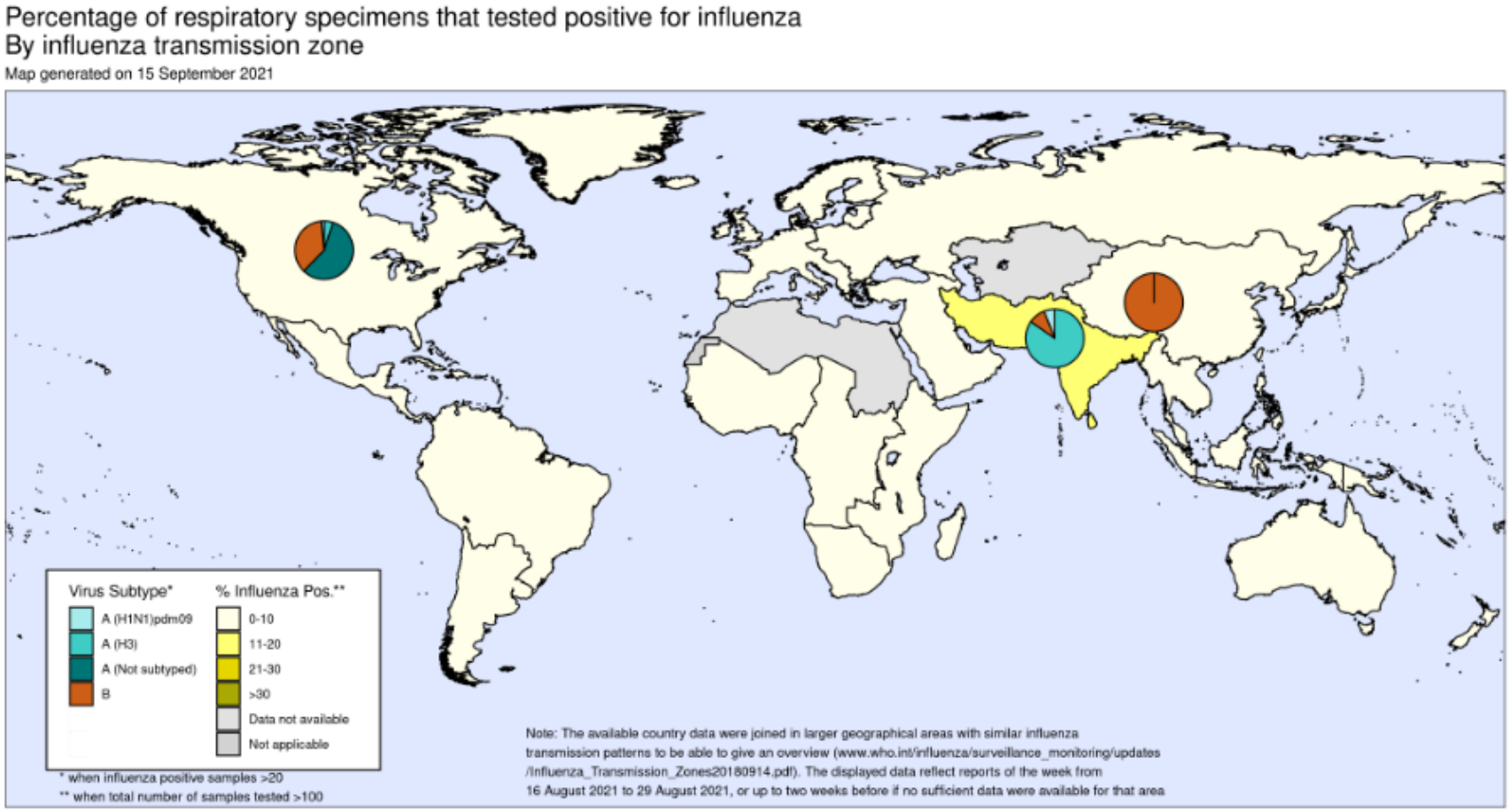
Reasons for low respiratory viral activity 2020-21

- COVID-19 mitigation measures (NPI)
  - Wearing face masks
  - Staying home
  - Hand hygiene
  - School closures
  - Reduced travel
  - Increased ventilation of indoor spaces
  - Physical distancing

- **How will SARS-CoV-2 vaccine and communities opening up affect influenza circulation????**

Influenza activity 8/16/21 - 8/29/21, WHO



Data source: Global Influenza Surveillance and Response System (GISRS), FluNet (www.who.int/flunet)

World Health Organization

https://www.who.int/teams/global-influenza-programme/surveillance-and-monitoring/influenza-updates/current-influenza-update

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COMMUNICATIONS

New communication challenges

- Target audiences: everyone
  - Patient/residents, staff, leadership, LHD, L&C
  - Varying levels of infection control knowledge
- Virtual communications, educational trainings
- Intra-facility communication with Occupational Health
- On-site assessments
- Testing
- Vaccine acceptance

Vaccinate with Confidence

CDC's Strategy to Reinforce Confidence in COVID-19 Vaccines

Build Trust

Objective: Share clear, complete, and accurate messages about COVID-19 vaccines and take visible actions to build trust in the vaccine, the vaccinator, and the system in coordination with federal, state, and local agencies and partners.

- ✓ Communicate transparently about the process for authorizing, approving, making recommendations for, monitoring the safety of, distributing, and administering COVID-19 vaccines, including data handling.
- ✓ Provide regular updates on benefits, safety, side effects and effectiveness; clearly communicate what is not known.
- ✓ Proactively address and mitigate the spread and harm of misinformation via social media platforms, partners, and trusted messengers.

Empower Healthcare Personnel

Objective: Promote confidence among healthcare personnel* in their decision to get vaccinated and to recommend vaccination to their patients.

- ✓ Engage national professional associations, health systems, and healthcare personnel often and early to ensure a clear understanding of the vaccine development and approval process, new vaccine technologies, and the benefits of vaccination.
- ✓ Ensure healthcare systems and medical practices are equipped to create a culture that builds confidence in COVID-19 vaccination.
- ✓ Strengthen the capacity of healthcare professionals to have empathetic vaccine conversations, address myths and common questions, provide tailored vaccine information to patients, and use motivational interviewing techniques when needed.

Engage Communities & Individuals

Objective: Engage communities in a sustainable, equitable and inclusive way—using two-way communication to listen, build trust, and increase collaboration.

- ✓ Empower vaccine recipients to share their personal stories and reasons for vaccination within their circles of influence.
- ✓ Work with health departments and national partners to engage communities around vaccine confidence and service delivery strategies, including adaptation of vaccination sites to meet community needs.
- ✓ Collaborate with trusted messengers—such as faith-based and community leaders—to tailor and share culturally relevant messages and materials with diverse communities.

Communication about COVID 19 vaccines

- IPs become involved in vaccine discussions, especially in LTCFs, because of the trust that has been built through guiding facilities through outbreaks.
- Let staff know how much they are valued
- Identify trusted individual who is not part of leadership, but rather "somebody like me"
  - Take into consideration job, socioeconomic factors
- Motivational interviewing techniques
- Ongoing one on one conversation
  - "No" at one time is not a final answer
- Exemptions

Harrison J. "Somebody Like Me". doi.org/10.1016/j.jamda.2021.03.012
Invest in Trust. AHRQ. (www.ahrq.gov/nursing-home/materials/prevention/vaccine-trust.html)

THE FUTURE

Amidst uncertainties, unprecedented opportunities

- **9/17/21**: Funding through CDC to strengthen and equip state, local, and territorial public health departments and other partner organizations with the resources needed to better fight infections in U.S. healthcare facilities, including COVID-19 and other known and emerging infectious diseases
  - State-based nursing home and long-term care strike teams
  - Strengthening state capacity to prevent, detect, and contain infectious disease threats across healthcare settings
  - Laboratory capacity for healthcare
  - Project Firstline
  - National Healthcare Safety Network (NHSN)
  - Antibiotic Stewardship

Opportunities

- Additional funding to healthcare partners, academic institutions, and other nonprofit partners to develop new prevention interventions and capacities for infection prevention and control training, data collection, and technical assistance

- What projects would you like to see funded?

Questions?

Contact us at,

HAIProgram@cdph.ca.gov