In the United States, annual vaccination against seasonal influenza is recommended for all persons aged ≥6 months except when contraindicated (1). Currently available influenza vaccines are designed to protect against four influenza viruses: A(H1N1)pdm09 (the 2009 pandemic virus), A(H3N2), B/Victoria lineage, and B/Yamagata lineage. Most influenza viruses detected this season have been A(H3N2) (2). With the exception of the 2020–21 season, when data were insufficient to generate an estimate, CDC has estimated the effectiveness of seasonal influenza vaccine at preventing laboratory-confirmed, mild/moderate (outpatient) medically attended acute respiratory infection (ARI) each season since 2004–05. This interim report uses data from 3,636 children and adults with ARI enrolled in the U.S. Influenza Vaccine Effectiveness Network during October 4, 2021—February 12, 2022. Overall, vaccine effectiveness (VE) against medically attended outpatient ARI associated with influenza A(H3N2) virus was 16% (95% CI = −16% to 39%), which is considered not statistically significant. This analysis indicates that influenza vaccination did not reduce the risk for outpatient medically attended illness with influenza A(H3N2) viruses that predominated so far this season. Enrollment was insufficient to generate reliable VE estimates by age group or by type of influenza vaccine product (1). CDC recommends influenza antiviral medications as an adjunct to vaccination; the potential public health benefit of antiviral medications is magnified in the context of reduced influenza VE. CDC routinely recommends that health care providers continue to administer influenza vaccine to persons aged ≥6 months as long as influenza viruses are circulating, even when VE against one virus is reduced, because vaccine can prevent serious outcomes (e.g., hospitalization, intensive care unit (ICU) admission, or death) that are associated with influenza A(H3N2) virus infection and might protect against other influenza viruses that could circulate later in the season. To derive these interim 2021–22 VE estimates, seven study sites of the U.S. Influenza Vaccine Effectiveness Network (California, Michigan, Pennsylvania, Tennessee, Texas, Washington, and Wisconsin) prospectively enrolled patients...
aged ≥6 months who had ARI with cough, fever or feverishness, or loss of taste or smell seeking outpatient medical care (i.e., telehealth, primary care, urgent care, or emergency department) or clinical testing for SARS-CoV-2 ≤10 days after illness onset. Inclusion criteria included age ≥6 months on September 1, 2021, enrollment after local influenza circulation was identified,∗ and no treatment with an influenza antiviral medication (e.g., oseltamivir or baloxavir) during this illness. After informed consent, participants or their guardians were interviewed to collect demographic data, information on general and current health status and symptoms, and 2021–22 influenza vaccination status. A clinical or research upper respiratory specimen for influenza and SARS-CoV-2 molecular testing was collected from eligible patients. Participants who require 2 vaccine doses during their first vaccination season (including children aged <9 years) were considered vaccinated if they received ≥1 dose of any seasonal influenza vaccine ≥14 days before illness onset, according to medical records and registries (Wisconsin site); medical records and self-report (California, Pennsylvania, Tennessee, Texas, and Washington sites); or self-report only (Michigan site). VE against all influenza A viruses and against influenza A(H3N2) viruses was estimated using the test-negative design as 100% x (1 − adjusted odds ratio [OR]).† Using logistic regression, estimates were adjusted for study site, age group, days from illness onset to enrollment, and month of illness onset. This study was reviewed and approved by CDC and U.S. Influenza Vaccine Effectiveness Institutional Review Boards.§

Among the 3,636 children and adults with ARI enrolled at the seven study sites during October 4, 2021–February 12, 2022, a total of 194 (5%) received a positive test result for influenza A virus infection by real-time reverse–transcription polymerase chain reaction; none received a positive test result for influenza B virus infection. Among 178 influenza A viruses subtyped, one was A(H1N1)pdm09 and 177 were A(H3N2) viruses (Table 1); 11 patients received positive test results for both influenza A and SARS-CoV-2 viruses. The proportion of patients with influenza differed by study site, age group, and days from illness onset to enrollment. The percentage of ARI patients with reported or documented receipt of 2021–22 influenza-positive case by site are the University of Michigan School of Public Health (in partnership with University of Michigan Health System [Ann Arbor, Michigan] and the Henry Ford Health System [Detroit, Michigan]) (October 4, 2021); Vanderbilt University Medical Center, Nashville, Tennessee (November 2, 2021); Kaiser Permanente Washington (Seattle, Washington) and Kaiser Permanente Southern California (Los Angeles, California) (November 9, 2021); Baylor Scott & White Health (Temple, Texas) (November 21, 2021); Marshfield Clinic Research Institute (Marshfield, Wisconsin) (November 24, 2021); and University of Pittsburgh Schools of the Health Sciences (in partnership with the University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania) (November 29, 2021).

* U.S. Influenza Vaccine Effectiveness Network sites and the dates of the first influenza-positive case by site are the University of Michigan School of Public Health (in partnership with University of Michigan Health System [Ann Arbor, Michigan] and the Henry Ford Health System [Detroit, Michigan]) (October 4, 2021); Vanderbilt University Medical Center, Nashville, Tennessee (November 2, 2021); Kaiser Permanente Washington (Seattle, Washington) and Kaiser Permanente Southern California (Los Angeles, California) (November 9, 2021); Baylor Scott & White Health (Temple, Texas) (November 21, 2021); Marshfield Clinic Research Institute (Marshfield, Wisconsin) (November 24, 2021); and University of Pittsburgh Schools of the Health Sciences (in partnership with the University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania) (November 29, 2021).

† 100% x (1 − OR [ratio of odds of being vaccinated among outpatients who received positive test results to CDC’s real-time reverse–transcription polymerase chain reaction influenza test to the odds of being vaccinated among outpatients who received influenza-negative test results]).

§ 45 C.F.R. part 46; 21 C.F.R. part 56.
influenza vaccine ranged from 31% to 64% among study sites and differed by age group.

Among participants with a positive influenza test result, 41% had received the 2021–22 seasonal influenza vaccine, compared with 50% of influenza test result–negative participants (Table 2). VE against outpatient medically attended ARI associated with influenza A virus types was 14% (95% CI = −17% to 37%). VE for all ages combined was 16% (95% CI = −16% to 39%) against outpatient medically attended ARI associated with influenza A(H3N2) virus infection.

As of February 12, 2022, CDC had genetically characterized 65 influenza A(H3N2) viruses from U.S. Influenza Vaccine Effectiveness Network participants; all viruses belonged to genetic clade 3C.2a1b subclade 2a.2. This viral subclade has been identified in >99% of genetically characterized A(H3N2) viruses subclade 3C.2a.1b. This viral subclade has been identified in >99% of genetically characterized A(H3N2) viruses subclade 3C.2a.1b.

### Table 1. Selected characteristics for enrolled patients with medically attended acute respiratory infection, by influenza test result status and seasonal influenza vaccination status* — U.S. Influenza Vaccine Effectiveness Network, United States, October 4, 2021–February 12, 2022

| Characteristic | Influenza-positive no. (%) | Influenza-negative no. (%) | P-value† | Total no. of patients | Vaccinated no. (%) | P-value‡ |
|---------------|-----------------------------|-----------------------------|----------|-----------------------|--------------------|----------|
| Overall       | 194 (5)                     | 3,442 (95)                  | NA       | 3,636                 | 1,817 (50)         | NA       |
| Study site    |                             |                             |          |                       |                    |          |
| California    | 3 (1)                       | 438 (99)                    | <0.001   | 441                   | 263 (60)           | <0.001   |
| Michigan      | 11 (4)                      | 268 (96)                    |          | 279                   | 178 (64)           |          |
| Pennsylvania  | 16 (5)                      | 325 (95)                    |          | 341                   | 147 (43)           |          |
| Tennessee     | 46 (9)                      | 441 (91)                    |          | 487                   | 251 (52)           |          |
| Texas         | 14 (3)                      | 476 (97)                    |          | 490                   | 151 (31)           |          |
| Washington    | 4 (1)                       | 405 (99)                    |          | 409                   | 235 (57)           |          |
| Wisconsin     | 100 (8)                     | 1,089 (92)                  |          | 1,189                 | 592 (50)           |          |
| Age group     |                             |                             |          |                       |                    |          |
| 6 mos–8 yrs   | 30 (8)                      | 356 (92)                    | <0.001   | 386                   | 214 (55)           | <0.001   |
| 9–17 yrs      | 51 (11)                     | 403 (89)                    |          | 454                   | 163 (36)           |          |
| 18–49 yrs     | 87 (5)                      | 1,699 (95)                  |          | 1,786                 | 793 (44)           |          |
| 50–64 yrs     | 19 (3)                      | 653 (97)                    |          | 672                   | 393 (58)           |          |
| ≥65 yrs       | 7 (2)                       | 331 (98)                    |          | 338                   | 254 (75)           |          |
| Illness onset to enrollment, days |                   |                             |          |                       |                    |          |
| <3            | 112 (6)                     | 1,614 (94)                  | 0.01     | 1,726                 | 888 (51)           | 0.28     |
| 3–4           | 55 (5)                      | 1,129 (95)                  |          | 1,184                 | 578 (49)           |          |
| 5–7           | 27 (4)                      | 699 (96)                    |          | 726                   | 351 (48)           |          |
| Influenza test result |                       |                             |          |                       |                    |          |
| Negative      | NA                          | 3,442                       | NA       | 3,442                 | 1,738 (50)         | NA       |
| Influenza A positive | 194 (100)                | NA                          |          | 194                   | 79 (41)            |          |
| A(H1N1)pdm09  | 1 (0.5)                     | NA                          |          | 1                     | 0 (—)              |          |
| A(H3N2)       | 177 (91)                    | NA                          |          | 177                   | 69 (39)            |          |
| A subtype pending | 16 (8)                  | NA                          |          | 16                    | 10 (63)            |          |
| Influenza B positive | 0 (—)                    | NA                          |          | 0                     | 0 (—)              | NA       |

Abbreviation: NA = not applicable.

* Defined as having received ≥1 doses of influenza vaccine ≥14 days before illness onset. A total of 101 participants who received the vaccine ≤13 days before illness onset were excluded from the study.

† Pearson's chi-square test was used to assess differences between the numbers of persons with influenza-negative and influenza-positive test results in the distribution of enrolled patient and illness characteristics and in differences between groups in the percentage vaccinated.

### Table 2. Number and percentage of persons receiving 2021–22 seasonal influenza vaccine among 3,636 outpatients with acute respiratory infection, by influenza test result status and vaccine effectiveness* against all influenza A and against virus type A(H3N2) — U.S. Influenza Vaccine Effectiveness Network, United States, October 4, 2021–February 12, 2022

| Influenza type, all ages | Influenza-positive | Influenza-negative | VE* |
|--------------------------|-------------------|-------------------|-----|
|                          | Total             | Vaccinated no. (%)| Total | Vaccinated no. (%) | Unadjusted % (95% CI) | Adjusted % (95% CI)‡ |
| Influenza A              | 194               | 79 (41)           | 3,442 | 1,738 (50)         | 32 (10 to 50)         | 14 (−17 to 37)       |
| Influenza A/H3N2         | 177               | 69 (39)           | 3,174 | 1,564 (49)         | 34 (11 to 52)         | 16 (−16 to 39)       |

Abbreviations: OR = odds ratio; VE = vaccine effectiveness.

* VE was estimated using the test-negative design as 100% x (1 − OR [ratio of odds of being vaccinated among outpatients who received influenza-positive test results to odds of being vaccinated among outpatients who received influenza-negative test results]); ORs were estimated using logistic regression. https://www.cdc.gov/flu/vaccines-work/us-flu-ve-network.htm

‡ Adjusted for study site, age group, number of days from illness onset to enrollment, and month of illness using logistic regression.
Discussion

This interim estimate of 2021–22 influenza VE suggests that influenza vaccination did not significantly reduce the risk of outpatient medically attended illness with influenza A(H3N2) viruses that have predominated so far this season. These findings are consistent with previous evidence of low to no protection against outpatient infection with A(H3N2) subclade 2a.2 viruses from an investigation of an influenza outbreak on a university campus during October–November 2021 (4). These VE estimates underscore the need for ongoing diagnostic testing for influenza, influenza antiviral treatment and prophylaxis when indicated, and everyday preventive measures (4,5).

CDC continues to recommend influenza vaccination when VE against outpatient illness is reduced because a growing body of evidence suggests that influenza vaccination can avert serious outcomes, including hospitalization, ICU admission, and death, among persons who are vaccinated but still become infected (6). In addition, vaccination is likely to prevent illness or serious complications of infection with other influenza viruses that might circulate later in the season, including influenza A(H1N1)pdm09 and B viruses (6).

Compared with influenza vaccination during 2020–21, influenza vaccination coverage is lower so far this season in certain groups, including some groups who are at high risk for severe influenza or complications from influenza, such as persons who are pregnant, infants, and preschool-aged children, as well as persons from racial and ethnic minority groups (7). Persons aged ≥6 months who have not yet been vaccinated this season should be vaccinated.

This influenza VE estimate is the first since the 2019–20 season; effectiveness of 2020–21 influenza vaccines could not be assessed because influenza virus circulation was historically low. Cumulative rates of laboratory-confirmed influenza hospitalizations so far this season have also been substantially lower than in recent A(H3N2)-predominant seasons (7). During the 2021–22 influenza season, clinical laboratory data reported to CDC showed increased influenza virus circulation beginning in November 2021 and continuing through mid-December 2021. From late December 2021 through late January 2022, during the rapid rise in SARS-CoV-2 B.1.1.529 (Omicron) variant positivity, influenza activity declined; however, during the first 2 weeks of February 2022, a slight increase in the percentage of specimens testing positive for influenza at clinical laboratories was reported. Influenza activity is difficult to predict and may continue for multiple weeks.

On February 25, 2022, the World Health Organization issued recommendations that the 2022–23 influenza vaccines for the northern hemisphere include updates to A(H3N2) reference viruses representing the 2a.2 subclade of A(H3N2) clade 3C.2a1b, as well as updates to the B/Victoria lineage vaccine component (3). Predicting circulation of virus subtypes and predominant clades within subtypes remains challenging. Evolution of circulating viruses has required frequent updates to the composition of influenza vaccines. Efforts to develop influenza vaccines that provide broader coverage of the diversity among circulating viruses are ongoing.

The findings in this report are subject to at least four limitations. First, because of low influenza test positivity, VE estimates were limited to all ages combined against influenza A overall and against A(H3N2); VE can vary by virus type or subtype (8), vaccine formulation, and antigenic match between circulating viruses and vaccine components (9,10). End-of-season VE estimates could change as enrollment continues or if other influenza viruses predominate later in the season. Second, vaccination status at six of seven sites included self-report, which might result in misclassification of influenza vaccination status for some patients. Third, health care seeking behavior has changed during the COVID-19 pandemic and enrollment of patients with outpatient illness from COVID-19 testing sites might have affected results. The test-negative design for estimating influenza VE requires validation when influenza test-negative controls include patients with COVID-19 and receipt of influenza and COVID-19 vaccines are correlated. Finally, VE estimates in this report are specific to the prevention of outpatient illness rather than to more severe illness outcomes (e.g., hospitalization or death); data from studies measuring VE against more severe outcomes this season will be available at a later date.

Although influenza virus circulation and laboratory-confirmed influenza associated hospitalizations declined from late December 2021 through January 2022, some regions of the United States have seen increases in influenza activity since that time.** Influenza activity is difficult to predict, and strategies to prevent influenza illness remain important to reduce strain on health care services. Vaccination against seasonal influenza might protect against other influenza viruses that could circulate later in the season and their potentially serious complications. Clinicians should consider diagnostic testing for patients with ARI, especially among hospitalized patients and those at increased risk for complications. All hospitalized patients and all outpatients at higher risk for serious complications

---

*Sample sizes to achieve an adequate number of influenza cases to estimate a significant VE with 95% CIs that do not include 0 were estimated for the following age groups: 6 months–17 years, 18–49 years, and ≥50 years. Sample size calculations were based on a type I error probability of 5% and a type II error probability of 20% (power 80%) to detect 40% VE against any influenza and 30% VE against influenza A(H3N2). Assumptions about vaccination coverage varied by age group: 50% for 6 months–17 years, 30% for 18–49 years, and 50% for ≥50 years.

**https://www.cdc.gov/flu/weekly/index.htm
**Summary**

What is already known about this topic?

Annual vaccination against seasonal influenza is recommended for all persons in the United States aged ≥6 months. Effectiveness of seasonal influenza vaccine varies by influenza season.

What is added by this report?

Based on data from 3,636 children, adolescents, and adults with acute respiratory infection during October 4, 2021–February 12, 2022, seasonal influenza vaccination did not reduce the risk for outpatient respiratory illness caused by influenza A(H3N2) viruses that have predominated so far this season.

What are the implications for public health practice?

CDC recommends influenza vaccination for as long as influenza viruses are circulating. Vaccination can prevent serious influenza-related complications caused by viruses that might circulate later in the season, including 2009 pandemic A(H1N1) and influenza B viruses.

from influenza should be treated as soon as possible with a neuraminidase inhibitor medication if influenza is suspected (5). Physicians should not wait for confirmatory influenza laboratory testing, and the decision to use antiviral medication should not be influenced by patient influenza vaccination status. Clinicians should be aware that influenza activity might continue or increase, and influenza should be considered as a possible diagnosis in all patients with ARI.

**Acknowledgments**

Alexander Arroliga, Madhava Beemar, Kayan Dunnigan, Jason Ettlinger, Ashley Graves, Eric Hoffman, Mufaddal Mamawala, Amanda McKillop, Kempapura Murthy, Manohar Mutnal, Elisa Priest, Chandni Raiyani, Arundhati Rao, Lydia Requenez, Natalie Settele, Michael Smith, Keith Stone, Jennifer Thomas, Marcus Volz, Kimberly Walker, Martha Zayed, Baylor Scott & White Health, Temple, Texas and Texas A&M University College of Medicine, Temple, Texas; Ekow Annan, Peter Daley, Krista Kniss, Angiezel Merced-Morales, Influenza Division, CDC; Elmer Ayala, Britta Amundsen, Michael Aragones, Raul Calderon, Vennis Hong, Gabriela Jimenez, Jeniffer Kim, Jen Ku, Bruno Lewin, Ashley McDaniel, Alexandria Reyes, Sally Shaw, Harp Takhar, Alicia Torres, Pasadena Medical Office Urgent Care Staff, Kaiser Permanente Southern California, Pasadena, California; Rachael Burganowski, Erika Kiniry, Kathryn A. Moser, Matt Nguyen, Suzie Park, Stacie Wellwood, Brianna Wickersham, Kaiser Permanente Washington Health Research Institute, Seattle, Washington; Juan Alvarado-Batres, Saydee Benz, Hannah Berger, Adam Bissonnette, Joshua Blake, Krystal Boese, Emily Botten, Jarod Boyer, Michaela Braun, Brianna Breu, Gina Burbey, Caleb Cravillion, Christian Delgadillo, Amber Donnerbauer, Tim Dziedzic, Joseph Eddy, Heather Edgren, Alex Ermeling, Kelsey Ewert, Connie Feibehrenbach, Rachel Fernandez, Wayne Frome, Sherri Guzinski, Linda Heeren, David Herda, Mitchell Hertel, Garrett Heuer, Erin Higdon, Lynn Ivacic, Lee Jepsen, Steve Kaiser, Julie Karl, Bailey Keffr, Jennifer King, Tamara Kronenwetter Koepel, Stephanie Kohl, Sarah Kohn, Diane Kohnhorst, Erik Kronholm, Thao Le, Alaura Lemieux, Carrie Marcis, Megan Maronde, Isaac McCreedy, Karen McGreevey, Nidhi Mehta, Daniel Miesbauer, Vicki Moon, Jennifer Moran, Collin Nikolai, Brooke Olson, Jeremy Olsstadt, Lisa Ott, Nan Pan, Cory Pike, DeeAnn Polacek, Martha Presson, Nicole Price, Christopher Rayburn, Chris Reardon, Miriah Rotar, Carla Rotscheit, Jacklyn Salzwedel, Juan Saucedo, Kelly Scheffen, Charity Schug, Kristin Seyfert, Ram Shrestha, Alexander Slenczka, Elisha Stefanski, Melissa Strupp, Megan Tichenor, Lyndsay Watkins, Anna Zachow, Ben Zimmerman, Marshfield Clinic Research Institute, Marshfield, Wisconsin; Sarah Bauer, Kim Beney, Caroline K. Cheng, Nahla Faraj, Amy Getz, Michelle Grissom, Michelle Groesbeck, Samantha Harrison, Kristen Henson, Kim Jermanus, Emileigh Johnson, Anne Kanicldies, Armanda Kimberly, Lois E. Lamerato, Adam Lauring, Regina Lehmann-Wandell, E. J. McSpadden, Louis Nabors, Rachel Truscon, University of Michigan, Ann Arbor, Michigan and Henry Ford Health System, Detroit, Michigan; G.K. Balasubramanion, Todd Bear, Erin Bowser, Karen Clarke, Lloyd G. Clarke, Klancie Dauer, Chris Deluca, Blair Dierks, Linda Haynes, Robert Hickey, Monika Johnson, Leah McKown, Alanna Peterson, Theresa M. Sax, Miles Stiegler, Michael Susick, Joe Suyama, Louise Taylor, Sara Walters, Alexandra Weissman, John V. Williams, University of Pittsburgh Schools of the Health Sciences and University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania; Marcia Blair, Juliana Carter, Jim Chappell, Emma Copen, Meredith Denney, Kellie Graes, Natasha Halasa, Chris Lindell, Zhouwen Liu, Stephanie Longmire, Rendie McHenry, Laura Short, His-Nien Tan, Denise Vargas, Jesse Wrenn, Dayna Wyatt, Yuwei Zhu, Vanderbilt University Medical Center, Nashville, Tennessee; state, county, city, and territorial health departments and public health laboratories; U.S. World Health Organization collaborating laboratories.

Corresponding author: Jessie R. Chung, jehung@cdc.gov. 

1Influenza Division, National Center for Immunization and Respiratory Diseases, CDC; 2Department of Research and Evaluation, Kaiser Permanente Southern California, Pasadena, California; 3Vanderbilt University Medical Center, Nashville, Tennessee; 4Kaiser Permanente Washington Health Research Institute, Seattle, Washington; 5University of Michigan School of Public Health, Ann Arbor, Michigan; 6Marshfield Clinic Research Institute, Marshfield, Wisconsin; 7Baylor Scott & White Health, Temple, Texas; 8Texas A&M University College of Medicine, Temple, Texas; 9University of Pittsburgh Schools of the Health Sciences and University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania; 10General Dynamics Information Technology, Falls Church, Virginia.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Ana Florea reports unrelated institutional grant support for research from Gilead, GlaxoSmithKline, Moderna, and Pfizer. Carlos G. Grijalva reports consulting fees from Merck, Pfizer, and Sanofi Pasteur, and institutional grant support from the Agency for Health Care Research and Quality, Campbell Alliance/Syneos Health, the Food and Drug Administration, and the National Institutes of Health. Emily T. Martin reports institutional grant support from Merck. Arnold S. Monto reports personal fees from
Sanofi and nonfinancial support from Seqirus. Mary Patricia Nowalk reports unrelated institutional grant support and personal fees from Merck Sharp & Dohme and institutional investigator-initiated grant support from Sanofi Pasteur. Sara Y. Tartof reports unrelated institutional grant support from Pfizer and GlaxoSmithKline. David E. Wentworth reports institutional grant support from Seqirus for a cooperative research and development agreement on isolation and propagation of influenza viruses in qualified manufacturing cell lines and patents 10,030,231 (influenza reassortment) and 10,272,149 (modified bat influenza viruses and their uses). No other potential conflicts of interest were disclosed.

References
1. Grohskopf LA, Alyanak E, Ferdinands JM, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices, United States, 2021–22 influenza season. MMWR Recomm Rep 2021;70(No. RR-5):1–28. PMID:34448800 https://doi.org/10.15585/mmwr.rr7005a1
2. CDC. Weekly U.S. influenza surveillance report. Atlanta, GA: US Department of Health and Human Services, CDC; 2022. https://www.cdc.gov/flu/weekly/index.htm
3. World Health Organization. Recommendations for influenza vaccine composition. Geneva, Switzerland: World Health Organization; 2022. https://www.who.int/teams/global-influenza-programme/vaccines/who-recommendations
4. Delahoy MJ, Mortenson L, Bauman L, et al. Influenza A(H3N2) outbreak on a university campus—Michigan. October–November 2021. MMWR Morb Mortal Wkly Rep 2021;70:1712–4. PMID:34882659 https://doi.org/10.15585/mmwr.mm7049e1
5. CDC. Influenza antiviral medications: summary for clinicians. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm
6. Olson SM, Newhams MM, Halasa NB, et al.; Pediatric Intensive Care Influenza Investigators. Vaccine effectiveness against life-threatening influenza illness in US children. Clin Infect Dis 2022. Epub January 13, 2022. PMID:35024795 https://doi.org/10.1093/cid/ciab931
7. CDC. Weekly flu vaccination dashboard. Atlanta, GA: US Department of Health and Human Services, CDC; 2022. https://www.cdc.gov/flu/fluvaxview/dashboard/vaccination-dashboard.html
8. Okoli GN, Racovitan F, Abdulwahid T, Righolt CH, Mahmud SM. Variable seasonal influenza vaccine effectiveness across geographical regions, age groups and levels of vaccine antigenic similarity with circulating virus strains: a systematic review and meta-analysis of the evidence from test-negative design studies after the 2009/10 influenza pandemic. Vaccine 2021;39:1225–40. PMID:33494964 https://doi.org/10.1016/j.vaccine.2021.01.032
9. Tenforde MW, Kondor RJG, Chung JR, et al. Effect of antigenic drift on influenza vaccine effectiveness in the United States—2019–2020. Clin Infect Dis 2021;73:e4244–50. PMID:33367650 https://doi.org/10.1093/cid/ciaa1884
10. Flannery B, Kondor RJG, Chung JR, et al. Spread of antigenically drifted influenza A(H3N2) viruses and vaccine effectiveness in the United States during the 2018–2019 season. J Infect Dis 2020;221:8–15. PMID:31665373 https://doi.org/10.1093/infdis/jiz543