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Use of Electronic Vapor Products Before, During, and After Pregnancy Among Women with a Recent Live Birth — Oklahoma and Texas, 2015

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Electronic vapor products (EVPs) comprise a diverse group of devices, including electronic cigarettes (e-cigarettes). EVP users inhale an aerosol that typically contains nicotine, flavorings, and other additives (*1*). Nicotine is a developmental toxicant that adversely affects pregnancy and infant outcomes (*2*). Data from the 2015 Pregnancy Risk Assessment Monitoring System (PRAMS) for Oklahoma and Texas were analyzed to estimate population-based EVP use among women with a recent live birth. EVP use before pregnancy (defined as >3 months before pregnancy) and around the time of pregnancy (defined as any time during the 3 months before pregnancy, the last 3 months of pregnancy, or 2–6 months after delivery), reasons for EVP use, and dual use of EVPs and cigarettes were assessed. Prevalence of EVP use was 10.4% before pregnancy and 7.0% around the time of pregnancy, including 1.4% during the last 3 months of pregnancy. Among women using EVPs during the last 3 months of pregnancy, 38.4% reported use of EVPs containing nicotine, and 26.4% were unsure of nicotine content. Among women who had used EVPs and cigarettes, dual use prevalence was 38.0% in the 3 months before pregnancy, 7.7% during the last 3 months of pregnancy, and 11.8% in the 2–6 months after delivery. The most frequently reported reasons for EVP use around the time of pregnancy were curiosity (54.0%), the perception that EVPs might help with quitting or reducing cigarette smoking (45.2%), and the perception of reduced harm to the mother, when compared with cigarette smoking (45.2%). Clear messages that EVP use is not safe during pregnancy are needed, and broad, barrier-free access to evidence-based tobacco cessation strategies need to be made available.

PRAMS is a state- and population-based surveillance system designed to monitor selected self-reported behaviors and experiences before, during, and after pregnancy among women who have had a recent live birth. Participating states select a stratified random sample of women from birth certificate records and survey them by mail 2–6 months after delivery. Women who do not respond to the mailed survey are followed up by telephone.* Oklahoma and Texas included supplementary questions on EVPs on their PRAMS questionnaire in 2015, and data from responses were analyzed for this report. Data were weighted to adjust for noncoverage and nonresponse and represent the total population of women with a live birth in each state in 2015. Weighted response rates were 68% for Oklahoma and 56% for Texas. The sample included 3,277 women, including 1,955 (60%) from Oklahoma and 1,322 (40%) from Texas.

* https://www.cdc.gov/PRAMS.

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EVP use >3 months before pregnancy was ascertained by counting the number of women who responded affirmatively to the question "Have you ever used electronic vapor products, even one time?" (excluding those who reported use 3 months before, during, and shortly after pregnancy). EVP use around the time of pregnancy was ascertained by responses to questions about three specific time frames: 1) 3 months before pregnancy ("During the 3 months before you got pregnant, on average, how often did you use electronic vapor products?"); 2) during the last 3 months of pregnancy ("During the last 3 months of your pregnancy, on average, how often did you use electronic vapor products?"); and 3) 2–6 months after delivery (at the time the survey was administered) ("Since your new baby was born, on average, how often do you use electronic vapor products that contain nicotine?"). Reasons for EVP use were ascertained from a list of nine options.[†] Cigarette smoking around the time of pregnancy was assessed among women who reported any cigarette smoking in the past 2 years. Among women who reported having ever used EVPs and having smoked cigarettes in the past 2 years, dual use of EVPs and cigarettes was estimated for each of the three periods.

[†] Assessed reasons included the following: they cost less than cigarettes or other forms of tobacco; EVPs can be used where smoking is not allowed; I can get EVPs without nicotine; they might be less harmful to me than regular cigarettes; they might be less harmful to my baby than regular cigarettes; they might be less harmful to the people around me than regular cigarettes; EVPs come in flavors; EVPs might help me quit or reduce smoking regular cigarettes; I was curious about EVPs.

Weighted prevalence estimates and 95% confidence intervals (CIs) were calculated overall and by state, using SUDAAN (version 11.0, RTI International) to account for the complex sampling design of PRAMS. Chi-squared tests were used to compare differences in the prevalence of EVP use between cigarette smokers and nonsmokers. P-values <0.05 were considered statistically significant.

Overall, among 3,277 women with a recent live birth, 2,533 (82.6%) had never used EVPs; 459 (10.4%), including 15.8% in Oklahoma and 9.7% in Texas, had used EVPs >3 months before pregnancy, but had not used them around the time of pregnancy (Table). The prevalence of EVP use around the time of pregnancy was 7.0% overall (10.3% in Oklahoma and 6.5% in Texas). EVP use during the last 3 months of pregnancy was 1.4% (3.2% in Oklahoma and 1.1% in Texas). Among women who used EVPs during the last three months of pregnancy, 38.4% reported using EVPs containing nicotine, 35.2% reported using EVPs that did not contain nicotine, and 26.4% did not know about the nicotine content of the EVPs they used.

Prevalence of any cigarette smoking in the past 2 years was 18.5% (813), 16.4% (722) in the 3 months before pregnancy, 6.1% (31) in the last 3 months of pregnancy, and 10.3% (507) during the 2–6 months after delivery. Compared with nonsmokers, a higher proportion of women who smoked cigarettes in the past 2 years used EVPs >3 months before pregnancy (29.8% versus 6.0%; p<0.001) and around the time of pregnancy (25.1% versus 2.9%, p<0.001).

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TABLE. Weighted prevalence of electronic vapor product (EVP) use and dual use of EVPs and cigarettes among women with a recent live birth (N = 3,277), by timing of use — Pregnancy Risk Assessment Monitoring System, Oklahoma and Texas, 2015

	Timing of EVP use relative to pregnancy											
	>3 months before pregnancy*		Around the time of pregnancy†		During 3 months before pregnancy		During last 3 months of pregnancy		2–6 months after delivery		None	
Characteristic (no.)	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Total (3,277)	**459**	**10.4 (8.7–12.3)**	**285**	**7.0 (5.7–8.6)**	**223**	**5.8 (4.6–7.3)**	**70**	**1.4 (0.9–2.1)**	**96**	**2.1 (1.5–3.1)**	**2,533**	**82.6 (80.3–84.7)**
State												
Oklahoma (1,955)	323	15.8 (13.2–18.8)	189	10.3 (8.2–12.9)	142	7.6 (5.8–9.9)	52	3.2 (2.1–5.0)	70	3.5 (2.3–5.2)	1,443	73.8 (70.3–77.1)
Texas (1,322)	136	9.7 (7.9–11.8)	96	6.5 (5.1–8.3)	81	5.6 (4.3–7.3)	18	1.1 (0.6–2.0)	26	2.0 (1.3–3.1)	1,090	83.8 (81.2–86.1)
Cigarette smoking status§												
Smoker (813)	299	29.8 (24.2–36.2)	219	25.1 (19.8–31.2)	173	21.7 (16.7–27.7)	56	5.1 (3.1–8.2)	73	8.6 (5.6–12.9)	295	45.1 (38.4–51.9)
Nonsmoker (2,428)	159	6.0 (4.6–7.9)	64	2.9 (2.0–4.2)	49	2.3 (1.5–3.4)	13	0.5 (0.2–1.3)	21	0.7 (0.3–1.4)	2,205	91.1 (89.0–92.8)

Abbreviation: CI = confidence interval.

* Reported ever using EVPs even one time, but not during the 3 months before pregnancy, the last 3 months of pregnancy, or during the 2–6 months after delivery (i.e., former users).

† Any use within 3 months before pregnancy, during last 3 months of pregnancy, or during the 2–6 months after delivery.

§ Any cigarette smoking during the last 2 years.

Overall, among women who smoked cigarettes in the past 2 years and had ever used EVPs, use of both cigarettes and EVPs was reported by 38.0% of women during the 3 months before pregnancy, 7.7% during the last 3 months of pregnancy, and 11.8% during the 2–6 months after delivery (Figure 1). The prevalence of EVP use alone was highest during the 2–6 months after delivery (3.8%), and the prevalence of neither cigarette smoking nor EVP use was highest (61.9%) during the last 3 months of pregnancy.

Among women who used EVPs >3 months before pregnancy, the most frequently reported reasons for use were curiosity about the products (78.6%), the perception that EVPs might help with quitting or reducing cigarette smoking (27.4%), the perception that EVPs are less harmful than cigarettes (24.6%), the availability of flavored EVPs (24.5%), and the ability to get EVPs without nicotine (16.9%) (Figure 2). Among women who used EVPs around the time of pregnancy, the most frequently reported reasons for use were curiosity (54.0%), the perception that EVPs might help with quitting or reducing cigarette smoking (45.2%), the perception that EVPs are less harmful to the mother than cigarettes (45.2%), the availability of flavored EVPs (42.3%), and the ability to get EVPs without nicotine (41.4%).

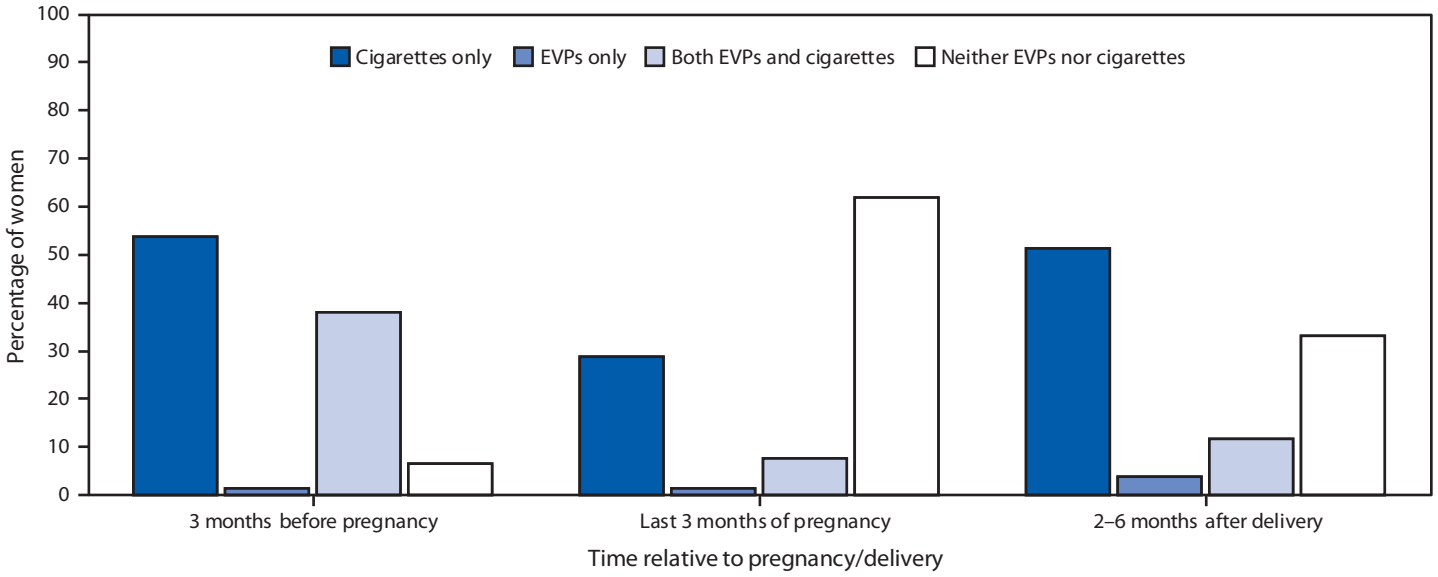
Discussion

These findings build on prior studies assessing use of tobacco products, including EVPs, among pregnant women (*3*–*5*) by highlighting the prevalence of EVP use, reasons for EVP use, and dual cigarette and EVP use in a large population-based sample. The current study confirms that, although EVPs are not safe to use during pregnancy (*1*,*2*), 7.0% of women (approximately one in 15 women) in Oklahoma and Texas who had a recent live birth used EVPs around the time of pregnancy; moreover, EVP use was higher among women who had smoked cigarettes in the past 2 years. Among women who smoked cigarettes in the past 2 years and had ever used EVPs, dual use of EVPs and cigarettes was higher in the 3 months before pregnancy and lower during the last 3 months of pregnancy and the 2–6 months after delivery.

This study's findings that 10% of women with a recent live birth used EVPs >3 months before becoming pregnant and 1.4% used them during the last 3 months of pregnancy differ from findings of the Population Assessment of Tobacco and Health (PATH) Study, which found that nearly twice as many (18.4%) pregnant women were former e-cigarettes users, and 4.9% reported use during pregnancy (*3*). The prevalence in the current study was likely lower because the PATH Study, a large nationally representative household-based study, assessed use during the entire pregnancy, rather than the last 3 months. Nevertheless, both studies found that a higher proportion of cigarette smokers used EVPs than did nonsmokers.

Nearly half of women who used EVPs around the time of pregnancy (45.2%) reported using the products because they perceived EVPs to be less harmful to them than regular cigarettes or that EVPs would help them with quitting or reducing smoking. Notably, the proportion of these users was approximately twice that of those who had used EVPs >3 months before pregnancy (27.4%). This suggests that women are aware of the harms of smoking during pregnancy, and, perceiving EVPs to be a safer alternative during pregnancy, might be using EVPs to mitigate those harms. This finding was consistent with an Internet survey of perceptions and prevalence of e-cigarette use among 445 pregnant women: among 67 pregnant women who reported using cigarettes or e-cigarettes, 50 (74.6%) reported switching from cigarettes to e-cigarettes or beginning use of e-cigarettes upon learning they were pregnant (*4*). Among those who switched, 23 (46%)

FIGURE 1. Percentage of women using electronic vapor products (EVPs) and cigarettes 3 months before pregnancy, during the last 3 months of pregnancy, or 2–6 months after delivery, among women with a recent live birth who smoked cigarettes in the last 2 years and ever used EVPs (N = 518) — Pregnancy Risk Assessment Monitoring System, Oklahoma and Texas, 2015



reported that they believed e-cigarettes were safer for them or their child than cigarettes, and nine (18%) reported switching to quit smoking cigarettes (*4*). A smaller clinical trial assessing smoking cessation among 103 pregnant smokers found that a similar proportion of women (14%) reported using e-cigarettes for smoking cessation during pregnancy (*5*).

Although aerosol from EVPs contains lower levels of toxicants than does cigarette smoke (*1*,*6*), EVPs are not safe to use during pregnancy because most contain nicotine (*7*). Nicotine, a developmental toxicant, adversely affects pregnancy and infant outcomes (*2*). Although the U.S. Preventive Services Task Force has determined that, currently, insufficient evidence exists to recommend EVPs for tobacco cessation among adults (including pregnant women) (*8*), many women report using EVPs in an attempt to quit smoking cigarettes around the time of pregnancy (*4*,*5*).

Barrier-free smoking cessation strategies with established effectiveness and safety need to be made available to all pregnant women (*2*). Behavioral intervention is a first-line treatment to help pregnant women quit smoking (*2*,*8*). In addition, Food and Drug Administration–recommended pharmacotherapy products (including nicotine replacement therapy), can be considered during pregnancy with close supervision of a clinician (*2*,*8*); these products don't contain the other harmful substances that have been found in the aerosol emitted from EVPs (*1*,*6*). However, variation in coverage provided by health insurance payers might prohibit access to effective treatment. In Texas, for example, women with Medicaid coverage have access to the full range of cessation interventions, with the exception of group and individual counseling, for which coverage varies by plan. In Oklahoma, Medicaid covers all treatment options except group counseling.[§] In addition, the Oklahoma Tobacco Helpline (1-800-QUIT NOW), a statewide, free, 24/7 tobacco cessation helpline, offers various options to aid in cessation efforts. In Texas, the toll-free Quitline phone number, 1-877-YES-QUIT was part of the resource list provided to mothers selected for the 2015 PRAMS survey. In both Oklahoma and Texas, all plans in the Health Insurance

Summary

What is already known about this topic?

Most electronic vapor products (EVPs) contain nicotine, a developmental toxicant, and other harmful additives.

What is added by this report?

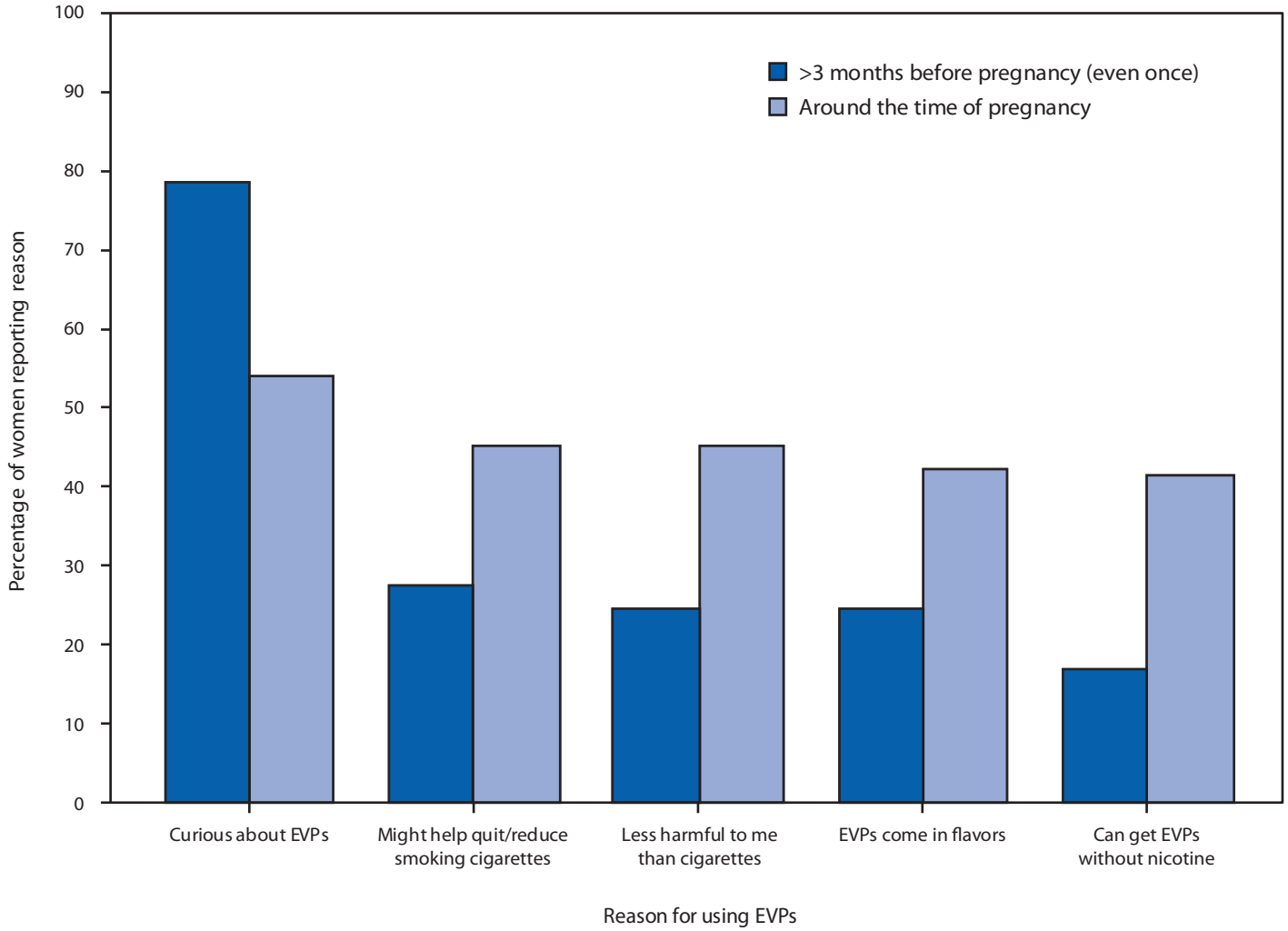
In 2015, 7.0% of women with a recent live birth in Oklahoma and Texas reported using EVPs shortly before, during, or after pregnancy, with 1.4% reporting use during pregnancy. Among prenatal EVP users, 38.4% reported using EVPs containing nicotine, and 26.4% did not know if the EVPs they used contained nicotine.

What are the implications for public health practice?

Messages that EVPs are not safe to use during pregnancy need to be clearly communicated. Education, counseling, and evidence-based cessation treatment could assist reproductive-aged women in preventing or reducing the use of all tobacco products, including EVPs.

[§] http//www.lungusa2.org /cessation2/.

FIGURE 2. Percentage of women with a recent live birth who reported a reason for using electronic vapor products (EVPs) >3 months before pregnancy (even once) and around the time of pregnancy,* by most frequently reported reasons — Pregnancy Risk Assessment Monitoring System, Oklahoma and Texas, 2015



* Around the time of pregnancy includes 3 months before pregnancy, during last 3 months of pregnancy, or 2–6 months after delivery.

Marketplace are required to cover tobacco cessation treatment; however, specific coverage varies by plan. In both states, private insurance plans are not required to cover cessation treatment, which could limit options available to some women.

The findings in this report are subject to at least three limitations. First, because data were self-reported postpartum, they are subject to recall and social desirability biases, which might result in underestimates of EVP use and cigarette smoking. Second, these data are only representative of women with a recent live birth in Oklahoma and Texas. Finally, because EVPs are an emerging product, these point-in-time estimates from 2015 might not reflect trends in use in Oklahoma and Texas in more recent years, including the use of increasingly popular EVPs shaped like USB flash drives, including JUUL, that contain very high levels of nicotine (*9*).

Among women with a recent live birth, many reported use of EVPs. Moreover, among those who used EVPs, a substantial percentage used EVPs in an attempt to quit smoking cigarettes, suggesting a possible lack of awareness of, or access to, evidence-based approaches to smoking cessation. Messages that EVPs are not safe to use during pregnancy and that nicotine adversely affects fetal development and infant outcomes need to be clearly communicated. Health care providers can offer education, counseling, and evidence-based cessation treatment to prevent use of all tobacco products, including EVPs, by women before, during, and after pregnancy.

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Progress Toward Hepatitis B Control and Elimination of Mother-to-Child Transmission of Hepatitis B Virus — Western Pacific Region, 2005–2017

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Hepatitis B vaccine (HepB), which has been available since 1982, provides lifelong protection against hepatitis B virus (HBV) infection and the associated 20%–30% increased lifetime risk for developing cirrhosis or hepatocellular carcinoma among >95% of vaccine recipients (*1*). Before HepB introduction into national childhood immunization schedules, the estimated hepatitis B surface antigen (HBsAg) prevalence in the World Health Organization (WHO) Western Pacific Region (WPR)* was >8% in 1990 (*2*). In 2005, the WPR was the first WHO region to establish a hepatitis B control goal, with an initial target of reducing HBsAg prevalence to <2% among children aged 5 years by 2012. In 2013, the WPR set more stringent control targets to achieve by 2017, including reducing HBsAg prevalence to <1% in children aged 5 years and increasing national coverage with both timely HepB birth dose (HepB-BD) (defined as administration within 24 hours of birth) and the third HepB dose (HepB3) to ≥95% (*3*). All WPR countries/areas endorsed the Regional Action Plan for Viral Hepatitis in the Western Pacific Region 2016–2020 in 2015 (*4*) and the Regional Framework for the Triple Elimination of Mother-to-Child Transmission of human immunodeficiency virus (HIV), Hepatitis B and Syphilis in Asia and the Pacific 2018–2030 (triple elimination framework) in 2017 (*5*). These regional targets and strategies are aligned with program targets established by the WHO Global Health Sector Strategy on Viral Hepatitis 2016–2021 that aim to reduce HBsAg prevalence among children aged 5 years to ≤1% by 2020 and to ≤0.1% by 2030 (*6*). This report describes progress made to achieve hepatitis B control in the WPR and the steps taken to eliminate mother-to-child transmission (MTCT) of HBV during 2005–2017. During this period, regional timely HepB-BD and HepB3 coverage increased from 63% to 85% and from 76% to 93%, respectively. As of December 2017, 15 (42%) countries/areas achieved ≥95% timely HepB-BD coverage; 18 (50%) reached ≥95% HepB3 coverage; and 19 (53%) countries/areas as well as the region as a whole were verified to have achieved the regional and global target of <1% HBsAg prevalence among children aged 5 years. Continued implementation of proven vaccination strategies will be needed to make further progress toward WPR hepatitis B control targets. In addition to high HepB-BD and HepB3 coverage, enhanced implementation of complementary hepatitis B prevention services through the triple elimination framework, including routine HBsAg testing of pregnant women, timely administration of hepatitis B immunoglobulin to exposed newborns, and antiviral treatment of mothers with high viral loads, will be needed to achieve the global hepatitis B elimination target by 2030.

Immunization Activities

HepB-BD and HepB3 coverage data are reported annually to WHO and the United Nations Children's Fund (UNICEF) from 36 of the 37 WPR countries and areas.† WHO and UNICEF estimate vaccination coverage for 27 countries in the region, using annual government-reported survey and administrative data; for the remaining areas and territories, government-reported coverage data are used. By 2005, all countries/areas in the region had introduced at least three HepB doses into national immunization schedules. By 2012, 34 (94%) of 36 countries/areas provided universal HepB-BD (Table 1); since 1987, Japan and New Zealand have provided selective administration of timely HepB-BD to infants born to mothers who are HBsAg-positive or whose HBsAg status is unknown. During 2005–2017, regional HepB-BD coverage increased from 63% to 85%, and HepB3 coverage increased from 76% to 93%. In 2017, 15 (42%) of 36 countries/areas achieved ≥95% timely HepB-BD coverage, and 18 (50%) countries/areas reached ≥95% HepB3 coverage.

HBsAg seroprevalence surveys

Surveillance for acute hepatitis B infection and its sequelae cannot fully capture the population prevalence of HBV infections, because most infants and children remain asymptomatic during acute infection. Nationally representative

*The Western Pacific Region, one of the six regions of the World Health Organization, consists of 37 countries and areas with a total population of approximately 1.8 billion, including American Samoa (USA), Australia, Brunei, Cambodia, China, Commonwealth of the Northern Mariana Islands (USA), Cook Islands, Federated States of Micronesia, Fiji, French Polynesia (France), Guam (USA), Hong Kong (China), Japan, Kiribati, Laos, Macao (China), Malaysia, Marshall Islands, Mongolia, Nauru, New Caledonia (France), New Zealand, Niue, Palau, Papua New Guinea, Philippines, Pitcairn Islands (UK), Samoa, Singapore, Solomon Islands, Republic of Korea, Tokelau (New Zealand), Tonga, Tuvalu, Vanuatu, Vietnam, and Wallis and Futuna (France).

†The Pitcairn Islands, with a population of approximately 50 persons, does not have an immunization program and does not report immunization coverage data to WHO/UNICEF.

TABLE 1. Hepatitis B vaccine (HepB) schedule and estimated coverage* with a timely birth dose† and third dose of HepB, by country/area — World Health Organization (WHO) Western Pacific Region, 2005, 2012, and 2017

			% Coverage					
			2005		2012		2017	
Country/Area	HepB schedule	Year birth dose introduced	Timely HepB-BD†	HepB3	Timely HepB-BD†	HepB3	Timely HepB-BD†	HepB3
American Samoa	0, 1 mo, 12 mos	1991	100	80	100 (2011)	77 (2011)	NR	NR
Australia	0, 2 mos, 4 mos, 6 mos	2000	NR	95	NR	91	NR	95
Brunei	0, 2 mos, 4 mos, 6 mos	1988	96	99	95	99	99	99
Cambodia	0, 6 wks, 10 wks, 14 wks	2005	NR	82§	68	91	79	93
China	0, 1 mo, 6 mos	1992	86	84	96	99	96	99
Commonwealth of Northern Mariana Islands	0, 6 wks, 4 mos, 6 mos	1988	99	89	98	76	95	71
Cook Islands	0, 6 wks, 3 mos, 5 mos	1989	99	99	97	98	99	99
Federated States of Micronesia	0, 2 mos, 4 mos, 6 mos	1988	93	91	81	82	75	80
Fiji	0, 6 wks, 10 wks, 14 wks	1989	90	99	90	99	90	99
French Polynesia	0, 2 mos, 10 mos	1992	100	97	98 (2014)	99	98	98
Guam	0, 1–2 mos, 6–18 mos	1988	98	88	100	38	80	83
Hong Kong SAR (China)	0, 1 mo, 6 mos	1988	100	95	95	95	95	95
Japan	2 mos, 3 mos, 7 mos	1986¶	NA¶	NR	NA¶	NR	NA¶	NR
Kiribati	0, 6 wks, 10 wks, 14 wks	1990	70	50	82	94	89	90
Laos	0, 6 wks, 10 wks, 14 wks	2004**	2§	49	NR	79	55	85
Macao SAR (China)	0, 1 mo, 6 mos	1989	100	88	100	94	100	95
Malaysia	0, 1 mo, 6 mos	1989	90	96	91	97	90	98
Marshall Islands	0, 2 mos, 4 mos, 6 mos	1998	99	89	96	80	97	82
Mongolia	0, 2 mos, 3 mos, 4 mos	1991	89	98	97	99	98	99
Nauru	0, 6 wks, 10 wks, 14 wks	NK	98	80	99	79	99	87
New Caledonia	0, 2 mos, 11 mos	NK	99 (2007)	99 (2006)	98	93	98	93
New Zealand	6 wks, 3 mos, 5 mos	1987¶	NA¶	87	NA¶	93	NA¶	94
Niue	0, 6 wks, 3 mos, 5 mos	NK	9	85	99	98	84	99
Palau	0, 2 mos, 6 mos	1989	99	98	99	89	99	98
Papua New Guinea	0, 1 mo, 2 mos, 3 mos	2003**	35 (2006)	63	35	68	33	56
Philippines	0, 6 wks, 10 wks, 14 wks	2007	NA	49	39	88	67	88
Republic of Korea	0, 1 mo, 6 mos	1983	98§	99	92 (2014)§	99	92	98
Samoa	0, 6 wks, 10 wks, 14 wks	NK	52	51	83	82	81	73
Singapore	0, 1 mo, 5 mos	1987	74	96	67	97	91	96
Solomon Islands	0, 6 wks, 10 wks, 14 wks	2005**	80	83	59	99	67	99
Tokelau	0, 6 wks, 10 wks, 14 wks	1990	100	100	56	100	100	100 (2016)
Tonga	0, 6 wks, 10 wks, 14 wks	1988	89	89	84	77	88	81
Tuvalu	0, 6 wks, 10 wks, 14 wks	NK	99	79	99	97	99	96
Vanuatu	0, 6 wks, 10 wks, 14 wks	1989–1990	92 (2006)§	61	79§	79	75§	85
Vietnam	0, 2 mos, 3 mos, 4 mos	2005	62§	94	76	97	77	94
Wallis and Futuna	0, 2 mos, 11 mos	2006	N/A	100 (2003)	100	>100§	97	>100§
Western Pacific Region	—	—	**63**	**76**	**80**	**93**	**85**	**93**
Global	—	—	**23**	**54**	**34**	**80**	**43**	**84**

Abbreviations: HepB-BD = birth dose of monovalent hepatitis B vaccine; HepB3 = third dose of hepatitis B containing vaccine; NA = not applicable; NK = not known; NR = not reported; SAR = special autonomous region; UNICEF = United Nations Children's Fund.

* WHO-UNICEF estimates except for areas and territories (American Samoa, French Polynesia, Guam, Hong Kong, Macao, New Caledonia, Commonwealth of Northern Mariana Islands, Tokelau, Wallis, and Futuna), and where otherwise specified.

† Timely hepatitis B birth-dose is defined as administration of a dose of hepatitis B vaccine within 24 hours of birth.

§ WHO-UNICEF estimates not available; reported coverage used instead.

¶ Year of introduction of selective birth dose vaccination of newborns of mothers who are HBsAg positive or of unknown HBsAg status.

** Approximate year of birth dose introduction into the routine immunization program.

HBsAg seroprevalence surveys allow countries to assess the prevalence of chronic HBV infection among children born after the introduction of hepatitis B vaccine in the national immunization schedule and track progress toward achievement of regional hepatitis B control targets. In 1990, before HepB was introduced into childhood immunization schedules in most WPR countries/areas, HBsAg seroprevalence among children aged 5 years was estimated to be >8% in 22 (61%) of 36 countries/areas (*2*), a level of chronic infection considered to be highly endemic (*1*). As of December 2017, all countries/areas in the WPR had completed serosurveys except for Nauru and New Caledonia; seven countries/areas conducted serosurveys before 2009 (Table 2). By December 2017, HBsAg seroprevalence among children aged 5 years declined to <1% in 25 (69%) countries/areas based on national serosurveys (Table 2). Notably, China, which has the largest birth cohort

in the region, was successful in decreasing the prevalence of HBV infection among children to <0.5%. In Laos, Papua New Guinea, Vietnam, and several of the Pacific Island countries, estimated HBsAg prevalence among children aged 5 years still exceeds 2%.

Regional Verification of Hepatitis B Control Goal

In 2007, the WPR established the Hepatitis B Immunization Expert Resource Panel that independently advises on the status of and strategies for achieving the regional hepatitis B control goal.[§] The Expert Resource Panel is an interdisciplinary team of 10–15 experts recognized in the field of hepatitis B, and members have expertise in immunization, epidemiology, virology, and hepatology. The Expert Resource Panel convenes verification panels to assess whether countries have met established regional control targets. The verification process includes review of data from nationally representative serosurveys conducted among children aged 5 years, who have already passed through the period of highest risk for perinatal and horizontal transmission of HBV. Panel members also review national and subnational HepB coverage data and supporting evidence of countries' progress in monitoring and targeting high-risk populations including HBsAg-positive mothers and their exposed newborns. As of December 2017, 19 (53%) of the 36 countries/areas were verified by the Expert Resource Panel as having met the regional <1% prevalence target based on serosurvey and vaccination coverage data (Table 2).

Progress Toward Elimination of Mother-to-Child Transmission of HBV

In 2017, the WPR established a goal for elimination of mother-to-child transmission (MTCT) of HBV by 2030, defined as achievement of a 90% reduction in new cases of chronic HBV infection, equivalent to 0.1% HBsAg seroprevalence among children aged 5 years, as part of the triple elimination framework. Key components of the WPR's strategy to achieve elimination of MTCT of HBV include achieving ≥95% HepB-BD and HepB3 coverage, screening ≥95% of pregnant women for chronic HBV infection, administering hepatitis B immunoglobulin (HBIG) to infants born to HBsAg-positive mothers, and treating pregnant women eligible for treatment with antiviral drugs (*5*). As of December 2017, 19 (53%) of 36 countries/areas had developed national plans for viral hepatitis prevention; 26 (70%) countries/areas reported having established integrated routine antenatal screening programs for HIV and syphilis (data not shown); and 20 (56%) countries/areas had a national policy for routine antenatal HBsAg testing (Table 3). However, only two (6%) countries reported testing ≥95% pregnant women for HBsAg, and eight countries (22%) reported providing antivirals to infected mothers. In addition to providing timely HepB-BD and HepB3 vaccination for HBV-exposed infants, 10 (28%) countries/areas administered HBIG to newborns of HBsAg-positive mothers, and seven (19%) provided postvaccination serologic testing to determine the infection status of exposed infants.

Summary

What is already known about this topic?

In 1990, chronic hepatitis B virus infection in the World Health Organization Western Pacific Region (WPR) was highly endemic (prevalence ≥8%).

What is added by this report?

During 2005–2017, regional hepatitis B vaccine birth dose (HepB-BD) and third dose (HepB3) coverage increased from 63% to 85% and from 76% to 93%, respectively. In 2017, 15 (42%) and 18 (50%) of 36 WPR countries/areas achieved ≥95% HepB-BD and HepB3 coverage, respectively. Chronic hepatitis infection in children declined to <1% in 25 (69%) countries/areas.

What are the implications for public health practice?

Continued commitment and enhanced coordination among programs that offer different hepatitis B prevention interventions are needed to achieve hepatitis B elimination by 2030.

Discussion

During 2005–2017, the WPR achieved remarkable progress toward the regional hepatitis B control goal and elimination of MTCT of HBV. HepB has been introduced in all countries/areas; almost all countries/areas provide universal HepB-BD; coverage with HepB-BD and HepB3 increased by 35% and 22%, respectively; and 19 (53%) countries/areas were verified to have achieved the 2017 regional control target by December 2017. This success was corroborated by a 2016 disease modeling study that estimated regional prevalence to be 0.93% among children born in 2012.[¶] This model also showed that immunization programs in the region prevented more than 37 million cases of chronic HBV infection, and averted more than seven million deaths related to hepatitis B that would have occurred in the lifetime of children born between 1990

[§] At the September 2018 Expert Resource Panel meeting (https://iris.wpro.who.int/bitstream/handle/10665.1/14321/RS-2018-GE-37b-PHL-eng.pdf), two new interim goals were proposed: 1) to reduce HBsAg prevalence to <1% among children aged 5 years in all countries and areas by 2025; and 2) in countries and areas that already have <1% HBsAg prevalence in children aged 5 years, to further reduce HBsAg prevalence to <0.3% by 2025. These are intended to be interim targets for countries to reach the hepatitis B elimination target of <0.1% HBsAg prevalence among children aged 5 years by 2030.

[¶] Cambodia, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, French Polynesia, Guam, Niue, and Tokelau presented serosurvey evidence of reaching the <1% HBsAg prevalence target among children aged 5 years after 2016, suggesting that regional prevalence might have further declined.

TABLE 2. Hepatitis B seroprevalence, by country/area — World Health Organization Western Pacific Region, 1976–2017

Country/Area	Year of most recent hepatitis B serosurvey	HBsAg prevalence (95% CI)	Year of verification of <1% HBsAg seroprevalence*
American Samoa	2011	0.2%	2014
Australia	2002	0.4% (0.0%–2.2%)	2012
Brunei	2011	0.1%	2013
Cambodia	2017	0.6% (0.3%–0.9%)†	NS§
China	2014	0.3% (0.2%–0.5%)	2012
Commonwealth of Northern Mariana Islands	2014	0.0% (0.0%–0.5%)	2017
Cook Island	2012	0.0%	2013
Federated States of Micronesia	2016	0.3% (0.1%–0.5%)	NS§
Fiji	2008¶	0.0%	NS
French Polynesia	2014	0% (0.0%–0.5%)	2016
Guam	2015	0.0%	2016
Hong Kong (China, SAR)	2009	0.8% (0.4%–1.2%)	2011
Japan	2010	0.2% (0.0%–0.4%)	NS
Kiribati	2014	3.3% (2.4%–4.6%)	NS
Laos	2012	1.7% (0.8%–2.6%)	NS
Macao (China, SAR)	2003	0% (0.0%–0.7%)	2008
Malaysia	2009	0.4% (0.2%–0.6%)	2011
Marshall Islands	2017	1.2% (0.6%–1.9%)	UR
Mongolia	2009	0.5% (0.4%–0.7%)	2012
Nauru	ND	—	NS
New Caledonia	ND	—	NS
New Zealand	2009	0.2% (0.0%–1.2%)	2012
Niue	2015	0.0%	2017
Palau	2008	0.0%	2013
Papua New Guinea	2012–2013	2.3%	NS
Philippines	2013	0.9%**	NS
Republic of Korea	2014	0.1%	2008
Samoa	2014	0.1%	NS
Singapore	2010	0.3% (0.1%–0.9%)	2015
Solomon Islands	2016	3.1% (2.0%–4.9%)†	NS
Tokelau	2014	0.0%	2016
Tonga	2005	0.8% (0.2%–2.5%)	2012
Tuvalu	1976	11.0%	NS
Vanuatu	1998	3.0%	NS
Vietnam	2011	2.2% (1.5%–3.1%)	NS
Wallis and Futuna	2012	0.9%	NS

Abbreviations: CI = confidence interval; HBsAg = hepatitis B surface antigen; ND = not done; NS = not submitted to the regional verification commission; SAR = special autonomous region; UR = under review by the regional verification commission.

* Verification is done by a regional commission of experts from the Hepatitis B Immunization Expert Resource Panel that determines if the country or area has reached the target of <1% HBsAg seroprevalence among children aged 5 years.

† Preliminary data.

§ By December 2017, Cambodia and the Federated States of Micronesia had conducted nationally representative serosurveys and were subsequently verified as meeting the <1% HBsAg seroprevalence target in 2018.

¶ Fiji completed a subnational hepatitis B serosurvey in 2008 and is planning its first nationally representative survey for 2019.

** The Philippines conducted a nationally representative serosurvey in 2018 with preliminary results indicating a 0.7% HBsAg prevalence among children aged 5 years.

and 2014 had hepatitis B vaccination programs not been established (*2*).

Interventions implemented to increase HepB-BD vaccination coverage included promoting community awareness about the need for HepB vaccination, especially the administration of a timely HepB-BD; building capacity and knowledge of health care staff to administer a timely birth dose; using HepB-BD outside the cold chain; and promoting institutional deliveries (*7*). WPR countries/areas have extensive experience using the highly heat stable monovalent HepB-BD outside the cold chain in areas that lack a reliable cold chain or have high home birth rates with limited health facility access. This use of the HepB-BD outside the commonly recommended storage temperatures of 35°F–46°F (2°C–8°C) for limited periods under monitored and controlled conditions, has been demonstrated to be safe and effective, with WHO suggesting outside-the-cold-chain use in settings where HepB-BD administration is restricted by access to cold storage (*1*). HepB-BD use outside the cold chain has been used to increase timely HepB-BD administration by 27% in Laos, 70% in China, and 150% in the Solomon Islands (*7*,*8*). Cambodia and China have national policies that encourage pregnant women to deliver in health facilities to reduce maternal and neonatal mortality by ensuring that mothers and newborns are examined by health care professionals within 24 hours of delivery. Institutional delivery also facilitates coordination of postnatal care services

TABLE 3. Policies and interventions implemented in elimination of mother-to-child transmission of hepatitis B — World Health Organization (WHO) Western Pacific Region (36 countries/areas)* 2017

Policies/Interventions	No. (%) of areas		
	Implemented	Not implemented	Data not available
National plan for viral hepatitis†	19 (53)	6 (17)	11 (31)
National policy for antenatal HBsAg testing†	20 (56)	2 (6)	14 (39)
Maternal antivirals given for EMTCT of hepatitis B†	8 (22)	8 (22)	20 (56)
HBIG given to HBV-exposed infants†	10 (27)	6 (17)	20 (56)
Follow-up with PVST for HBV-exposed infants†	7 (19)	9 (25)	20 (56)
ANC1 ≥95%§	13 (36)	10 (28)	13 (36)
ANC4 ≥95%§	1 (3)	19 (53)	16 (44)
SBA present at ≥95% births§	17 (47)	10 (28)	9 (25)
Antenatal HBsAg testing coverage ≥95%¶	2 (6)	1 (3)	33 (92)
HB-BD coverage ≥95%**,††	15 (42)	17 (47)	2 (6)
HB3 coverage ≥95%**	18 (50)	16 (44)	2 (6)

Abbreviations: ANC1 = at least 1 antenatal care visit; ANC4 = at least 4 antenatal care visits; EMTCT = elimination of maternal-to-child transmission; HBsAg = hepatitis B surface antigen; HBIG = hepatitis B immunoglobulin; HBV = hepatitis B virus; HepB-BD = birth dose of monovalent hepatitis B vaccine; HepB3 = third dose of a hepatitis B containing vaccine; PVST = postvaccination serological testing; SBA = skilled birth attendant; UNICEF = United Nations Children's Fund.

* The Pitcairn Islands is excluded from analysis because it does not report immunization coverage.

† Information collected from countries in preparation for the Midterm review of the Regional Action Plan for Viral Hepatitis in the Western Pacific 2016–2020, December 13–14, 2018, Manila, Philippines.

§ UNICEF data. Monitoring the situation of children and women; https://data.unicef.org/ updated June 2018, data from 2006–2017.

¶ China, Wang et al. Bull World Health Organ 2015;93:52–6; Republic of Korea, unpublished study of the liver 2013; Mongolia, reported at the Informal Consultation on Validation of Elimination of Mother-to-child Transmission of HIV, Hepatitis B and Syphilis: Developing the Method for Validating Hepatitis B Elimination, February 27–28, 2018.

** WHO and UNICEF estimates for all 27 countries in the Western Pacific Region, unless otherwise specified; reported coverage for the remaining nine reporting areas and territories in the Western Pacific Region.

†† Japan and New Zealand are excluded for this indicator as these countries selectively offer hepatitis B birth dose to newborns of HBsAg-positive mothers or mothers with unknown HBsAg status.

between maternal, neonatal, and child health programs and national immunization programs that can improve timely HepB-BD coverage (*7*,*9*).

To reach the global hepatitis B elimination goal of ≤0.1% HBsAg prevalence among children aged 5 years by 2030, WPR countries/areas need to achieve elimination of MTCT of HBV, because perinatal transmission accounts for a high proportion of chronic HBV infections among children (*1*). The triple elimination framework provides guidance for a coordinated delivery of services for immunization, HIV, sexually transmitted infections, and reproductive, maternal, neonatal, and child health to ensure that a timely HepB-BD is administered and high HepB3 coverage is achieved. The framework also provides guidance for implementation of complementary interventions in addition to vaccination to prevent perinatal HBV transmission, including routine testing of pregnant women and timely administration of hepatitis B immunoglobulin to exposed newborns. In addition, the framework suggests possible administration of antiviral drugs to mothers with high viral loads, while awaiting global guidance on its use to prevent MTCT of HBV (*5*).** In Cambodia, a modeling analysis indicated that offering an integrated package of services through the triple elimination platform could reduce MTCT of HBV by 76%, from 14.1% to 3.4%; syphilis by 51%, from 9.4% to 4.6%; and HIV by 8%, from 6.6% to 6.1%. It could prevent approximately 3,200 infant HBV infections annually at a cost of $114 USD per disability-adjusted life-year (*10*).

The WPR has significantly decreased the incidence of chronic HBV infection, with a few countries still requiring programmatic improvement in vaccination to achieve hepatitis B control. As the WPR expands implementation of interventions for elimination of MTCT of HBV, global and regional guidance is needed on 1) the use of monitoring indicators to assess the effect of these interventions on elimination of MTCT, 2) the appropriate frequency of costly serosurveys for verification of achievement of low HBsAg seroprevalence targets, and 3) the use of models to estimate infection prevalence from programmatic data to support countries in their control efforts and the elimination of MTCT verification process.

** World Health Organization. Guidelines for the prevention, care, and treatment of persons with chronic hepatitis B infection. https://apps.who.int/iris/bitstream/handle/10665/154590/9789241549059_eng.pdf.

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Notes from the Field

Measles Outbreak in an Era of Stricter Immunization Requirements — California, March 2018

George Han, MD[1]; Neale Batra, MSc[1,2]; Alvin Vallejo[1]; Robert Schechter, MD[3]; Jennifer Zipprich, PhD[3]; Kathleen Harriman, PhD[3]

On March 4, 2018, an unvaccinated adolescent boy (patient A, aged 15 years) who had recently returned from England and Wales, where measles outbreaks were occurring, was evaluated by a physician for fever, cough, coryza, conjunctivitis, Koplik spots, and rash. Measles virus nucleic acid was detected in an oropharyngeal swab and in urine tested at the Santa Clara County (California) Public Health Department (SCCPHD). Nineteen days later, on March 23, measles was reported in an unvaccinated adolescent boy (patient B, aged 16 years) who had been at a scouting event with patient A (Figure). Patient B was not contacted during public health investigation because patient A had not reported attending this event. On March 24, an unvaccinated male classmate of patient A's (patient C, aged 15 years) developed measles while in quarantine. On April 2, a man (patient D, aged 21 years) who had received 2 doses of measles, mumps, and rubella (MMR) vaccine and who had attended a different scouting event in Santa Clara County with patient B before returning to college in Nevada was reported as a measles patient to the Washoe County (Nevada) Health District.

On April 3, the Alameda County (California) Public Health Department received a report of measles in an unvaccinated man (patient E, aged 33 years). He identified his nephew (patient F, aged 7 years) as the source of his illness but declined to provide contact information. SCCPHD eventually confirmed his nephew's presence at a tutoring center attended by patient A. The nephew's parents could not be reached by phone; his mother was interviewed at their home. She acknowledged that her son was not vaccinated and revealed that both he and his unvaccinated brother (patient G, aged 4 years) had experienced recent illnesses consistent with measles. Hundreds of contacts of these seven patients were traced across 10 counties in California and Nevada.

Although patient A's parents had chosen not to vaccinate him, his immunocompromised brother, an organ transplant recipient, had received intravenous immunoglobulin to protect him against measles before traveling overseas. When patient A's illness was reported, SCCPHD recommended that his brother receive additional intravenous immunoglobulin and be quarantined 7 additional days; the family followed both recommendations. Patient C's unvaccinated sister, aged 17 years, received parental permission to choose to receive MMR vaccine when her brother was quarantined; she opted to receive the vaccine. Patient D, who had received 2 doses of MMR vaccine, exhibited mild symptoms consistent with modified measles (*1*). None of his many contacts at a large university developed measles.

MMR vaccine is recommended for all persons born in the United States since 1957 who do not have a contraindication for the vaccine.* In this outbreak, the six unvaccinated patients with measles all had parents who had chosen not to vaccinate them during childhood. Since California Senate Bill 277 (SB277) went into effect in 2016, children entering school in California may no longer receive exemptions from immunization requirements based on parental personal beliefs.† However, medical exemptions for reasons determined by individual physicians, including family medical history, rather than a uniform standard (i.e., a medical contraindication to vaccination), remain permitted (*2*). Interviews with local health authorities suggest that some students without contraindications to vaccination have received medical exemptions (*3*). Patients F and G received identical broad medical exemptions to all vaccines from a physician located several hundred miles away from the patients' residence. Patients E and G represent the first documented cases of measles in California infected by a child with a medical exemption since SB277 became law; had SCCPHD received accurate information about patient F's immunization status, these two illnesses might have been prevented, and the expenditure of resources to investigate their contacts might have been avoided. Prompt public health action and continued maintenance of a high level of population immunity to measles likely averted a larger outbreak.

* https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm.
† https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB277.

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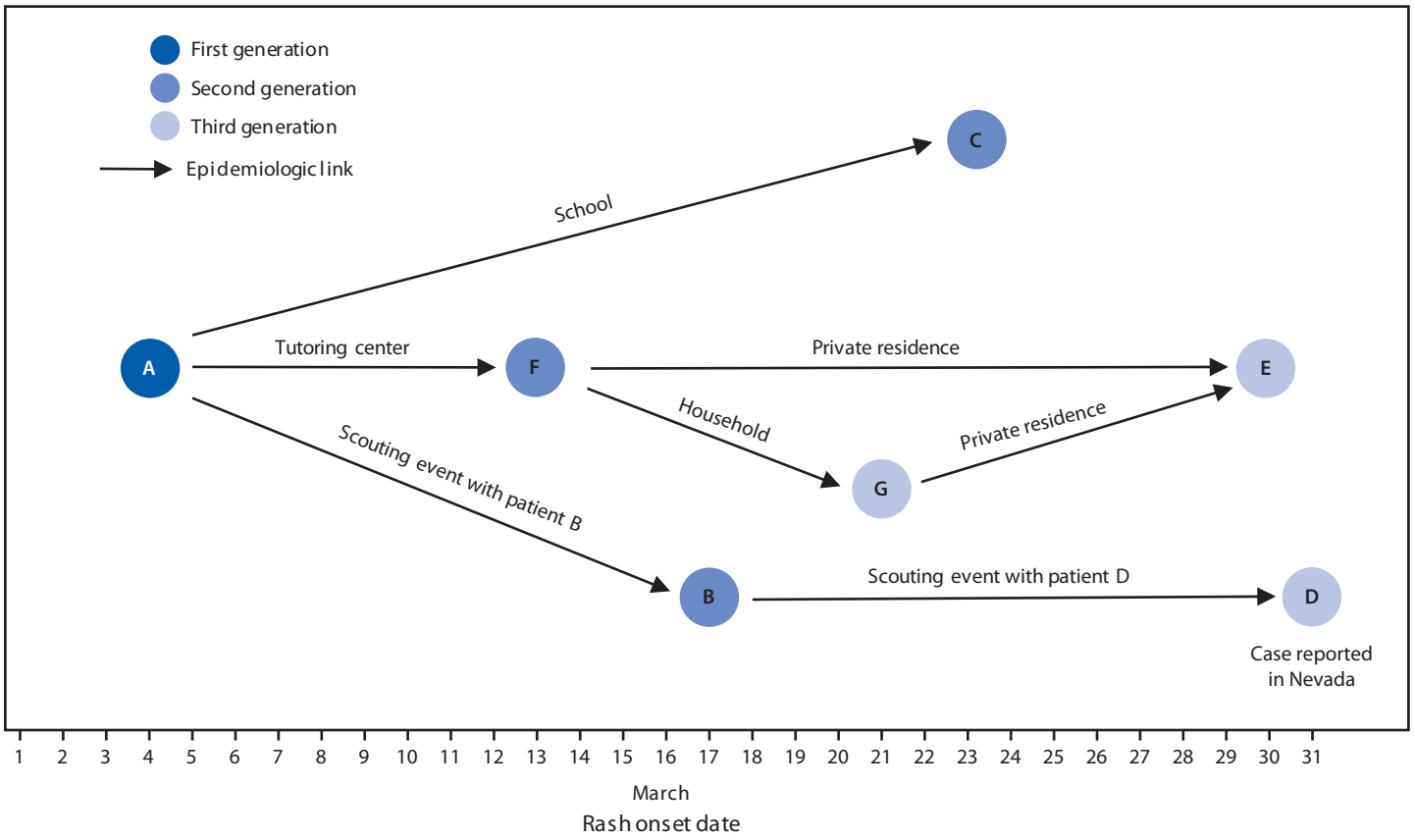
FIGURE. Measles transmission associated with community exposures to persons who had not received measles, mumps, and rubella vaccine, by date of rash onset — California, March 2018*,†



* Patients A–E had measles genotype D8. The parents of patients F and G did not consent to laboratory testing.
† Patient E could have been infected by either patient F or patient G during a visit to their home on March 17.

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Notes from the Field

Age Distribution of Patients with Laboratory-Detected Respiratory Syncytial Virus — Arizona, 2013–2017

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Respiratory syncytial virus (RSV)–positive laboratory detections have been reportable in Arizona since 2004 as part of the state's passive infectious disease surveillance. All Arizona clinical laboratories are mandated to report*; however, some health care providers also report RSV detections, and surveillance includes both inpatient and outpatient facilities. A case is defined as a laboratory-positive result reported during the RSV season, which is from October to September in Arizona. During the 2016–17 season, the Arizona Department of Health Services noted a shift in age distribution of patients with reported detections. During the 2009–10 through 2012–13 seasons, >90% of reported cases each season were among children aged <5 years. In the 2016–17 season, the percentage of cases in children aged <5 years declined to 78%, whereas the percentage among adults aged ≥65 years increased from 1% in 2009–10 to 11% in 2016–17. Simultaneous with this observed change in age distribution, an overall increase in polymerase chain reaction (PCR) testing for RSV diagnosis and a decrease in antigen-based RSV testing has been reported in the United States (*1*,*2*). The Arizona Department of Health Services analyzed RSV surveillance data to investigate whether the observed shift in age distribution of patients with RSV reflected a change in RSV epidemiology or was related to changes in testing practices, including an increase in PCR use.

During four RSV seasons (2013–14 through 2016–17), approximately 3,000–5,000 cases were reported each season in Arizona. Reported laboratory tests were categorized as rapid antigen, PCR, or other (i.e., culture or immunofluorescence assays). The percentage of tests that could not be categorized ranged from 1% (2015–16 season) to 11% (2013–14).

All analyses were performed using SAS software (version 9.4, SAS Institute). Children aged <5 years accounted for a decreasing percentage of reported cases in each successive RSV season from 2013–14 to 2016–17 (89%, 84%, 82%, and 78%) (Table), while the percentage of cases in persons aged ≥65 years increased in each successive season (4%, 6%, 9%, and 11%) (chi-squared test for trend, p<0.001). Simultaneously, the percentage of positive test results by PCR increased 152%, from 21% of cases with a categorized test during 2013–14, to 53% during 2016–17 (p<0.001). Notably, although the percentage of cases with PCR testing increased among all age groups during this period, the largest percentage increase in reported cases was in patients aged ≥65 years. In addition, over the four RSV seasons, the percentage of reported PCR detections in patients aged ≥65 years was higher (range = 58%–88%) than the percentage among those aged <5 years (range = 18%–45%).

This shift toward an overall increasing percentage of cases with reported PCR detections since 2013 corresponds with the noted shift in age distribution among reported RSV cases. Although historically RSV has been diagnosed primarily in

* Clinical laboratories are encouraged to report electronically via electronic laboratory reporting or via direct entry into Arizona's statewide electronic surveillance system. However, electronic reporting is not required; laboratories also may report via fax, mail, telephone, or secure e-mail.

TABLE. Percentage of reported respiratory syncytial virus (RSV) cases, by patient age group and polymerase chain reaction (PCR) test positivity — Arizona, 2013–14 through 2016–17 RSV seasons

	Age group (yrs)					
RSV season	<5	5–14	15–64	≥65	Total	p-value*
2013–14						
Total no. of cases (%)	2,466 (89)	84 (3)	105 (4)	100 (4)	**2,735 (100)**	
No. (%) with PCR-positive tests	446 (18)	36 (43)	47 (45)	58 (58)	**587 (21)**	<0.001
2014–15						
Total no. of cases (%)	4,334 (84)	242 (5)	277 (5)	299 (6)	**5,152 (100)**	
No. (%) with PCR-positive tests	1,640 (38)	157 (65)	217 (78)	231 (77)	**2,245 (44)**	<0.001
2015–16						
Total no. of cases (%)	3,592 (82)	135 (3)	286 (6)	420 (9)	**4,433 (100)**	
No. (%) with PCR-positive tests	1,469 (41)	112 (83)	234 (82)	364 (87)	**2,179 (49)**	<0.001
2016–17						
Total no. of cases (%)	4,221 (78)	219 (4)	403 (7)	591 (11)	**5,434 (100)**	
No. (%) with PCR-positive tests	1,880 (45)	166 (76)	332 (83)	519 (88)	**2,897 (53)**	<0.001

* Chi-squared test for trend.

young children, in recent years, awareness of infection in older adults has increased, possibly reflected by the increase in observed testing in this age group. PCR use differs across age groups, suggesting that the change in age distribution might be attributed to changes in testing practices rather than to changes in the epidemiology of the disease, particularly if there is increased use of PCR-based respiratory viral panels among older adults, who might otherwise not have been tested for RSV. RSV antigen testing is less sensitive in older age groups (*3*), which might further encourage health care providers to order PCR tests instead of antigen tests for older adults.

Because Arizona surveillance data only include positive test results, it was not possible to rule out an age-related change in disease incidence. In addition, the percentage of test results categorized by test type has increased in recent seasons, perhaps as a result of increasing use of electronic laboratory reporting, which facilitates the reporting and entry of more specific test type information, compared with handwritten reports or manual data entry. Future analyses of RSV reporting will include examination of other sources of testing data that include both positive and negative results. As new tools for diagnosing and preventing RSV infection are developed, it is important to understand epidemiologic changes identified through population-based RSV surveillance (*4*).

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Notes from the Field

Identifying Risk Behaviors for Invasive Group A *Streptococcus* Infections Among Persons Who Inject Drugs and Persons Experiencing Homelessness — New Mexico, May 2018

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In the spring of 2018, the New Mexico Department of Health (NMDOH) contacted CDC about an increase in the number and prevalence of invasive group A *Streptococcus* (GAS) infections reported through New Mexico's Active Bacterial Core surveillance (ABCs) system. From 2013 to 2017, the annual rate of invasive GAS infections increased approximately 120%, from 6.8 to 14.9 per 100,000 persons, approximately double the estimated national rate (*1*,*2*). In New Mexico, the prevalence of injection drug use (IDU) reported in the medical charts of patients with invasive GAS infection during this period (1,108 patients) increased approximately 200%, from 6.4% (nine of 141 invasive GAS infections) to 20.1% (62 of 308 invasive GAS infections), and the prevalence of reported homelessness among persons with invasive GAS infections increased 125%, from 3.6% (five of 141) to 8.1% (25 of 308). IDU is a known risk factor for GAS infections; however, specific behaviors causing the recent increase in the prevalence of IDU among patients with GAS infection are unknown. Although recent outbreaks of invasive GAS infection among persons experiencing homelessness have been reported in Canada, Europe, Arizona, and Alaska, homelessness is not a well-defined risk factor for invasive GAS infection in the United States; therefore, identifying specific behaviors that might increase the risk for infection in this group might help inform prevention efforts (*3*–*6*). NMDOH requested CDC assistance in characterizing GAS disease and specific high-risk behaviors among persons who inject drugs and persons experiencing homelessness to recommend potential public health interventions to reduce disease risk and transmission among these populations.

NMDOH and CDC received daily laboratory lists to identify patients hospitalized with GAS infection during May 1–23, 2018, at one of four hospital systems in Albuquerque and Santa Fe. A case was defined as illness with GAS cultured from any site (excluding throat and urine cultures) in an adult aged 18–65 years. Identified patients were interviewed using a standardized questionnaire focusing on known risk factors (e.g., exposure to ill children; crowding; IDU; and presence of underlying medical conditions, such as diabetes, chronic liver disease, and skin breakdown) and potential risk factors (e.g., poor hygiene, injection practices, and sharing of drug paraphernalia) for GAS infection and abstracted these data from their medical charts. The team interviewed personnel from organizations that care for persons who inject drugs and those experiencing homelessness to generate hypotheses for the increase in GAS infections among these groups.

Thirty-five patients with GAS infection were identified; 26 (74%) could be contacted and are included in the analysis. The mean patient age was 48 years (range = 24–63 years); 17 (65.4%) were male, seven (26.9%) were American Indian, and 15 (57.7%) identified as Hispanic/Latino (Table). Approximately half of the cases were identified as cellulitis, and approximately one third were identified as abscesses. Among known risk factors for GAS infections, skin breakdown, either recent (21; 80.8%) or current (20; 76.9%), was reported most frequently. Fifteen (57.7%) patients had been seen by a wound care provider in the month preceding their admission. Eight (30.8%) interviewed patients were experiencing homelessness, and three (11.5%) injected drugs. Persons experiencing homelessness did not report staying in crowded settings, such as shelters. However, recent or current skin breakdown was reported by six and five persons experiencing homelessness, respectively, and six reported having seen a wound care provider before their hospital admission. Reported injected drugs included heroin, cocaine, and methamphetamines, alone or in combination. All three persons who injected drugs reported injecting multiple times in the same day, two reported injecting multiple times with the same needle, and one reported sharing needles and licking the needle before injection.

Among 15 interviewed providers, barriers to good hygiene and appropriate skin care in persons experiencing homelessness and persons who inject drugs were noted, including limited access to clean running water, showers, or bathrooms; poverty; or alcohol and drug addiction. To prevent GAS infection, seven providers suggested developing educational tools for persons experiencing homelessness, persons who inject drugs, and personnel working with these populations.

The increased number of invasive GAS cases occurring among persons experiencing homelessness and those who inject drugs might have contributed to the overall increase in GAS in New Mexico from 2013 to 2017. However, the small number of persons interviewed for this study limit the ability to draw significant conclusions regarding specific risk behaviors that might increase the risk for GAS infection among these populations. Replicating this pilot investigation at other sites

TABLE. Characteristics of interviewed patients with group A streptococcal (GAS) infection (N = 26) — New Mexico, May 2018

Characteristic	No. (%)
Sex	
Male	17 (65.4)
Female	9 (34.6)
Race	
White	6 (23.1)
Black	1 (3.8)
American Indian	7 (26.9)
Asian/Pacific Islander	1 (3.8)
Multiracial	1 (3.8)
Unknown	10 (38.5)
Ethnicity	
Hispanic/Latino	15 (57.7)
Type of GAS infection*	
Cellulitis	15 (57.7)
Abscess	9 (34.6)
Osteomyelitis	4 (15.4)
Septic shock	3 (11.5)
Necrotizing fasciitis	2 (7.7)
Pneumonia	2 (7.7)
Bacteremia	1 (3.9)
Septic arthritis	1 (3.9)
Risk factors for group A streptococcal infections	
Skin breakdown in the last month	21 (80.8)
Current skin breakdown	20 (76.9)
Diabetes	9 (34.6)
Contact with ill children	7 (26.9)
Chronic hepatitis C	6 (23.1)
Cirrhosis of liver	6 (23.1)
Injection drug use	3 (11.5)
Contact with ill adults	2 (7.7)
Heart disease	2 (7.7)
Cancer	1 (3.9)
Chronic obstructive pulmonary disease	1 (3.9)
Contact with health care system	
Saw health care provider in the past year	22 (84.6)
Saw health care provider in week before illness	16 (61.5)
Saw wound care provider in last month	15 (57.7)

* Categories are not mutually exclusive.

might help identify specific risk behaviors for acquiring GAS among these vulnerable populations. Because most patients had previous encounters with the health care system, it is important for providers who care for persons who inject drugs or are experiencing homelessness to be aware of the risk for severe GAS infections in these groups. In addition, educational material, that describes GAS symptoms, good hygiene and skin care, and safe injection practices, could benefit both patients and providers.

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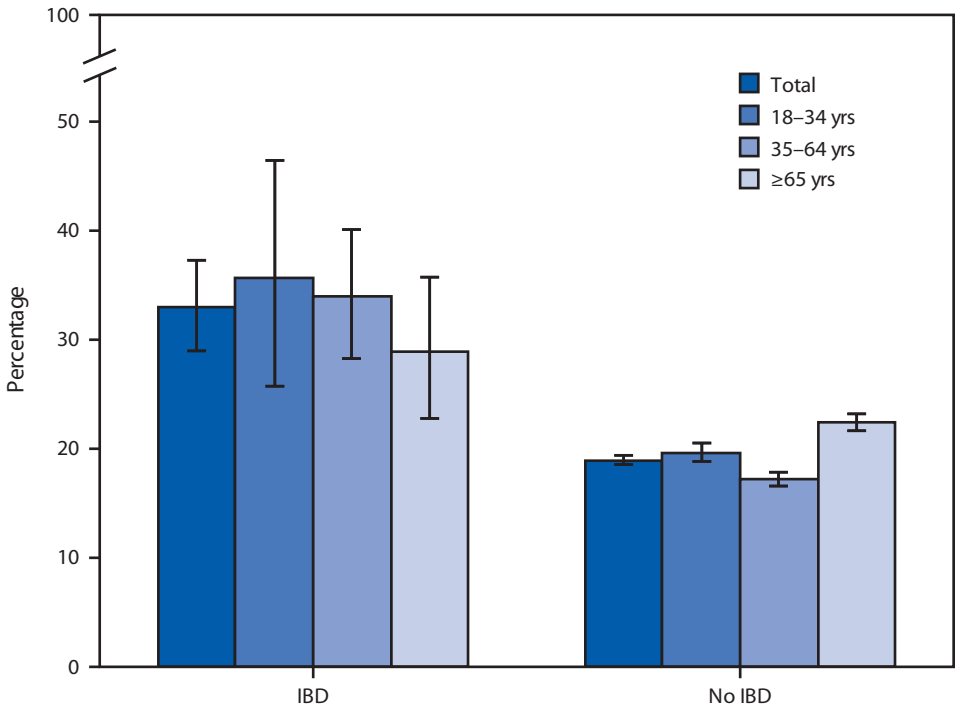
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Had Visited an Emergency Department at Least Once in the Past 12 Months,† by Age Group and Inflammatory Bowel Disease (IBD) Status§ — National Health Interview Survey, 2015 and 2016¶



* With 95% confidence intervals indicated by error bars.
† Based on a question in the National Health Interview Survey Sample Adult component that asked "During the past 12 months, how many times have you gone to a hospital emergency room about your own health? (This includes emergency room visits that resulted in a hospital admission.)"
§ Based on a question in the National Health Interview Survey Sample Adult component that asked "Have you ever been told by a doctor or other health professional that you had Crohn's disease or ulcerative colitis?"
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey Sample Adult component.

In 2015 and 2016, adults with IBD were more likely to have visited an emergency department at least once in the past 12 months than were those without IBD (33.0% versus 18.9%); this pattern was observed for all age groups. Among adults aged 18–34, 35–64, and ≥65 years, those with IBD were more likely to have visited an emergency department at least once in the past 12 months (35.6%, 34.0%, and 28.9%, respectively), compared with adults without IBD (19.6%, 17.2%, and 22.4%, respectively).

Source: National Health Interview Survey, 2015 and 2016 data. https://www.cdc.gov/nchs/nhis.htm.

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