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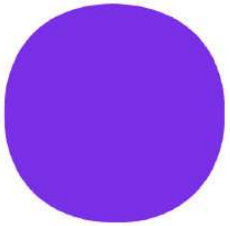
National Tribal Health Conference

Developments in Immunizations: Roundtable to Discuss Flu, RSV, and Strategies for Improving Immunization Rates in American Indian and Alaskan Native Communities

Susanna Bachle and Sagar Shah

Today's Agenda

- **INTRODUCTIONS**
- **RESPIRATORY SYNCYTIAL VIRUS (RSV):** BURDEN OF DISEASE IN ALL INFANTS
  - RSV FOCUSED GROUP DISCUSSION
- **INFLUENZA:** ESTIMATED DISEASE BURDEN, CARDIOVASCULAR RISKS, INFLUENZA VACCINE COVERAGE RATES, AND CONSIDERATIONS DURING THE COVID-19 PANDEMIC
  - INFLUENZA FOCUSED GROUP DISCUSSION
- **SHARE IDEAS & BEST PRACTICES FOR ACHIEVING HIGH IMMUNIZATION RATES**



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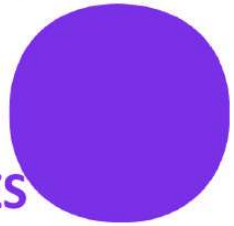
Learning Objectives:

1. UNDERSTAND THE BURDEN OF RSV IN INFANTS AND THE DISPROPORTIONATE IMPACT ON AMERICAN INDIANS AND ALASKAN NATIVES
2. SUMMARIZE THE IMPACT OF INFLUENZA IN ADULTS AND THE IMPORTANCE OF VACCINATION IN THE COVID-19 ERA
3. REVIEW DATA ON THE DISPROPORTIONATE IMPACT OF INFLUENZA ON AMERICAN INDIANS AND ALASKAN NATIVES
4. SHARE IDEAS FOR ACHIEVING HIGH IMMUNIZATION RATES AMONG AMERICAN INDIAN AND ALASKAN NATIVE COMMUNITIES



Respiratory Syncytial Virus (RSV):

Burden of Disease in All Infants

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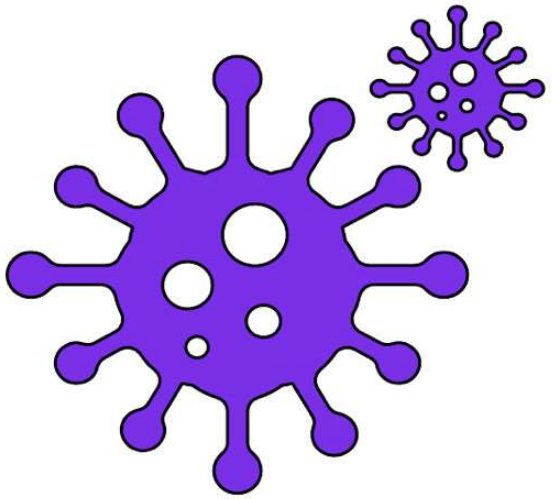
RSV Is Transmitted by Respiratory Droplets

RSV
is transmitted by respiratory droplets and considered "highly contagious"[1-3]

R_0 of 4.5
mean R_0 ranging from 1.7 to 8.2[4]



RSV, respiratory syncytial virus.

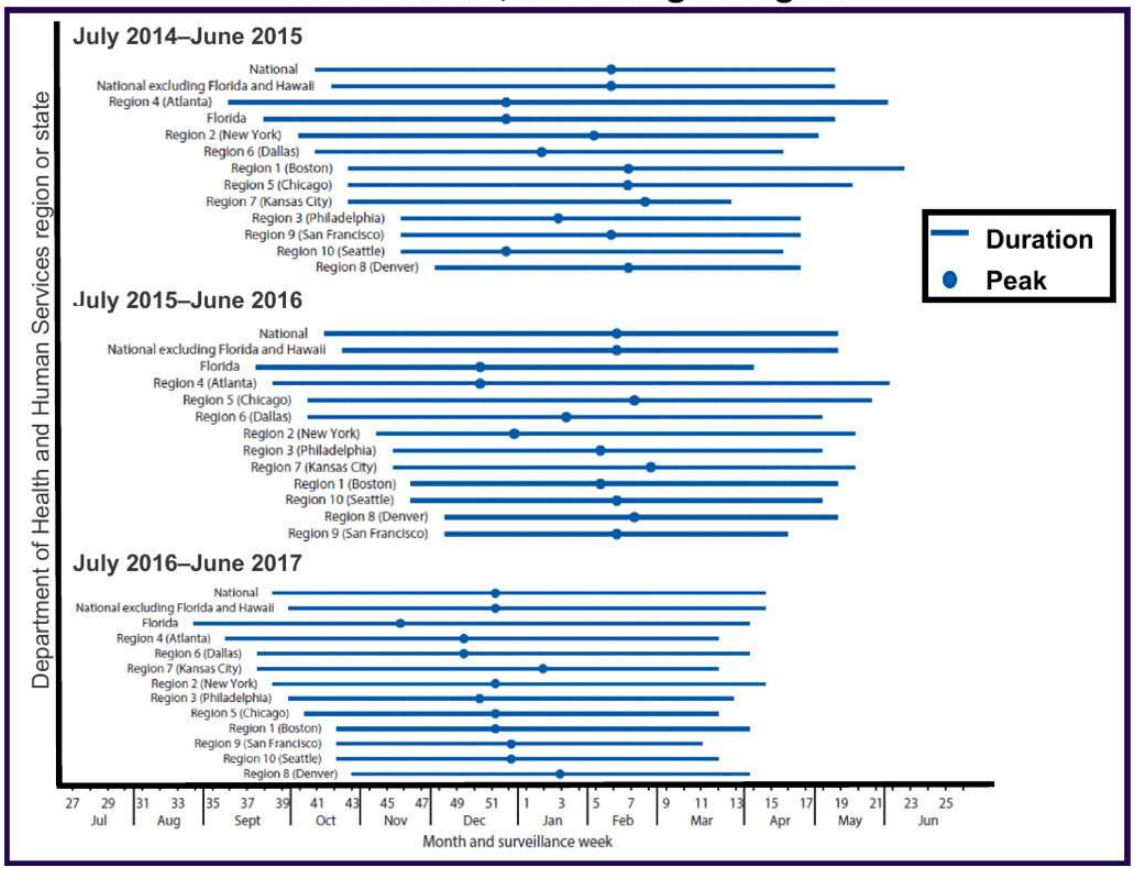
References: **1**. Heylen E, et al. Biochem Pharmacol. 2017;127:1-12. **2.** Carvajal JJ, et al. Front Immunol. 2019;10:2152. **3**. Drajac C, et al. J Immunol Res. 2017;2017:8734504. **4.** Reis J et al. Infect Dis Mod. 2018;3:23-34.

RSV Disease Seasonality

- In the US, RSV infections typically occur during late fall, winter, and early spring[1]
- Onset, offset, peak, and duration vary from season to season and by geographic region[1]
- RSV season can be longer in tropical locations such as Florida and Hawaii in the US[1,2]

"RSV seasonality data can guide diagnostic testing and inform policy decisions"[1]

RSV season, according to region[1]

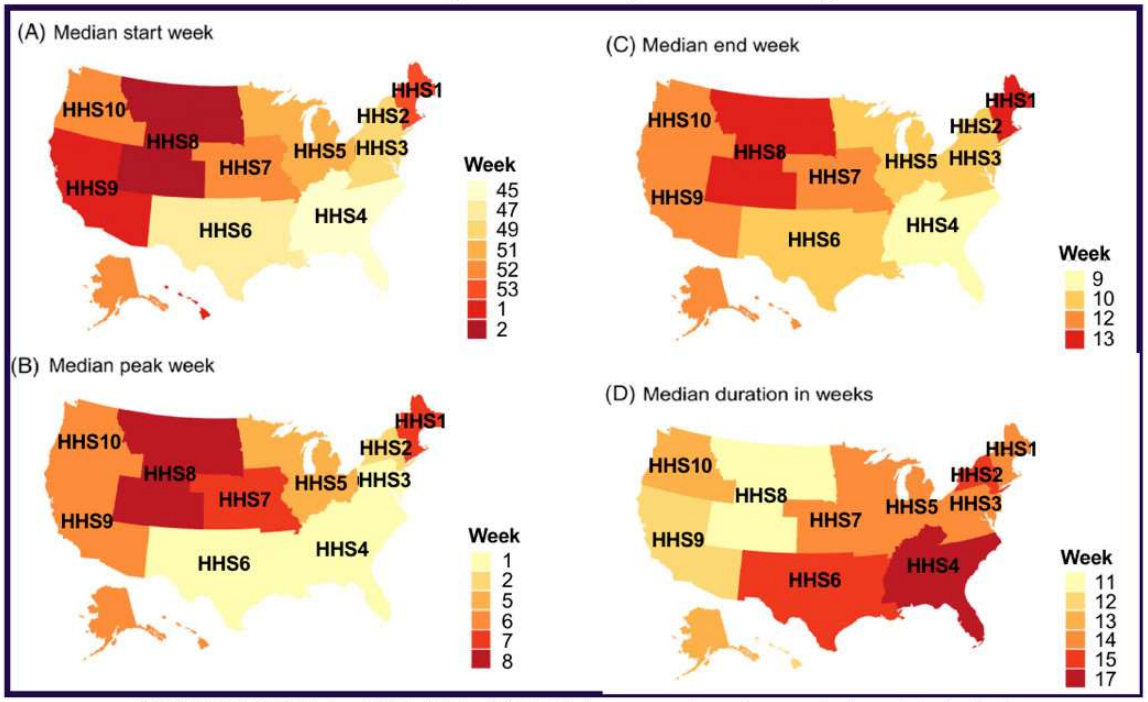


RSV, respiratory syncytial virus.

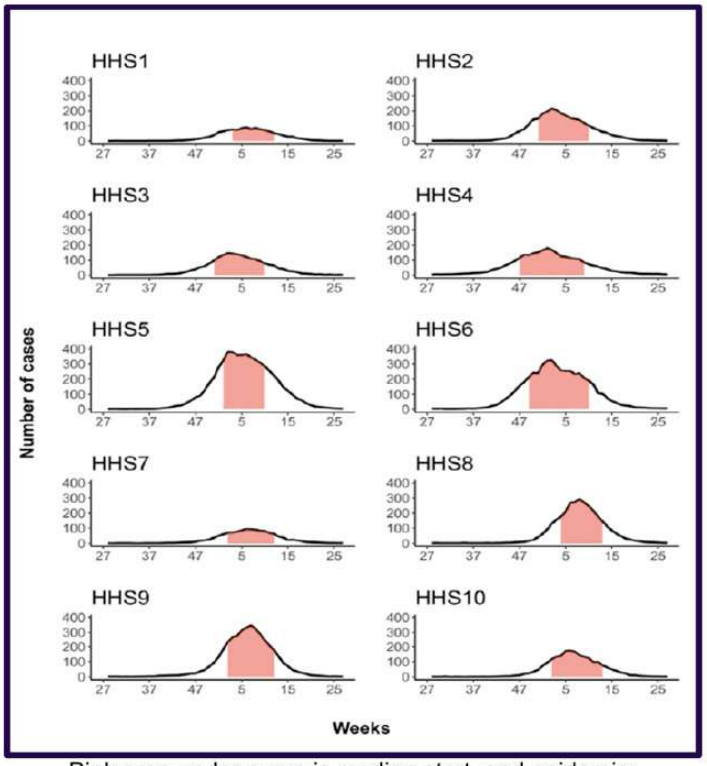
References: **1**. Rose EB, et al. *MMWR*. 2018;67(2):71-76. **2**. Florida Department of Health. Respiratory Syncytial Virus in Florida. www.floridahealth.gov/diseases-and-conditions/respiratory-syncytial-virus/index.html [Accessed February 17, 2022].

RSV Epidemic Curves by Region

RSV Seasonality according to HHS region[1]



CDC NREVSS Data; 2005-06 to 2018-19 (some regions have missing data in first few seasons).



Pink area under curve is median start–end epidemic; curve symbolizes the average number of RSV cases each week for all available years.

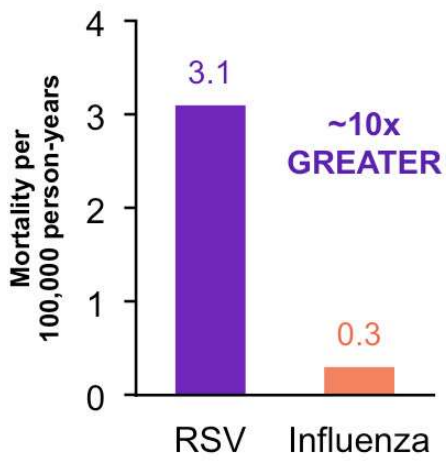
CDC, Centers for Disease Control and Prevention; HHS, Health and Human Services; NRVESS, National Respiratory and Enteric Virus Surveillance System; RSV, respiratory syncytial virus.

References: **1**. Staadegaard L, et al. Infl Oth Resp Vir. 2021;15:732-741.

RSV has a Larger Impact than Influenza on US Infants

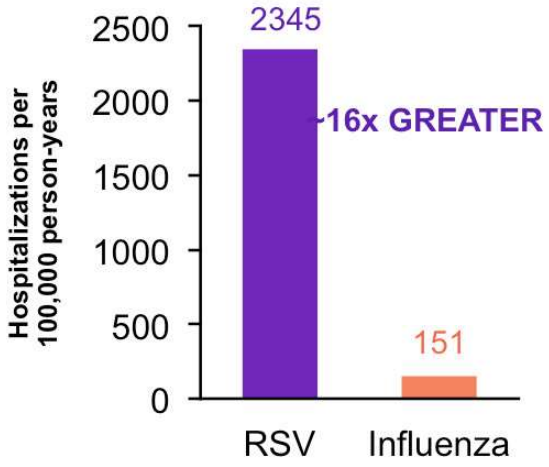
Mortality
(0–11 months)

Estimated annual mean infant RSV-associated mortality for pneumonia and influenza deaths (CDC data, 1990–1999)[1]



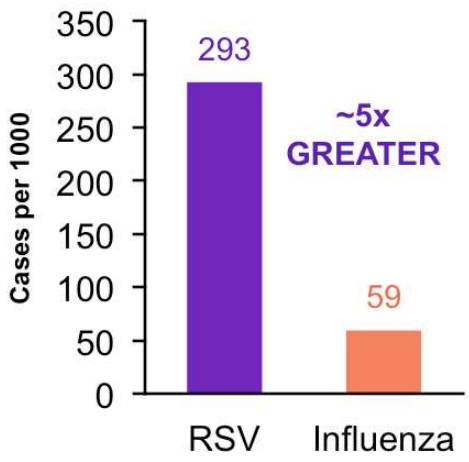
Hospitalization
(0–11 months)

Estimated annual mean infant hospitalization rates for RSV and influenza (CDC data, 1993–2008)[2]



Medically-attended
(6–11 months)

Estimated seasonal incidence of medically-attended RSV and influenza (Marshfield, 2006–2010)[3]



Note: Influenza vaccination of all children aged 6–23 months was recommended by the ACIP beginning in the 2004–2005 influenza season[4]

ACIP, Advisory Committee on Immunization Practices; CDC, Centers for Disease Control and Prevention; RSV, respiratory syncytial virus.

References: 1. Thompson WW, et al. *JAMA*. 2003;289(2):179-186. **2.** Zhou H, et al. *Clin Infect Dis*. 2012;54(10):1427-1436. **3.** Simpson MD, et al. *Open Forum Infect Dis*. 2016;3
4. Harper S, et al. *MMWR Recomm Rep*. 2004 May 28;53(RR-6):1-40.

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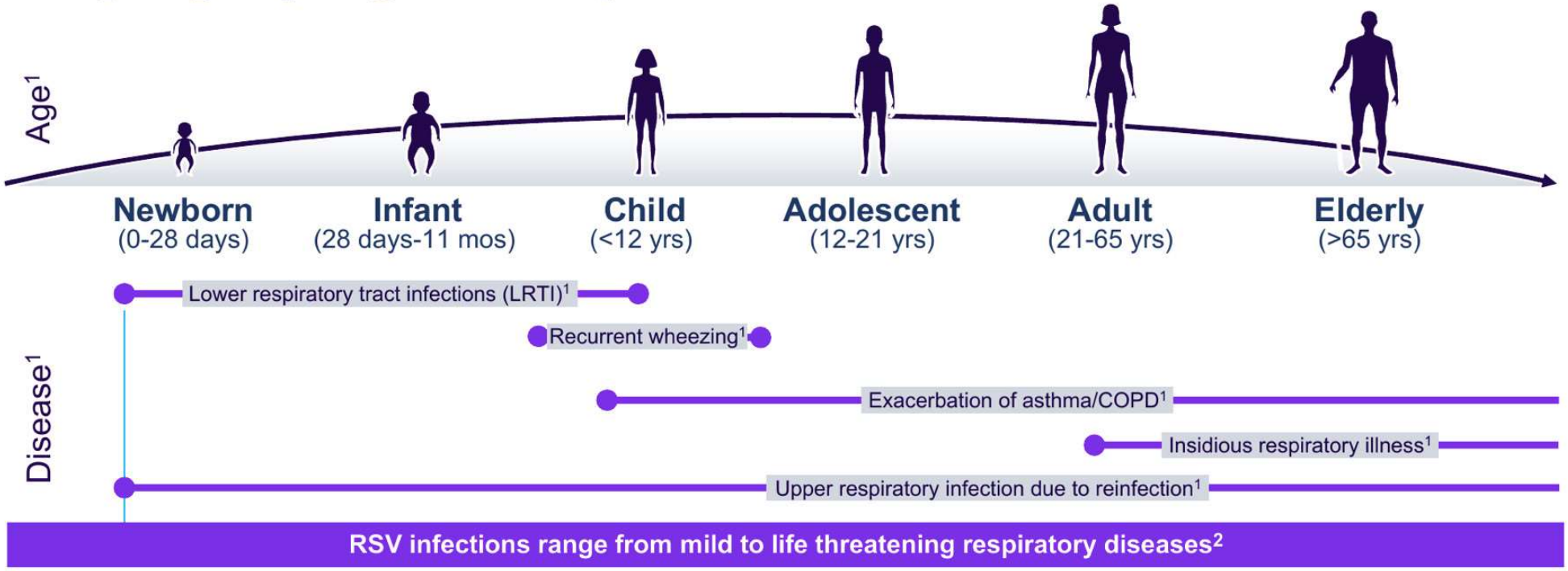
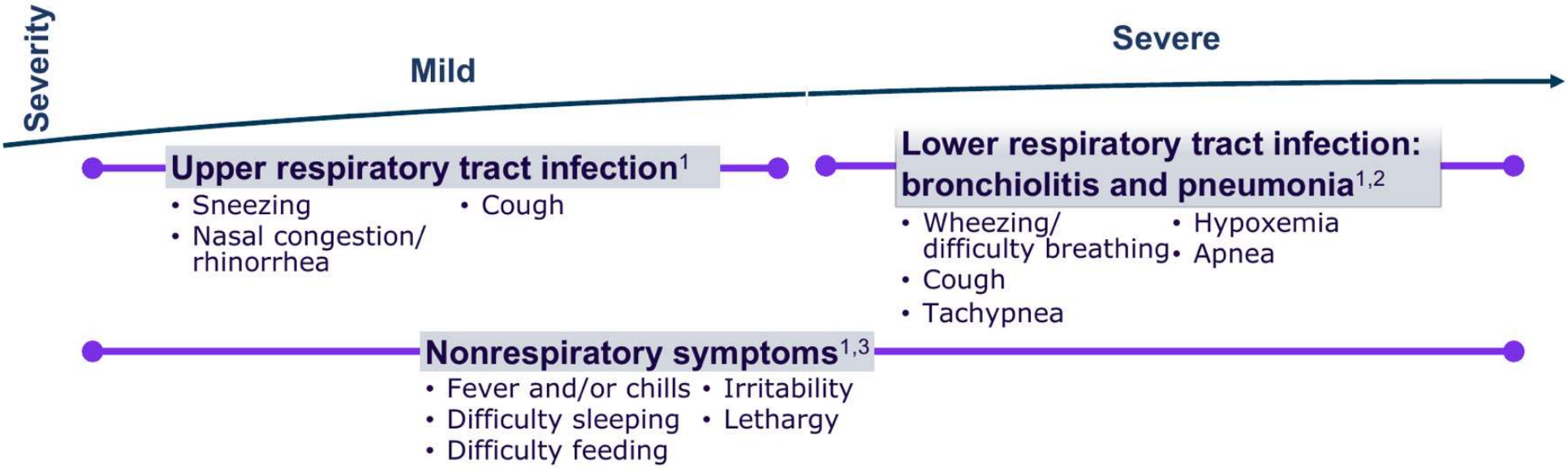
RSV Is a Common Respiratory Virus With Symptoms Varying by Age Group



COPD, chronic obstructive pulmonary disease; LRTI, lower respiratory tract infections; MOS, months; YRS, years; RSV, respiratory syncytial disease

References: **1**. Adapted from: Openshaw PJM, et al. *Annu Rev Immunol.* 2017;35:501-532. **2.** Carvajal JJ, et al. *Front Immunol*. 2019;10:2152

The Symptoms and Severity of RSV in Infants Are Unpredictable



Difficult to predict which infants will develop severe symptoms and require intensive care[4]

RSV, respiratory syncytial virus.

References: **1.** Smith DK, et al. *Am Fam Physician.* 2017;95(2):94-99. **2**. Pérez-Yarza EG, et al. *Pediatr Infect Dis J.* 2007;26(8):733-739. **3.** Eiland LS. *J Pediatr Pharmacol Ther*. 2009;14(2):75-85. **4.** Meissner HC. Viral Bronchiolitis in Children. N Engl J Med. 2016 May 5;374(18):1793-4. doi: 10.1056/NEJMc1601509. PMID: 27144864.

The Symptoms and Severity of RSV in Infants Are Unpredictable

RSV causes URTI but often progresses to LRTI (bronchiolitis or pneumonia)[1]

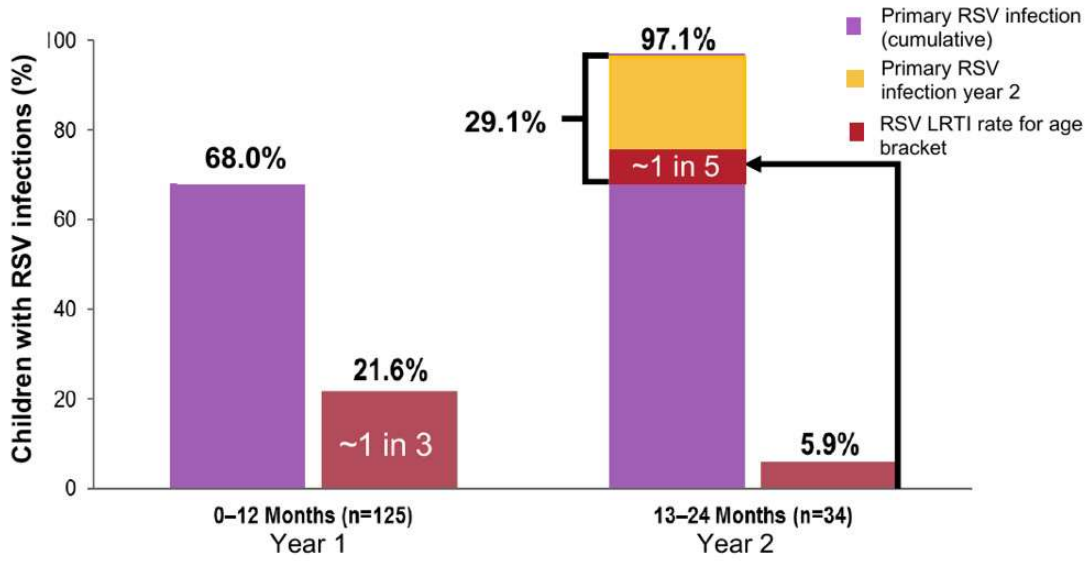
Immunity is not durable, resulting in repeated infections throughout life[1]

Treatment is supportive[1]

Mortality is rare in the US[1,2]

Risk of RSV-associated LRTI is highest for first exposure as an infant[3]

Primary RSV infection during first 24 months[3]



RSV infects nearly all children by age 2 years[3]

LRTI, lower respiratory tract infection; RSV, respiratory syncytial virus; URTI, upper respiratory tract infection.

References: 1. Domachowske J, et al. *Pediatr Ann* 2018;47(9):e371–e376. **2.** Prill MM et al. *Health Sci Rep*. 2021 Nov 2;4(4):e428. doi: 10.1002/hsr2.428. eCollection 2021 Dec. **3.** Glezen WP, et al. *Am J Dis Child* 1986;140(6):543–546.

Most of the Healthcare Utilization Related to RSV in Children <12 Months Occurs in Outpatient Settings in the US

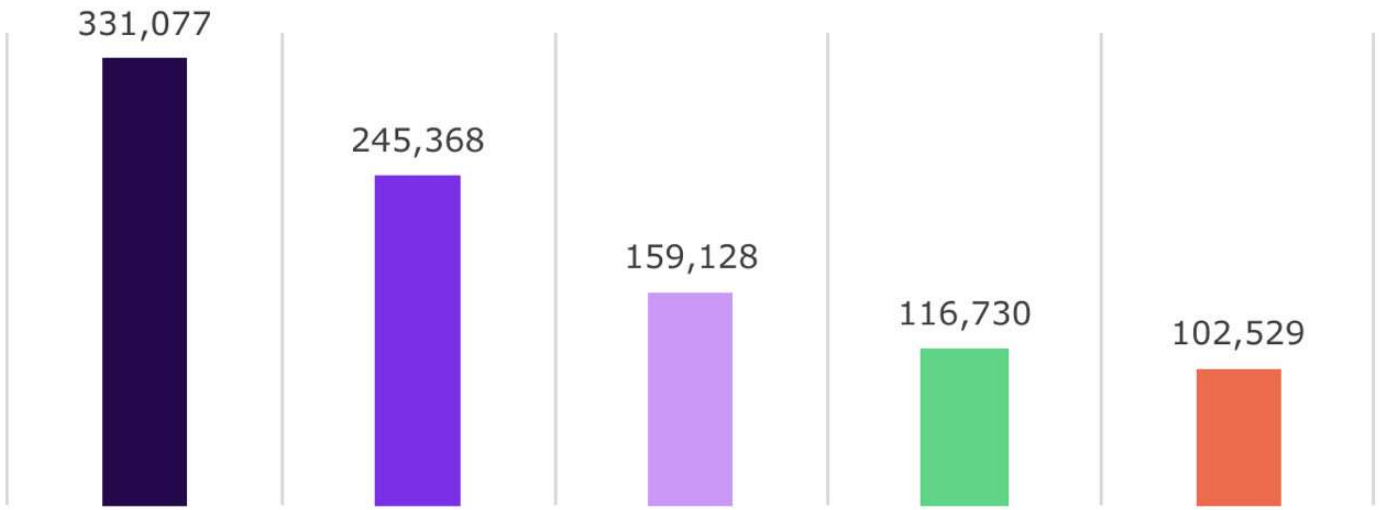
In the US annually

RSV, respiratory syncytial virus.

References: **1.** Hansen, C. L., Chaves, S. S., Demont, C. & Viboud, C. Mortality Associated With Influenza and Respiratory Syncytial Virus in the US, 1999-2018. Jama Netw Open 5, e220527 (2022). **2.** Rainisch G, et al. Vaccine. 2020;38(2):251-257.

RSV is the Leading Cause of Hospitalization Among Infants in the US

Top 5 primary diagnoses in hospitalized infants <1 year of age



RSV remains the leading cause of bronchiolitis among infants

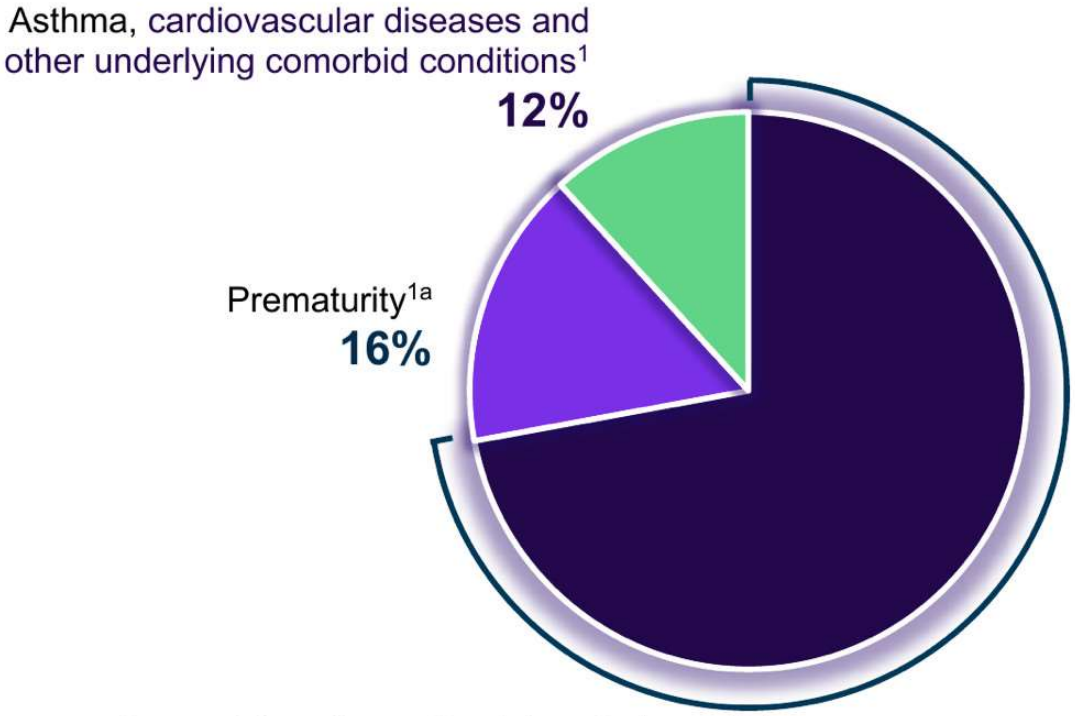
- Bronchiolitis due to RSV
- Bronchiolitis, unspecified
- Pneumonia, unspecified
- Jaundice
- Volume depletion

Retrospective analysis of National Center for Health Statistics, CDC data (1997–2000) in the United States investigating emergency department visits, hospitalizations, and death associated with severe RSV infection in infants. Study included 718,008 emergency visits by infants with LRTI diagnoses during the RSV season.

RSV, respiratory syncytial virus.

References: **1.** Leader S, Kohlhase K. *J Pediatr.* 2003;143(5 Suppl):S127-S132.

Most Hospitalizations for RSV occur in Healthy Full Term Infants



72%
are previously healthy full term Infants[1]

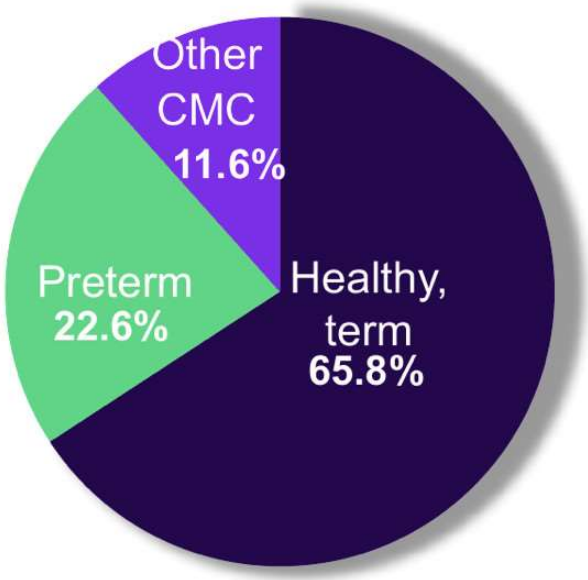
a. Premature infants refers to <37 weeks' gestational age at birth.

RSV, respiratory syncytial virus.

References: **1**. Arriola CS, et al. J Pediatric Infect Dis Soc. 2020;9(5):587-595 Supplemental Tables 4-6

Most RSV ICU Admissions and MV Episodes Occur in Healthy, Term Infants

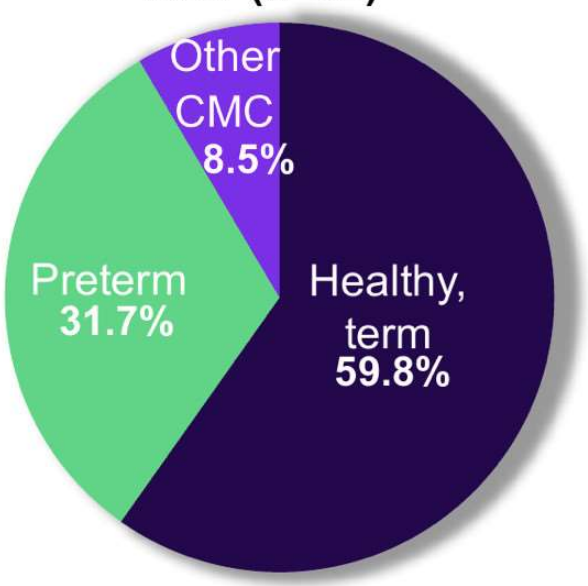
ICU admissions for infants with RSV (n=336)[1]



26% (221/851) of hospitalized healthy term infants were admitted to the ICU[1]

22% (49/221) of ICU-admitted healthy term infants required mechanical ventilation[1]

Mechanical ventilation (MV) for infants with RSV (n=82)[1]



Infant, age <12 months; preterm, born at <37 weeks gestational age; term, born at 37+ weeks gestational age.
CMC, chronic medical condition (includes chronic lung disease, cardiovascular disease, upper airway abnormality, asthma, neurologic/neuromuscular conditions, blood disease, renal disorder, immunocompromised status, chronic metabolic disease, liver disease, and other); ICU, Intensive Care Unit; MV, mechanical ventilation; RSV, respiratory syncytial virus.

References: **1**. Arriola CS, et al. J Pediatr Infect Dis Soc. 2019;9(5):587-595.

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Burden of RSV Extends Beyond the Initial Medical Care

Short Term

RSV infection is associated with **increased incidence of otitis media and pneumonia, and excessive antibiotic use**[1a]

Long Term

RSV infection is associated with the following: **recurrent wheezing, reduced pulmonary function, and increased healthcare utilization**[2-4*]

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a. Data representative for the second 6 months of life after considering an RSV infection in the first 6 months of life. *Causality has not been determined

References: **1**. Abreo A, et al. Clin Infect Dis. 2020;71(1):211-214. **2.** Piedimonte G, Perez MK. Pediatr Rev. 2014;35(12):519-30. Erratum in: Pediatr Rev. 2015;36(2):85. **3.** Driscoll AJ, et al. Vaccine. 2020;38(11):2435-2448. **4.** Simoes EAF, et al. J Infect Dis. 2020;221(8):1256-1270.

Disproportional Impact of Severe RSV in Infants

RSV hospitalization rates

Medicaid Infants	**2x higher**	Infants enrolled in Medicaid have relative risk for RSVH of 2.03 (1.99-2.06) compared to non-Medicaid payers.[1]
American Indian Infants	**2.5x higher**	The annual rates of RSVH in Navajo and Apache infants are almost 2.5 times more than those of healthy infants in the general US population.[2]
Alaskan Native Infants	**5x higher**	Alaska Native infants in the rural Yukon–Kuskokwim Delta region of Alaska have RSVH rates 5 times higher than the general US infant population.[3]

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RSV, respiratory syncytial virus; RSVH, RSV hospitalization.

References: 1. Sangaré L, et al. *J Pediatr.* 2006;149:373-377. **2**. O'Brien KL, et al. *Lancet Infect Dis*. 2015;15(12):1398-1408. **3**. Borse RH, et al. *J Pediatric Infect Dis Soc*. 2014;3:201-212.

All Infants Need Protection from RSV

- RSV causes 16x as many hospitalizations in infants as influenza
- 72% of RSV hospital admissions are in full-term healthy infants
- There are 17x as many RSV LRTI outpatient visits as there are RSV admissions
- Most ICU admissions and mechanical ventilation episodes are in full-term healthy infants
- RSV is the leading cause of infant hospitalization
- RSV disproportionally affects infants with Medicaid coverage, American Indians, and Alaska Natives

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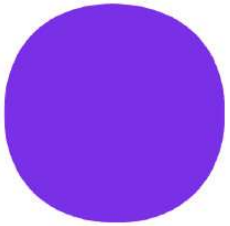
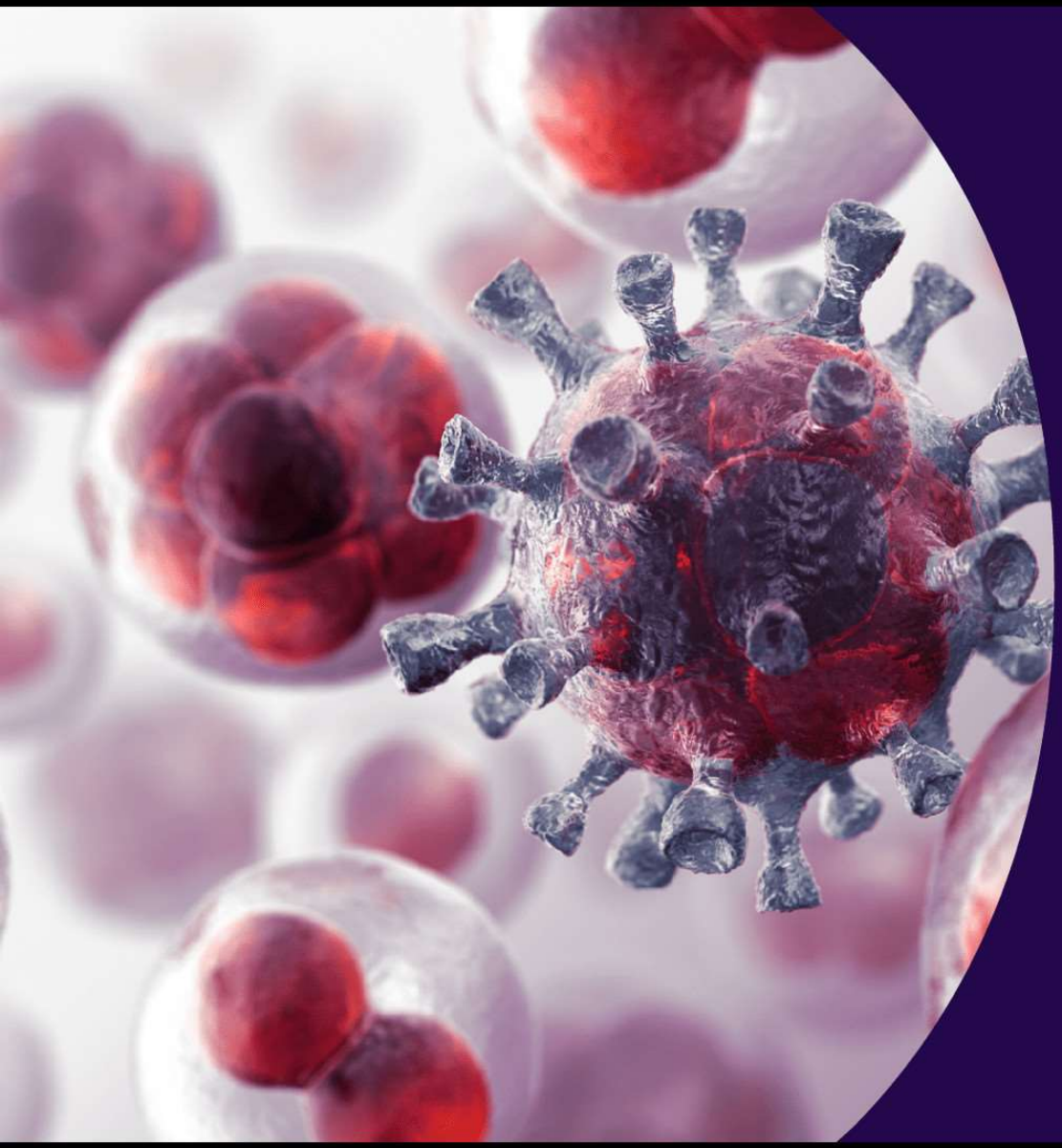
RSV, Respiratory syncytial virus; LRTI, lower respiratory tract infections; ICU, Intensive care unit

RSV Discussion Questions

- HOW DO YOU PREPARE YOURSELF AND/OR YOUR HEALTH CENTER/PRACTICE FOR RSV SEASON?
- WHAT BURDENS HAVE YOU SEEN FAMILIES TAKE ON WHEN THEIR INFANT HAS RSV DISEASE?
- HOW HAS THE OUT-OF-SEASON SURGE IN RSV, DUE TO COVID-19, AFFECTED YOU AND YOUR HEALTH CENTER/PRACTICE?





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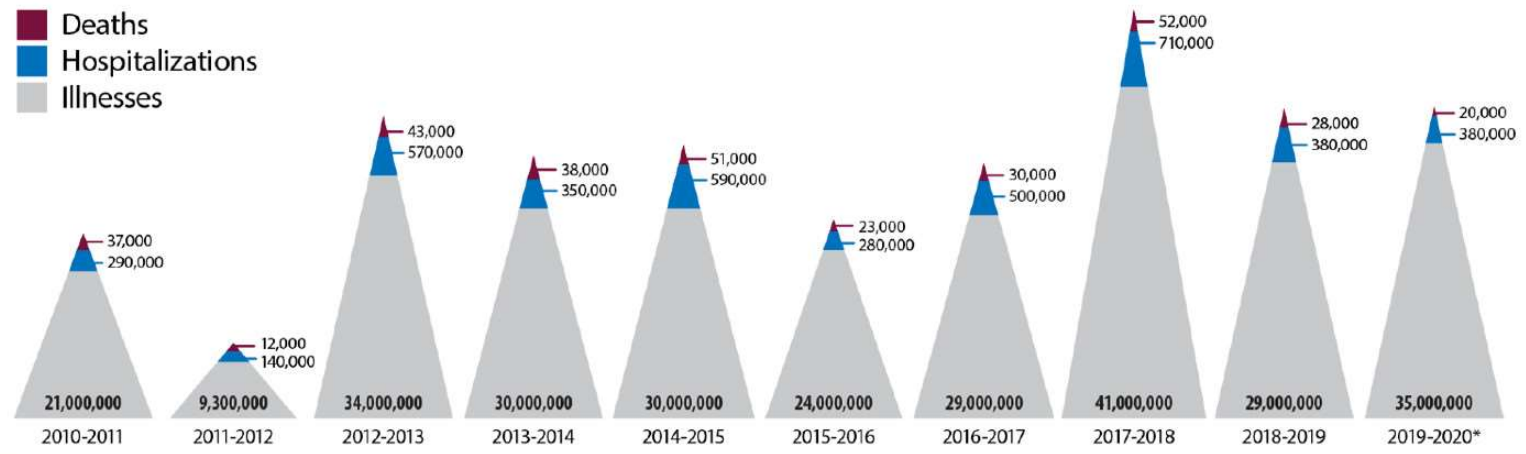
Influenza

Estimated Influenza Burden in the United States



Annual Estimated Range*

Deaths: 12,000 – 52,000

Hospitalizations: 140,000 – 710,000

Cases: 9,300,000 – 41,000,000

sanofi **References**: **1**. CDC. Influenza (FLU). January 2022. https://www.cdc.gov/flu/about/burden/index.html . Accessed 13 July 2022

The Extensive Health Impact of Influenza is Under-Recognized

Perception

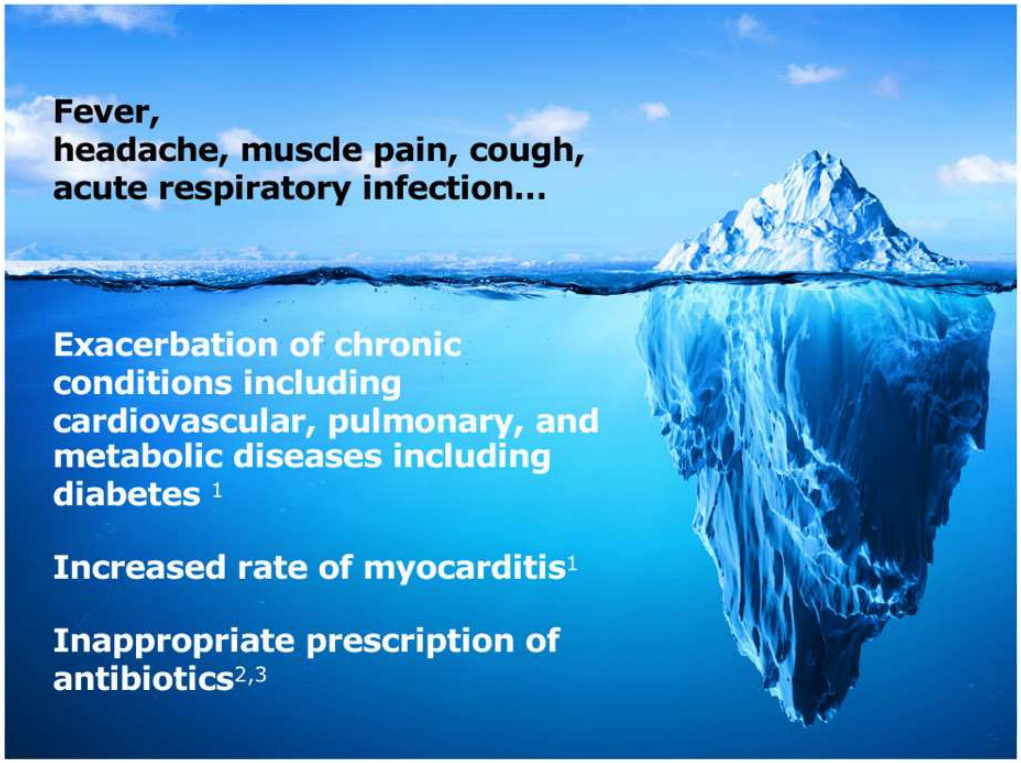
Influenza is just a short-term nuisance and vaccination isn't worth it

But

Laboratory-confirmed or diagnosed influenza is only the tip of the iceberg

More!

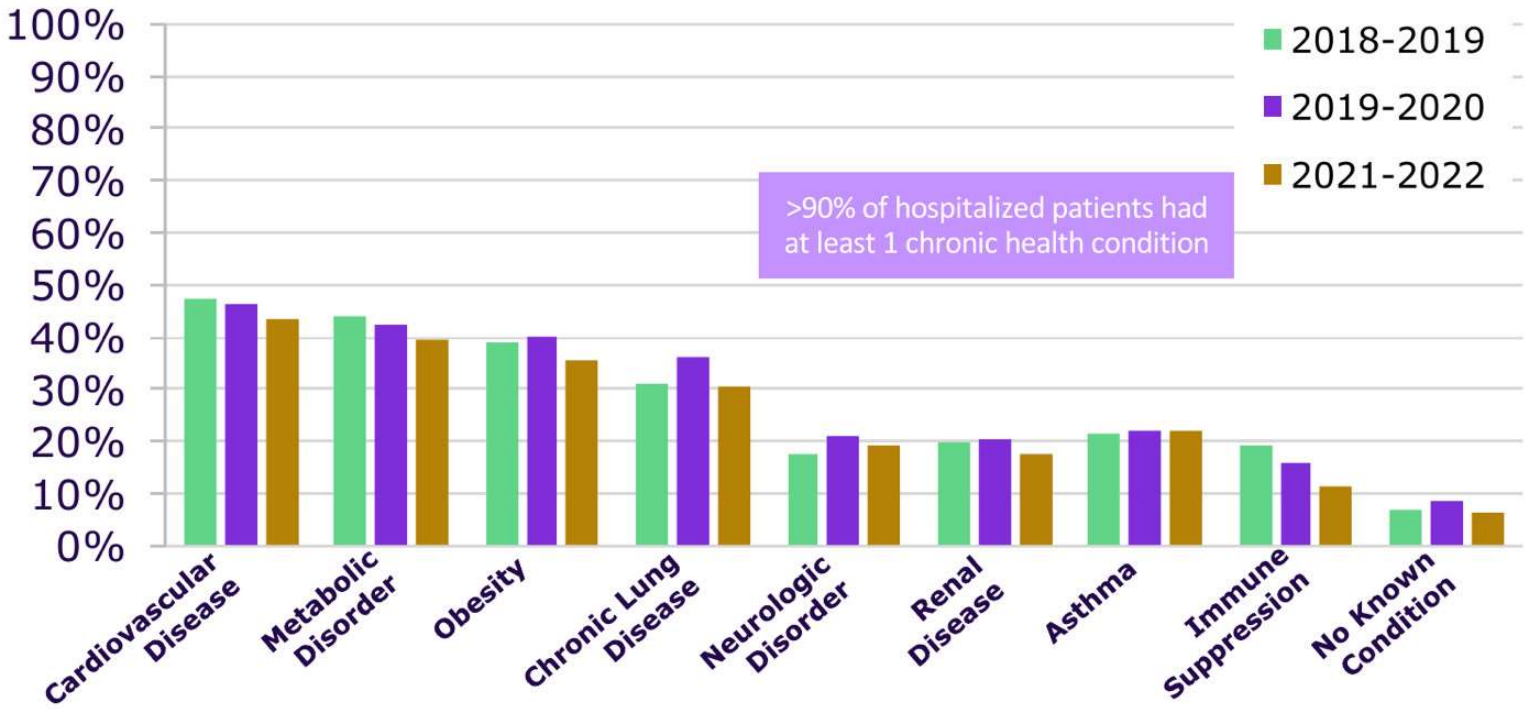
Entire iceberg = true medical, economical, and societal burden of influenza and complications



References: **1**. CDC. https://www.cdc.gov/flu/highrisk/index.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fflu%2Fabout%2Fdisease%2Fhigh_risk.htm. Accessed July 13, 2022. **2**. Willis GA, et al. WAIVE Study Team. Influenza Other Respir Viruses. 2019;13(1):18-27. **3**. Havers FP, et al. Clin Infect Dis. 2019;68(10):1616-22.

Adults Hospitalized for Influenza Commonly Suffer From Serious Chronic Conditions

% of Adults (≥18 Years) Hospitalized for Lab-Confirmed Influenza Who Were Also Diagnosed With an Underlying Medical Condition



*No data available for 20-21 season

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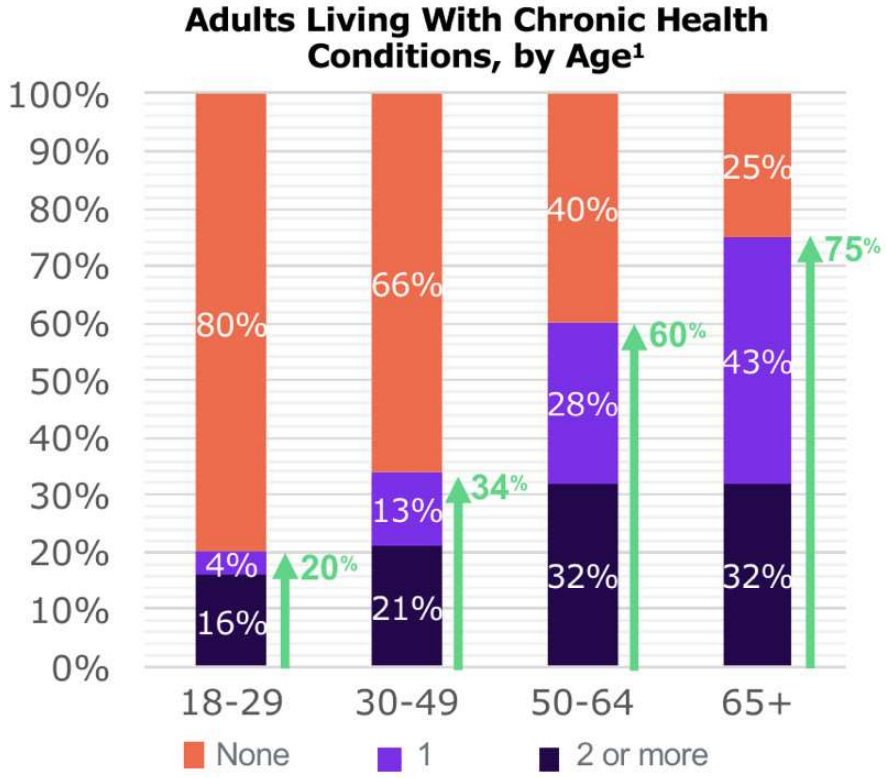
References: 1. CDC. https://gis.cdc.gov/grasp/fluview/FluHospChars Accessed July 14, 2022

The Majority of Adults 50+ Have Been Diagnosed With at Least One Chronic Condition



Prevalence of Most Common Chronic Conditions in Older Adults

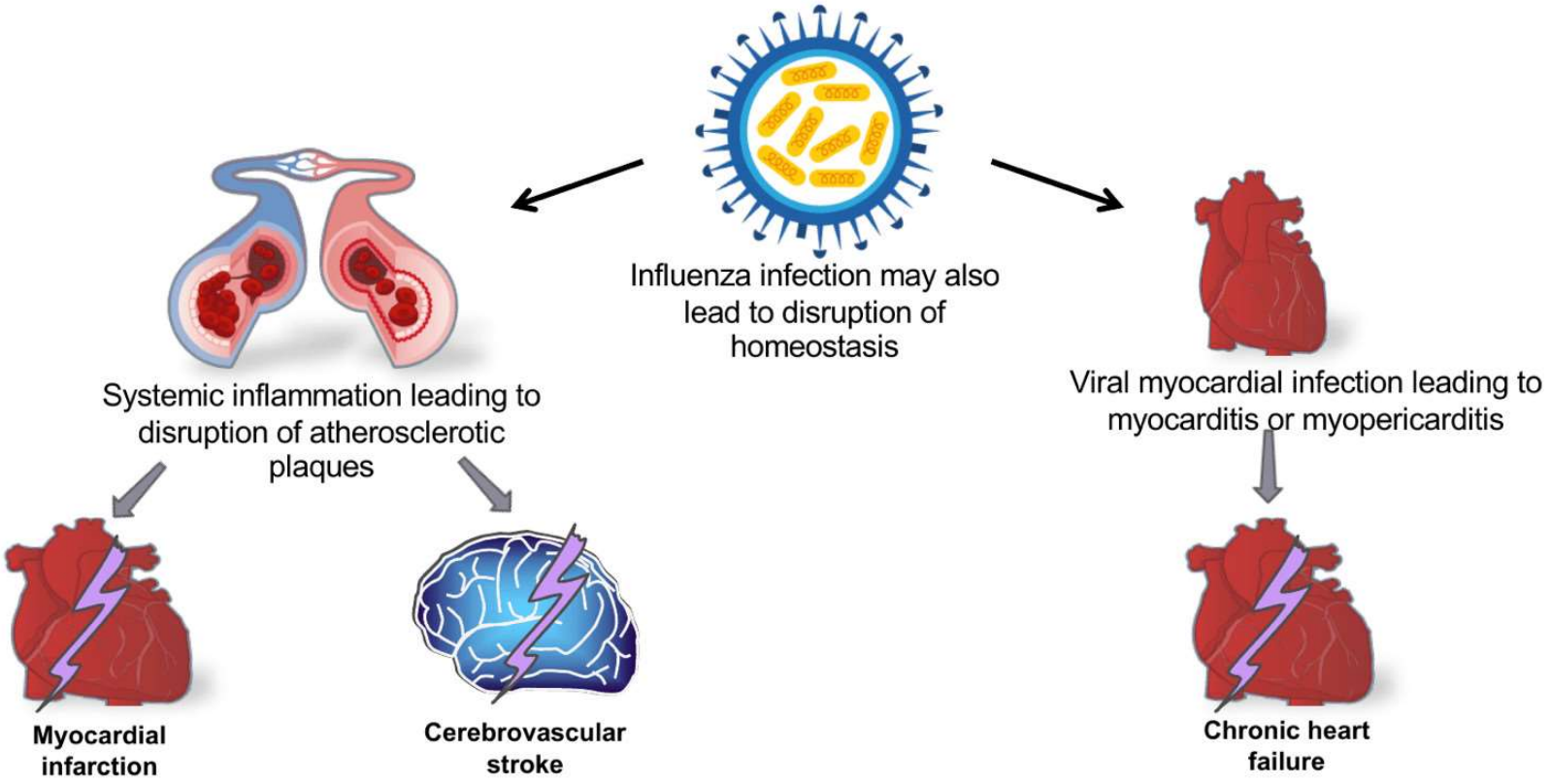
>50% Adults 45-64 years of age living with cardiovascular disease (CVD)[2]

25% Adults 65+ years of age affected by diabetes[2]

~10% Adults living with COPD or asthma[3]

References: 1. Fox S, Duggan M. http://www.pewinternet.org/2013/11/26/part-one-who-lives-with-chronic-conditions/ Accessed June 7, 2022. **2.** NFID. http://www.nfid.org/idinfo/influenza/cta-dangers-of-influenza-in-adults-with-chronic-health-c.pdf. Accessed June 7, 2022. **3.** CDC Healthy People 2020 Progress Review - Respiratory Diseases and Sleep Health. https://www.cdc.gov/nchs/ppt/hp2020/hp2020_RD_and_SH_progress_review_presentation.pdf Accessed June 7, 2022.

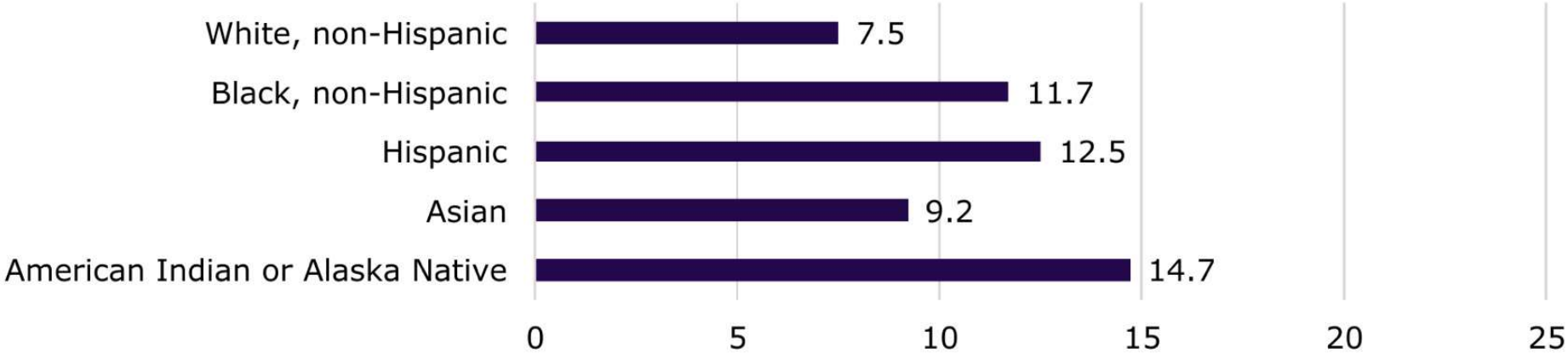
Possible Causative Role of Influenza Infection in CVD



References: 1. Udell JA, et al. Expert Rev Cardiovasc Ther. 2015;13(6):593-6.

Percentage of Adults Aged ≥18 Years With Diagnosed Diabetes by Racial or Ethnic Group

Percentage of Adults Aged 18 Years or Older With Diagnosed Diabetes, by Racial or Ethnic Group, United States, 2017–2018



Percentages are age-adjusted to the 2000 US standard population. Figure adapted from CDC's National Diabetes Statistics Report 2020. Data sources: CDC's National Health Interview Survey, 2017–2018, and the Indian Health Service National Data Warehouse, 2017 (American Indian or Alaska Native data).

American Indian or Alaska Native adults have the highest rates of diagnosed diabetes (14.7%) among all US racial and ethnic groups, followed by Hispanics (12.5%) and non-Hispanic blacks (11.7%)

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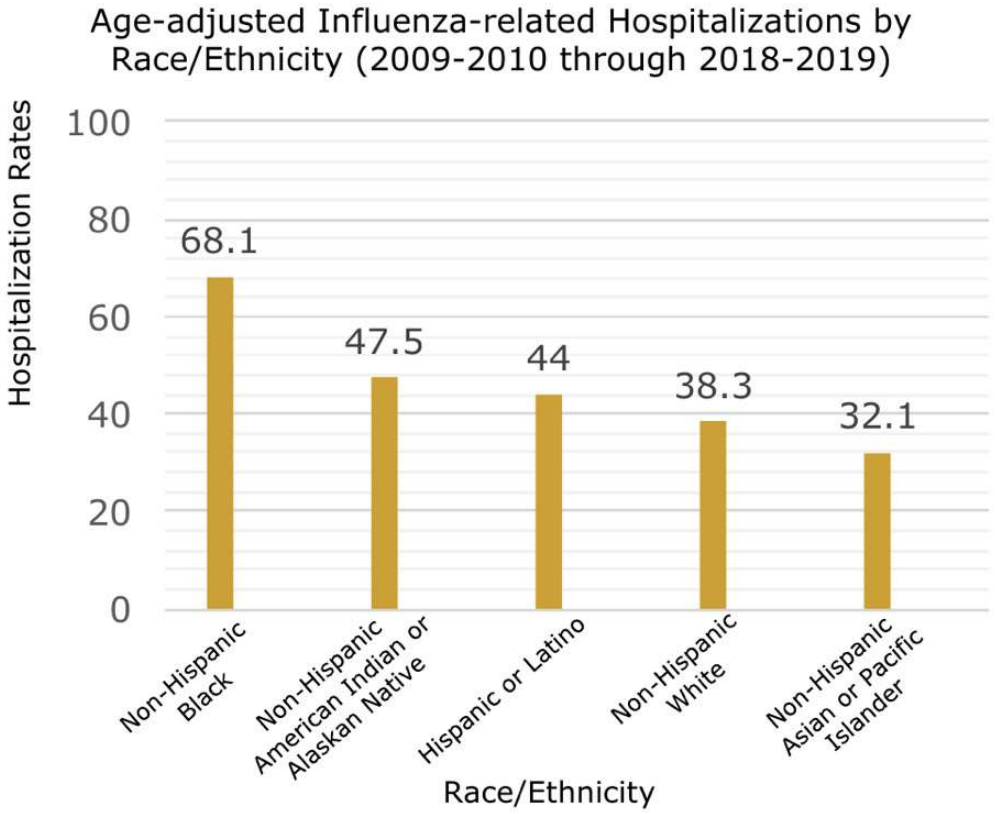
Reference: CDC. September 2020. https://www.cdc.gov/diabetes/pdfs/library/Diabetes-Report-Card-2019-508.pdf Accessed 19 March 2021.

Influenza Hospitalization Rates by Race and Ethnicity

A CDC analysis of **flu hospitalization rates by race and ethnicity (adjusted for age) during 10 flu seasons from 2009-2010 through 2018-2019** showed that:

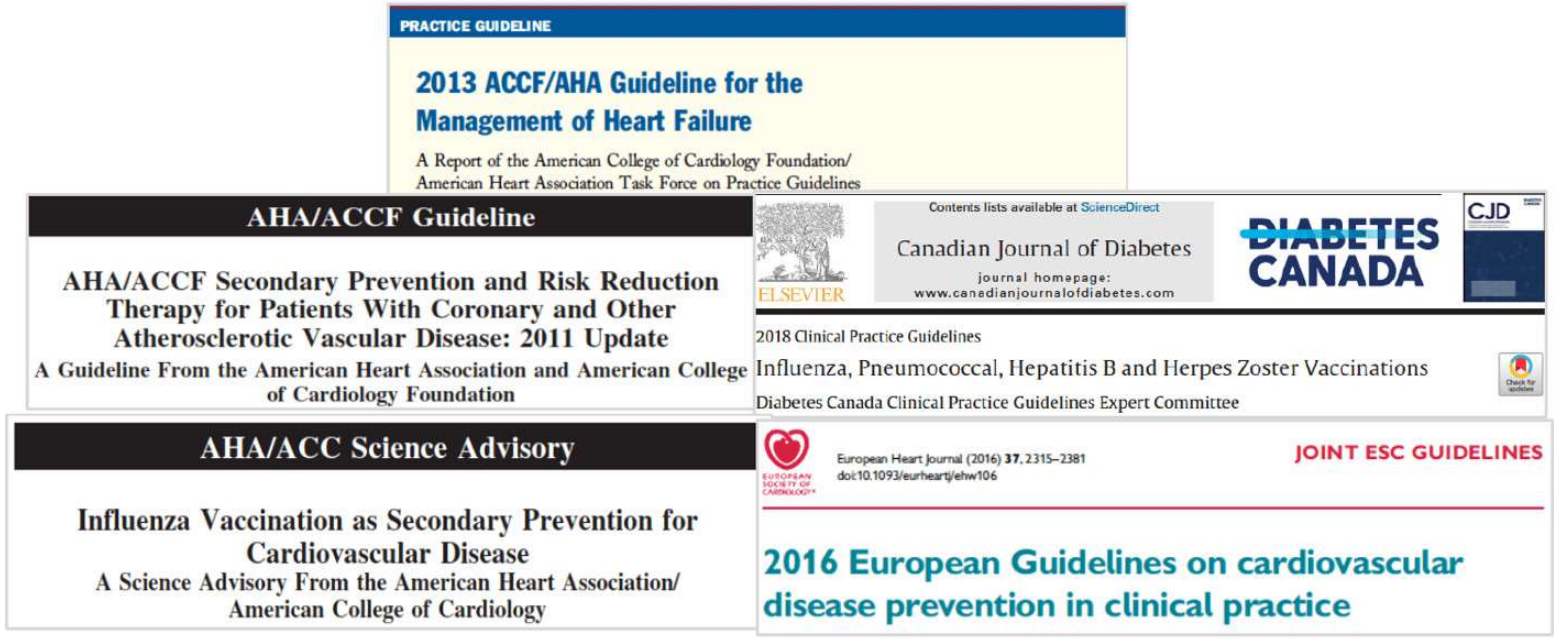
- Non-Hispanic Black persons had the highest flu-related hospitalization rates (68 per 100,000)
- Non-Hispanic American Indian or Alaska Native persons had the second highest flu-related hospitalization rates (48 per 100,000)
- Hispanic or Latino persons had the third highest flu-related hospitalization rates (44 per 100,000)
- Non-Hispanic White persons had lower flu-related hospitalization rates (38 per 100,000) compared to these three groups



sanofi **Reference: 1.** CDC. February 2021. https://www.cdc.gov/flu/highrisk/disparities-racial-ethnic-minority-groups.html. Accessed 19 March 2021

Many CVD Guidelines Recommend Influenza & Pneumococcal Vaccination

Guidelines



References: 1. Davis MM, et al. Circulation. 2006;114(14):1549-53. **2.** Smith SC, et al. Circulation. 2011;124(22):2458-73. **3**. Yancy CW. J Am Coll Cardiol. 2013; 16:e147-e239. **4**. Piepoli MF, et al. Eur Heart J. 2016;37(29):2315-81. **5**. Husein N, et al. Can J Diabetes. 2018;42:S142-44.

Effect of Influenza and Influenza Vaccination on Cardiovascular Events

Avoiding influenza through vaccination is associated with:

36%
lower risk of major cardio-vascular events

Number needed to vaccinate to prevent a major cardiovascular event (in patients with recent acute coronary syndromes):

8
People

Number needed to vaccinate to prevent a major cardiovascular event

58
People

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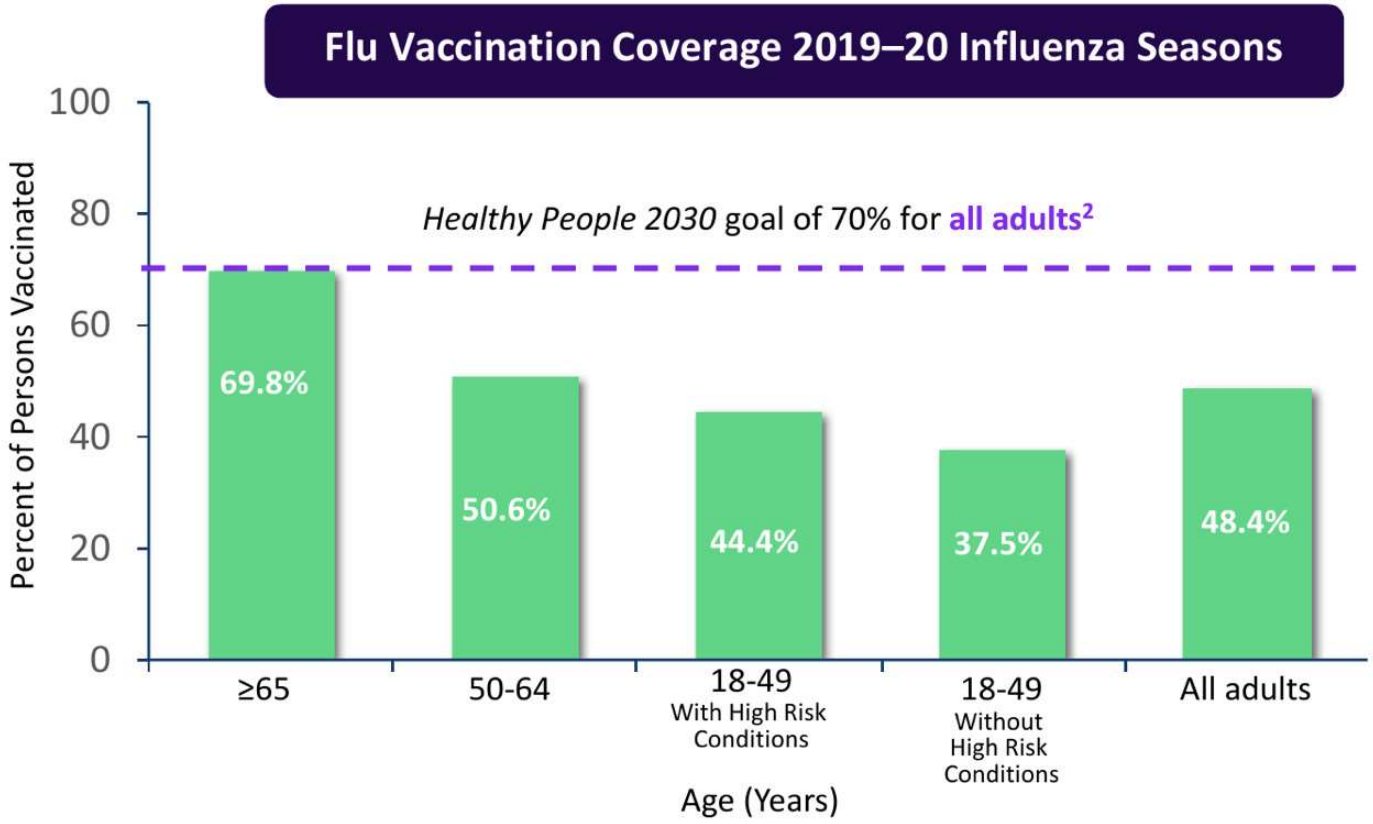
References: 1. Udell JA, et al. JAMA. 2013;310(16):1711-20.

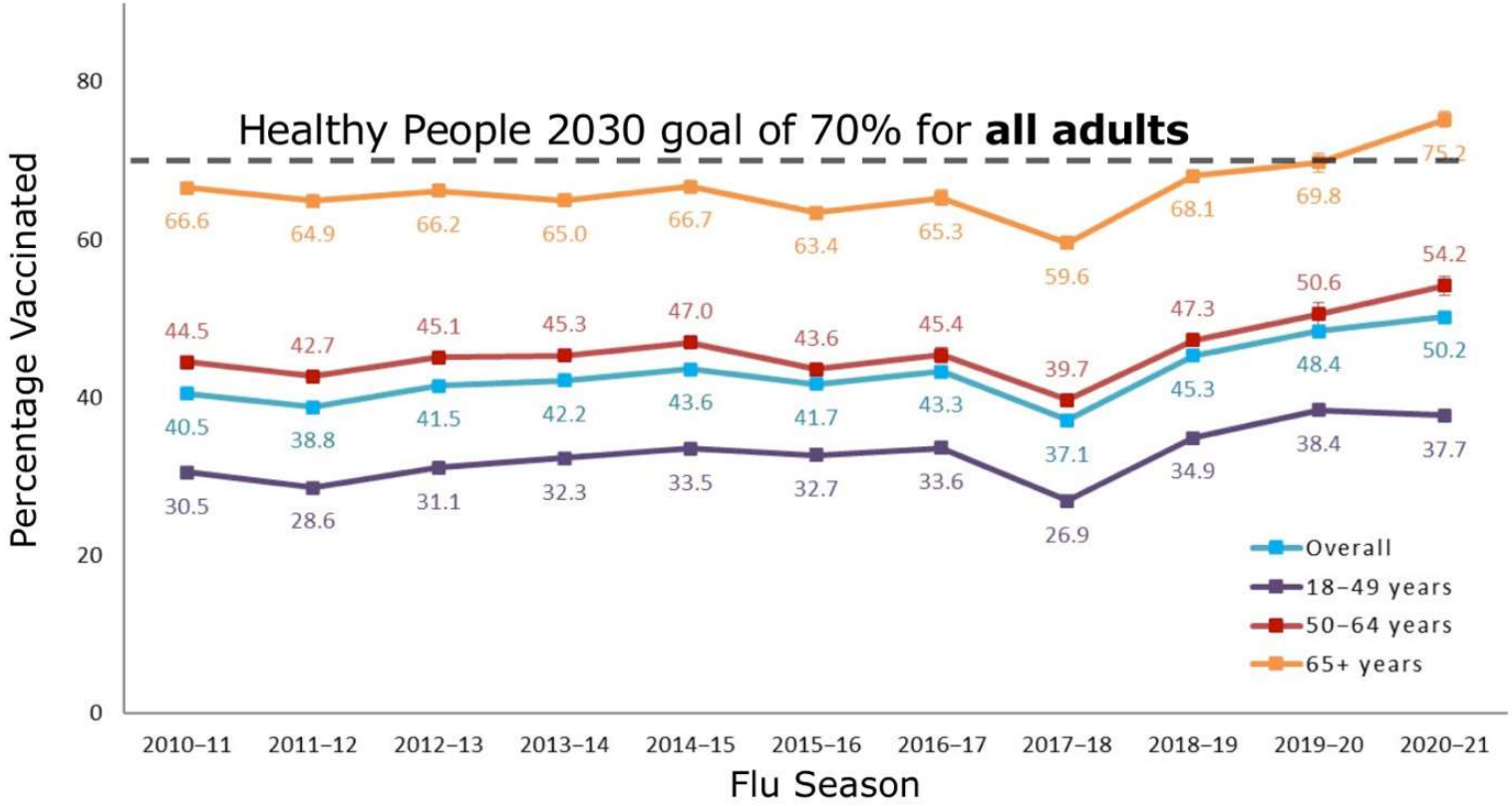
Where We Fall Short: Adults



References: 1. CDC. October 2020. https://www.cdc.gov/flu/fluvaxview/coverage-1920estimates.htm. Accessed 11 February 2021. **2.** US Department of Health and Human Services and Office of Disease Prevention and Health Promotion. December 2020. https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-people-who-get-flu-vaccine-every-year-iid-09. Accessed 11 February 2021.

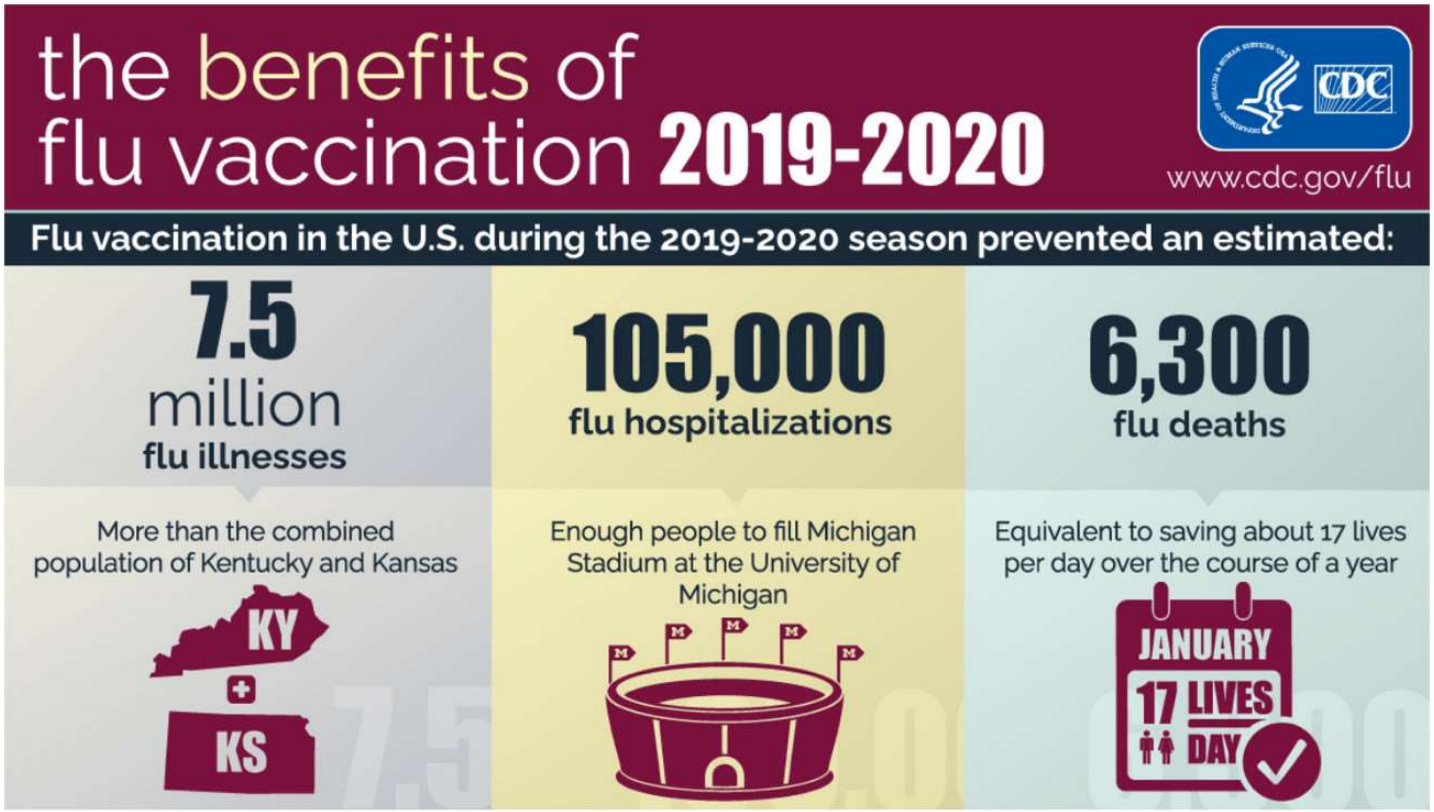
US Adults Influenza Immunization Rate

US Flu Vaccination Coverage by Age Group from 2010-2021



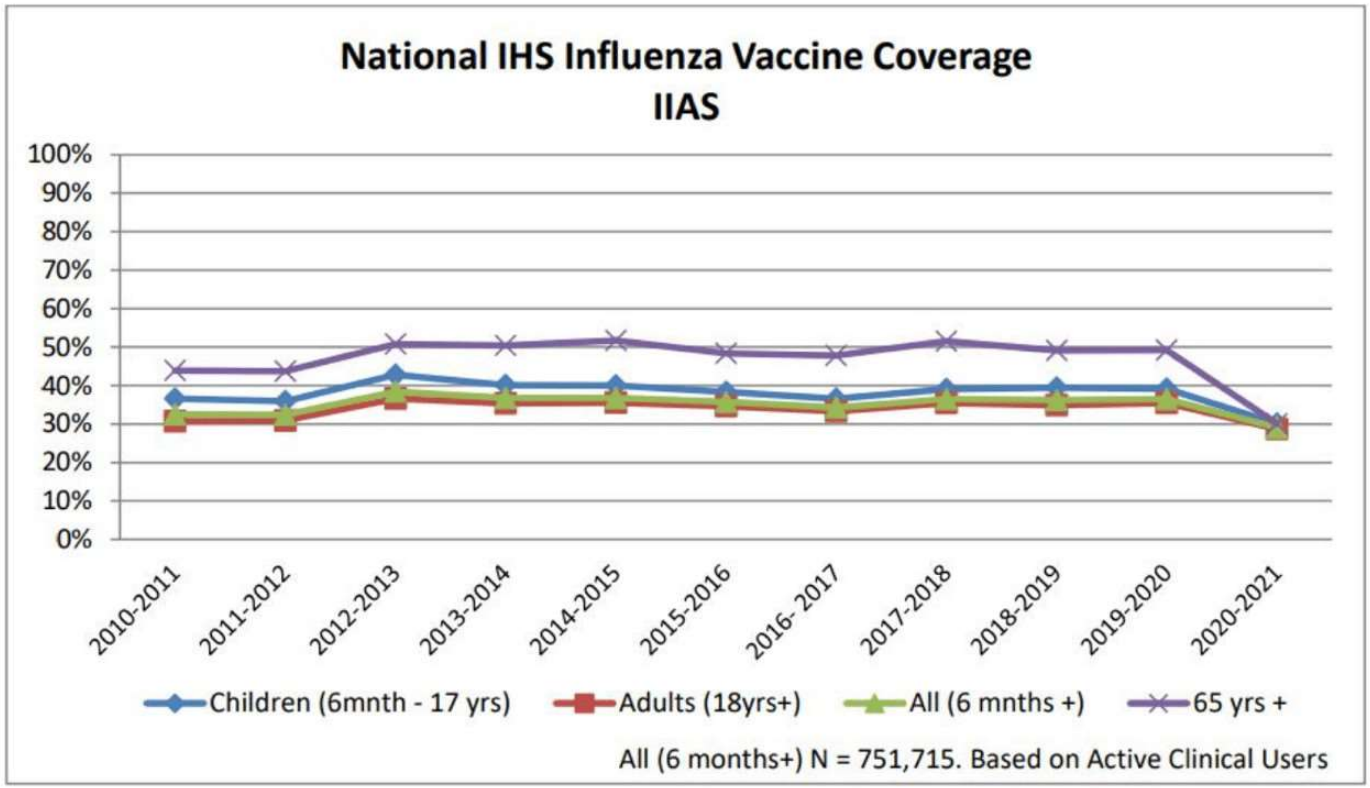
References: 1. CDC. Flu Vaccination Coverage. 2021. https://www.cdc.gov/flu/fluvaxview/coverage-2021estimates.htm . Accessed 27 July 2022. **2.** U.S. Department of Health and Human Services. Healthy People 2030. https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination Accessed 1 Mar 2023.

Benefits of Influenza Vaccination



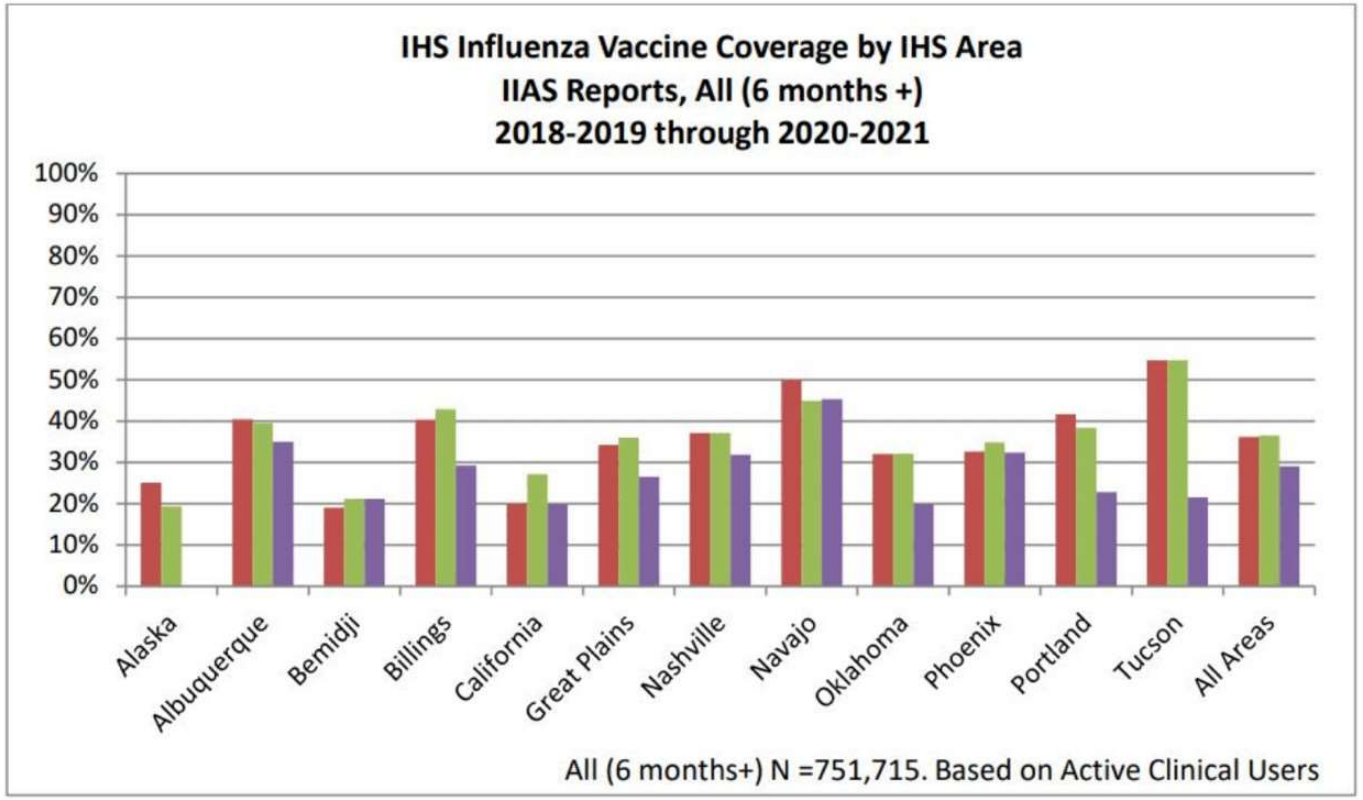
sanofi **References: 1.** Infographic from CDC : https://www.cdc.gov/flu/about/burden-averted/2019-2020.htm. Accessed September 1, 2022

National IHS Influenza Vaccine Coverage – IHS Influenza Awareness System (IIAS)



References: 1. IHS. 2021. https://www.ihs.gov/epi/immunization-and-vaccine-preventable-diseases/statistics-and-reports/. Accessed August 2022.

Influenza Vaccine Coverage by IHS Area – IIAS Influenza Vaccine Coverage Report



References: 1. IHS. 2021. https://www.ihs.gov/epi/immunization-and-vaccine-preventable-diseases/statistics-and-reports/. Accessed August 2022.

Estimated Influenza Vaccination Coverage Among US Adults by Race and Ethnicity

Estimated Influenza Vaccination Coverage (%) Among US Adults (≥18) by Race and Ethnicity for 2019-2020 and 2020-2021 Influenza Seasons[1&2]		
Group	**2019-2020**	**2020-2021**
Overall	48.4	50.2
Non-Hispanic, White	52.8	55.5
Non-Hispanic, Black	41.2	40.4
Hispanic	38.3	38.6
Asian	52.3	54.5
American Indian/Alaskan Native	42.3	41.5
Other	40.1	44.3

- About half of US adults receive an annual influenza vaccine
- Influenza Vaccine Coverage Rates vary by race and ethnicity
- Compared to non-Hispanic White adults, VCRs **remained substantially lower** for:

-15.1 Non-Hispanic Black Adults

-16.9 Hispanic Adults

-14.0 American Indian/Alaskan Native Adults

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References: 1. Flu Vaccination Coverage* by Race/Ethnicity, Adults 18 years and older, United States,† Behavioral Risk Factor Surveillance System (BRFSS), 2019-20 Season **2**. Flu Vaccination Coverage* by Race/Ethnicity, Adults 18 years and older, United States,† Behavioral Risk Factor Surveillance System (BRFSS), 2020-21 Season

Influenza Resources

Initiative Name	Sponsor(s)	Purpose of Initiative
IHS AI/AN Seasonal Flu Education Resources[1]	IHS/CDC	• Customized outreach tools for tribal communities • Seasonal Flu Surveillance, FAQs, and guidance documents • PSA and media tools created by tribal communities
Demonstrating Real Improvement Value in Equity (DRIVE)[2]	Center for Sustainable Health Care Quality and Equity	• Provides education and support to primary care teams and community organizations in underserved communities around the nation • Assist in implementing strategies for improving flu vaccination rates

sanofi **References: 1.** IHS. 2021. https://www.ihs.gov/epi/health-surveillance/educational-resources/ Accessed August 2022. **2.** National Minority Quality Forum. 2022. https://nmqf-shc.org/drive/ Accessed August 2022

What are Opportunities for Change?

Identify barriers to vaccination

- Vaccine hesitancy (inclusive of vaccine deliberation, vaccine apathy, trust)
- Other barriers (eg, access, transportation, cost, time)
- Barriers can differ within as well as between racial/ethnic groups

Understand vaccine hesitancy

- Differentiate from other barriers (not a sole justification for inequities)
- Not synonymous with trust or safety
- Distinguish from vaccine deliberation and vaccine apathy

Focus on equity

- Without equity at implementation, vaccines can exacerbate existing inequities
- Improve equity in vaccination (eg, influenza vaccinations in workplace)

Target messaging

- Address concerns/perceptions relevant to population (eg, severe side effects, perceived risk for specific communities, vaccine effectiveness for all groups)
- Deliberate specific messaging for demographics associated with low vaccine uptake (eg, younger age, low income, low education level)

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Influenza Summary of Key Points

About 9 - 40 million cases of flu with 140 - 710K hospitalizations occur in the US annually

Over 100K hospitalizations and 6000 deaths were averted due to flu vaccine in 2019/20

Flu immunization rates for adults remain under 70% (target for Healthy People 2030)

IHS flu immunization rates in 2020/21 were under 30% for all age groups

Adults hospitalized for influenza commonly suffer from chronic conditions

Compared to non-Hispanic White adults, VCRs remain substantially lower for AI/AN

Opportunity for change: identify barriers, understand hesitancy, focus on equity and target groups

IHS, Indian Health System; VCR, Vaccine Coverage Rate; AI, American Indian; AN, Alaskan Native

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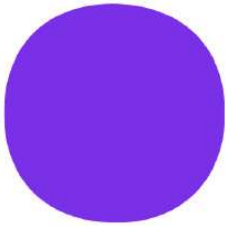
Influenza Discussion Questions

- IS THE INFORMATION ON INFLUENZA BURDEN AND VACCINATION COVERAGE RATES (VCRS) IN AMERICAN INDIANS / ALASKA NATIVES PRESENTED IN LINE WITH YOUR TRIBAL HEALTH CENTER EXPERIENCE?
- WHICH MESSAGES HAVE YOU DISCOVERED WORK WITH YOUR PATIENTS TO INCREASE ACCEPTANCE OF RECEIVING INFLUENZA VACCINATION?
- HAVE YOU STARTED PLANNING FOR THE 2022-23 INFLUENZA IMMUNIZATION SEASON? WHAT DOES YOUR OVERALL STRATEGY AND IMPLEMENTATION PLAN TO DRIVE IMMUNIZATION RATES LOOK LIKE?
- HOW PRACTICAL AND USEFUL ARE EXISTING RESOURCES FOR HCPS WITHIN THE TRIBAL HEALTH CENTERS ON INFLUENZA?
- THERE ARE MULTIPLE STRATEGIES TO INCREASE VACCINE COVERAGE RATES, WHAT STRATEGIES DO YOU THINK WORK BEST WITHIN YOUR TRIBAL HEALTH CENTER?



Thank You!

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