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Progress Toward Regional Measles Elimination — Worldwide, 2000–2020

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In 2012, the World Health Assembly endorsed the Global Vaccine Action Plan,* with the objective of eliminating measles† in five of the six World Health Organization (WHO) regions by 2020 (*1*). The Immunization Agenda 2021–2030 (IA2030)§ uses measles incidence as an indicator of the strength of immunization systems. The Measles-Rubella Strategic Framework 2021–2030¶ and the Measles Outbreaks Strategic Response Plan 2021–2023** are aligned with the IA2030 and highlight robust measles surveillance systems to document immunity gaps, identify root causes of undervaccination, and develop locally tailored solutions to ensure administration of 2 doses of measles-containing vaccine (MCV) to all children. This report describes progress toward World Health Assembly milestones and measles elimination objectives during 2000–2020 and updates a previous report (*2*). During 2000–2010, estimated MCV first dose (MCV1) coverage increased globally from 72% to 84%, peaked at 86% in 2019, but declined to 84% in 2020 during the COVID-19 pandemic. All countries conducted measles surveillance, although fewer than one third

* The Global Vaccine Action Plan is the implementation plan of the Decade of Vaccines, a collaboration between WHO; UNICEF; the Bill and Melinda Gates Foundation; the National Institute of Allergy and Infectious Diseases; the African Leaders Malaria Alliance; Gavi, the Vaccine Alliance; and others to extend the full benefit of immunization to all persons by 2020 and beyond. In addition to 2015 targets, it also set a target for measles and rubella elimination in five of the six WHO regions by 2020. https://www.who.int/teams/immunization-vaccines-and-biologicals/strategies/global-vaccine-action-plan

† Measles elimination is defined as the absence of endemic measles virus transmission in a region or other defined geographic area for ≥12 months in the presence of a high-quality surveillance system that meets targets of key performance indicators.

§ Immunization Agenda 2030 is the global vision and strategy to extend the benefits of vaccines to everyone, everywhere, developed by immunization stakeholders and endorsed by the World Health Assembly in 2020. https://www.who.int/teams/immunization-vaccines-and-biologicals/strategies/ia2030

¶ The Measles and Rubella Strategic Framework 2021–2030 aims to provide high-level guidance for developing regional and national strategies and operational plans. It was developed through a broad consultative process that generated feedback on achievements and major shortfalls in measles and rubella control over the past decade and defined strategic pivots and focus areas for the next decade. It is meant to serve as a disease-specific strategy under the IA2030 structure, and it aligns with other important strategy documents, including WHO's Thirteenth General Programme of Work 2019–2023; the UNICEF Immunization Roadmap 2018–2030; and Gavi, the Vaccine Alliance's 2021–2025 strategy. The Measles and Rubella Strategic Framework 2021–2030 envisions "a world free from measles and rubella." https://www.who.int/publications/i/item/measles-and-rubella-strategic-framework-2021-2030

** The Measles Outbreaks Strategic Response Plan 2021–2023 envisions a world in which all countries are equipped with robust measles outbreak prevention, preparedness, and response systems and contains four objectives: 1) improved coordination mechanisms for measles outbreak preparedness and response; 2) expanded vaccination efforts in vulnerable communities through resource mobilization for risk-based national plans in countries that are not eligible for Gavi support; 3) enhanced national capacity for outbreak preparedness in priority countries (e.g., planning, detection, readiness for investigation, and response), including robust surveillance; and 4) improved timeliness and effectiveness of investigation and response to measles outbreaks, including detection, root cause analysis to identify programmatic gaps to prevent future outbreaks, after action reviews and recovery. https://apps.who.int/iris/handle/10665/340657

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achieved the sensitivity indicator target of ≥2 discarded[††] cases per 100,000 population in 2020. Annual reported measles incidence decreased 88% during 2000–2016, from 145 to 18 cases per 1 million population, rebounded to 120 in 2019, before falling to 22 in 2020. During 2000–2020, the annual number of estimated measles deaths decreased 94%, from 1,072,800 to 60,700, averting an estimated 31.7 million measles deaths. To achieve regional measles elimination targets, enhanced efforts are needed to reach all children with 2 MCV doses, implement robust surveillance, and identify and close immunity gaps.

Immunization Activities

WHO and UNICEF estimate immunization coverage using data from administrative records (calculated by dividing the number of vaccine doses administered by the estimated target population, reported annually), country estimates, and vaccination coverage surveys to estimate MCV1 and second dose MCV (MCV2) coverage through routine immunization (i.e., not mass campaigns).[§§] During 2000–2010, estimated MCV1 coverage worldwide increased from 72% to 84%. However, coverage stagnated at 84%–85% since 2010, peaked at 86% in 2019, and declined to 84% in 2020. Regional variation exists; however, five of the six WHO regions reported a decline in MCV1 coverage between 2019 and 2020 (Table 1).

Among 194 WHO member states, 75 (39%) achieved ≥90% MCV1 coverage in 2020, a 13% decrease from 86 (45%) countries in 2000, and a 37% decrease from 119 (61%) countries in 2019. In 2020, 22.3 million infants did not receive MCV1 through routine immunization services, an increase of three million (16%) from 2019. The 10 countries with the highest numbers of infants not receiving MCV1 were Nigeria (3.3 million), India (2.6 million), the Democratic Republic of the Congo (1.5 million), Ethiopia (1.4 million), Indonesia (1.1 million), Pakistan (1.0 million), Angola (0.7 million), the Philippines (0.6 million), Brazil (0.6 million), and Afghanistan (0.4 million); accounting for nearly two thirds (59%) of the global total. Estimated global MCV2 coverage nearly quadrupled from 18% in 2000 to 71% in 2019, then declined to 70% in 2020. The number of countries offering MCV2 increased 88%, from 95 (50%) in 2000 to 179 (92%) in 2020. Two countries (Madagascar and Nigeria) introduced MCV2 in 2020.

[††] A discarded case is defined as a suspected case that has been investigated and determined to be neither measles nor rubella using 1) laboratory testing in a proficient laboratory or 2) epidemiologic linkage to a laboratory-confirmed outbreak of a communicable disease that is not measles or rubella. The discarded case rate is used to measure the sensitivity of measles surveillance.

[§§] Calculated for MCV1, among children aged 1 year or, if MCV1 is given at age ≥1 year, among children aged 24 months. Calculated for MCV2 among children at the recommended age for administration of MCV2, per the national immunization schedule. WHO/UNICEF estimates of national immunization coverage are available at https://www.who.int/teams/immunization-vaccines-and-biologicals/immunization-analysis-and-insights/global-monitoring/immunization-coverage/who-unicef-estimates-of-national-immunization-coverage.

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TABLE 1. Estimates of coverage with the first and second doses of measles-containing vaccine administered through routine immunization services, reported measles cases, and incidence, by World Health Organization region — worldwide, 2000, 2010, 2016, 2019, and 2020

WHO region/Year (no. of countries in region)	% MCV1* coverage	% Countries with ≥90% MCV1 coverage†	% MCV2* coverage	% Reporting countries with <5 measles cases per 1 million population§	No. of reported measles cases§ (% of total cases)	Measles incidence per 1 million population§,¶
African						
2000 (46)	53	9	5	8	520,102 (60.9)	842
2010 (46)	73	37	4	30	199,174 (57.9)	235
2016 (47)	69	34	22	51	36,269 (27.4)	37
2019 (47)	70	30	33	34	618,595 (70.9)	567
2020 (47)	68	15	36	32	115,364 (77.0)	108
Americas						
2000 (35)	93	63	65	89	1,754 (0.2)	2
2010 (35)	93	74	67	100	247 (0.1)	0.3
2016 (35)	92	66	80	100	97 (0.1)	0.1
2019 (35)	87	69	72	91	21,971 (2.5)	32
2020 (35)	85	37	73	100	1,548 (1.0)	2
Eastern Mediterranean						
2000 (21)	71	57	28	17	38,592 (4.5)	90
2010 (21)	77	62	52	40	10,072 (2.9)	17
2016 (21)	82	57	74	55	6,275 (4.7)	10
2019 (21)	84	52	75	42	18,458 (2.1)	27
2020 (21)	83	33	76	64	6,122 (4.1)	10
European						
2000 (52)	91	62	48	45	37,421 (4.4)	50
2010 (53)	93	83	80	69	30,625 (8.9)	34
2016 (53)	93	81	88	82	4,440 (3.4)	5
2019 (53)	96	85	91	29	106,130 (12.2)	116
2020 (53)	94	57	91	80	10,772 (7.2)	17
South-East Asia						
2000 (10)	63	30	3	0	78,558 (9.2)	51
2010 (11)	83	45	15	36	54,228 (15.8)	30
2016 (11)	89	64	75	27	27,530 (20.8)	14
2019 (11)	94	73	83	30	29,389 (3.4)	15
2020 (11)	88	55	78	56	9,389 (6.3)	5
Western Pacific						
2000 (27)	85	48	2	30	177,052 (20.7)	104
2010 (27)	96	63	87	68	49,460 (14.4)	27
2016 (27)	96	63	93	68	57,879 (43.7)	31
2019 (27)	95	67	93	46	78,479 (9.0)	41
2020 (27)	95	44	94	60	6,601 (4.4)	4
Total						
2000 (191)	**72**	**45**	**18**	**38**	**853,479 (100)**	**145**
2010 (193)	**84**	**63**	**42**	**60**	**343,806 (100)**	**50**
2016 (194)	**85**	**61**	**67**	**70**	**132,490 (100)**	**18**
2019 (194)	**86**	**62**	**71**	**45**	**873,022 (100)**	**120**
2020 (194)	**84**	**39**	**70**	**65**	**149,796 (100)**	**22**

Abbreviations: MCV1 = first dose of measles-containing vaccine; MCV2 = second dose of measles-containing vaccine; WHO = World Health Organization.

* https://www.who.int/teams/immunization-vaccines-and-biologicals/immunization-analysis-and-insights/global-monitoring/immunization-coverage/who-unicef-estimates-of-national-immunization-coverage; data accessed July 6, 2021.

† Denominator is the number of WHO member states.

§ https://immunizationdata.who.int/pages/incidence/measles.html?GROUP%20=%20Countries&YEAR%20=; data accessed July 6, 2021. Only those countries that reported data are in the numerator and denominator.

¶ Population data from United Nations, Department of Economic and Social Affairs, Population Division, 2020. Any country not reporting measles cases for that year was removed from both the numerator and denominator in calculating incidence.

Approximately 36 million persons received MCV during supplementary immunization activities (SIAs)[¶¶] in 24 countries in 2020. An additional two million persons received MCV during measles outbreak response activities. Twenty-four SIAs in 23 countries planned for 2020 were postponed because of the COVID-19 pandemic, affecting ≥93 million persons (LL Ho, WHO, personal communication, November 2021).

Reported Measles Incidence and Surveillance Performance

In 2020, all 194 countries conducted measles surveillance, and 193[***] (99%) had access to standardized quality-controlled laboratory testing through the WHO Global Measles and Rubella Laboratory Network (GMRLN).[†††] In spite of this access, surveillance worsened in 2020: GMRLN received 122,517 specimens for measles testing in 2020, the lowest number since 2010, and only 46 (32%) of 144 countries that reported discarded cases achieved the sensitivity indicator target of two or more discarded cases per 100,000 population, compared with 81 (52%) of 157 countries in 2019.

Countries report the number of incident measles cases[§§§] to WHO and UNICEF annually, using the Joint Reporting Form.[¶¶¶] During 2000–2016, the number of reported measles cases decreased 84%, from 853,479 (2000) to 132,490 (2016). From 2000 to 2016, annual measles incidence decreased 88%, from 145 cases per million (2000) to 18 (2016), then increased 567% to 120 per million (2019) before decreasing 82% to 22 (2020) (Table 1). In 2020, 26 large and disruptive outbreaks (≥20 cases per million) were reported across five WHO regions (Supplementary Table, https://stacks.cdc.gov/view/cdc/111172); 17 (65%) of these outbreaks occurred in countries in the African Region (AFR).

Genotypes of viruses isolated from persons with measles were reported by 47 (46%) of 102 countries reporting at least one measles case in 2020, compared with 88 (62%) of 141 countries in 2019. The number of genotypes detected per year decreased from 13 in 2002, to three in 2020, a sign of progress toward elimination. Among 1,268 reported sequences in 2020, 947 (75%) were D8, 307 (24%) were B3, and 14 (1%) were D4.

Measles Case and Mortality Estimates

A previously described model for estimating measles cases and deaths (*3*) was updated with annual vaccination coverage data, case data, and United Nations population estimates for all countries during 2000–2020. The model was revised (*4*,*5*) to incorporate alternative assumptions of correlation between routine MCV doses and SIAs and updated case-fatality ratios, enabling derivation of new global disease and mortality estimates. On the basis of updated annual data and model revisions, the estimated number of measles cases decreased 79%, from 36,763,000 in 2000 to 7,549,000 in 2020; estimated annual measles deaths decreased 94%, from 1,072,800 to 60,700 (Table 2). During 2000–2020, compared with no measles vaccination, measles vaccination prevented an estimated 31.7 million deaths globally (Figure).

Regional Verification of Measles Elimination

By the end of 2020, 81 (42%) countries had been verified by independent regional commissions as having sustained measles elimination, but no new countries had achieved elimination. No WHO region had achieved and sustained elimination, and no AFR country has yet been verified to have eliminated measles. The WHO Region of the Americas achieved verification of measles elimination in 2016; however, endemic measles transmission was reestablished in Venezuela (2016) and Brazil (2018). Since 2016, endemic transmission has been reestablished in nine other countries that had previously eliminated measles (Albania, Cambodia, Czechia, Germany, Lithuania, Mongolia, Slovakia, the United Kingdom, and Uzbekistan).

¶¶ SIAs generally are carried out using two target age ranges. An initial, nationwide catch-up SIA focuses on all children aged 9 months–14 years, with the goal of eliminating susceptibility to measles in the general population. Periodic follow-up SIAs then focus on all children born since the last SIA. Follow-up SIAs generally are conducted nationwide every 2–4 years and focus on children aged 9–59 months; their goal is to eliminate any measles susceptibility that has developed in recent birth cohorts because of low MCV coverage and to protect children who did not respond to MCV1. Data on SIAs by country are available at https://immunizationdata.who.int/listing.html?topic=&location=.

*** São Tomé and Príncipe did not have access to standardized quality-controlled testing by the WHO Measles and Rubella Laboratory Network in 2020.

††† http://www.who-measles.org/Public/Web_Front/main.php; data accessed August 3, 2021.

§§§ https://apps.who.int/immunization_monitoring/globalsummary/timeseries/tsincidencemeasles.html; accessed July 6, 2020. Only countries that reported data are in both the numerator and denominator.

¶¶¶ https://immunizationdata.who.int/pages/incidence/measles.html?GROUP%20=%20Countries&YEAR%20=. Countries that did not report case data, by year (total number, country name), are: 2000 (25: Algeria, Austria, Belgium, Comoros, Equatorial Guinea, Fiji, Finland, Germany, Guinea-Bissau, Ireland, Libya, Mauritania, Monaco, Montenegro, North Korea, Samoa, Saudi Arabia, Seychelles, Slovenia, Solomon Islands, South Sudan, Switzerland, Timor-Leste, Tuvalu, and Yemen); 2010 (five: Federated States of Micronesia, Libya, Monaco, Nauru, and South Sudan); 2016 (15: Belgium, Cabo Verde, Cook Islands, Haiti, Italy, Kiribati, Marshall Islands, Monaco, Morocco, Mozambique, Niue, Samoa, Singapore, Tuvalu, and Vanuatu); 2019 (nine: Austria, Djibouti, Marshall Islands, Morocco, North Korea, Palau, Solomon Islands, Switzerland, and the United States); 2020 (50: Afghanistan, Albania, Algeria, Bahamas, Belgium, Bhutan, Bosnia and Herzegovina, Brazil, Cabo Verde, Cook Islands, Cyprus, Czechia, Djibouti, Federated States of Micronesia, Fiji, Gambia, Germany, Iraq, Kuwait, Kyrgyzstan, Libya, Marshall Islands, Mauritius, Monaco, Montenegro, Morocco, Namibia, Nauru, Netherlands, Niue, North Macedonia, Oman, Palau, Peru, Poland, Portugal, Korea, Moldova, Saint Kitts and Nevis, São Tomé and Príncipe, Serbia, Singapore, Solomon Islands, Tajikistan, Thailand, Tonga, Trinidad and Tobago, Turkey, Turkmenistan, and Tuvalu). Countries do not provide WHO with their reasons for not reporting case data.

TABLE 2. Estimated number of measles cases and deaths,* by World Health Organization region — worldwide, 2000 and 2020

WHO region/Year (no. of countries in region)	Estimated no. of measles cases (95% CI)	Estimated no. of measles deaths (95% CI)	Estimated % measles mortality reduction, 2000–2020	Cumulative no. of measles deaths averted by vaccination, 2000–2020
African				
2000 (46)	11,416,700 (7,212,400–16,519,900)	647,800 (429,500–919,300)	95	16,129,100
2020 (47)	1,944,700 (1,227,300–3,482,200)	33,400 (22,300–56,000)		
Americas				
2000 (35)	8,800 (4,400–35,000)	NA†	NA	105,200
2020 (35)	43,700 (21,800–174,700)	NA†		
Eastern Mediterranean				
2000 (21)	4,641,600 (2,120,400–10,419,900)	156,400 (83,400–317,500)	87	3,274,300
2020 (21)	2,043,600 (1,394,300–2,944,600)	20,400 (14,400–28,700)		
European				
2000 (52)	813,500 (592,400–1,296,000)	4,100 (3,000–5,400)	97	103,400
2020 (53)	179,600 (70,800–392,500)	100 (0–200)		
South-East Asia				
2000 (10)	13,856,500 (10,730,400–17,563,500)	231,400 (190,500–282,000)	98	10,487,700
2020 (11)	2,552,600 (1,509,300–3,902,300)	5,600 (3,800–8,000)		
Western Pacific				
2000 (27)	6,026,000 (4,955,600–7,899,400)	33,100 (26,700–38,200)	96	1,597,700
2020 (27)	784,900 (153,700–2,173,500)	1,200 (300–2,800)		
Total				
2000 (191)	**36,763,000 (25,615,600–53,733,800)**	**1,072,800 (733,100–1,562,300)**	**94**	**31,697,500**
2020 (194)	**7,549,000 (4,377,300–13,069,700)**	**60,700 (40,800–95,800)**		

Abbreviations: NA = not applicable; WHO = World Health Organization.

* The measles mortality model used to generate estimated measles cases and deaths is rerun each year using the new and revised annual WHO/UNICEF estimates of national immunization coverage data, as well as updated surveillance data. In addition, in 2021, the model was revised with respect to correlations in coverage among different measles-containing vaccine delivery methods; therefore, the estimated number of cases and mortality estimates in this report differ from previous reports.

† Estimated measles mortality was too low to allow reliable measurement of mortality reduction.

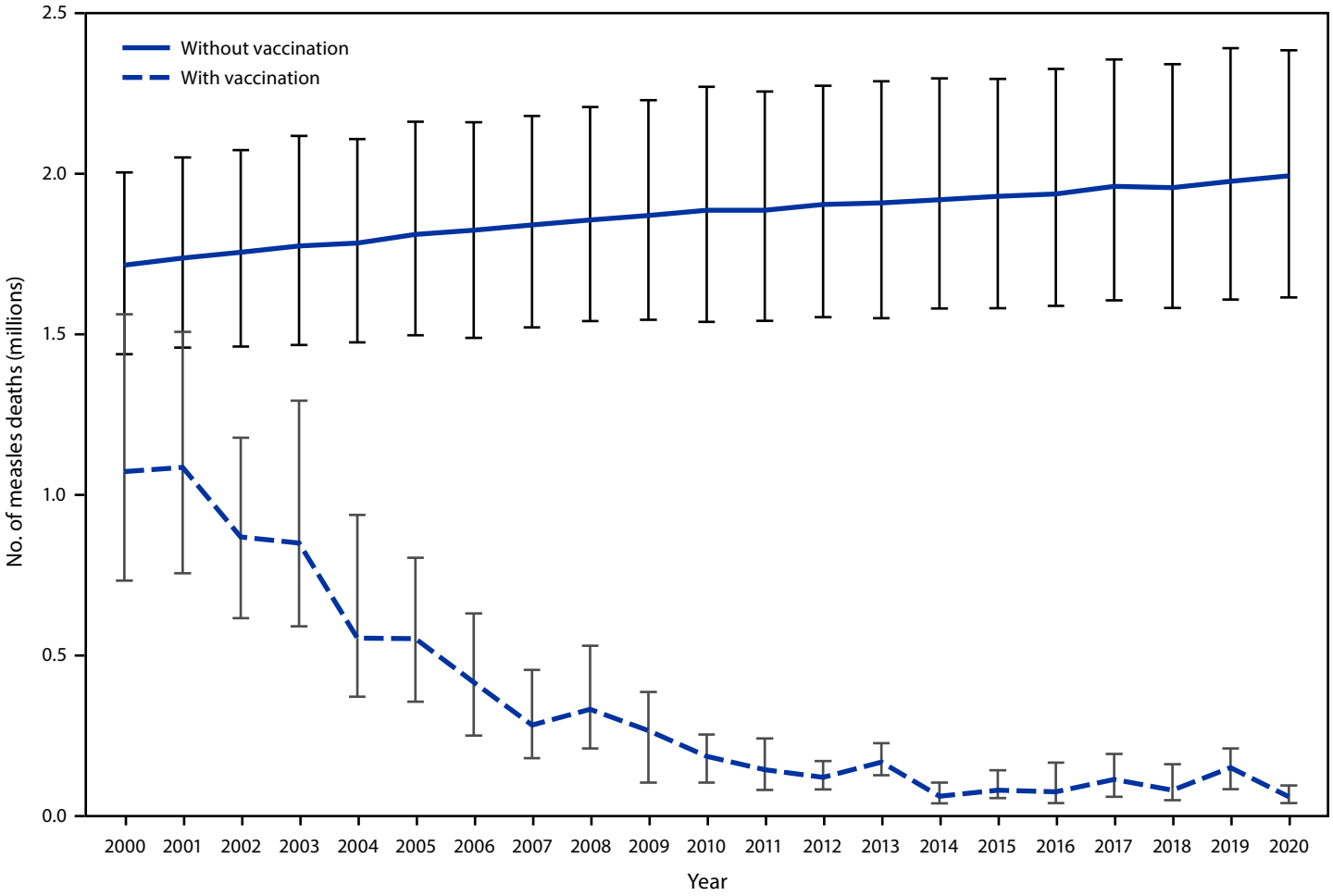
Discussion

A substantial decrease in measles incidence and associated mortality occurred worldwide during 2000–2016, followed by a global resurgence during 2017–2019, then an apparent decline in 2020 during the COVID-19 pandemic. Despite this decline, millions more children were susceptible to measles at the end of 2020 than in 2019. MCV1 coverage decreased globally and in all but one region in 2020; 22.3 million children did not receive MCV1 through routine immunization, and at least 93 million persons did not receive MCV because of COVID-19–related postponement of measles SIAs. Measles surveillance also deteriorated in 2020: the number of specimens submitted was the lowest in over a decade, many countries did not report, and few countries (32%) achieved the measles surveillance sensitivity indicator. Increased population susceptibility and suboptimal measles surveillance portend an immediate elevated risk for measles transmission and outbreaks, threatening the already fragile progress toward regional elimination goals.

The extent to which measles transmission declined in 2020 is unclear. Fewer reported cases might reflect lower transmission secondary to increased immunity from outbreaks during 2017–2019, COVID-19 mitigation measures, or both. Conversely, measles cases might have been underreported in 2020 because of reductions in health care–seeking behavior from patients, health facility availability and reporting, or overall pandemic-related health system disruptions. Large and disruptive measles outbreaks in 2020, however, suggest that measles transmission was underreported. Robust case-based measles surveillance systems enable countries to detect and respond promptly to measles cases and outbreaks. Expanded virologic surveillance can better monitor local patterns of transmission, particularly in high-incidence areas like AFR. The Measles Outbreaks Strategic Response Plan 2021–2023 recommends annual risk assessments to strengthen preparedness and response, investigation of every outbreak, rapid implementation of effective interventions to stop transmission, and root cause analysis to close immunity gaps and prevent future outbreaks through tailored approaches.

Coverage of ≥95% with MCV1 and MCV2 is necessary to ensure and sustain high population immunity against measles. MCV1 coverage has stagnated since 2010, and the largest annual increase since 2000 in children who did not receive MCV1 was reported in 2020, representing an acute setback in progress toward measles elimination (*6*). Accelerated efforts are needed to expand MCV1 coverage among the 22.3 million unvaccinated children in 2020 and ensure immunization of future birth cohorts. Routine MCV2 immunization has been recommended since 2017 (*7*); timely introduction is needed in the 15 countries that have yet to introduce MCV2, including

FIGURE. Estimated number of annual measles deaths with vaccination and without vaccination* — worldwide, 2000–2020



* Deaths prevented by vaccination are estimated by the area between estimated deaths with vaccination and without vaccination (total of 31.7 million deaths prevented during 2000–2020). Vertical bars represent upper and lower 95% CIs around the point estimate.

Summary

What is already known about this topic?

All six World Health Organization (WHO) regions remain committed to measles elimination.

What is added by this report?

Annual reported measles incidence decreased globally during 2000–2016, increased in all regions during 2017–2019, then decreased in 2020. Measles surveillance, already suboptimal, worsened in 2020. Since 2000, estimated measles deaths decreased 94%. Measles vaccination has prevented an estimated 31.7 million deaths worldwide. No WHO region has achieved and maintained measles elimination.

What are the implications for public health practice?

To achieve regional measles elimination targets, enhanced efforts are needed to reach all children with 2 doses of measles-containing vaccine, implement robust surveillance, and identify and close immunity gaps.

13 of the 47 countries in AFR. The revised measles estimation model indicates that in many countries, MCV is provided through SIAs to children with access to routine services (*4*); instead, SIAs should aim to fill immunity gaps among persons without access to routine service delivery, including older children and adults.

The findings in this report are subject to at least three limitations. First, in 2020, 35 (18%) countries did not report MCV1 coverage and 50 (26%) did not report case data to WHO/UNICEF by the deadline. This decreased reporting precludes a complete understanding of measles epidemiology globally and regionally. Second, revisions to the measles estimation model limit comparability of the estimates in this report to those of previous years' reports. Finally, genotype data are based on a limited number of sequences, most of which do not originate from AFR, which has the highest disease incidence. The proportion of circulating genotypes might differ from those reported here.

Progress toward measles elimination during the COVID-19 pandemic and beyond necessitates strong case-based surveillance systems to document immunity gaps and quickly identify cases and outbreaks. Outbreaks should be viewed as opportunities to identify weaknesses across the immunization system and develop tailored strategies to close immunity gaps. Together, these actions will bolster measles elimination efforts while strengthening immunization systems.

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HIV Prevention Program Eligibility Among Adolescent Girls and Young Women — Namibia, 2019

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The U.S. President's Emergency Plan for AIDS Relief (PEPFAR) relies on comprehensive and reliable population data to implement interventions to reduce HIV transmission in high-incidence areas among populations disproportionately affected by the HIV epidemic. Adolescent girls and young women in sub-Saharan Africa account for a disproportionate number of new HIV infections compared with their male peers (*1*). The DREAMS (Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe) program includes multisectoral, layered interventions aimed at reducing factors that contribute to vulnerability to HIV infection among adolescent girls and young women in PEPFAR-supported sub-Saharan African countries (*1*). Namibia, a southern African country with a population of approximately 2.55 million among whom approximately 8% live with HIV infection, had their DREAMS program first implemented in 2017* (*2*,*3*). Data from the 2019 Namibia Violence Against Children and Youth Survey (VACS), the most recent and comprehensive nationally representative data source available to study the epidemiology of violence and other HIV risk factors, were used to estimate the percentage of adolescent girls and young women aged 13–24 years who would be eligible for DREAMS program services. The prevalence of individual DREAMS eligibility criteria, which comprise known age-specific risk factors associated with HIV acquisition, were estimated by age group. Among all adolescent girls and young women in Namibia, 62% were eligible for DREAMS based on meeting at least one criterion. Common eligibility criteria included adverse childhood experiences, specifically exposure to physical, emotional, and sexual violence and being an orphan;† and high-risk behaviors, such as early alcohol use,§ recent heavy alcohol use,¶ and infrequent condom use.** Using VACS data to estimate the prevalence of HIV risk factors and identify adolescent girls and young women at elevated risk for HIV acquisition in countries like Namibia with high HIV-incidence can inform programs and policies aimed at improving the well-being of these adolescent girls and young women and help control the HIV epidemics in these countries.

In 2019, Namibia's Ministry of Gender Equality, Poverty Eradication, and Social Welfare led the country's first VACS in collaboration with CDC,†† the International Training and Education Center for Health at the University of Washington, and the Namibia Statistics Agency. The Namibia VACS was a cross-sectional, nationally representative household cluster survey of randomly selected noninstitutionalized adolescents aged 13–17 years and young women and men aged 18–24 years.§§ Local survey workers conducted face-to-face interviews with participants and inquired about lifetime experiences of physical, emotional, and sexual violence and other adverse childhood experiences; associated risk and protective factors; and related health outcomes and behaviors. For participants aged 13–17 years, informed consent and assent were obtained from a parent or guardian and the participant, respectively. Informed consent was directly obtained from participants aged ≥18 years and other nondependent participants.¶¶ Free, direct, and locally accessible referrals to social support services were offered to each participant, and response plans were created and implemented on a case-by-case basis.

Because DREAMS aims to prevent HIV infection among adolescent girls and young women, this analysis was limited to adolescent girls and young women who did not have an HIV infection or whose HIV status was unknown (i.e., did not know or refused to disclose their status and refused voluntary HIV testing at time of the survey); girls and young women living with HIV (based on self-report or voluntary HIV testing at time of the survey)*** and boys and young

* DREAMS program was first implemented in 2017 in three regions (Khomas, Oshikoto and Zambezi) and expanded to include two more regions (Kavango East and Oshana) in 2020.

† Orphanhood defined as having one or both parents deceased before the 18th birthday per UNICEF.

§ Early alcohol use defined as ever drinking more than a few sips of alcohol among adolescents aged 13–14 years.

¶ Recent heavy alcohol use defined as having had four or more drinks of alcohol on one occasion in the past 30 days.

** Infrequent condom use defined as reporting no or infrequent condom use with at least one sexual partner in the past 12 months and excludes those who reported being married or living with someone as being married and only having one sexual partner in the past 12 months.

†† As part of the Together for Girls Partnership. https://www.togetherforgirls.org

§§ In Namibia, VACS was implemented nationwide across the country's 14 regions, with oversampling in three regions where DREAMS had been implemented in 2017 (Khomas, Oshikoto, and Zambezi).

¶¶ Namibia VACS also directly obtained consent from participants who were aged ≥16 years and had a child, were married under civil law, or were a child head of household.

*** Namibia's antiretroviral therapy guidelines recommend that, in most situations, only children aged ≥14 years can consent to HIV testing without parental or guardian consent.

men who participated in the Namibia VACS were excluded. Participants were considered eligible for DREAMS if they met at least one DREAMS criterion for their age group, based on responses to the VACS questionnaire (Table 1). Nationally weighted prevalence of meeting at least one criterion, and two or more criteria, for DREAMS eligibility were estimated for adolescent girls and young women aged 13–14, 15–19, and 20–24 years. The weighted prevalence of individual DREAMS eligibility criteria for each age group were also estimated. All analyses were conducted using SAS (version 9.4; SAS Institute), accounting for the complex survey design. The Namibia VACS was reviewed and approved by Namibia's Ministry of Health and Social Services research ethics committee and the CDC Institutional Review Board.[†††]

Overall, 4,211 girls and young women (89% response rate) completed the Namibia VACS. Among participating girls and young women, 175 (4.2%) had known HIV infection and were excluded from analysis. Among the 4,036 adolescent girls and young women without known HIV infection, 18%, 42%, and 40% were aged 13–14, 15–19, and 20–24 years, respectively.

Among all adolescent girls and young women in Namibia aged 13–24 years eligible for the Namibia VACS and without known HIV infection, 62% met at least one DREAMS criterion or risk factor, and 26% met two or more criteria (Figure). The highest prevalence of having at least one criterion was observed among adolescent girls aged 13–14 years (71%), followed by young women aged 20–24 years (63%). Even among the group with the lowest prevalence (aged 15–19 years), 57% had at least one DREAMS criterion. In addition, 28% of those aged 13–14 years, 28% of those aged 15–19 years, and 23% of those aged 20–24 years met two or more criteria.

Among adolescent girls in Namibia aged 13–14 years, common DREAMS eligibility criteria that were met included experiencing physical or emotional violence in the past 12 months (50%),[§§§] experiencing early alcohol use (21%), and having been orphaned (19%) (Table 2). Among girls and young women aged 15–19 years, common criteria included having been orphaned (23%), experiencing lifetime sexual violence (19%), and being out of school (18%). Among young women aged 20–24 years, common criteria included infrequent condom use in the past 12 months (39%), ever experiencing sexual violence (26%), and recent heavy alcohol use (18%).

[†††] 45 C.F.R. part 46; 21 C.F.R. part 56; https://www.cdc.gov/violenceprevention/childabuseandneglect/vacs/country-process.html

[§§§] Among adolescent girls aged 13–14 years, 29% reported experiencing physical violence and 40% reported experiencing emotional violence in the past 12 months.

TABLE 1. DREAMS* eligibility criteria for adolescent girls and young women and corresponding Violence Against Children and Youth Survey indicators or questionnaire items — Namibia, 2019

Age group/Criteria	Survey indicators
13–14 yrs	
Ever had sex	Ever had vaginal, anal, or oral sexual intercourse
History of pregnancy	Ever been pregnant
Lifetime experience of sexual violence	Ever experienced sexual violence in lifetime
Experience of physical or emotional violence (within last year)	Experienced physical violence or emotional violence in the previous 12 mos
Early alcohol use	Ever drank alcohol (more than a few sips)
Out of school	Not currently attending school
Orphanhood	One or more biologic parents deceased[†]
15–19 yrs	
Multiple sexual partners (in last yr)	Had >1 sexual partner in previous 12 months
History of pregnancy	Ever been pregnant
STI	Ever received a diagnosis of an STI or had a genital sore or ulcer
Infrequent or no condom use	Not always using a condom with ≥1 sexual partner in the past 12 mos[§]
Transactional sex (including staying in a relationship for material or financial support)	Had sex with someone for material support or help in the past 12 mos
Lifetime experience of sexual violence	Ever experienced sexual violence in lifetime
Recent heavy alcohol use	Had ≥4 drinks of alcohol on one occasion in the past 30 days
Out of school	Not currently attending school
Orphanhood	One or both biologic parents deceased before the 18th birthday[†]
20–24 yrs	
Multiple sexual partners (in last yr)	Had >1 sexual partner in previous 12 mos
STI (diagnosed or treated)	Ever received a diagnosis of an STI or had a genital sore or ulcer
Infrequent or no condom use	Not always using a condom with ≥1 sexual partner in the past 12 mos[§]
Transactional sex (including staying in a relationship for material or financial support)	Had sex with someone for material support or help in the past 12 mos
Lifetime experience of sexual violence	Ever experienced sexual violence in lifetime
Recent heavy alcohol use	Had ≥4 drinks of alcohol on one occasion in the past 30 days

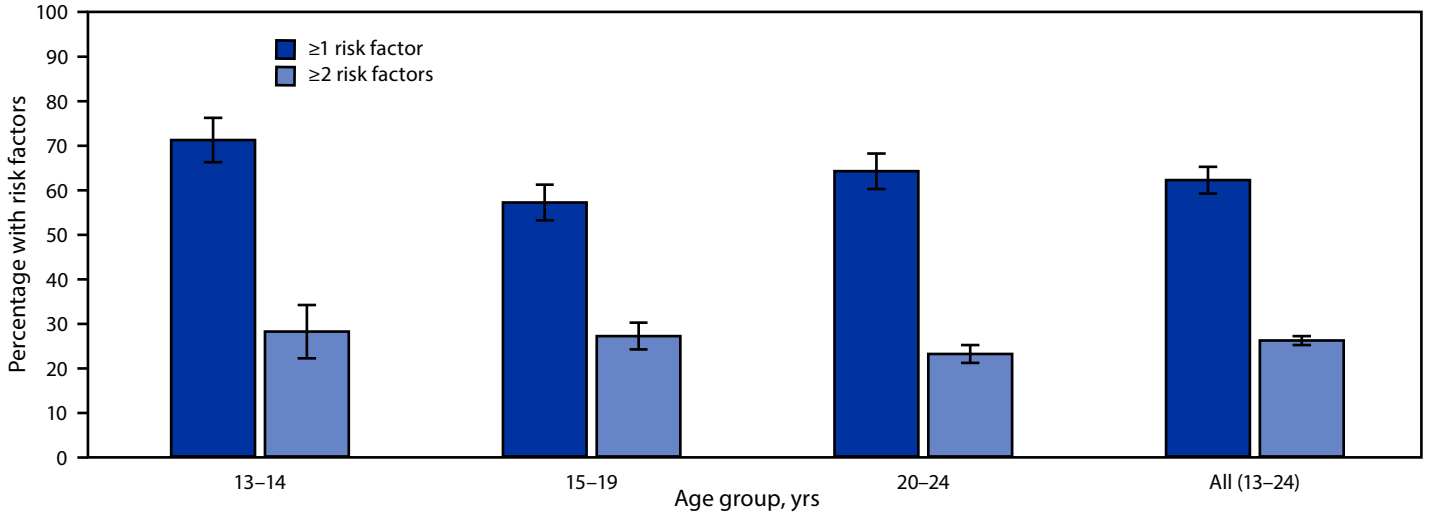
Abbreviations: DREAMS = Determined, Resilient, Empowered, AIDS-free, Mentored, and SAFE; STI = sexually transmitted infection.

* Saul J, Bachman G, Allen S, Toiv NF, Cooney C, Beamon T. The DREAMS core package of interventions: a comprehensive approach to preventing HIV among adolescent girls and young women. PLoS One, 2018;13:e0208167.

† Orphanhood defined as having one or both parents deceased before the 18th birthday per UNICEF.

§ Excludes adolescent girls and young women who reported being married or living with someone as being married and only having one sexual partner in past 12 months.

FIGURE. Prevalence* of having one or more or two or more risk factors for HIV infection† among adolescent girls and young women, by age group — Namibia, 2019



Abbreviation: DREAMS = Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe.
* With 95% CIs, shown by error bars; all results were weighted to account for the survey design.
† Presence of one or more HIV risk factors indicates eligibility for DREAMS programming (Saul J, Bachman G, Allen S, Toiv NF, Cooney C, Beamon T. The DREAMS core package of interventions: a comprehensive approach to preventing HIV among adolescent girls and young women. PLoS One, 2018;13:e0208167).

Discussion

Many adolescent girls and young women in Namibia experience increased risk for HIV acquisition, and the majority are eligible for DREAMS programming to prevent HIV infection. The 2019 VACS also found that one quarter of adolescent girls and young women met more than one DREAMS criterion, indicating that many are affected by multiple HIV risk factors requiring multipronged prevention strategies. The DREAMS approach of implementing multiple interventions, such as HIV and violence prevention programming, postviolence care services, HIV testing, preexposure prophylaxis, parenting/caregiver support, and a combination of socioeconomic approaches, addresses the multiple needs of adolescent girls and young women at risk for acquiring HIV. This multipronged approach can, in turn, lead to reductions in HIV risk behaviors, exposure to violence, and HIV and violence-related outcomes (*1*).

Physical, emotional, and sexual violence and other adverse childhood experiences were common and contributed to DREAMS eligibility. Experiencing violence is directly associated with increased risk for HIV acquisition and poor outcomes along the HIV care continuum (*4*). It is also associated with risk-taking behaviors, which can also increase the risk for HIV acquisition, and health consequences, including mental health problems, substance use, maternal health problems, and chronic diseases, all of which complicate HIV management (*5*). Primary and secondary prevention of violence is an integral part of DREAMS programming through emphasizing social asset building and safe spaces, changing harmful gender norms through community mobilization, promoting parenting/caregiving programming, and providing postviolence care (*1*). Expansion of violence prevention programming and services, using technical packages such as INSPIRE (*5*), can complement DREAMS and reduce violence in communities.

Early or recent heavy alcohol use and infrequent condom use in the past 12 months contribute to risk and were also commonly reported. These behaviors, along with other DREAMS eligibility criteria that were relatively uncommon, including having multiple sexual partners and participating in transactional sex in the past 12 months, increase risk for HIV acquisition among adolescent girls and young women in sub-Saharan Africa (*6*–*8*). DREAMS and other HIV prevention programs can leverage data-driven efforts to target risk-reducing interventions, such as HIV testing and partner testing, initiation of preexposure prophylaxis, economic strengthening, and school-based sexuality education, for populations at highest risk for HIV acquisition (*1*).

The findings in this report are subject to at least five limitations. First, data are self-reported and subject to recall and social desirability biases that might underestimate the prevalence of risk factors and behaviors.¶¶¶ Second, sampling excluded certain vulnerable subpopulations, particularly those experiencing homelessness or are institutionalized, and thus, these findings are not generalizable to those populations. Third, VACS

¶¶¶ Certain measures were implemented to maximize disclosure, help ensure confidentiality, and reduce biases related to self-reporting, including a split sample approach that required sampling females and males from different sampling units, private face-to-face interviews, and an informed consent process that assured participants of the confidentiality of their responses.

TABLE 2. Prevalence* of risk factors for HIV consistent with DREAMS† eligibility criteria among adolescent girls and young women aged 13–24 years (N = 4,036), by age group — Namibia, 2019

HIV risk factor	Age group, yrs											
	13–14			15–19			20–24			Total (13–24)		
	No.	Weighted % (95% CI)	Pop. est.	No.	Weighted % (95% CI)	Pop. est.	No.	Weighted % (95% CI)	Pop. est.	No.	Weighted % (95% CI)	Pop. est.
Ever had sex	742	3.9 (2.4–5.5)	1,713	1,698	40.5 (35.9–45.1)§	37,514	1,539	90.2 (88.3–92.1)§	76,780	3,979	52.5 (49.9–55.0)	116,007
History of pregnancy	742	0.3 (0.1–0.6)	150	1,698	15.3 (12.4–18.2)	14,148	1,536	56.5 (51.6–61.4)§	48,034	3,976	28.2 (25.3–31.0)	62,331
Experience of sexual violence in lifetime	741	10.6 (5.2–16.0)	4,610	1,709	19.3 (15.3–23.4)	17,955	1,569	26.0 (22.5–29.5)	22,309	4,019	20.2 (17.9–22.4)	44,874
Experience of physical or emotional violence in past 12 mos	745	49.5 (42.5–56.5)	21,567	1,709	44.8 (40.5–49.0)§	41,538	1,571	25.9 (22.4–29.3)§	22,258	4,025	38.4 (34.9–41.9)	85,363
Ever drank alcohol	716	21.3 (16.1–26.4)	9,048	1,639	44.9 (40.5–49.4)§	40,089	1,499	56.2 (51.5–60.8)§	46,904	3,854	44.6 (40.9–48.4)	96,041
Out of school	745	2.7 (1.0–4.5)	1,196	1,710	18.0 (15.2–20.9)	16,758	1,571	63.6 (60.9–66.4)§	54,714	4,026	32.7 (30.1–35.3)	72,667
Orphanhood¶	733	18.8 (14.1–23.6)	7,982	1,655	22.9 (19.6–26.2)	20,583	1,482	31.8 (27.4–36.2)§	26,047	3,870	25.5 (22.5–28.5)	54,612
Multiple sexual partners in past 12 mos	740	0.1 (0–0.3)§	46	1,693	3.4 (1.6–5.2)	3,164	1,526	6.0 (4.2–7.8)	5,106	3,959	3.8 (2.8–4.7)	8,316
STI**	743	3.8 (0.6–7.0)§	1,656	1,708	3.5 (2.4–4.6)	3,249	1,569	7.1 (5.1–9.2)	6,140	4,020	5.0 (3.8–6.1)	11,045
Infrequent condom use in past 12 mos††	739	0.6 (0.2–0.9)§	246	1,689	15.9 (13.2–18.5)	14,633	1,514	39.4 (35.5–43.4)	33,036	3,942	21.9 (20.4–23.4)	47,914
Transactional sex in past 12 mos	742	0.1 (0–0.3)§	63	1,705	1.4 (0.4–2.3)	1,261	1,567	2.5 (1.3–3.6)	2,128	4,014	1.6 (0.9–2.2)	3,451
Recent heavy alcohol use§§	735	4.6 (1.2–7.9)§	1,973	1,671	9.6 (7.2–12.0)	8,756	1,528	18.2 (15.6–20.7)	15,350	3,934	11.9 (10.2–13.7)	2,6079
DREAMS eligible (≥1 HIV risk factor)	745	70.6 (65.2–76.0)	30,742	1,711	57.0 (53.1–60.8)	52,898	1,580	63.1 (59.0–67.2)	54,963	4,036	62.0 (59.4–64.6)	138,603
≥2 HIV risk factors	745	27.6 (21.3–33.9)	12,007	1,711	27.5 (24.5–30.4)	25,516	1,580	23.1 (20.9–25.3)	20,130	4,036	25.8 (24.5–27.1)	57,653

Abbreviations: DREAMS = Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe; Pop. est. = population estimate; STI = sexually transmitted infection.

* All results were weighted to account for the survey design.

† Saul J, Bachman G, Allen S, Toiv NF, Cooney C, Beamon T. The DREAMS core package of interventions: a comprehensive approach to preventing HIV among adolescent girls and young women. PLoS One, 2018;13:e0208167.

§ Factors that do not represent DREAMS eligibility criteria for that age group.

¶ Orphanhood defined as having one or both parents deceased before the 18th birthday per UNICEF.

** STI was defined as reporting having received a diagnosis of a STI or having a genital sore or ulcer in lifetime.

†† Infrequent condom use defined as reporting no or infrequent condom use with at least one sexual partner in the past 12 months and excludes adolescent girls and young women who reported being married or living with someone as being married and only having one sexual partner in past 12 months.

§§ Recent heavy alcohol use defined as having had four or more drinks of alcohol on at least one occasion in the past 30 days.

questions might not precisely reflect all DREAMS eligibility criteria, and results might underestimate DREAMS eligibility. Fourth, a small proportion of responses (<5% for any variable) were missing, unknown, or declined, and were excluded from the analysis. Prevalence calculations were weighted to adjust for these responses. Finally, the analysis did not stratify or account for possible regional differences within Namibia.

These findings have significant implications for HIV prevention programming in Namibia and other PEPFAR-supported countries. VACS can complement data sources, such as the Demographic and Health Surveys (*9*), the Population-based HIV Impact Assessment Surveys (*10*), and DREAMS program data to inform efforts to tailor DREAMS and other HIV prevention programs. Estimates of DREAMS program eligibility among adolescent girls and young women can guide resource planning and prioritization, offer a baseline estimate for monitoring and evaluation, and improve stakeholder engagement by emphasizing the confluence of factors that increase the risk for HIV among adolescent girls and young women. Specifically, in Namibia, VACS implementers, government ministries and civil society partners, including nongovernmental organizations implementing DREAMS, conducted intensive data-to-action workshops during July–August 2020. During these workshops, Namibia VACS data were examined and discussed and recommendations for adjusting and adapting programming and policies were made. The findings and

Summary

What is already known about this topic?

HIV disproportionately affects adolescent girls and young women in high-incidence sub-Saharan African countries. The DREAMS (Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe) program, supported by the U.S. President's Emergency Fund for AIDS Relief, aims to reduce HIV incidence within this population.

What is added by this report?

Namibia's 2019 Violence Against Children and Youth Surveys found that 62% of girls and young women aged 13–24 years were eligible for DREAMS programming, having one or more risk factors associated with HIV acquisition.

What are the implications for public health practice?

Use of nationally representative data can inform programs and policies aimed to improve the well-being of adolescent girls and young women and help control the HIV epidemic in high-incidence countries.

recommendations from this workshop have informed the current drafting of a national action plan aimed to address violence against children in Namibia. Consequently, Namibia VACS data have helped guide efforts to expand and adapt DREAMS and violence prevention and response programming in the country. Lastly, other PEPFAR-supported countries that implement VACS in the future could consider using VACS to identify participants at high risk and link them to DREAMS and other HIV and violence prevention programming in real time. Using VACS data in these ways can inform programs and policies aimed at improving the well-being of adolescent girls and young women and help to control the HIV epidemic in high-incidence countries.

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Influenza Vaccinations During the COVID-19 Pandemic — 11 U.S. Jurisdictions, September–December 2020

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Influenza causes considerable morbidity and mortality in the United States. Between 2010 and 2020, an estimated 9–41 million cases resulted in 140,000–710,000 hospitalizations and 12,000–52,000 deaths annually (*1*). As the United States enters the 2021–22 influenza season, the potential impact of influenza illnesses is of concern given that influenza season will again coincide with the ongoing COVID-19 pandemic, which could further strain overburdened health care systems. The Advisory Committee on Immunization Practices (ACIP) recommends routine annual influenza vaccination for the 2021–22 influenza season for all persons aged ≥6 months who have no contraindications (*2*). To assess the potential impact of the COVID-19 pandemic on influenza vaccination coverage, the percentage change between administration of at least 1 dose of influenza vaccine during September–December 2020 was compared with the average administered in the corresponding periods in 2018 and 2019. The data analyzed were reported from 11 U.S. jurisdictions with high-performing state immunization information systems.* Overall, influenza vaccine administration was 9.0% higher in 2020 compared with the average in 2018 and 2019, combined. However, in 2020, the number of influenza vaccine doses administered to children aged 6–23 months and children aged 2–4 years, was 13.9% and 11.9% lower, respectively than the average for each age group in 2018 and 2019. Strategic efforts are needed to ensure high influenza vaccination coverage among all age groups, especially children aged 6 months–4 years who are not yet eligible to receive a COVID-19 vaccine. Administration of influenza vaccine and a COVID-19 vaccine among eligible populations is especially important to reduce the potential strain that influenza and COVID-19 cases could place on health care systems already overburdened by COVID-19.

Influenza vaccination data reported to CDC from 11 study jurisdictions† with high-performing state immunization information systems for persons in the following age groups were analyzed: 6–23 months, and 2–4, 5–12, 13–17, 18–49, 50–64, and ≥65 years. Persons aged ≥6 months with at least 1 dose of influenza vaccine administered between the first week of September and last week of December in 2018, 2019, and 2020, were included in the analysis. The numbers of vaccine doses administered to each age group in 2020 were compared with the average number of reported doses administered during the corresponding weeks in 2018 and 2019. In addition, the percentage change between the number of influenza vaccine doses administered during September–December 2020 and the average administered in the corresponding periods in 2018 and 2019 among persons aged ≥6 months was calculated overall and stratified by age groups. Analyses were conducted with SAS (version 9.4; SAS Institute). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.§

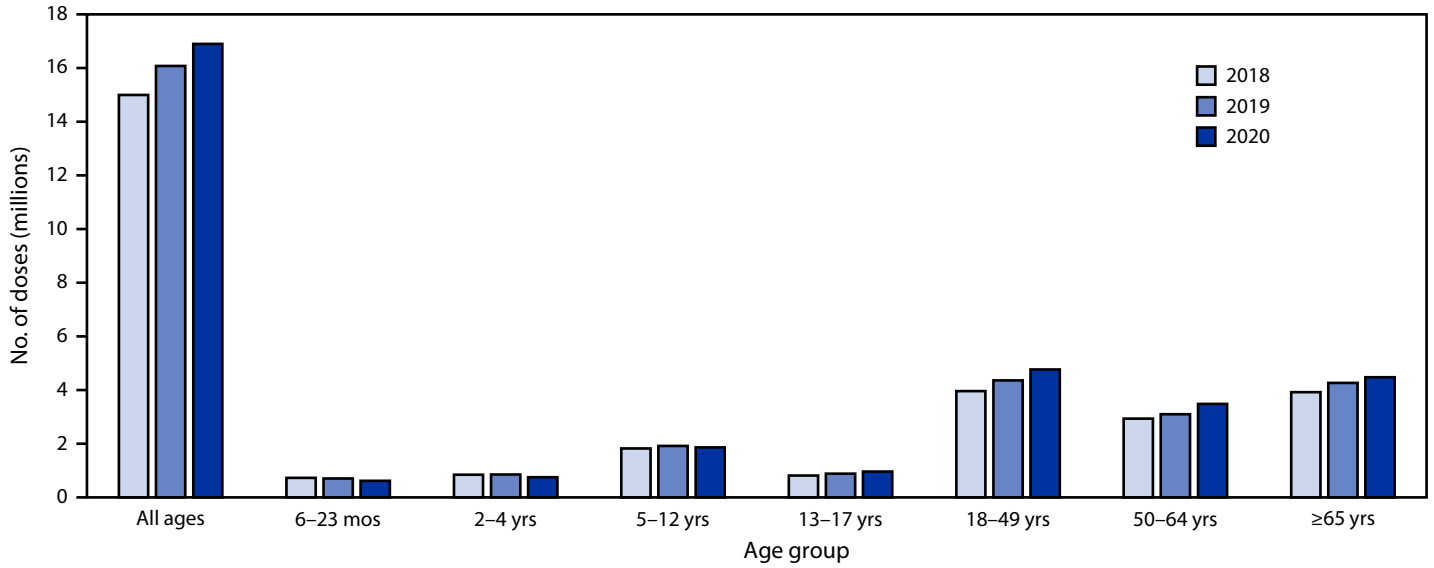
A total of 16,872,970 influenza vaccine doses were reported by 11 study jurisdictions to state immunization information systems during September–December 2020, compared with an average of 15,513,428 doses reported during the same weeks in 2018 and 2019 (Figure 1), representing an overall increase of 9.0% in influenza doses administered to all age groups compared with 2018 and 2019 (Figure 2). However, the numbers of influenza vaccine doses administered to children aged 6–24 months and children aged 2–4 years were

* A high-performing immunization information system was defined as a system with vaccine estimates within 10 percentage points of those from the 2018 National Immunization Survey-Child and National Immunization Survey-Teen (https://www.cdc.gov/vaccines/imz-managers/nis/about.html), and which recorded ≥90% of doses administered to persons aged <19 years that were submitted and processed within 30 days of vaccine administration.

† Study jurisdictions included Idaho; Iowa; Louisiana; Michigan; Minnesota; New York, New York; North Dakota; Oregon; Utah; Washington; and Wisconsin. Immunization information systems are confidential, computerized, population-based systems that collect and consolidate vaccination data from providers in 64 jurisdictions nationwide and can be used to track administered vaccines and measure vaccination coverage. The 64 jurisdictions include the 50 U.S. states, five U.S. territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and U.S. Virgin Islands), three freely associated states (Federated States of Micronesia, Marshall Islands, and Palau), and six local jurisdictions (Chicago, Illinois; Houston, Texas; New York, New York; Philadelphia, Pennsylvania; San Antonio, Texas; and Washington, DC).

§ 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE 1. Number of influenza vaccine doses reported to immunization information systems* administered to persons aged ≥6 months during 2020 compared with the number of doses administered during the corresponding period in 2018 and 2019 — 11 U.S. jurisdictions,† September–December 2018, 2019, and 2020



* Vaccine doses were reported to immunization information systems, which are confidential, computerized, population-based systems that collect and consolidate vaccination data from providers in 64 jurisdictions nationwide and can be used to track administered vaccines and measure vaccination coverage. The 64 jurisdictions include the 50 U.S. states, five U.S. territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and U.S. Virgin Islands), three freely associated states (Federated States of Micronesia, Marshall Islands, and Palau), and six local jurisdictions (Chicago, Illinois; Houston, Texas; New York, New York; Philadelphia, Pennsylvania; San Antonio, Texas; and Washington, DC).

† Study jurisdictions included Idaho; Iowa; Louisiana; Michigan; Minnesota; New York, New York; North Dakota; Oregon; Utah; Washington; and Wisconsin.

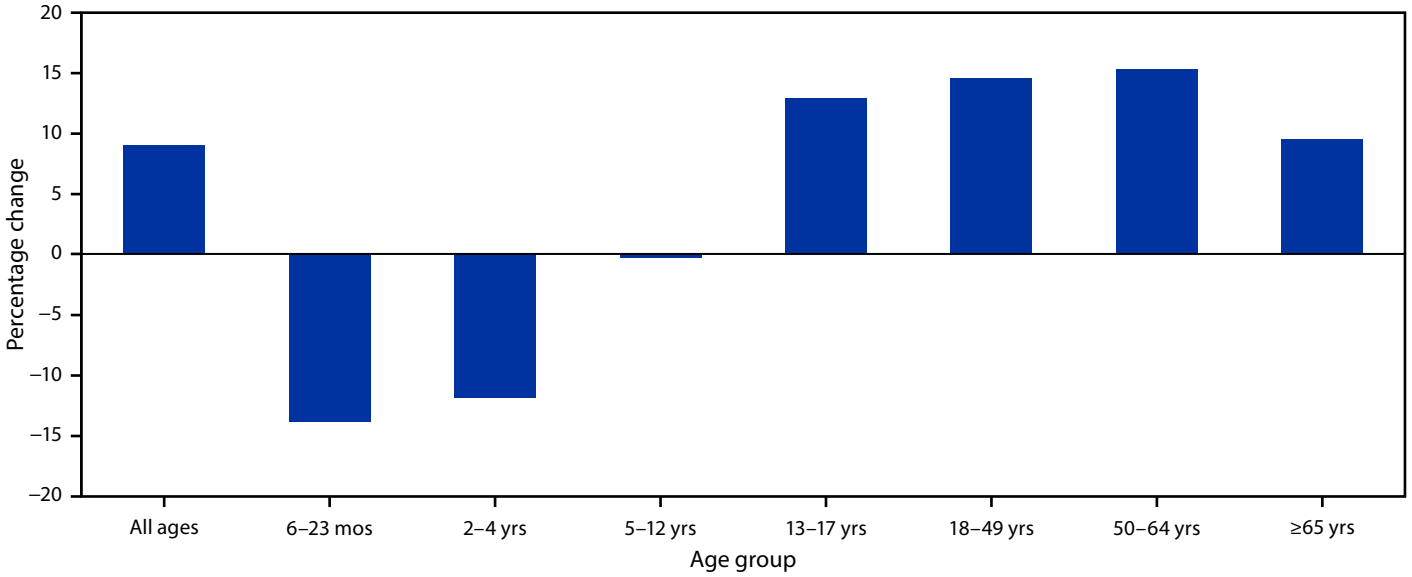
13.9% and 11.9% lower, respectively than the average numbers administered during September–December of 2018 and 2019. The number of doses administered to children aged 5–12 years was similar in 2018, 2019, and 2020. During September–December 2020, the number of influenza vaccine doses administered increased 12.9% among adolescents aged 13–17 years, the only increase observed among all children, compared with the average during the corresponding period in 2018 and 2019. Influenza doses administered to adults increased in all age groups during September–December 2020, compared with the average during the preceding 2 years: the largest increase (15.3%) was among persons aged 50–64 years, followed by persons aged 18–49 years (14.6%); the smallest increase was among persons aged ≥65 years (9.5%).

Discussion

During September–December 2020, the number of influenza vaccine doses administered to persons in 11 reporting U.S. jurisdictions with high-performing immunization information systems increased 9.0% compared with the average for the corresponding period in 2018 and 2019; however, the overall increase was driven largely by increases in doses administered to adolescents and adults. In contrast, the number of influenza vaccine doses administered to children aged 6 months–4 years declined during this period compared with the average during 2018 and 2019. These findings are consistent with those of a 2021 study of influenza vaccination coverage using national survey data (National Immunization Survey-Flu and Behavioral Risk Factor Surveillance System [BRFSS]) that found influenza vaccination coverage was lower among persons aged 6 months–17 years and higher among those aged ≥18 years during the 2020–21 influenza season compared with coverage during 2019–20 (*3*). Whether this finding was attributable to influenza immunization campaigns was unclear; these campaigns emphasized the importance of receiving the annual influenza vaccine to help reduce the spread of influenza viruses. Although the flu vaccine does not protect against COVID-19, influenza vaccination was part of a public health strategy to flatten the curve of respiratory illnesses overall, protect essential workers from influenza, and preserve medical resources for care of COVID-19 patients.

Influenza activity during the 2020–21 season was unusually low in the United States and worldwide (*5*). Public health measures to limit the spread of SARS-CoV-2, the virus that causes COVID-19, such as wearing face masks, implementing stay-at-home recommendations, promoting good hand hygiene, closing schools, restricting travel, increasing ventilation of indoor spaces, and maintaining physical distancing

FIGURE 2. Percentage change* in the number of administered influenza vaccine doses reported to immunization information systems† in persons aged ≥6 months during 2020 compared with the average number of doses administered during the same period in 2018 and 2019 — 11 U.S. jurisdictions,§ September–December 2020



* Percentage change in vaccine administration of at least 1 dose of influenza vaccine for September–December 2020 was compared with the corresponding weeks in 2018 and 2019.

† Vaccine doses were reported to immunization information systems, which are confidential, computerized, population-based systems that collect and consolidate vaccination data from providers in 64 jurisdictions nationwide and can be used to track administered vaccines and measure vaccination coverage. The 64 jurisdictions include the 50 U.S. states, five U.S. territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and U.S. Virgin Islands), three freely associated states (Federated States of Micronesia, Marshall Islands, and Palau), and six local jurisdictions (Chicago, Illinois; Houston, Texas; New York, New York; Philadelphia, Pennsylvania; San Antonio, Texas; and Washington, DC).

§ Study jurisdictions included Idaho; Iowa; Louisiana; Michigan; Minnesota; New York, New York; North Dakota; Oregon; Utah; Washington; and Wisconsin.

all likely contributed to the decline in influenza-like illnesses during 2020. Since these COVID-19 mitigation strategies also reduced the spread of influenza viruses, these measures, combined with the transition to hybrid or fully virtual learning, might have led parents to perceive that their children were at lower risk for contracting influenza. Decisions about whether to vaccinate children against influenza might have been influenced by the time of year children received an annual well-child check-up, or by COVID-19–related barriers to health care access, including provider office closures or fear of contracting COVID-19 while getting the influenza vaccine (*5*). Reports have also noted a reduction in routine pediatric vaccine (other than the influenza vaccine) ordering and administration during the COVID-19 pandemic (*6*–*8*), indicating that these barriers might have also discouraged parents and guardians from seeking routine pediatric care for their children, including annual influenza vaccination (*5*).

The findings in this report are subject to at least four limitations. First, findings might not be representative of the entire United States, because only data from 11 jurisdictions were analyzed. Second, data analyzed from immunization information systems might include potentially incomplete vaccination histories that could underestimate vaccine administration in the current analysis. Third, the change in the number of administered doses reported likely overestimates the change in number of persons vaccinated, especially among children aged 6 months–8 years, who require 2 influenza vaccine doses during their first season of vaccination (*2*). Finally, there has been a gradual increase in the number of influenza vaccine doses administered to adults reported via immunization information systems and in the BRFSS survey over the past few years, and the increase in 2020 could be due to continuation of the temporal trend, unrelated to the pandemic.

Given that the 2021–22 influenza season will coincide with the ongoing COVID-19 pandemic, strategic efforts are necessary to ensure high influenza vaccination coverage among all age groups, especially children aged 6 months–4 years, who are not yet eligible to receive a COVID-19 vaccine. ACIP recommends routine annual influenza vaccination for all persons aged ≥6 months who have no contraindications (*2*). With the continued effort to safely keep schools open for in-person learning, and workplaces and businesses resuming in-person activities, CDC recommends that health care providers consider co-administering COVID-19 vaccines with routine vaccines such as influenza (*2*). To address the importance of influenza vaccination during the COVID-19 pandemic, CDC

Summary

What is already known about this topic?

As the United States enters the 2021–22 influenza season, influenza-associated morbidity and mortality could further strain health care systems already overburdened by the ongoing COVID-19 pandemic.

What is added by this report?

During September–December 2020, overall influenza vaccine administration was 9.0% higher than the average during September–December in 2018 and 2019; however, the number of administered doses declined among children aged 6–23 months (13.9%) and 2–4 years (11.9%).

What are the implications for public health practice?

Continued strategic efforts are needed to ensure high influenza vaccination coverage among all eligible persons aged ≥6 months, especially children aged ≤4 years.

increased the availability of influenza vaccines and conducted targeted communication outreach to groups at higher risk, such as adults aged ≥65 years, young children, pregnant women, and persons with certain chronic conditions. Influenza vaccination in 2020 was part of a comprehensive public health strategy to reduce the prevalence of respiratory illnesses overall, to help protect essential workers from influenza, and preserve medical resources for patients with COVID-19 (*4*). Influenza vaccination among all age groups could help reduce the spread of influenza this fall and winter, and reduce the potential burden that influenza cases could place on health care systems already overburdened by COVID-19.

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The Advisory Committee on Immunization Practices' Interim Recommendation for Use of Pfizer-BioNTech COVID-19 Vaccine in Children Aged 5–11 Years — United States, November 2021

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On November 5, 2021, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

The Pfizer-BioNTech COVID-19 (BNT162b2) vaccine is a lipid nanoparticle–formulated, nucleoside-modified mRNA vaccine encoding the prefusion spike glycoprotein of SARS-CoV-2, the virus that causes COVID-19. On August 23, 2021, the Food and Drug Administration (FDA) approved a Biologics License Application (BLA) for use of the Pfizer-BioNTech COVID-19 vaccine, marketed as Comirnaty (Pfizer, Inc.), in persons aged ≥16 years (*1*). The Pfizer-BioNTech COVID-19 vaccine is also recommended for adolescents aged 12–15 years under an Emergency Use Authorization (EUA) (*1*). All persons aged ≥12 years are recommended to receive 2 doses (30 μg, 0.3 mL each), administered 3 weeks apart (*2*,*3*). As of November 2, 2021, approximately 248 million doses of the Pfizer-BioNTech COVID-19 vaccine had been administered to persons aged ≥12 years in the United States.* On October 29, 2021, FDA issued an EUA amendment for a new formulation of Pfizer-BioNTech COVID-19 vaccine for use in children aged 5–11 years, administered as 2 doses (10 μg, 0.2 mL each), 3 weeks apart (Table) (*1*). On November 2, 2021, the Advisory Committee on Immunization Practices (ACIP) issued an interim recommendation† for use of the Pfizer-BioNTech COVID-19 vaccine in children aged 5–11 years for the prevention of COVID-19. To guide its deliberations regarding recommendations for the vaccine, ACIP used the Evidence to Recommendation (EtR) Framework§ and incorporated a Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach.¶ The ACIP recommendation for the use of the Pfizer-BioNTech COVID-19 vaccine in children aged 5–11 years under an EUA is interim and will be updated as additional information becomes available. The Pfizer-BioNTech COVID-19 vaccine has high efficacy (>90%) against COVID-19 in children aged 5–11 years, and ACIP determined benefits outweigh risks for vaccination. Vaccination is important to protect children against COVID-19 and reduce community transmission of SARS-CoV-2.

Since June 2020, ACIP has convened 21 public meetings to review data relevant to the potential use of COVID-19 vaccines, including the Pfizer-BioNTech COVID-19 vaccine.** In addition, the ACIP COVID-19 Vaccines Work Group, comprising experts in infectious diseases, vaccinology, vaccine safety, public health, and ethics, has held weekly meetings to review COVID-19 surveillance data, evidence for vaccine efficacy and effectiveness, safety, and implementation considerations for COVID-19 vaccines. Within the EtR Framework for the Pfizer-BioNTech COVID-19 vaccine for children aged 5–11 years, ACIP considered the importance of COVID-19 as a public health problem, as well as benefits and harms, parents' values and preferences, acceptability, feasibility, resource use, and equity for use of the vaccine among children. After conducting a systematic review of published and unpublished evidence for benefits and harms, the Work Group used the GRADE approach to assess the certainty of evidence for outcomes related to the vaccine, rated on a scale of type 1 (high certainty) to type 4 (very low certainty).†† Work Group conclusions regarding evidence for the Pfizer-BioNTech COVID-19 vaccine were presented to ACIP at a public meeting on November 2, 2021.

The body of evidence regarding immunogenicity, efficacy, and safety of the Pfizer-BioNTech COVID-19 vaccine among children aged 5–11 years was primarily composed of data from one randomized, double-blind, placebo-controlled phase II/III clinical trial that initially enrolled 2,268 participants aged 5–11 years, randomized 2:1 to receive vaccine or saline placebo (*1*). Interim findings from this clinical trial were based on data from participants with a median follow-up of 3.3 months. Vaccine efficacy was supported by two types of evidence: direct efficacy against symptomatic infection and immunobridging data consisting of neutralizing antibody titers from vaccine recipients aged 5–11 years who received 2 doses of 10 μg each compared with those from vaccine recipients aged 16–25 years who received 2 doses of 30 μg each. Vaccine efficacy was 90.9% (95% CI = 68.3%–98.3%) in preventing symptomatic,

* Accessed November 3, 2021. https://covid.cdc.gov/covid-data-tracker/#vaccinations

† On November 2, 2021, ACIP voted 14–0 (with one member absent) in favor of the interim recommendation for use of Pfizer-BioNTech COVID-19 vaccine for persons aged 5–11 years.

§ https://www.cdc.gov/vaccines/acip/recs/grade/downloads/acip-evidence-recs-framework.pdf

¶ https://www.cdc.gov/vaccines/acip/recs/grade/about-grade.html

** https://www.cdc.gov/vaccines/acip/meetings/index.html

†† https://www.cdc.gov/vaccines/acip/recs/grade

TABLE. COVID-19 vaccines approved or authorized by the Food and Drug Administration for persons aged <18 years — United States, November 2021*

Age group at vaccination, yrs	Vaccine manufacturer	Vial cap color	Concentration of mRNA per dose	Injection volume	Diluent† volume	Doses per vial
5–11	Pfizer-BioNTech	Orange	10 μg	0.2 mL	1.3 mL	10
12–17	Pfizer-BioNTech	Purple	30 μg	0.3 mL	1.8 mL	6

* Both Pfizer-BioNTech COVID-19 vaccines are administered intramuscularly as 2 doses with a recommended interval of 21 days between doses. Additional information regarding each Pfizer-BioNTech formulation (e.g., ingredients and storage conditions) as well as educational materials and information regarding other Food and Drug Administration–approved or -authorized COVID-19 vaccines is available at https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html.
† Diluent for both formulations is 0.9% sterile sodium chloride injection, USP (nonbacteriostatic).

laboratory-confirmed COVID-19 in children aged 5–11 years with or without evidence of previous SARS-CoV-2 infection, based on infection in three vaccine recipients and 16 placebo recipients, none of whom were hospitalized. The measure of immune response to 2 doses of the Pfizer-BioNTech COVID-19 vaccine in children aged 5–11 years without evidence of previous SARS-CoV-2 infection was at least as high as the response observed in persons aged 16–25 years, with a geometric mean ratio for 50% neutralizing antibody titer of 1.04 (95% CI = 0.93–1.18), satisfying the noninferiority criteria.§§ Among vaccine recipients aged 5–11 years, reactogenicity symptoms, defined as solicited local injection site or systemic reactions during the 7 days after vaccination, were frequent (86.2% of vaccine recipients reported any local reaction, and 66.6% reported any systemic reaction); the vast majority were mild to moderate. Reactogenicity symptoms were generally less frequent in children aged 5–11 years than in persons aged 16–25 years. Systemic adverse reactions were more commonly reported after the second dose than after the first dose, had a median onset of 1–2 days after vaccination, and resolved in a median of 1–2 days. Severe local and systemic adverse reactions (grade 3 or higher, defined as interfering with daily activity) occurred in 2.7% of vaccine recipients and 1.1% of placebo recipients. Among vaccine recipients who reported any reaction of grade 3 or higher, the most common symptoms were fatigue (0.9%), headache (0.3%), fever (0.8%) and injection site pain (0.6%). Overall, reactions of grade 3 or higher were also more commonly reported after the second dose than after the first dose. The prevalence of related adverse events was lower in children who were seropositive at baseline (two of 133; 1.5%) compared with the prevalence in those who were seronegative at baseline (44 of 1,385; 3.2%); in addition, individual local and systemic reactions were less common in seropositive children. Serious adverse events¶¶ were uncommon and occurred with similar frequency among vaccine (0.07%) and placebo (0.10%) recipients, with no statistically significant difference in frequency observed between the two groups. An expanded safety cohort of 2,379 children (including 1,591 vaccine recipients) was added to monitor for serious adverse events, which had a median follow-up of 2.4 weeks after receipt of the second dose. No serious adverse events related to the vaccination were identified in either group, and no specific safety concerns were identified among vaccine recipients aged 5–11 years. A detailed summary of safety data, including information on reactogenicity, is available at https://www.cdc.gov/vaccines/covid-19/info-by-product/pfizer/reactogenicity.html.

From the GRADE evidence assessment, the level of certainty for the benefits of Pfizer-BioNTech COVID-19 vaccination among children aged 5–11 years was type 1 (high certainty) for the prevention of symptomatic laboratory-confirmed COVID-19. Regarding potential harms after vaccination, evidence was type 4 (very low certainty) for serious adverse events because of small sample size and short follow-up time and type 2 (moderate certainty) for reactogenicity for imprecision. No data were available to assess the other GRADE benefits, specifically prevention of hospitalization for COVID-19, prevention of multisystem inflammatory syndrome in children (MIS-C), or prevention of asymptomatic SARS-CoV-2 infection.

Data reviewed within the EtR Framework supported the use of the Pfizer-BioNTech COVID-19 vaccine in children aged 5–11 years. ACIP concluded that COVID-19 in children is a major public health problem. Approximately 1.9 million COVID-19 cases and 8,300 hospitalizations among U.S. children aged 5–11 years had been reported to CDC as of October 10, 2021 (*5*). As of October 4, 2021, CDC had received reports of 5,217 cases of MIS-C, a severe hyperinflammatory syndrome occurring several weeks after acute SARS-CoV-2 infection; 44% of MIS-C cases have occurred in children aged 5–11 years.*** In addition, children aged 5–11 years represent a growing proportion of new COVID-19 cases reported to CDC, accounting for 10.6% of infections for the week of October 10, 2021, although children aged 5–11 years represent 8.7% of the population (*4*). In addition, children can contribute to transmission of SARS-CoV-2 in households and communities (*5*,*6*). A study of residual

§§ 1.5-fold noninferiority criterion: lower bound of the two-sided 95% CI for geometric mean ratio >0.67.

¶¶ Serious adverse events that were reported in the initial cohort of the trial included a limb fracture in one vaccine recipient and abdominal pain and pancreatitis in one placebo recipient. Serious adverse events that were reported in the expanded safety cohort included infective arthritis (infection of the knee), foreign body ingestion of a penny, and epiphyseal fracture in three children (one each) in the vaccine group.

*** https://covid.cdc.gov/covid-data-tracker/#mis-national-surveillance

sera from commercial laboratories in 47 U.S. jurisdictions estimated the seroprevalance in this age group to be 38% as of September 2021 (*7*). As of October 14, 2021, the cumulative COVID-19–associated hospitalization rate for children aged 5–11 years over the course of the pandemic was 28.6 per 100,000 population,[†††] which is similar to the influenza-associated hospitalization rate for the same age group during the 2017–18, 2018–19, and 2019–20 influenza seasons (24.3–31.7 per 100,000 population), despite intensive mitigation efforts in place during the COVID-19 pandemic not present during previous influenza seasons.[§§§] During January 1, 2020–October 16, 2021, 94 COVID-19–associated deaths among children aged 5–11 years were reported to CDC's National Center for Health Statistics, representing 1.7% of all deaths in this age group during the same period; COVID-19 ranks as the eighth leading cause of death in this age group (*8,9*). Post-COVID conditions, a range of new, worsening, or ongoing health problems after SARS-CoV-2 infection, have been reported in children (*10*). During the 2020–21 school year, an estimated 19,692 school closures occurred in the 50 U.S. states, affecting approximately 12 million students. During August 2–October 22, 2021, approximately 2,350 schools faced COVID-19–related closures, with nearly one half resulting from COVID-19 cases among students (*11*). Several surveys suggested that 34%–57% of parents intended to have their children vaccinated (*11*).

Implementation of this vaccine recommendation will require educating providers regarding the different formulation, dose, and volume of vaccine for use in this population to avoid vaccine administration errors. COVID-19 vaccines must be administered according to applicable state and territorial vaccination laws. ACIP determined that use of the Pfizer-BioNTech COVID-19 vaccine among children is a reasonable and efficient allocation of resources. To expand COVID-19 vaccine access, additional considerations should be given to demographic groups that have experienced disproportionate COVID-19 morbidity and mortality, as well as those with barriers to routine health care (e.g., members of certain racial/ethnic groups and those living in a rural or frontier area, experiencing homelessness, with a disability, or lacking health insurance). Children from racial and ethnic minority groups have experienced a disproportionally high incidence of COVID-19 as well as secondary impacts of the COVID-19 pandemic such as reduced in-person learning (*12*). Providing rapid and equitable access to COVID-19 vaccines for children will necessitate increasing the enrollment of pediatric health care providers into the COVID-19 vaccination program, using the broad geographic accessibility of pharmacies, and expanding school-focused strategies to ensure vaccination opportunities for a diverse population, as well as engagement with community leaders, pediatric health care providers, and parents or guardians.

The GRADE evidence profile, which provides details on the identification and assessment of relevant evidence, and EtR-supporting evidence are available at https://www.cdc.gov/vaccines/acip/recs/grade/covid-19-pfizer-age-5-11-eua.html and https://www.cdc.gov/vaccines/acip/recs/grade/covid-19-pfizer-age-5-11-eua-etr.html. Additional clinical considerations are available at https://www.cdc.gov/vaccines/covid-19/info-by-manufacturer/pfizer/clinical-considerations.html.

ACIP reviewed the balance of benefits and risks regarding vaccination of children aged 5–11 years, considering evidence around both known and potential benefits and risks. Myocarditis is a rare adverse event that has been reported after receipt of mRNA COVID-19 vaccines (*13*). The observed risk is highest in males aged 12–29 years.[¶¶¶] No cases of myocarditis were reported among 3,082 trial participants aged 5–11 years with ≥7 days of follow-up after receipt of dose 2, although the study was not powered to assess the risk for myocarditis (*1*). The baseline (before the COVID-19 pandemic) risk for myocarditis is much higher in adolescents aged 12–17 years than in children aged 5–11 years.[****] Therefore, myocarditis after receipt of an mRNA COVID-19 vaccine by adolescents might not predict risk for myocarditis in younger children. Regardless of seropositivity rates, ACIP determined that the benefits of COVID-19 vaccination outweigh the known and potential risks. Vaccination after infection significantly enhances protection and further reduces risk for reinfection;[††††] no concerns have been identified in postauthorization safety surveillance associated with vaccination of seropositive persons aged ≥12 years. Children can experience significant morbidity, such as MIS-C and post-COVID sequelae, after mild or asymptomatic infection (*7*). Further, Delta-wave surges of pediatric COVID-19 hospitalizations occurred even with a significant proportion of children who were seropositive at that time (*7*). After assessing the balance of benefits and risks for COVID-19 vaccination in children aged 5–11 years, ACIP made an interim recommendation for vaccination in this population as authorized under the EUA.

The interim recommendation and clinical considerations are based on use of the Pfizer-BioNTech COVID-19 vaccine under an EUA and might change as more evidence becomes available. Before vaccination, the EUA Fact Sheet should be

[†††] https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html
[§§§] https://gis.cdc.gov/GRASP/Fluview/FluHospRates.html

[¶¶¶] https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-10-20-21/07-COVID-Su-508.pdf
[****] https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-11-2-3/04-COVID-Oster-508.pdf
[††††] https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/vaccine-induced-immunity.html

Summary

What is already known about this topic?

On October 29, 2021, the Food and Drug Administration granted Emergency Use Authorization for the Pfizer-BioNTech COVID-19 vaccine for children aged 5–11 years.

What is added by this report?

On November 2, 2021, after a systematic review of available data, the Advisory Committee on Immunization Practices made an interim recommendation for use of the Pfizer-BioNTech COVID-19 vaccine in children aged 5–11 years in the United States for prevention of COVID-19.

What are the implications for public health practice?

The Pfizer-BioNTech COVID-19 vaccine has high efficacy (>90%) against COVID-19 in children aged 5–11 years, and benefits outweigh risks for vaccination. Vaccination is important to protect children against COVID-19 and reduce community transmission of SARS-CoV-2.

provided to parents or guardians. ACIP will continue to review additional data as they become available; updates to recommendations or clinical considerations will be posted on the ACIP website (https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/covid-19.html).

Reporting of Vaccine Adverse Events

FDA requires that vaccination providers report vaccination administration errors, serious adverse events, cases of multisystem inflammatory syndrome, and cases of COVID-19 that result in hospitalization or death after administration of COVID-19 vaccine under an EUA (*1*). Adverse events that occur after receipt of any COVID-19 vaccine should be reported to the Vaccine Adverse Event Reporting System (VAERS). Information on how to submit a report to VAERS is available at https://vaers.hhs.gov/index.html or 1-800-822-7967. Any person who administers or receives a COVID-19 vaccine (or their parent or guardian) is encouraged to report any clinically significant adverse event, whether or not it is clear that a vaccine caused the adverse event. In addition, CDC has developed a new, voluntary smartphone-based online tool (v-safe) that uses text messaging and online surveys to provide near real-time health check-ins after receipt of a COVID-19 vaccine. Parents or guardians can register their children in v-safe and complete the health surveys on their behalf. CDC's v-safe call center follows up on reports to v-safe that include possible medically significant health events to collect additional information for completion of a VAERS report. Information on v-safe is available at https://www.cdc.gov/vsafe.

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Notes from the Field

Childhood Lead Poisoning Associated with Turmeric Spices — Las Vegas, 2019

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In March 2019, the Office of Epidemiology and Disease Surveillance of the Southern Nevada Health District (SNHD) was contacted by a local pediatrician regarding a developmentally normal boy aged 2 years (child A) with a high venous blood lead level (BLL) of 48 μg/dL (reference range <5 μg/dL) obtained during a routine well-child visit.* The pediatrician was not aware of any obvious source of lead exposure and also reported that child A's cousin, a girl aged 9 months (child B), who lived in a different household, also had a high venous BLL of 11 μg/dL. The parents in both families had immigrated from Afghanistan; both children were born in the United States.

Child A was admitted to a local hospital for a 2-day inpatient evaluation and treatment. The Poison Control Center recommended oral chelation therapy with succimer; however, because no succimer was locally available at the time of evaluation, succimer therapy (10 mg per kg body weight twice daily for 14 days) was scheduled to be initiated shortly after hospital discharge and after the home had undergone a lead assessment.† During hospitalization, child A's hemoglobin was 12.3 g/dL (reference range 11.0–12.8 g/dL), with red blood cell microcytosis (mean corpuscular volume = 72.5 fL [reference range 76.8–83.3 fL]) and hypochromia (mean corpuscular hemoglobin concentration = 32.3 g/dL [reference range 34.2–35.7 g/dL]). Ferritin level was 8 ng/mL (reference range = 7–140 ng/mL).

A standardized questionnaire administered to both families by SNHD did not initially identify potential sources of lead exposure. Child A's parents live in an apartment built in 2013. Child B's parents live in a single-family home built in 2005. No occupational exposures were identified. A certified assessor conducted a lead-risk assessment to identify and recommend removal of lead sources in both homes. Painted and nonpainted surfaces were tested using calibrated Niton XL3t-700 and calibrated Niton XL3p-303A-ray fluorescence (XRF) analyzers.

In child A's home, several pieces of crockery, a meat grinder, turmeric spice, and a rice seasoning spice were identified as lead hazards by XRF. The turmeric and rice seasoning spices were purchased from a local market, and samples collected from the home were sent to an environmental laboratory accredited by the National Lead Laboratory Accreditation Program (NLLAP), which confirmed lead levels of 2,000 mg/kg (turmeric) and 0.6 mg/kg (rice seasoning) by atomic absorption spectroscopy (AAS).

In child B's home, lead hazards identified by XRF included several pieces of crockery, floor tile, and two types of turmeric spice, one imported from Afghanistan and the other from the same local market as that of the turmeric found in child A's home. Dust from the floor tile had an average lead level of 0.50 μg/ft^2 (Environmental Protection Agency clearance level = 10 μg/ft^2).§ AAS testing found lead levels of 15,000 mg/kg and 3,000 mg/kg in the turmeric from Afghanistan and from the local market, respectively.

The local acquisition of some of the leaded products raised concerns about potential continued exposure among vulnerable populations. Therefore, additional samples from the local market were obtained and tested; lead was not detected by XRF or by AAS analysis conducted by the NLLAP-accredited laboratory. Because the turmeric spice purchased from the local market had been removed from its original packaging, information regarding the product origin and lot number were not available. Child B's family acknowledged purchasing the turmeric spice from the local market several months earlier.

Additional family members of both children were screened. Child A's father had a venous BLL of 49 μg/dL, and child B's sister (aged 2 years) had a venous BLL of 13 μg/dL. Interviews with both families indicated that the family of child A reportedly consumed larger quantities of turmeric-containing food than did the family of child B. Both families were advised to discontinue use of the lead-containing turmeric, obtain turmeric from reputable brands, and were provided nutritional counseling stressing the importance of a diet consisting of foods rich in calcium, iron, and vitamin C. Child A's BLL was 18 μg/dL in April 2019 after initiation of chelation therapy and was 9 μg/dL by December. Repeat testing of BLLs in child B and her sister found that their BLLs had both declined to 3 μg/dL by September.

These findings support other reports of lead-contaminated turmeric in the United States (*1*,*2*) and highlight the diverse pathways through which children can be exposed to lead. They underscore the importance of a multidisciplinary approach and communication between health care providers and health

*At the time of publication, the CDC blood lead level reference (BLRV) is ≥3.5 μg/dL. The BLRV is based on the 97.5th percentile of the National Health and Nutrition Examination Survey blood lead distribution in children aged 1–5 years. The BLRV is used to identify children with BLLs that are much higher than most children's BLLs. https://www.cdc.gov/nceh/lead/data/blood-lead-reference-value.htm

†Hospital records did not indicate whether any other chelating agents were considered or available.

§https://www.epa.gov/lead/hazard-standards-and-clearance-levels-lead-paint-dust-and-soil-tsca-sections-402-and-403 (Accessed January 23, 2020).

department staff members in identifying potential links among lead poisoning cases, and the need for health care facilities to be prepared to respond to cases of lead poisoning.

The national blood lead reference level had been 5 μg/dL but was lowered to 3.5 μg/dL in October 2021 (*3*). There is no safe BLL in children (*4*); BLLs once thought to pose little to no risk have shown to be risk factors for reading problems, intellectual delays, school failure, attention deficit-hyperactivity disorder, and antisocial behavior (*3,5–7*). Whereas the impact of lead exposure might be irreversible, exposure is preventable.¶,** Clinicians and public health professionals should be aware of risks outside traditional lead exposures (e.g., paint, dust, and contaminated soil). Adulteration of turmeric has reportedly been a source of lead exposure in other countries (*1*), where lead is purposefully added to enhance weight and color (*2*). Referrals for lead-risk assessments should emphasize same-day assessments when possible to reduce continued exposure to and absorption of lead. Public health officials and health care providers should work together to ensure the sources of lead exposure have been identified and controlled before chelation therapy is started. Health care providers who are unfamiliar with chelation therapy should consult with their regional pediatric environmental health specialty unit or poison control center for assistance.

¶ https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health (Accessed January 23, 2020).

** https://www.atsdr.cdc.gov/csem/leadtoxicity/physiological_effects.html (Accessed January 23, 2020).

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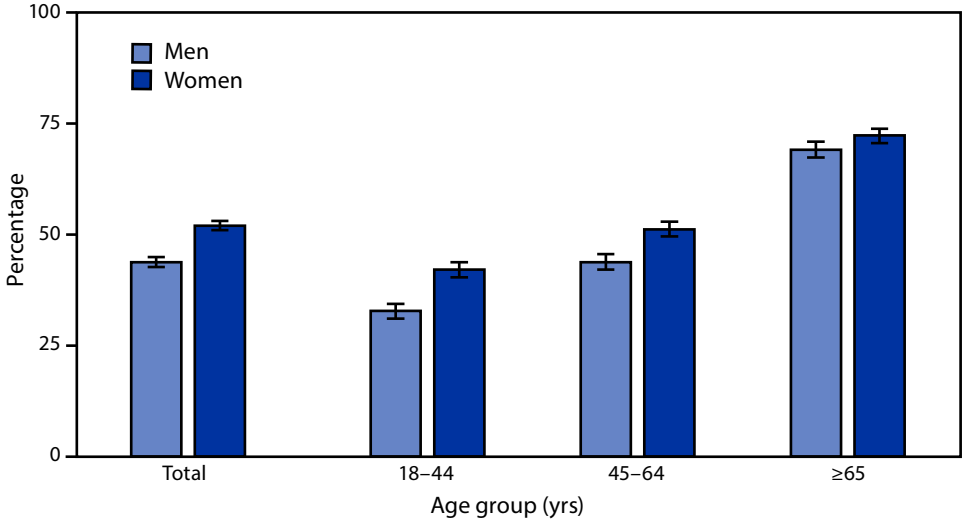
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Received an Influenza Vaccination in the Past 12 Months,† by Sex and Age Group — National Health Interview Survey,§ United States, 2020



* With 95% CIs indicated with error bars.
† Based on a response to the question, "During the past 12 months, have you had a flu vaccination?" Annual calendar-year estimates of vaccinations differ from seasonal influenza vaccination totals, which reflect vaccinations obtained during the influenza season.
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.

During 2020, 43.7% of men and 51.9% of women aged ≥18 years received an influenza vaccination in the past 12 months, and the prevalence increased with age for both sexes. Among men, 32.7% aged 18–44 years, 43.7% aged 45–64 years, and 69.0% aged ≥65 years received an influenza vaccination. Among women, 42.0% aged 18–44 years, 51.1% aged 45–64 years, and 72.2% aged ≥65 years received an influenza vaccination. For each age group, women were more likely to have received an influenza vaccination compared with men.

Source: National Center for Health Statistics, National Health Interview Survey, 2020. https://www.cdc.gov/nchs/nhis/index.htm

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