Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 63 / No. 41
October 17, 2014

Vaccination Coverage Among Children in Kindergarten — United States, 2013–14 School Year

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State and local vaccination requirements for school entry are implemented to maintain high vaccination coverage and protect schoolchildren from vaccine-preventable diseases (*1*). Each year, to assess state and national vaccination coverage and exemption levels among kindergartners, CDC analyzes school vaccination data collected by federally funded state, local, and territorial immunization programs. This report describes vaccination coverage in 49 states and the District of Columbia (DC) and vaccination exemption rates in 46 states and DC for children enrolled in kindergarten during the 2013–14 school year. Median vaccination coverage was 94.7% for 2 doses of measles, mumps, and rubella (MMR) vaccine; 95.0% for varying local requirements for diphtheria, tetanus toxoid, and acellular pertussis (DTaP) vaccine; and 93.3% for 2 doses of varicella vaccine among those states with a 2-dose requirement. The median total exemption rate was 1.8%. High exemption levels and suboptimal vaccination coverage leave children vulnerable to vaccine-preventable diseases. Although vaccination coverage among kindergartners for the majority of reporting states was at or near the 95% national *Healthy People 2020* targets for 4 doses of DTaP, 2 doses of MMR, and 2 doses of varicella vaccine (*2*), low vaccination coverage and high exemption levels can cluster within communities.* Immunization programs might have access to school vaccination coverage and exemption rates at a local level for counties, school districts, or schools that can identify areas where children are more vulnerable to vaccine-preventable diseases. Health promotion efforts in these local areas can be used to help parents understand the risks for vaccine-preventable diseases and the protection that vaccinations provide to their children.

Federally funded immunization programs assess vaccination coverage among children entering kindergarten each school year. Health departments, school nurses, or school personnel assess the vaccination and exemption status, as defined by state and local school requirements, of a census or sample of kindergartners enrolled in public and private schools. Among the 49 states and DC reporting vaccination coverage data, 42 used their immunization information system (IIS) as at least one source of data for their school assessment. The type of school survey varied among the

* *Healthy People 2020* objective IID-10.1 is based on 4 doses of DTaP vaccine. This report describes compliance with state regulations of 3, 4, or 5 doses of DTaP vaccine. Of the 49 states and DC, only Nebraska, New York, and Pennsylvania report <4 doses of DTaP vaccine. IID-10.2 sets a target of 95% of kindergartners receiving ≥2 doses of MMR vaccine. IID-10.5 sets a target of 95% of kindergartners receiving ≥2 doses of varicella vaccine.

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49 states and DC reporting either vaccination coverage or exemption: 38 reported using a census of kindergartners; nine a sample of schools, kindergartners, or both; one a voluntary response of schools; and two a mix of methods. Two states used a sample to collect vaccination coverage data and a census to collect exemption data. Four states changed their type of survey from the previous school year.† Data from the public and private school vaccination assessments were aggregated by state and DC immunization programs and sent to CDC.§ Vaccination coverage data were provided for 4,252,368 kindergartners included in reports from 49 states and DC, and exemption data were provided for 3,902,571 kindergartners included in reports from 46 states and DC.

All estimates of coverage and exemption rates were adjusted based on the type of survey conducted and response rates, using data aggregated at school or county level as appropriate and available, unless otherwise noted.¶ Vaccination requirements for school entry, as reported to CDC by the federally funded immunization programs, varied.** Kindergartners were considered up-to-date for any single vaccine if they had received all of the doses of that vaccine required for school entry in their jurisdiction. Nine states considered kindergartners up-to-date only if they had received all of the doses for all vaccines required for school entry in their jurisdiction.†† Of the 49 states and DC reporting vaccination coverage, 13 met CDC standards for school assessment methods in 2013–14.§§

Among the 49 states and DC that reported 2013–14 school vaccination coverage, median 2-dose MMR vaccination coverage was 94.7% (range = 81.7% in Colorado to ≥99.7% in Mississippi); 23 reported coverage ≥95% (Table 1), and eight reported coverage <90% (Table 1, Figure). Median local requirement for DTaP vaccination coverage was 95.0% (range = 80.9% in Colorado to ≥99.7% in Mississippi);

† Alaska, Georgia, Missouri, and North Dakota.

§ Data from one local area (Houston) were reported separately and included in the data for the state of Texas. Oregon estimates included vaccination coverage and exemption data for children enrolled in public online homeschools. Pennsylvania included homeschool students in their public school data.

¶ Most of the programs that used complex sample surveys provided CDC with data aggregated at the school or county level for weighted analysis. Coverage and exemption data based on a reported census were adjusted for nonresponse using the inverse of the response rate, stratified by school type. For data collected using a complex sample design and with sufficient data provided, weights were calculated to account for sample design and adjusted for nonresponse. Where sufficient data were not available to account for the use of a stratified two-stage cluster sample design, data were analyzed as a stratified simple random sample (Delaware, Houston, Virginia, and Puerto Rico).

** Among the 49 reporting states and DC, all programs required 2 doses of a measles-containing vaccine, of which MMR is the only one available in the United States. For local requirements for DTaP vaccine, two required 3 doses, 27 required 4 doses, 20 required 5 doses, and one state did not require pertussis. For varicella vaccine, 13 required 1 dose, 36 required 2 doses, and 1 did not require varicella vaccination.

†† States reporting estimates based on receiving all doses of all vaccines required for school entry might have actual antigen-specific coverage estimates at least as high as the coverage for all required vaccines.

§§ CDC standards include use of a census or random sample of public and private schools or students, assessment using number of doses recommended by the Advisory Committee on Immunization Practices, assessment of vaccination status before December 31, collection of data by health department personnel or school nurses, validation if data are collected by school administrative staff, and documentation of vaccination from a health-care provider.

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR 2014;63:[inclusive page numbers].

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TABLE 1. Estimated vaccination coverage,* by state/area and vaccination among children enrolled in kindergarten — United States, 2013–14 school year

State/Area	Kindergarten population†	Total surveyed	Proportion surveyed (%)	Type of survey conducted§	MMR¶ (%)	DTaP** (%)	Varicella 1 dose (%)	Varicella 2 doses (%)
Alabama††	76,927	76,927	100.0	Census	≥92.0	≥92.0	≥92.0	NReq
Alaska§§	10,222	946	9.3	Stratified 2-stage cluster sample	94.4	96.0		92.5
Arizona	89,606	85,861	95.8	Census	93.9	94.3	96.4	NReq
Arkansas	42,649	41,068	96.3	Census	86.5	83.3		85.4
California¶¶	548,606	533,680	97.3	Census	92.3	92.2	95.3	NReq
Colorado	69,904	350	0.5	Random sample	81.7	80.9		81.7
Connecticut††	40,978	40,978	100.0	Census	96.9	97.0		96.7
Delaware	11,997	1458	12.2	Stratified 2-stage cluster sample	≥96.4	≥96.4		≥96.4
District of Columbia††	7,856	7,856	100.0	Census	89.0	88.7		88.8
Florida†††***	233,797	233,797	100.0	Census	≥93.2	≥93.2		≥93.2
Georgia††	143,988	143,988	100.0	Census	≥94.0	≥94.0		≥94.0
Hawaii	20,056	1,074	5.4	Stratified 2-stage cluster sample	98.7	99.0	99.2	NReq
Idaho††	23,934	23,934	100.0	Census	88.2	88.0		86.5
Illinois††	163,316	163,316	100.0	Census	94.7	95.0	96.6	NReq
Indiana††	87,193	61,336	70.3	Census	92.9	81.8		90.2
Iowa	43,728	41,349	94.6	Census	≥91.0	≥91.0		≥91.0
Kansas§§¶¶	41,107	11,931	29.0	Stratified 1-stage sample (Public), Census (Private)	86.9	87.6		85.5
Kentucky††	57,857	57,857	100.0	Census	92.6	93.9		91.9
Louisiana††	63,976	63,976	100.0	Census	96.8	98.3		96.1
Maine	15,441	12,716	82.4	Census	89.9	94.4	93.8	NReq
Maryland¶¶	75,659	73,349	96.9	Census	97.6	99.0	99.0	NReq
Massachusetts	79,894	78,188	97.9	Census	95.1	93.0		93.9
Michigan††	120,297	120,297	100.0	Census	97.5	94.8		93.0
Minnesota¶¶	72,087	70,972	98.5	Census	93.4	96.6		92.6
Mississippi††	45,719	45,719	100.0	Census	≥99.7	≥99.7		≥99.7
Missouri††	78,140	78,140	100.0	Census	95.5	96.0		94.6
Montana	12,855	12,259	95.4	Census	93.7	94.8		NReq
Nebraska¶¶	27,000	26,282	97.3	Census	96.6	96.8		94.9
Nevada	35,782	1,114	3.1	Stratified 2-stage cluster sample	95.6	94.4		93.6
New Hampshire††	13,240	13,240	100.0	Census	≥94.7	≥94.7		≥94.7
New Jersey	123,085	117,477	95.4	Census	≥96.8	≥96.8	≥96.8	NReq
New Mexico¶¶	30,725	830	2.7	Stratified 2-stage cluster sample	95.9	97.4		93.4
New York¶¶	240,318	240,318	100.0	Census	96.8	98.1	98.2	NReq
North Carolina	126,084	123,192	97.7	Census	98.8	98.7	99.7	NReq
North Dakota	9,780	9,397	96.1	Census (public) Stratified 2-stage cluster sample (private)	90.0	90.2		89.4
Ohio	150,000	138,820	92.5	Census	96.2	96.1		95.7
Oklahoma	57,377	40,929	71.3	Voluntary response	96.4	96.1		98.0
Oregon††	47,649	47,649	100.0	Census	93.2	93.3	94.3	NReq
Pennsylvania††¶¶	151,253	151,253	100.0	Census	85.3	NReq†††		84.0
Rhode Island	11,521	11,421	99.1	Census	95.1	96.0		94.7
South Carolina	61,661	6,771	11.0	1-stage stratified sample	96.8	97.3	94.4	NReq
South Dakota††	12,566	12,566	100.0	Census	96.6	96.7		95.3
Tennessee	80,212	80,079	99.8	Census	≥94.9	≥94.9		≥94.9
Texas§§ (including Houston)	409,255	397,262	97.1	Census	97.5	97.2		97.2
Houston, Texas	36,254	1,856	5.1	2-stage cluster sample, nonrandom schools selection	91.9	90.4		90.4

See table footnotes on page 916.

25 reported coverage ≥95%. Median 2-dose varicella vaccination coverage among the 36 states and DC requiring and reporting 2 doses was 93.3% (range = 81.7% in Colorado to ≥99.7% in Mississippi); nine reported coverage ≥95%.

Among the 46 states plus DC reporting 2013–14 school vaccination exemption data, the percentage of kindergartners with an exemption was <1% for eight states and ≥4% for 11 states (range = <0.1% in Mississippi to 7.1% in Oregon), with a median of 1.8% (Figure; Table 2). Two states reported increases over the previous school year of ≥1.0 percentage point: Kansas (1.5 percentage points) and Maine (1.2 percentage points). One state reported a decrease of ≥1.0 percentage points: West Virginia (1.0 percentage point). Where reported separately, the median rate of medical exemptions was 0.2%

TABLE 1. (*Continued*) Estimated vaccination coverage,* by state/area and vaccination among children enrolled in kindergarten — United States, 2013–14 school year

State/Area	Kindergarten population†	Total surveyed	Proportion surveyed (%)	Type of survey conducted§	MMR¶ (%)	DTaP** (%)	Varicella 1 dose (%)	Varicella 2 doses (%)
Utah††	54,779	54,779	100.0	Census	98.5	98.1	99.6	NReq
Vermont††	6,771	6,771	100.0	Census	91.2	92.0		89.4
Virginia	105,692	4,287	4.1	2-stage cluster sample	93.1	98.3		91.3
Washington	89,165	78,924	88.5	Census	89.7	90.3		88.4
West Virginia	22,814	19,313	84.7	Census	96.1	96.5		95.5
Wisconsin¶¶	71,363	1,990	2.8	Stratified 2-stage cluster sample	92.6	96.3		91.2
Wyoming	NA	NA	NA	Not conducted				
Median§§§					*94.7*	*95.0*	*96.6*	*93.3*
American Samoa	NA	NA	NA	Not conducted				
Guam	2,935	1,235	42.1	Stratified 2-stage cluster sample	88.4	92.8		NReq
Marshall Islands	NA	NA	NA	Not conducted				
Micronesia	NA	NA	NA	Not conducted				
N. Mariana Islands	725	725	100.0	Census	96.0	94.3		92.3
Palau	402	NA	NA	Not conducted				NReq
Puerto Rico	39,170	6,789	17.3	Stratified 2-stage cluster sample	94.3	91.3		91.4
U.S. Virgin Islands	1,612	731	45.3	Stratified 2-stage cluster sample	90.5	91.0		87.9

Abbreviations: MMR = measles, mumps, and rubella vaccine; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; NA = not available; NReq = not required for school entry.

* Estimates are adjusted for nonresponse and weighted for sampling where appropriate, except where complete data were unavailable. Percentages for Delaware, Houston, Virginia, and Puerto Rico are approximations. Estimates based on a completed vaccine series (i.e., not antigen-specific) are designated by use of the ≥ symbol.

† The kindergarten population is an approximation provided by each state/area.

§ Sample designs varied by state/area: census = all schools (public and private) and all children within schools were included in the assessment; simple random = a simple random sample design was used; mixed design = a census was conducted among public schools, and a random sample of children within the schools were selected; 1-stage or 2-stage cluster sample = schools were randomly selected, and all children in the selected schools were assessed (1-stage) or a random sample of children within the schools were selected (2-stage); voluntary response = a census among those schools that submitted assessment data.

¶ Most states require 2 doses; Alaska, California, New York, and Oregon require 2 doses of measles, 1 dose of mumps, and 1 dose of rubella vaccine.

** Pertussis vaccination coverage might include some DTP (diphtheria and tetanus toxoids and pertussis vaccine) vaccinations if administered in another country or if a vaccination provider continued to use DTP after 2000. Most states require 4 doses of DTaP vaccine; 5 doses are required for school entry in Colorado, District of Columbia, Hawaii, Idaho, Indiana, Iowa, Kansas, Massachusetts, Minnesota, New Jersey, New Mexico, North Carolina, North Dakota, Oregon, Rhode Island, Tennessee, Texas, Utah, Vermont, Washington, Northern Mariana Islands, Puerto Rico, and U.S. Virgin Islands; 3 doses are required by Nebraska and New York. Pertussis vaccine is not required in Pennsylvania.

†† The proportion surveyed is probably <100%, but is shown as 100% based on incomplete information about the actual current enrollment.

§§ Kindergarten coverage data were collected from a sample, and exemption data were collected from a census of kindergartners.

¶¶ Counts the vaccine doses received regardless of Advisory Committee on Immunization Practices recommended age and time interval; vaccination coverage rates shown might be higher than those for valid doses.

*** Does not include nondistrict-specific, virtual, and college laboratory schools, or private schools with fewer than 10 students.

††† Pertussis is not required in Pennsylvania; coverage for diphtheria and tetanus was 88.3%.

§§§ The median is the center of the estimates in the distribution. The median does not include Houston, Guam, the Commonwealth of the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

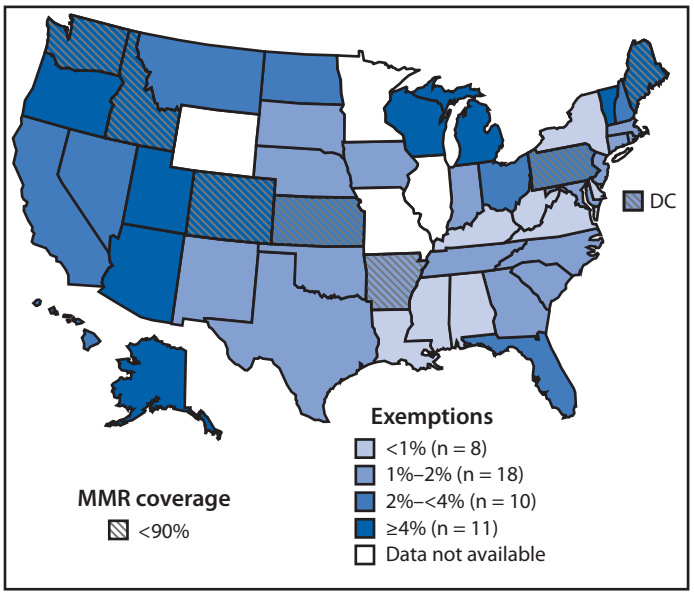
(range = <0.1% in eight states [Alabama, Arkansas, Colorado, Delaware, Georgia, Hawaii, Mississippi, and Nevada] to 1.2% [Alaska and Washington]). Where allowed and reported separately, the median rate of nonmedical exemptions was 1.7% (range = 0.4% in Virginia and DC to 7.0% in Oregon).

Discussion

Most federally funded immunization programs continued to report high vaccination coverage and stable exemption rates among kindergartners during the 2013–14 school year compared with the 2012–13 school year, although 26 states and DC did not report meeting the *Healthy People 2020* target of 95% coverage for 2 doses of MMR vaccine. Although high levels of vaccination coverage by state are reassuring, vaccination exemptions have been shown to cluster geographically (*3,4*), so vaccine-preventable disease outbreaks can still occur where unvaccinated persons cluster in schools and communities (*5*).

School vaccination coverage assessment is used to assess state or local-level school vaccination requirements. Eighteen states provide local-level data online, helping to strengthen immunization programs, guide vaccination policies, and inform the public.¶¶ Local-level school vaccination and exemption data can be used by health departments and schools to focus vaccine-specific interventions and health communication efforts in a school or local area with documented low vaccination coverage or high exemption rates. Where expanded health communication strategies or other interventions are implemented, continued assessment and reporting can be used to facilitate program improvement.

FIGURE. Estimated percentage of children enrolled in kindergarten who have been exempted from receiving one or more vaccines* and with <90% coverage with 2 doses of measles, mumps, and rubella (MMR) vaccine — United States, 2013–14 school year



* Exemptions might not reflect a child's vaccination status. Children with an exemption who did not receive any vaccines are indistinguishable from those who have an exemption but are up-to-date for one or more vaccines.

To be most effective, accurate and reliable estimates of vaccination coverage and exemptions are needed. Use of appropriate sampling and survey methods can improve the usefulness of data for local use and comparability of estimates across school, local area, state, and national levels to accurately assess vaccination coverage and track progress toward *Healthy People 2020* targets.

School vaccination coverage reporting can be labor intensive, involving education systems at the start of the school year, when they are busiest. School vaccination assessment systems can be linked to an IIS, allowing schools to review the vaccination status of individual children. During the 2013–14 school year, 36 of the 50 states and DC reported that they allowed schools to obtain provider-reported vaccination data from their IIS, and 14 reported using an IIS algorithm to determine vaccination status for at least some of the students in their school vaccination assessment. An example of how an IIS can be used to simplify school vaccination assessment is Tennessee's Immunization Certificate Validation Tool, which compares a child's record in the state IIS against Tennessee vaccination requirements for pre-school or school attendance, allowing vaccination providers and school nurses to quickly assess a schoolchild's vaccination status. It produces an official Tennessee Immunization Certificate or a detailed failure report. Tools linking school vaccination assessment systems to IIS data provide access to provider-reported information, reduce the documentation burden on parents and vaccination providers, and lessen the workload required by the assessment process on schools and health departments.

The findings in this report are subject to at least six limitations. First, not every state reported vaccination and exemption data.

What is already known on this topic?

To protect school children from vaccine-preventable disease, annual school vaccination assessments indicate vaccination coverage and exemptions from state vaccination requirements. Although state vaccination coverage is high and exemptions are low, undervaccination and exemptions cluster at a local level, where vaccine-preventable diseases might be easily transmitted.

What is added by this report?

In 49 states and the District of Columbia (DC), median vaccination coverage for three vaccines was 94.7% for the measles, mumps, and rubella vaccine, 95.0% for varying local requirements for the diphtheria, tetanus toxoid, and acellular pertussis vaccine, and 93.3% for varicella vaccine among states with a 2-dose requirement. Of the 49 states and DC reporting vaccination coverage estimates, 27 did not report meeting the *Healthy People 2020* target of 95% coverage for 2 doses of measles, mumps, and rubella vaccine. Median exemption levels continue to be low overall (1.8%).

What are the implications for public health practice?

Local data are essential to controlling the spread of vaccine-preventable disease. Accurate and reliable school vaccination assessments can provide a unique opportunity for school and health departments to identify local areas of undervaccination, even at a school or classroom level, where the potential for disease transmission is higher. Health departments can use these data to identify schools and communities at higher risk for outbreaks and provide health communication interventions to protect school children and the community at large against vaccine-preventable diseases.

¶ Information available, by state, at the following websites: Alabama, http://www.adph.org/immunization/index.asp?id=761; Arizona, http://www.azdhs.gov/phs/immunization/statistics-reports.htm; California, http://www.cdph.ca.gov/programs/immunize/pages/immunizationlevels.aspx; Florida, http://www.floridahealth.gov/reports-and-data/immunization-coverage-surveys-reports/state-surveys.html; Illinois, http://www.isbe.state.il.us/research/htmls/immunization.htm#immu; Iowa, http://www.idph.state.ia.us/immtb/immunization.aspx?prog=imm&pg=audits; Kansas, http://www.kdheks.gov/immunize/kindergarten_coverage.htm; Kentucky, http://chfs.ky.gov/dph/epi/annual+immunization+school+and+childcare+survey.htm; Michigan, http://www.michigan.gov/mdch/0,4612,7-132-2942_4911_4914_68361-321114--,00.html; Minnesota, http://www.health.state.mn.us/divs/idepc/immunize/stats/school/index.html; New Jersey, http://www.state.nj.us/health/cd/stats.shtml; North Dakota, www.ndhealth.gov/immunize/rates; Oregon, http://public.health.oregon.gov/preventionwellness/vaccinesimmunization/gettingimmunized/pages/schresources.aspx; Texas, https://www.dshs.state.tx.us/immunize/coverage/default.shtm; Utah, http://www.immunize-utah.org/statistics/utah%20statistics/immunization%20coverage%20levels/index.html; Vermont, http://www.healthvermont.gov/hc/imm/immsurv.aspx; Virginia, http://www.vdh.state.va.us/epidemiology/immunization/datamanagement/sisreports.htm; Washington, http://www.doh.wa.gov/dataandstatisticalreports/schoolimmunization/datareports.aspx.

TABLE 2. Estimated number and percentage* of children enrolled in kindergarten with exemption(s) from vaccination, by state/area and type of exemption — United States, 2013–14 school year

State/Area	Medical exemptions†		Nonmedical exemptions†				Total exemptions†			
	No.	%	No. of religious exemptions	No. of philosophic exemptions	Total no.	%	Total no.	2013–14 (%)	2012–13 (%)	Percentage point difference
Alabama	70	<0.1	447	§	447	0.6	517	0.7	0.7	0.0
Alaska	119	1.2	421	§	421	4.1	539	5.3	5.6	-0.3
Arizona	175	0.2	¶	4,195	4,195	4.7	4,370	4.9	4.2	0.7
Arkansas	24	<0.1	135	333	468	1.1	493	1.2	1.1	0.1
California	1017	0.2	††	17,253	17,253	3.1	18,270	3.3	3.0	0.3
Colorado	0	<0.1	195	3,097	3,292	4.6	3,291	4.6	4.3	0.3
Connecticut	128	0.3	670	§	670	1.6	725	1.9	1.7	0.2
Delaware	9	<0.1	83	§	83	0.7	92	0.8	0.7	0.1
District of Columbia	85	1.1	33	§	33	0.4	118	1.5	1.6	-0.1
Florida	772	0.3	3,991	§	3,991	1.7	4,763	2.0	1.8	0.2
Georgia	143	<0.1	2,420	§	2,420	1.7	2,563	1.8	2.3	-0.5
Hawaii	0	<0.1	634	§	634	3.2	634	3.2	2.5	0.7
Idaho	89	0.4	147	1,304	1,451	6.1	1,540	6.4	5.9	0.5
Illinois**	NA				NA		NA	NA	6.1	NA
Indiana	348	0.4	727	§	727	0.8	1,075	1.2	1.3	-0.1
Iowa	205	0.5	521	§	521	1.2	726	1.7	1.7	0.0
Kansas	213	0.8	527	§	527	1.9	739	2.6	1.1	1.5
Kentucky	148	0.3	357	§	357	0.6	505	0.9	0.7	0.2
Louisiana	83	0.1	28	394	422	0.7	505	0.8	0.7	0.1
Maine	56	0.4	30	766	796	5.2	852	5.5	4.3	1.2
Maryland	244	0.3	513	§	513	0.7	758	1.0	1.0	0.0
Massachusetts	332	0.4	860	§	860	1.1	1,192	1.5	1.5	0.0
Michigan	573	0.5	1,250	5,226	6,476	5.4	7,049	5.9	5.9	0.0
Minnesota**	NA				NA		NA	NA	1.6	NA
Mississippi	17	<0.1	¶	§	NA		17	<0.1	<0.1	0.0
Missouri**	NA				NA		NA	NA	1.8	NA
Montana	36	0.3	426	§	426	3.3	463	3.6	3.5	0.1
Nebraska	158	0.6	307	§	307	1.1	465	1.7	1.7	0.0
Nevada	7	<0.1	724	§	724	2.0	731	2.0	2.5	-0.5
New Hampshire	49	0.4	328	§	328	2.5	377	2.8	2.5	0.3
New Jersey	262	0.2	1,741	§	1,741	1.4	2,003	1.6	1.4	0.2
New Mexico	72	0.2	277	§	277	0.9	349	1.1	0.4	0.7
New York	302	0.1	1,547	§	1,547	0.6	1,849	0.8	0.7	0.1
North Carolina	161	0.1	1,105	§	1,105	0.9	1,266	1.0	0.8	0.2
North Dakota	32	0.3	45	185	230	2.3	262	2.7	1.8	0.9
Ohio	369	0.2	††	††	2,681	1.8	3,050	2.0	2.0	0.0
Oklahoma	73	0.1	221	586	808	1.4	880	1.5	1.3	0.2
Oregon	62	0.1	3,331	††	3,331	7.0	3,393	7.1	6.5	0.6
Pennsylvania	510	0.3	1,133	1,419	2,552	1.7	3,062	2.0	2.0	0.0
Rhode Island	33	0.3	81	§	81	0.7	114	1.0	1.1	-0.1
South Carolina§§	83	0.1	772	§	772	1.2	855	1.4	NA	NA
South Dakota§§	21	0.2	199	§	199	1.6	220	1.8	1.8	0.0
Tennessee	132	0.2	773	§	773	1.0	906	1.1	1.2	-0.1
Texas (including Houston)	2,266	0.6	††	††	5,536	1.4	7,803	1.9	1.7	0.2
Houston	979	0.3	NA	NA	NA		979	0.3	0.9	-0.6

See table footnotes on page 919.

Second, vaccination and exemption status reflected the child's status at the time of assessment. Reports might not be updated when parents submit amended school vaccination records after the required vaccines are received or an exemption is claimed. Third, a child with an exemption is not necessarily unvaccinated. More than 99% of the 2008–2009 birth cohorts who became kindergartners in 2013–14 received at least one vaccine in early childhood (*6*). An exemption might be provided for all vaccines even if a child missed a single vaccine dose or vaccine, or different exemptions might be provided for different vaccinations. A parent or guardian might choose to complete the required exemption paperwork if that is more convenient than having a child vaccinated or documenting a kindergartner's vaccination history at school enrollment, which might be the reason for up to 25% of nonmedical exemptions (*7*–*9*).*** Fourth, methodology varied by

*** Tools are available to help parents manage vaccination records for their family; additional information available at http://www.cdc.gov/vaccines/parents/record-reqs/immuniz-records-child.html.

TABLE 2. (*Continued*) Estimated number and percentage* of children enrolled in kindergarten with exemption(s) from vaccination, by state/area and type of exemption — United States, 2013–14 school year

State/Area	Medical exemptions†		Nonmedical exemptions†				Total exemptions†			
	No.	%	No. of religious exemptions	No. of philosophic exemptions	Total no.	%	Total no.	2013–14 (%)	2012–13 (%)	Percentage point difference
Utah	94	0.2	16	2,296	2,312	4.2	2,406	4.4	3.8	0.6
Vermont	11	0.2	13	399	412	6.1	423	6.2	6.1	0.1
Virginia	173	0.2	446	§	446	0.4	619	0.6	0.5	-0.5
Washington§§	1,035	1.2	311	2,866	3,177	3.6	4,212	4.7	4.6	0.1
West Virginia	35	0.2	¶	§			35	0.2	1.2	-1.0
Wisconsin	103	0.1	373	3,042	3,415	4.8	3,519	4.9	4.5	0.4
Wyoming	NA				NA		NA	NA	2.3	NA
Median¶¶		*0.2*				*1.7*		*1.8*	*1.8*	*0.0*
American Samoa	NA				NA		NA	NA	NA	NA
Guam	0	<0.1	1	§	1	<0.1	1	<0.1	<0.1	0.0
Marshall Islands	NA				NA		NA	NA	NA	NA
Micronesia	NA				NA		NA	NA	NA	NA
N. Mariana Islands	0	0.0	0	0	0	0.0	0	0.0	0.1	-0.1
Palau	NA				NA		NA	NA	0.6	NA
Puerto Rico	0	<0.1	0	§	0	<0.1	0	<0.1	<0.1	0.0
U.S. Virgin Islands	0	0.0	17	§	17	1.1	17	1.1	0.6	0.5

Abbreviation: NA = not available (i.e., not collected or reported to CDC).

* Estimates are adjusted for nonresponse and sampling design where appropriate, except where complete data were unavailable. Percentages for Delaware, Houston, Virginia, and Puerto Rico are approximations.

† Medical and nonmedical exemptions might not be mutually exclusive. Some children might have both medical and nonmedical exemptions. Total exemptions is the number of children with an exemption. Temporary exemptions are included in the total for South Carolina, South Dakota, and Washington.

§ Exemptions because of philosophic reasons are not allowed.

¶ Exemptions because of religious reasons are not allowed.

** Lower bounds of the percentage of children with any exemptions, estimated using the individual vaccines with the highest number of exemptions are, for Illinois, 0.3% with medical exemptions, 1.0% with religious exemptions, and 1.3% for total exemptions, and for Missouri, 0.2% with medical exemptions, 1.6% with religious exemptions, and 1.8% for total exemptions. For Minnesota, the lower bounds of the percentage of children with any exemptions, estimated using the number of children exempt for all vaccines, are <0.1% with medical exemptions, 1.7% with religious exemptions, and 1.7% for total exemptions.

†† Religious and philosophic exemptions are not reported separately.

§§ Includes both temporary and permanent medical exemptions.

¶¶ The median is the center of the estimates in the distribution. The median does not include Houston, Guam, the Commonwealth of the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

reporting program or between school years for the same program. Methods and times for data collection differed, as did requirements for vaccinations and exemptions. Fifth, some programs (Delaware, Houston, Virginia, and Puerto Rico) were unable to provide detailed information needed to weight and analyze their data in the most statistically appropriate way, limiting the validity of their reported estimates. Finally, in adjusting data collected using school or student census methods to account for nonresponse, it was assumed that nonresponders and responders of the same school type had similar vaccination coverage and exemption rates.

State and local school vaccination assessments might detect local areas of undervaccination where disease transmission is more likely to occur. These data are most useful when the assessment is accurate and reliable. Use of statistically appropriate sampling methods and access to provider-reported vaccination data in an IIS can streamline the data collection process while providing accurate local-level data, allowing health departments to appropriately direct vaccination efforts during outbreaks of vaccine-preventable disease and identify schools and communities potentially at higher risk for vaccine-preventable disease transmission. Accurate local-level data can also be used by health departments and schools to focus health communication and other interventions that protect children and the community at large against vaccine-preventable diseases.

Acknowledgments

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References

1. Orenstein W, Hinman A. The immunization system in the United States: the role of school immunization laws. Vaccine 1999;17(Suppl 3):S19–24.
2. US Department of Health and Human Services. Healthy people 2020: immunization and infectious diseases. Washington, DC: US Department of Health and Human Services; 2010. Available at http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=23.

3. Sugerman D, Barskey AE, Delea MG, et al. Measles outbreak in a highly vaccinated population, San Diego, 2008: role of the intentionally undervaccinated. Pediatrics 2010;125:747–55.
4. Omer SB, Enger KS, Moulton LH, Halsey NA, Stokley S, Salmon DA. Geographic clustering of nonmedical exemptions to school immunization requirements and associations with geographic clustering of pertussis. Am J Epidemiol 2008;168:1389–96.
5. Gay N. The theory of measles elimination: implications for the design of elimination strategies. J Infect Dis 2004;189(Suppl 1):S27–35.
6. CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2012. MMWR 2013;62:733–40.
7. Rota JS, Salmon DA, Rodewald LE, Chen RT, Hibbs BF, Gangarosa EJ. Processes for obtaining nonmedical exemptions to state immunization laws. Am J Public Health 2001;91:645–8.
8. Blank N, Caplan A, Constable C. Exempting schoolchildren from immunizations: states with few barriers had highest rates of nonmedical exemptions. Health Aff 2013;32:1282–90.
9. Luthy KE, Beskstrand RL, Callister LC, Cahoon S. Reasons parents exempt children from receiving immunizations. J Sch Nurs 2012;28:153–60.

Increases in Smoking Cessation Interventions After a Feedback and Improvement Initiative Using Electronic Health Records — 19 Community Health Centers, New York City, October 2010–March 2012

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Quitting smoking substantially reduces smokers' risk for smoking-related morbidity and mortality and can increase life expectancy by up to a decade (*1*). Most smokers want to quit and make at least one medical provider visit annually (*2*). Health care providers can play an important role in helping smokers quit by documenting patients' tobacco use, advising smokers to quit, and providing evidence-based cessation treatments or referrals for treatment, but many providers and practices do not regularly take these actions (*2*). Systems to increase provider screening and delivery of cessation interventions are available (*2*); in particular, electronic health records (EHRs) can be powerful tools to facilitate increased cessation interventions (*3*–*6*). This analysis reports on an EHR-based pay-for-improvement initiative in 19 community health centers (CHCs) in New York City (NYC) that sought to increase smoking status documentation and cessation interventions. At the end of the initiative, the mean proportion of patients who were documented as smokers in CHCs had increased from 24% to 27%, whereas the mean proportion of documented smokers who received a cessation intervention had increased from 23% to 54%. Public health programs and health systems should consider implementing strategies to equip and train clinical providers to use information technology to increase delivery of cessation interventions.

The NYC Department of Health and Mental Hygiene (DOHMH) established the Primary Care Information Project in 2005 to support EHR adoption among primary care practices that provide health care to underserved populations. The Health eQuits program, which was funded by a CDC Communities Putting Prevention to Work grant, targeted CHCs that had implemented EHRs and that were already participating in the Primary Care Information Project with the goal of increasing smoking cessation interventions through incentive payments (*7*). The program was conducted during October 2010–March 2012, with baseline data collected during October 2009–September 2010. Centers were located in traditionally underserved neighborhoods with a high proportion of Medicaid enrollees, who have a higher smoking prevalence than the general population (18.9% of NYC adults with Medicaid insurance smoke compared with 14.8% of NYC adults overall).* CHCs were required to document smoking status in the EHR at least annually for all patients aged ≥18 years. The initiative included a $20 incentive payment to CHCs (not individual health care providers) for each additional cessation intervention above baseline (capped at $50,000 total).

Qualifying interventions for incentive payments included: physician counseling, prescriptions for cessation medications, or electronic or fax referrals to the New York State quitline. Participating CHCs received quarterly reports based on their EHR data accompanying their payments. For some sites, provider-level reports also were provided upon request. The Health eQuits program manager called or visited practices quarterly to review reports and answer questions. Additional training and support were offered to all CHCs quarterly (*7*). To assess the initiative's impact, DOHMH collected data on the unique number of 1) patients, 2) documented smokers, and 3) smokers who received at least one cessation intervention during the 12 months before the start of the program (to create a baseline) and during the 18 months of the program.

The number of unique patients seen by the individual CHCs during the baseline period ranged from 632 to 124,582 (Table). The proportion of Medicaid patients with an office visit at CHCs ranged from 0% to 83%, with a mean of 48% and a median of 49%.

At baseline, the mean documented smoking rate was 24%, with a range of 0% to 75% and a median of 14%; seven of the 19 CHCs reported baseline smoking rates of <10%. In order to be searchable and available for generating reports, information on patients' smoking status in an EHR was required to be recorded in structured fields. Lower baseline rates of smoking might reflect the failure of CHCs to systematically screen all patients for smoking or the fact that information was not recorded in a reportable format. At the end of the initiative, the mean documented smoking rate was 27%, with a range of 3% to 79% and a median of 17%. Thirteen CHCs showed increases in the proportion of documented smokers, and five CHCs reported smoking rates of <10%.

* Additional information available at https://a816-healthpsi.nyc.gov/epiquery.

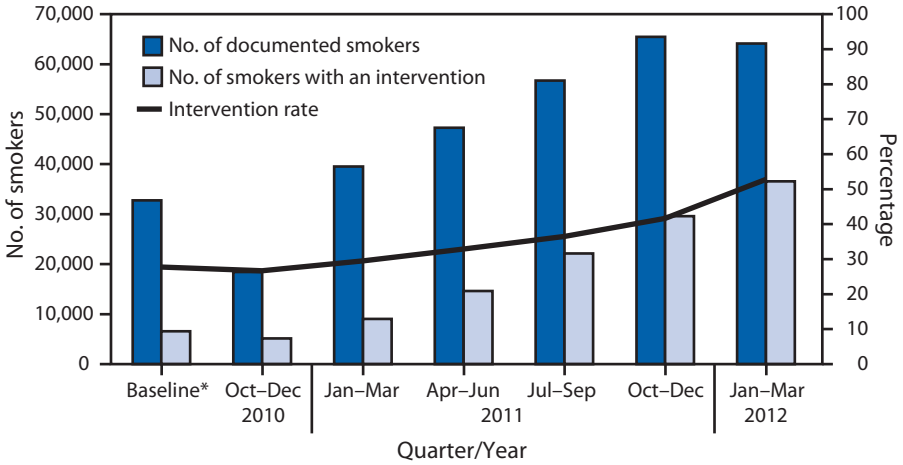
TABLE. Smoking documentation and intervention before and after a pay-for-improvement initiative using electronic health records (EHRs) — 19 community health centers, New York City, October 2010–March 2012

Reported practice characteristics at baseline*					Unique patients		Documented smokers				Smokers with at least one intervention				
							Baseline*		End†		Baseline*		End†		Percentage-point change from baseline to end
Practice ID no.	No. of mos. using EHR	No. of sites	No. FTE providers	Medicaid (%)	Baseline* No.	End† No.	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
1	22	9	86	(2)	45,998	26,732	5,889	(13)	3,351	(13)	805	(14)	412	(12)	(-2)
2	24	3	23	(41)	43,468	47,268	32	(<1)	7,744	(16)	0	(0)	1,240	(16)	(16)
3	11	4	11	(64)	4,748	5,672	928	(20)	1,120	(20)	204	(22)	292	(26)	(4)
4	32	13	45	(57)	27,420	38,680	3,708	(14)	1,304	(3)	488	(13)	380	(29)	(16)
5	22	8	48	(67)	26,328	31,072	444	(2)	2,248	(7)	48	(11)	680	(30)	(19)
6	10	1	14	(57)	5,680	7,448	488	(9)	1,344	(18)	76	(16)	424	(32)	(16)
7	18	2	21	(80)	12,412	13,844	0	(0)	672	(5)	0	(0)	304	(45)	(45)
8	35	5	6	(68)	1,592	2,264	1,008	(63)	1,180	(52)	248	(25)	580	(49)	(24)
9	24	6	4	(48)	5,340	5,484	1,820	(34)	2,072	(38)	928	(51)	1,204	(58)	(7)
10	28	1	5	(49)	2,324	2,108	336	(14)	640	(30)	84	(25)	372	(58)	(33)
11	17	1	12	(83)	3,056	3,160	2,292	(75)	2,508	(79)	108	(5)	1,552	(62)	(57)
12	17	1	6	(63)	868	916	436	(50)	496	(54)	68	(16)	308	(62)	(46)
13	27	1	2	(20)	632	932	112	(18)	104	(11)	60	(54)	68	(65)	(11)
14	11	24	33	(46)	29,292	11,572	140	(<1)	1,079	(9)	8	(6)	744	(69)	(63)
15	24	22	464	(43)	124,582	202,450	10,129	(8)	25,536	(13)	854	(8)	21,620	(85)	(76)
16	95	4	61	(42)	NA	NA	1,384	(NA)	2,692	(NA)	652	(47)	1,924	(71)	(24)
17	8	4	8	(0)	2,088	1,800	1,068	(51)	988	(55)	448	(42)	708	(72)	(30)
18	31	5	16	(75)	3,912	3,960	2,220	(57)	2,372	(60)	1,176	(53)	1,980	(83)	(30)
19	81	4	NA	(0)	39,276	39,545	969	(2)	1,955	(5)	260	(27)	1,780	(91)	(64)
Mean	*28*	*6*	*48*	*(48)*	*21,056*	*24,717*	*1,758*	*(24)*	*3,127*	*(27)*	*343*	*(23)*	*1,925*	*(54)*	*(31)*
Median	*24*	*4*	*15*	*(49)*	*5,510*	*6,560*	*969*	*(14)*	*1,344*	*(17)*	*204*	*(16)*	*680*	*(58)*	*(42)*
Total	**NA**	**118**	**865**	**NA**	**379,016**	**444,907**	**33,403**	**(9)**	**59,405**	**(13)**	**6,515**	**(20)**	**36,572**	**(62)**	**(42)**

Abbreviations: NA = not available (means, medians, and totals do not include these missing data); FTE = full-time equivalent.
* Baseline data were collected during October 2009–September 2010.
† Centers provided data for the 18-month duration of the program.

At baseline, a mean of 23% of documented smokers had received at least one cessation intervention (counseling, cessation medications, and/or referral to the New York State quitline), with a range of 0% to 54% and a median of 16% among the CHCs. At the end of the program, a mean of 54% of documented smokers had received at least one cessation intervention, with a range of 12% to 91% and a median of 58%. Eighteen CHCs showed increases in the proportion of documented smokers who received at least one intervention. As rates of documentation of smoking status improved, intervention rates also increased (Figure). During the 18-month initiative, 36,572 smokers received at least one intervention, compared with only 6,515 smokers during the 12-month baseline period. Over the course of the initiative, NYC paid a total of approximately $220,000 in incentives to the 19 CHCs.

FIGURE. Number of documented smokers, number of smokers with an intervention, and intervention rate, by quarter — 19 community health centers, New York City, October 2010–March 2012



* Baseline data were collected during October 2009–September 2010.

Discussion

EHRs can facilitate clinical smoking cessation interventions in three ways. First, they can be used to prompt health care providers to screen for and document tobacco use and to intervene with tobacco users by integrating these steps into the clinical workflow (*4–6*). EHRs also can be used to facilitate provider referral of patients to state quitlines (*5,6,8,9*), which have broad reach, are effective with diverse populations, and increase quit rates (*2*).

Second, EHR-generated patient lists (using an EHR registry-like function) can be used to supply providers and practices with rapid feedback on tobacco screening and intervention performance; such feedback can motivate improvement in these areas, especially if performance is compared with other practices and tied to financial or other incentives (*3,6,7*). Information on performance also can be used to track progress, identify areas where improvement is needed, and ensure that providers and practices receive full credit and reimbursement for their cessation interventions (*7*).

Third, EHRs can be used to track the impact of clinical cessation and health systems change initiatives on longer-term outcomes in patient populations, including quit rates, smoking rates, and outpatient visits and hospitalizations for smoking-related diseases (*3*). Such findings can demonstrate to providers, health care systems, and health care policymakers that cessation interventions can reduce smoking prevalence, as well as smoking-related morbidity and health care costs (*3*). Thus, EHRs have the potential to increase provider screenings and interventions for tobacco use while also making it easier to assess the resulting outcomes (*3*).

Cigarette smoking remains the leading preventable cause of death and disease in the United States (*1*). *Healthy People 2020* objectives TU-9 and TU-10 call for increasing tobacco screening and tobacco cessation counseling in health care settings.† The potential role that EHRs can play in increasing cessation interventions likely will grow over time as more physicians and hospitals shift from paper records to EHRs, partly in response to the Centers for Medicare and Medicaid Services Meaningful Use initiative, and also as more smokers gain access to evidence-based cessation treatments under the Affordable Care Act, which requires nongrandfathered private health plans to cover such treatments,§ bars state Medicaid programs from excluding FDA-approved cessation medications from coverage, and requires these programs to provide pregnant women with a comprehensive cessation benefit.¶ Meaningful Use standards require smoking status documentation as a core element to receive Centers for Medicare and Medicaid Services financial incentives.** A recent report found that 72% of U.S. office-based physicians had adopted EHRs as of 2012.††

The mere adoption of EHRs, however, will not be sufficient to increase the frequency and quality of smoking cessation interventions. Consideration of clinical workflows, incentives, and use of quality improvement approaches are also necessary. In addition, clinical cessation interventions are most effective when they are implemented in conjunction with population-based tobacco control interventions that motivate smokers to quit and support their efforts to do so (*1,10*). Over the past decade, NYC has implemented several interventions of the latter kind, including smoke-free policies in workplaces and public places, cigarette excise tax increases, and graphic tobacco education mass media campaigns (*10*). The clinical initiative described in this report complements these efforts by incentivizing CHCs to provide evidence-based cessation assistance to underserved populations.

CHCs serve a high proportion of Medicaid patients, a population known to have a high smoking prevalence. However, over a third of participating clinics initially reported smoking rates

What is already known on this topic?

Most smokers want to quit and make at least one medical visit each year. Documentation of smoking status and interventions with smokers in health care settings increase quit rates, but many providers and practices do not routinely take these actions.

What is added by this report?

An electronic health record-based pay-for-improvement initiative conducted in 19 community health centers in New York City during October 2010–March 2012 sought to increase smoking status documentation and cessation interventions. At the end of the initiative, the mean proportion of patients who were documented as smokers had increased from 24% to 27%, while the mean proportion of documented smokers who received a cessation intervention increased from 23% to 54%.

What are the implications for public health practice?

Electronic health records have the potential to make it easier for providers to screen for and document tobacco use and to intervene with patients who use tobacco products. In addition, patient lists generated by the electronic health record can be used to offer timely feedback to providers that can motivate better performance, and can also be used to identify sites or issues where improvement is needed. Policymakers might consider harnessing EHRs to support future clinical and health systems cessation initiatives.

† Additional information available at http://www.healthypeople.gov/2020/topics-objectives/topic/tobacco-use/objectives.

§ Additional information available at http://www.dol.gov/ebsa/faqs/faq-aca19.html.

¶ Additional information available at http://docs.house.gov/energycommerce/ppacacon.pdf.

** Additional information available at http://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/meaningful_use.html.

†† Additional information available at http://www.cdc.gov/nchs/data/databriefs/db111.htm.

of less than 10%, confirming the need for better smoking status screening and documentation to maximize the opportunity for EHRs to have a significant impact on disparities. Increases in observed smoking rates likely are a reflection of increased documentation. Baseline smoking rates reported by CHCs varied widely, which might indicate that some practices, including those with greater proportions of underserved populations and large practices, could require targeted training interventions and other approaches to improve their performance in this area. A separate publication describes the changes implemented in the practice that experienced the greatest increase in smoking cessation interventions.[§§]

The findings in this report are subject to at least four limitations. First, data were not available for all CHCs on the number of patients who were screened for smoking, the specific cessation interventions delivered, or whether smokers quit. Incentive payments were made for increases above baseline in physician counseling, prescriptions for cessation medications, and electronic or fax referrals to the New York State quitline. Neither the nature nor the effectiveness of the counseling delivered was assessed, and whether prescriptions were filled or quitline referrals led to receipt of quitline services is not known. As a result, the effectiveness of this initiative in reducing smoking cannot be assessed. Future evaluations of similar initiatives should seek to measure these outcomes. However, the types of cessation interventions for which incentive payments were provided have been shown to increase quit rates (*2*). Second, the intervention was conducted in a single city, so the findings might not be generalizable elsewhere. However, the intervention addressed a diverse, underserved population, and similar results have been reported in other settings (*3*–*6*). Third, the effect of implementing EHRs in CHCs was assessed in combination with a financial incentive; therefore, it is uncertain whether the implementation of EHRs alone (without such an incentive) would have yielded similar results. Finally, NYC's population-based tobacco control interventions could have contributed to the observed increase in clinical cessation interventions by encouraging smokers to ask their health care providers for help quitting.

This analysis suggests that an initiative employing EHRs, feedback to sites, and a monetary incentive can increase clinical cessation interventions with smokers. When totaled across centers, the proportion of all patients with documented smoking status receiving an intervention increased from 20% during the 12-month period preceding the initiative to 62% during the 18-month initiative. The analysis also indicates that data from EHRs can be used to document improvements of this kind, and suggests that EHR data also could be used to capture longer-term outcomes, including quit attempts and quit rates, smoking prevalence, and possibly (with more advanced health information exchanges) smoking disease-related inpatient visits and hospitalizations (*3*). Return on investment was not calculated for this initiative; an economic evaluation of this sort would be useful.

This initiative could be replicated in other locations, with tailoring to local circumstances as necessary. In addition to facilitating the integration of clinical cessation interventions into routine clinical care, EHRs offer a promising avenue for expanded surveillance and evaluation of the effects of these interventions.

[§§] Additional information available at http://millionhearts.hhs.gov/docs/ss_ny.pdf.

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References

1. US Department of Health and Human Services. The health consequences of smoking—50 years of progress: a report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, CDC; 2014.
2. Fiore MC, Jaen CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update. Clinical practice guideline. Rockville, MD: US Department of Health and Human Services, Public Health Service; 2008.
3. Land TG, Rigotti NA, Levy DE, Schilling T, Warner D, Li W. The effect of systematic clinical interventions with cigarette smokers on quit status and the rates of smoking-related primary care office visits. PLoS One 2012;7:e41649.
4. Boyle R, Solberg L, Fiore M. Use of electronic health records to support smoking cessation. Cochrane Database Syst Rev 2011;12:CD008743.
5. Greenwood DA, Parise CA, MacAller TA, et al. Utilizing clinical support staff and electronic health records to increase tobacco use documentation and referrals to a state quitline. J Vasc Nurs 2012;30:107–11.
6. Bentz CJ, Bayley KB, Bonin KE, et al. Provider feedback to improve 5A's tobacco cessation in primary care: a cluster randomized clinical trial. Nicotine Tob Res 2007;9:341–9.
7. Duquaine D, Farley SM, Sacks R, Mandel-Ricci J, Silfen SL, Shih SC. Designing a quality improvement program with electronic health records: New York City's Health eQuits. Am J Med Qual 2014; March 6 [Epub ahead of print].
8. Warner DD, Land TG, Rodgers AB, Keithly L. Integrating tobacco cessation quitlines into health care: Massachusetts, 2002–2011. Prev Chronic Dis 2012;9:E133.
9. Vidrine JI, Shete S, Cao Y, et al. Ask-Advise-Connect: a new approach to smoking treatment delivery in health care settings. JAMA Intern Med 2013;173:458–64.
10. Frieden TR, Mostashari F, Kerker BD, Miller N, Hajat A, Frankel M. Adult tobacco use levels after intensive tobacco control measures: New York City, 2002–2003. Am J Public Health 2005;95:1016–23.

Cluster of Ebola Cases Among Liberian and U.S. Health Care Workers in an Ebola Treatment Unit and Adjacent Hospital — Liberia, 2014

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On October 14, 2014, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

The ongoing Ebola virus disease (Ebola) epidemic in West Africa, like previous Ebola outbreaks, has been characterized by amplification in health care settings and increased risk for health care workers (HCWs), who often do not have access to appropriate personal protective equipment. In many locations, Ebola treatment units (ETUs) have been established to optimize care of patients with Ebola while maintaining infection control procedures to prevent transmission of Ebola virus. These ETUs are considered essential to containment of the epidemic. In July 2014, CDC assisted the Ministry of Health and Social Welfare of Liberia in investigating a cluster of five Ebola cases among HCWs who became ill while working in an ETU, an adjacent general hospital, or both. No common source of exposure or chain of transmission was identified. However, multiple opportunities existed for transmission of Ebola virus to HCWs, including exposure to patients with undetected Ebola in the hospital, inadequate use of personal protective equipment during cleaning and disinfection of environmental surfaces in the hospital, and potential transmission from an ill HCW to another HCW. No evidence was found of a previously unrecognized mode of transmission. Prevention recommendations included reinforcement of existing infection control guidance for both ETUs and general medical care settings,* including measures to prevent cross-transmission in co-located facilities.

Investigation

On July 26, 2014, Liberian Ministry of Health and Social Welfare was informed of a laboratory-confirmed case of Ebola in an HCW at an ETU located adjacent to a general hospital (hospital A) in Monrovia, Liberia; in the following 24 hours CDC was informed of two additional HCW cases at the same ETU. Concern among HCWs and patients about the possible risk for Ebola transmission resulted in suspension of hospital and ETU operations. During July 27–31, CDC conducted a rapid evaluation to identify additional cases among HCWs and possible sources of exposure at the request of the Liberian Ministry of Health and Social Welfare and the humanitarian relief organizations involved in ETU and hospital A operations. Given time constraints in an evolving, somewhat chaotic epidemic environment, evaluation methods included unstructured in-person and telephone interviews with the infected HCWs, staff members and volunteers at the ETU and hospital A, and administrators, as well as onsite visits to hospital A and the ETU (at both its initial and relocated sites) (Figure). Employee work schedules were reviewed when available. Exposure risk to HCWs outside of the work environment at the ETU or hospital A were assessed through interview when possible.

Cases of Ebola were categorized as suspected, probable, or confirmed; this was consistent with the CDC Ebola virus disease case definitions in use in the field during the investigation. A suspected case was defined as fever and three or more additional symptoms (intense fatigue, myalgia, headache, nausea, difficulty in breathing or swallowing, hiccups, abdominal pain, vomiting, and diarrhea); fever with signs and symptoms of hemorrhage, or any unexplained death. A probable case was an illness meeting the suspected case definition in a person who had contact with a person with a confirmed or probable case in the past 3 weeks, or had at least fever and contact with a person with a confirmed or probable case in the past 3 weeks. A confirmed case was a suspected or probable case with laboratory evidence of Ebola virus infection by reverse transcription–polymerase chain reaction at the National Reference Laboratory in Liberia.

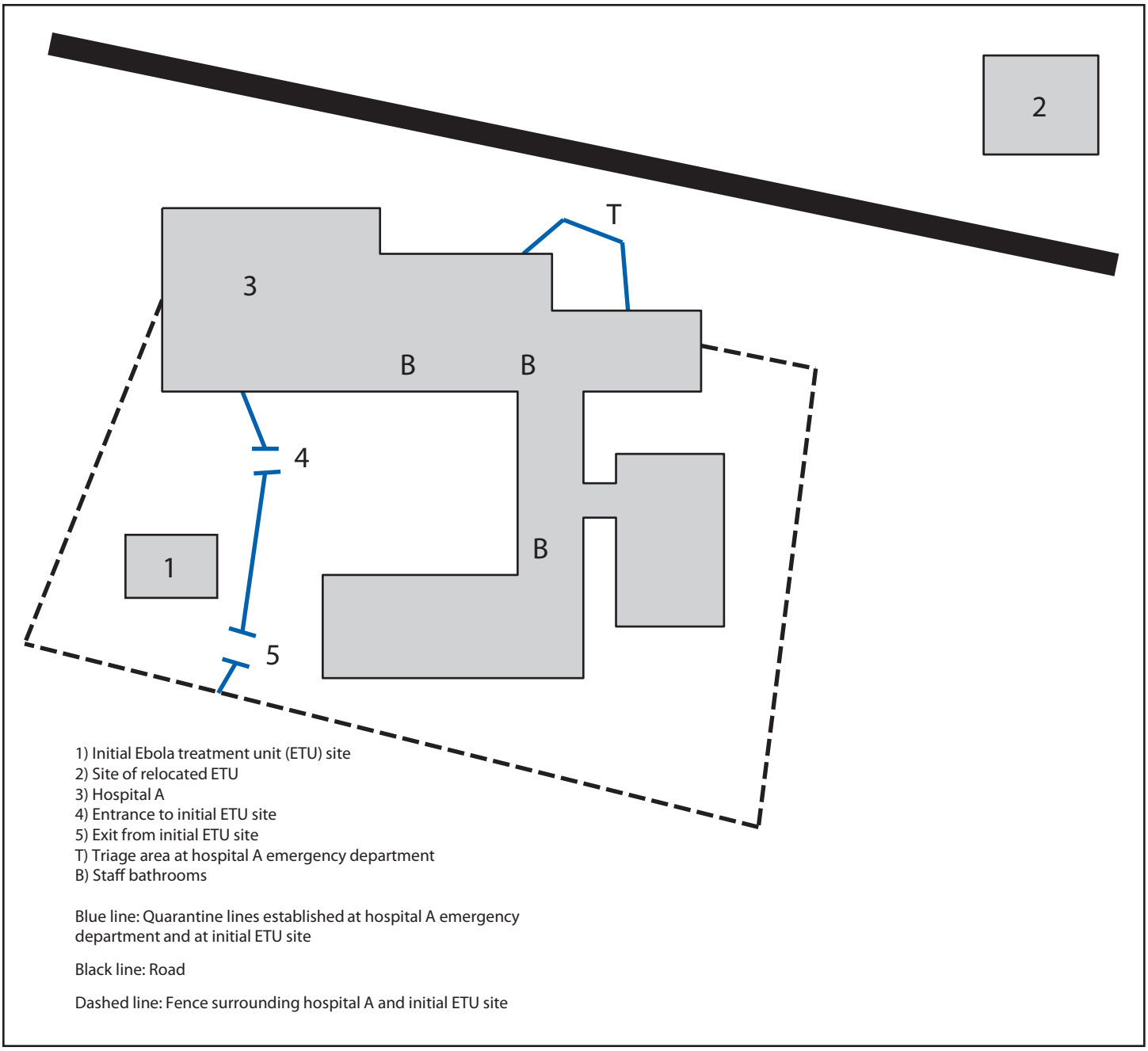
Findings

Hospital A is a private community hospital with approximately 150 to 200 inpatient admissions per month; its predominant function is provision of general medical care. Because of its proximity to the ETU (at the time, the only ETU in Monrovia), hospital A functionally served as a triage point for patients with suspected Ebola. Protocols for diverting Ebola patients to the ETU from hospital A's emergency department included a triage area at the entrance to the emergency department; patient screening for risk factors for Ebola; and direct transfer of suspected, probable, and confirmed cases.

Five HCWs (three Liberian nationals and two U.S. nationals) who worked at the ETU, hospital A, or both, were identified

* Available at http://www.cdc.gov/vhf/ebola/hcp/index.html.

FIGURE. Location of hospital A and adjacent Ebola treatment units* — Monrovia, Liberia



* The ETU was initially located on the grounds of hospital A (1) after opening during the second wave of the Ebola epidemic in late spring 2014. On July 20, 2014, the ETU was moved to a facility (2) approximately 100 meters (328 feet) away.

as being infected with Ebola virus during July 14–July 29 (HCWs A, B, C, D, and E); two died from their Ebola virus infection. Work responsibilities and clinical features of the five HCWs varied (Table). No unprotected exposures to Ebola patients or contaminated surfaces were reported by HCWs in the ETU (staff reported adherence to personal protective equipment guidelines consistent with job duties in the ETU) (*1*). Information about exposure outside of work to persons with Ebola could not be determined for the three HCWs (A, D, and E) who died or were otherwise unavailable at the time of evaluation.

Three findings from the evaluation of the health care environment and health care practices were identified as opportunities for transmission of Ebola virus: First, at the hospital A emergency

department, failure to identify patients with Ebola promptly resulted in delayed transfer to the ETU (by several hours to >1 day); in one case, a patient with undiagnosed Ebola died in the emergency department, potentially exposing HCWs. Second, daily fever and symptom monitoring was not routinely performed on the staff at the ETU or hospital A; a HCW working in these areas could become infected, yet go undetected. Third, all ETU and hospital A staff had access to hospital A facilities, including eating areas, showers, bathrooms, and work stations and direct, physical contact between staff members in these common areas was reported; transmission between an infected, but undetected, coworker could occur.

Regarding the transfer of Ebola patients from the hospital A emergency department to the ETU, the investigation revealed that on June 26 one confirmed patient and on July 14 one confirmed and one probable patient (none part of the five-HCW cluster) were treated for other diseases in the hospital A emergency department while their Ebola remained unrecognized, leaving bodily fluids on surfaces in the emergency department that required cleaning and disinfection.

Discussion

Despite the temporal and geographic clustering of the five HCWs with Ebola, no common source exposure or chain of transmission to explain all five cases was identified. Because persons being treated for other diseases in the emergency department of hospital A (adjacent to the ETU) had undiagnosed Ebola, patients or coworkers in this hospital or the immediate surrounding area might have been at higher risk. Specifically, three opportunities for exposure consistent with known Ebola virus transmission modes were identified in this HCW cluster: 1) HCW exposures to undetected Ebola patients treated before their diagnosis in hospital A, 2) inadequate use of personal protective equipment during cleaning and disinfection of grossly contaminated surfaces in hospital A, and 3) exposure of noninfected HCWs to infected HCWs in the ETU or hospital A. Three infected HCWs (B, C, and D) participated in activities that included spraying disinfectant in the ETU or hospital A; however, the risk for exposure to Ebola virus from these activities could not be assessed during this investigation. There were no self-reported, unprotected exposures to Ebola patients or contaminated materials in the ETU. Staff reported adherence to personal protective equipment use consistent with job duties in the ETU (*1*). Based on interviews, protection against exposure to Ebola virus might have been less stringent outside of the ETU than inside it. Clinical and cleaning and disinfection activities in the adjacent hospital and triage area of hospital A potentially served as unrecognized, but nonetheless high risk, exposures. Shared facilities and physical contact with coworkers could have resulted in transmission of Ebola virus if a coworker was infected, but not diagnosed. None of the information collected suggested a mode of Ebola virus transmission that had not previously been described.

The findings in this report are subject to at least three limitations. First, interviews were not performed in a standardized format, so formats of responses varied. Second, two HCWs in this cluster had died before the start of the investigation, and one was unable to be interviewed, so exposure history in these three persons was obtained through interviews with coworkers or administrators. Finally, exposure history for these three persons was based on postevent interviews in a chaotic and stressful environment; therefore, recall might be incomplete.

Several action items were identified for public health intervention. All hospitals in epidemic areas should be considered as sites where Ebola patients might come for medical care and should ensure patients can be promptly identified and safely isolated (*2*). HCWs working in epidemic areas should maintain a high index of suspicion regarding patients who have any of the signs or symptoms of Ebola.[†] All HCWs should be trained to recognize signs and symptoms of Ebola, have personal protective equipment[§] available that is suitable for protecting themselves from transmission of Ebola virus, and be trained in its use. Separation of ETUs from hospitals, including designating trained HCW staff to provide health care only at the ETU, and provision of independent facilities such as restrooms, eating, and work areas, could minimize the opportunities of HCW exposure to Ebola virus, as suggested by recent recommendations (*1*,*2*). Daily monitoring for signs and symptoms of Ebola, such as fever screening, could improve early detection and isolation of an Ebola virus–infected HCW. A strict "no touching" policy (*1*) among HCWs as advocated by Médecins Sans Frontières could reduce the opportunity for an infected, yet undiagnosed HCW to transmit Ebola virus to a coworker. Finally, four of five HCWs in this cluster worked commonly or exclusively at night; fatigue and reduced levels of supervision might contribute to suboptimal adherence to recommended preventive measures.

Rapidly identifying and isolating patients with Ebola is essential to preventing further transmission. ETUs are usually established in close collaboration with international health care organizations. Ebola virus infection of HCW staff members working at, or associated with, an ETU can undermine community confidence in the health care system, create new opportunities for ongoing transmission, and reduce an already insufficient clinical workforce. Preventing exposures of HCWs and reducing the risk for Ebola virus infection of HCW must continue to be a high priority to halt transmission of Ebola and maintain adequate care for Ebola patients.

[†] Additional information available at http://www.cdc.gov/vhf/ebola/symptoms.
[§] Available at http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html.

TABLE. Work responsibilities and clinical information for five health care workers (HCWs) who became infected with Ebola virus while working in an Ebola treatment unit (ETU) or an adjacent general hospital (hospital A) — Monrovia, Liberia, July 2014

Work responsibilities/ Clinical information	HCW A	HCW B	HCW C	HCW D	HCW E
Work location	Hospital A ED	ETU and hospital A ED triage area	ETU and hospital A ED triage area	ETU (hospital A ED triage area: unknown)	Hospital A ED
Work shift; shift Frequency	Night only; 3.5 shifts per week	Day and night; ~14 day and 7 night shifts per month	Day only; shift frequency not available	Night only; shift frequency not available	Night only; 3.5 shifts per week
Responsibilities	Direct patient care in hospital A ED	Direct patient care in ETU; assessment of patients in hospital A ED and triage area; cleaning and disinfection of grossly contaminated surfaces in hospital A triage area; cleaning and disinfection of grossly contaminated surfaces in hospital A ED	Disinfecting soiled surfaces and HCWs leaving ETU ward, but inside the ETU containment area; cleaning and disinfection of grossly contaminated surfaces in hospital A triage area	Disinfecting soiled surfaces and HCWs leaving ETU ward, but inside the ETU containment area; unknown whether cleaning and disinfection activities were performed in hospital A triage area	Direct patient care in hospital A ED
Barrier precaution equipment use in ETU	Did not work in this setting	As recommended by MSF for this setting*	As recommended by MSF for this setting*	As recommended by MSF for this setting*	Did not work in this setting
Barrier precaution equipment use in hospital A ED	Gloves were used when available; use of other equipment unknown†	Double gloves and gown reported at a minimum for all patient and cleaning encounters; use of additional mucus membrane barrier precaution equipment variable†	Unknown	Unknown	Gloves were used when available; use of other equipment unknown†
Ill contacts outside of work	Unknown	None reported	None reported	Unknown	Unknown
Date of symptom onset	July 14	July 22	July 22	July 23	July 29
Outcome	Died July 26	Recovered	Recovered	Died July 27	Recovered
Case status	Laboratory confirmed§	Laboratory confirmed§	Laboratory confirmed§	Probable	Laboratory confirmed§
Additional comments	No other HCWs in cluster were reported to have contact with this HCW after July 14 Did not work on July 14	Participated in cleaning and disinfecting surfaces grossly contaminated on July 14	No additional information	Died with hemorrhagic manifestations of EVD	Had direct, unprotected patient contact with undetected, but infected patient in hospital A ED on July 14 Never worked same night shift as HCW A
Information source	Indirect: interview of coworkers, administrators; review of work schedule	Direct: interview Indirect: interview of coworkers, administrators; review of work schedule	Direct; interview Indirect: interview of coworkers, administrators; review of work schedule	Indirect: interview of coworkers and administrators; review of work schedule	Indirect: interview of coworkers and administrators; review of work schedule

Abbreviations: ED = emergency department; MSF = Médecins Sans Frontières (Doctors Without Borders).

* A description of personal protective equipment use recommended for ETUs can be found in Sterk E. Filovirus haemorrhagic fever guidelines, Médecins Sans Frontières, 2008:34. Available at http://www.slamviweb.org/es/ebola/fhffinal.pdf.

† This is not adequate barrier precaution use for caring for patients with Ebola or for cleaning and disinfecting surfaces grossly contaminated with Ebola-containing fluids.

§ Laboratory-confirmed by reverse transcription–polymerase chain reaction.

What is already known on this topic?

The Ebola virus disease (Ebola) epidemic in West Africa has been characterized by amplification in health care settings and increased risk for health care workers (HCWs). Ebola treatment units (ETUs) have been established to optimize care of patients with Ebola while maintaining infection control procedures to prevent transmission of Ebola virus and protect HCWs. These ETUs are considered essential to containment of the epidemic.

What is added by this report?

Five cases of Ebola among HCWs at an ETU and an adjacent hospital in Monrovia, Liberia, did not have an identifiable common source of exposure or chain of transmission. However, opportunities existed for transmission of Ebola virus to HCWs in this cluster, including HCW exposure to unrecognized, infected patients outside of the ETU, inadequate use of personal protective equipment during cleaning and disinfection of environmental surfaces in hospital A, and potential transmission from an ill HCW to another HCW in the ETU or hospital A. No evidence was found of any previously unrecognized mode of transmission.

What are the implications for public health practice?

Health care workers in ETUs who have clinical, cleaning, or disinfection responsibilities in other settings might be exposed to infected persons or contaminated surfaces in those settings. Hospital emergency departments should be alert to quickly recognize and isolate persons with suspected Ebola. Appropriate infection control precautions and personal protective equipment should be available.

Acknowledgment

The Liberian Ministry of Health and Social Welfare.

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References

1. Sterk E. Filovirus haemorrhagic fever guidelines. Médecins Sans Frontières; 2008:1–134. Available at http://www.slamviweb.org/es/ebola/fhffinal.pdf.
2. World Health Organization. Infection prevention and control guidance for care of patients in health-care settings, with focus on Ebola. Geneva, Switzerland: World Health Organization; 2014. Available at http://www.who.int/csr/resources/publications/ebola/filovirus_infection_control/en.

Developing an Incident Management System to Support Ebola Response — Liberia, July–August 2014

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On October 14, 2014, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

The ongoing Ebola virus disease (Ebola) outbreak in West Africa is the largest and most sustained Ebola epidemic recorded, with 6,574 cases (*1*). Among the five affected countries of West Africa (Liberia, Sierra Leone, Guinea, Nigeria, and Senegal), Liberia has had the highest number cases (3,458) (*1*). This epidemic has severely strained the public health and health care infrastructure of Liberia, has resulted in restrictions in civil liberties, and has disrupted international travel (*2*). As part of the initial response, the Liberian Ministry of Health and Social Welfare (MOHSW) developed a national task force and technical expert committee to oversee the management of the Ebola-related activities. During the third week of July 2014, CDC deployed a team of epidemiologists, data management specialists, emergency management specialists, and health communicators to assist MOHSW in its response to the growing Ebola epidemic. One aspect of CDC's response was to work with MOHSW in instituting incident management system (IMS) principles to enhance the organization of the response. This report describes MOHSW's Ebola response structure as of mid-July, the plans made during the initial assessment of the response structure, the implementation of interventions aimed at improving the system, and plans for further development of the response structure for the Ebola epidemic in Liberia.

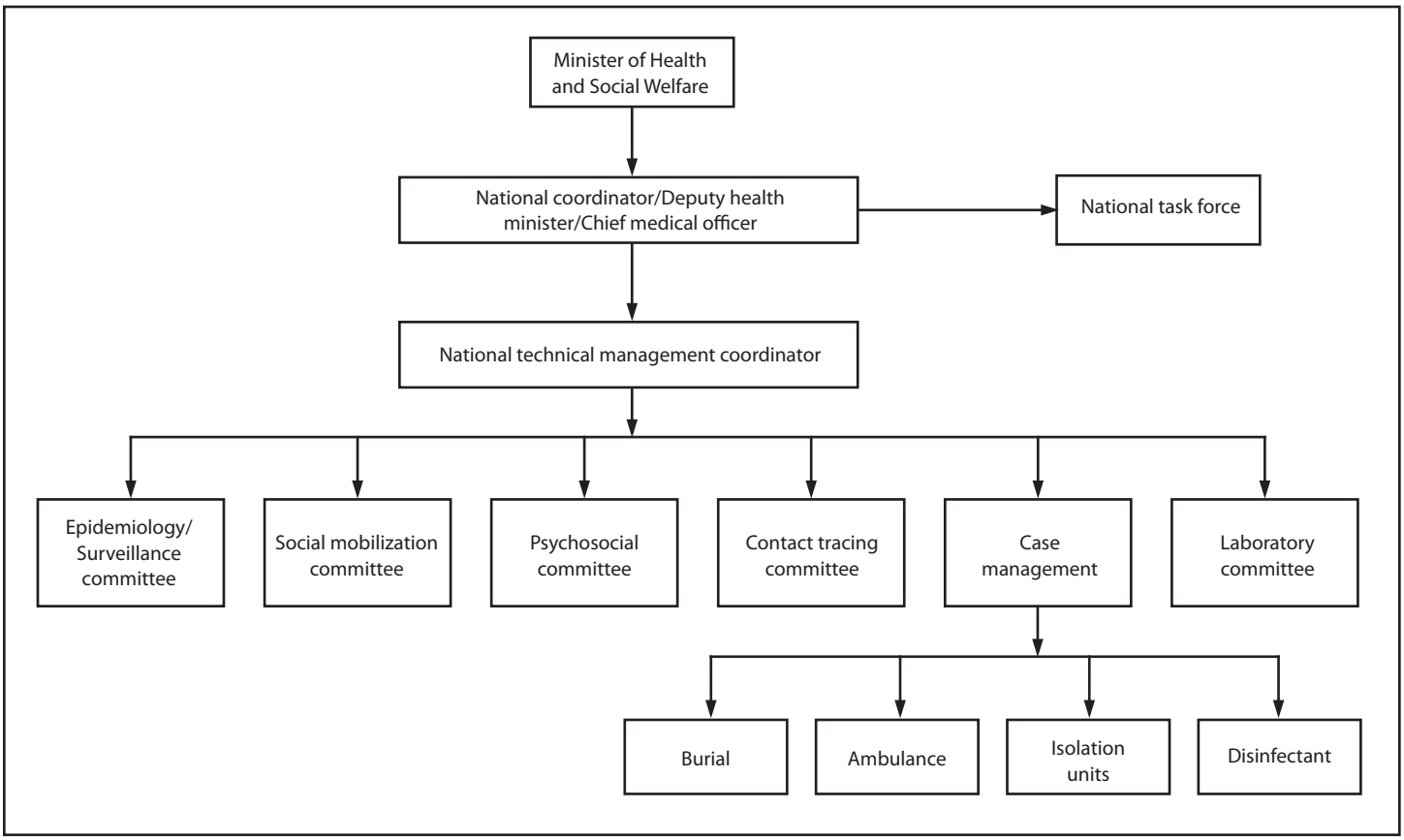
A clearly defined chain of command and organizational structure, effective resource management, and advanced planning are important aspects of an emergency response. An IMS is a standard structure based on these principles that is used in large and small-scale incidents throughout the United States at the federal, state, and local level (*3*). CDC has adapted IMS principles in managing their responses to public health emergencies, which in addition to the command, operations, logistics, planning, and finance/administrative functions, also includes scientific/public health response roles (*4*).

Initial Ebola Response Structure and Efforts to Improve Response Structure

The national response system that was initially established by MOHSW employed several IMS elements. For example, a national coordinator for the Ebola response was identified. This position was held by MOHSW's deputy health minister/chief medical officer. Additionally, daily meetings were held that were attended by the heads of each technical committee deemed important for the operational response to the epidemic: epidemiology/surveillance, social mobilization (responsible for communication of key messages), psychosocial (responsible for ensuring adequate social and mental health support for patients and families affected by Ebola infection), contact tracing, case management, and laboratory. MOHSW leadership recognized that this organizational structure (Figure 1) and the overall response could be further optimized and sought to implement improvements with technical support from CDC.

Several areas were identified where the response structure might benefit from adjustment. The initial response structure implemented by MOHSW represented what would be recognized as the scientific response section of a public health response (*4*). The deputy health minister was responsible for not only MOHSW's Ebola response framework as the national coordinator but also for other, non–Ebola-related public health responsibilities as the country's chief medical officer (e.g., overseeing the county-level delivery of health care in outpatient and inpatient settings and overseeing prevention and control programs, including those related to immunization, human immunodeficiency virus, tuberculosis, and malaria) (*5*). The national coordinator did not have a deputy to serve as an alternate decision-maker when the national coordinator was unavailable (e.g., when attending higher level meetings). In addition to overseeing the national response, MOHSW's span of control over the response was stretched because it also provided direct support for many activities in the counties surrounding the capital (e.g., assisting with case management and coordinating ambulance and burial transport). Regarding meetings, each morning the national coordinator presided over a national task force meeting, during which presentations were made by technical committee heads. The meeting included numerous partner organizations working in Liberia on the Ebola response (e.g., representatives of the World Health Organization [WHO], public health agencies from other countries, and nongovernmental organizations), with attendance exceeding 50 persons. The numerous comments and input from this large group made it difficult to develop clearly articulated action items. Furthermore, when logistics

FIGURE 1. Ministry of Health and Social Welfare Ebola response framework — Liberia, July 2014



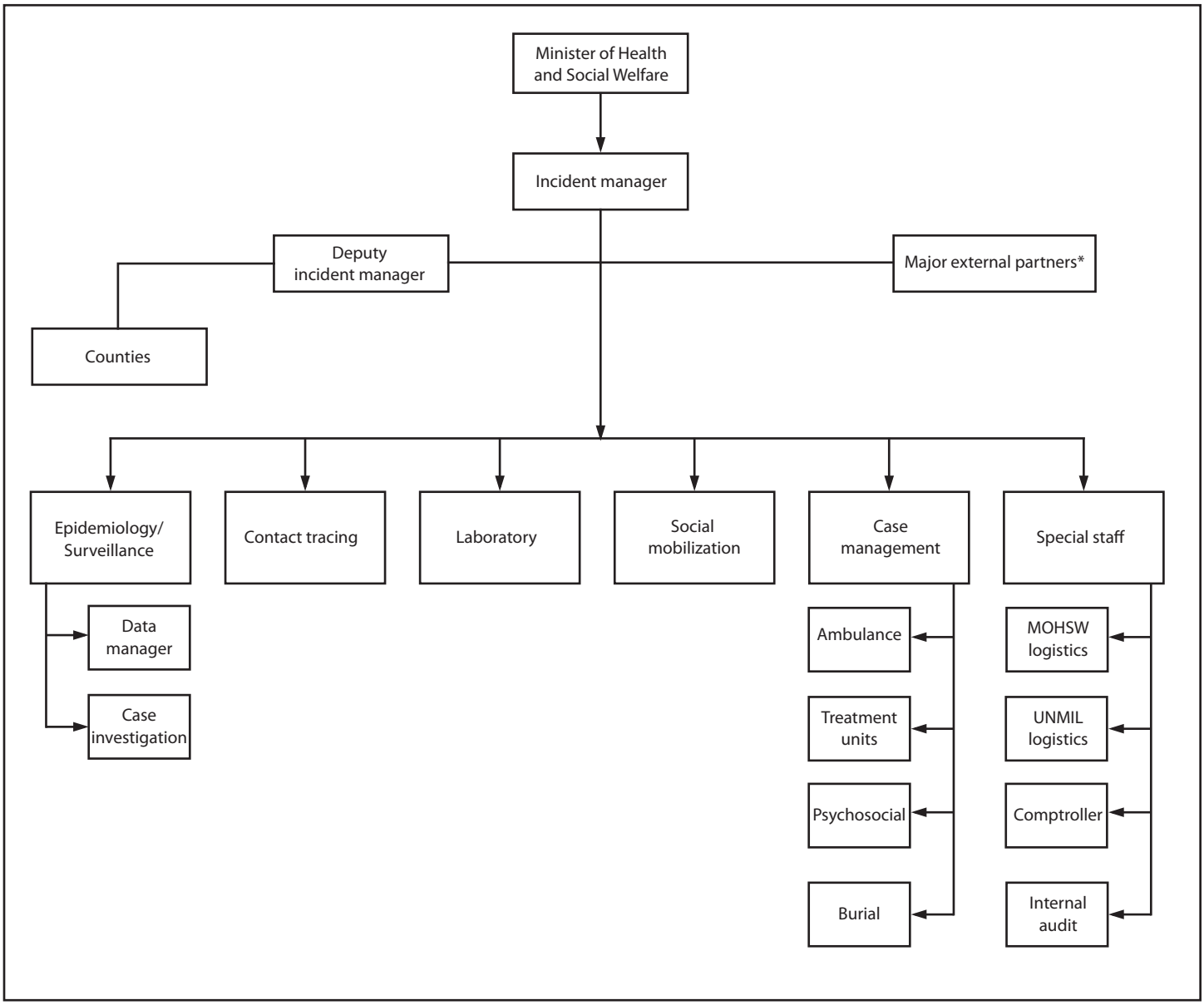
challenges were identified (e.g., lack of fuel or vehicles to transport teams to investigate potential cases, or to transport a burial team), there was not a single point of contact among the large assembled group to provide the logistical and administrative support to respond to these needs.

Improvements to the Ebola Response Structure

MOHSW developed plans to further refine the command and control structure; develop an IMS general staff section to support the scientific response section with logistical, administrative, and planning components; identify how best to link the national IMS to the county-level response and external partners; and improve the organization of IMS meetings to ensure response objectives had clearly identified action items and that these action items were acted upon. Where possible, efforts were made to work within the existing MOHSW framework to facilitate implementation of the changes (Figure 2).

Regarding command and control, on August 10, 2014, the Minister of Health and Social Welfare appointed an incident manager (IM) responsible for only the Ebola response, chairing a 9:00 am incident management meeting, and establishing, following-up, and adjusting the response priorities and objectives. This allowed the deputy health minister/chief medical officer to focus on other pressing, non–Ebola-related public health activities. In terms of organizational structure, a deputy IM, operations chief, and planning chief were identified. The deputy IM had the authority to step in and function as the IM, to ensure the response continued to have command and control when the IM was in higher level coordination meetings related to the response. The deputy IM also convened and guided a regular logistics meeting attended by MOHSW and partners with logistical interests or resources and chaired a subcommittee to address county level issues. This county-specific subcommittee served as the forum where technical, administrative, and logistical needs for the county responses could be raised. The deputy IM and all technical and general staff committees reported directly to the IM. With respect to IM meetings, each key Ebola response committee was instructed to have the chair (or an alternate with decision-making authority) attend. An agenda was implemented that focused meeting discussions on the key actions completed during the previous 24 hours, actions to be completed during the next 24 hours, and major challenges being faced. The meetings also included a representative from the logistics and finance

FIGURE 2. Ministry of Health and Social Welfare Ebola response incident management system — Liberia, August 2014



* Including the World Health Organization, CDC, Medécins Sans Frontières, UNICEF, and the U.S. Agency for International Development.

section (responsible for keeping track of the financial resources available to MOHSW for the managing the response). These changes allowed for more regular reporting of key logistical items to the IM, such as availability of personal protective equipment and regular budget status reports. A task listing was implemented assigning responsibility and due dates for action items as they were identified, and more detailed meeting minutes were prepared and issued the same day as the meeting. The addition of logistical and financial/administrative general staff facilitated completion of the objectives identified by the IM. When expertise did not exist within MOHSW, assistance was sought from other response partners (e.g., logistics support was sought from the United Nations Mission in Liberia, given the mission is a well-resourced organization in Liberia with a track record of timely and efficient movement of personnel and equipment across the country). To facilitate the ability of MOHSW to reach out to external partners, the IMS included liaisons with key external stakeholders involved in the coordination of international partners and provision of essential supplies and technical expertise, such as WHO, CDC, Medécins Sans Frontières, UNICEF, and the U.S. Agency for International Development (Figure 2).

What is already known on this topic?

The ongoing Ebola virus disease (Ebola) outbreak in West Africa is the largest recorded outbreak in history, and the response to the outbreak involves numerous domestic and international partners. A clearly defined chain-of-command and organizational structure, effective resource management, and advanced planning are important aspects of an emergency response. An incident management system (IMS) is a standard tool based on these principles, and CDC has adapted IMS principles in managing numerous public health emergency responses.

What is added by this report?

During July and August 2014, the Liberian Ministry of Health and Social Welfare (MOHSW), in consultation with CDC, refined their response to the Ebola outbreak through the institution of an IMS. This system included the establishment of a dedicated incident manager responsible for defining the specific goals and objectives of the response; the creation of additional support staff positions to aid the logistical, administrative, and financial components of the response; and enhancement of the efficiency of incident management meetings.

What are the implications for public health practice?

IMS provides an organized response framework, which will allow MOHSW to more rapidly and effectively address the burgeoning Ebola outbreak. Additionally, the findings in this report might also be useful in other settings where IMS has not been used previously and is being considered for the first time for the management of public health emergencies.

The revised IMS structure did not replace the national task force, which consists of a higher-level interministerial coordination group and key external partners. Thus, ongoing work is need to integrate the MOHSW response structure into this overarching national Ebola response framework. Also, the current "planning horizon" is about 24 hours. Continued development of a planning section in the IMS, to look beyond this limited timeframe, is required to anticipate potential problems and develop contingency plans.

Next Steps

The changes described represent work done during mid-July through mid-August. MOHSW colleagues, with technical assistance from CDC, will continue refining the IMS during the next 6–9 months. During this period, there are several anticipated objectives, the first of which is to ensure the IM designates all priorities for the subsequent 24–48-hour operational periods. Development of a robust planning section to look beyond this 24–48-hour timeframe also will occur. Because much of the operational component of the response (case identification and contact tracing) resides at the county level, there needs to be ongoing information exchange with the counties and MOHSW through the subcommittee chaired by the deputy IM. This information exchange will need to focus on ensuring sufficient logistical support for these county-level operations. Finally, a permanent emergency operations center at MOHSW is planned to serve as a location to receive calls and reports, to replace the current model of direct reporting of information to the scientific response section chairs and IM leadership.

Conclusion

MOHSW has readily adopted the concept of IMS during the early months of this response to align their national response structure with well-recognized emergency management principles. Clearly, the institution of an IMS in Liberia for the management of the Ebola response will be an evolutionary process, not only because the concepts are new to MOHSW, but because these concepts are also new to the other ministries with which MOHSW coordinates and to the political structure to which MOHSW reports. It is hoped that by instituting an organized response framework, which IMS provides, MOHSW will be able to more rapidly and effectively deal with the burgeoning Ebola outbreak in Liberia. The findings in this report might also be useful in other settings where IMS has not been used previously and is being considered for the first time.

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References

1. Incident Management System Ebola Epidemiology Team, CDC; Ministries of Health of Guinea, Sierra Leone, Liberia, Nigeria, and Senegal; Viral Special Pathogens Branch, National Center for Emerging and Zoonotic Infectious Diseases, CDC. Ebola virus disease outbreak—West Africa, September 2014. MMWR 2014;63:865–6.
2. CDC. Ebola in Liberia. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. Available at http://wwwnc.cdc.gov/travel/notices/warning/ebola-liberia.
3. Emergency Management Institute. ICS review document. Washington, DC: US Department of Homeland Security, Federal Emergency Management Agency, Emergency Management Institute; 2008. Available at http://www.training.fema.gov/emiweb/is/icsresource/assets/reviewmaterials.pdf.
4. Papagiotas S, Frank M, Bruce S, Posid JM. From SARS to 2009 H1N1 influenza: the evolution of a public health incident management system at CDC. Public Health Rep 2012;127:267–74.
5. Ministry of Health and Social Welfare (Liberia). Department of Health Services. Monrovia, Liberia: Ministry of Health and Social Welfare, Department of Health Services; 2014. Available at http://www.mohsw.gov.lr/content_display.php?submenu_id=60&sub=submenu.

Surveillance and Preparedness for Ebola Virus Disease — New York City, 2014

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On October 14, 2014, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

In July 2014, as the Ebola virus disease (Ebola) epidemic expanded in Guinea, Liberia, and Sierra Leone, an air traveler brought Ebola to Nigeria and two American health care workers in West Africa were diagnosed with Ebola and later medically evacuated to a U.S. hospital. New York City (NYC) is a frequent port of entry for travelers from West Africa, a home to communities of West African immigrants who travel back to their home countries, and a home to health care workers who travel to West Africa to treat Ebola patients. Ongoing transmission of *Ebolavirus* in West Africa could result in an infected person arriving in NYC. The announcement on September 30 of an Ebola case diagnosed in Texas in a person who had recently arrived from an Ebola-affected country further reinforced the need in NYC for local preparedness for Ebola.

To ensure that NYC is prepared to manage Ebola cases and prevent disease transmission, the NYC Department of Health and Mental Hygiene (DOHMH), in close coordination with local hospitals and clinicians, nongovernmental organizations and community groups, and city, state, and federal agencies, established systems around Ebola surveillance and management of suspected cases and contacts, and built upon existing general protocols for early recognition and management of persons with a viral hemorrhagic fever. Objectives included rapidly identifying Ebola patients in health care settings, implementing infection control precautions, and transporting ill persons to hospitals via emergency medical services, including persons arriving on international flights into John F. Kennedy International Airport. Enhanced planning began immediately after a CDC alert about Ebola on July 28, 2014. Reporting criteria and infection control guidance were developed in collaboration with local hospitals and sent to hospitals and clinicians via an electronic health alert system on August 11. Information also was shared on three citywide conference calls and in oral presentations to target audiences (*1*). DOHMH developed Ebola-specific data collection forms and triage protocols and trained staff to handle calls.

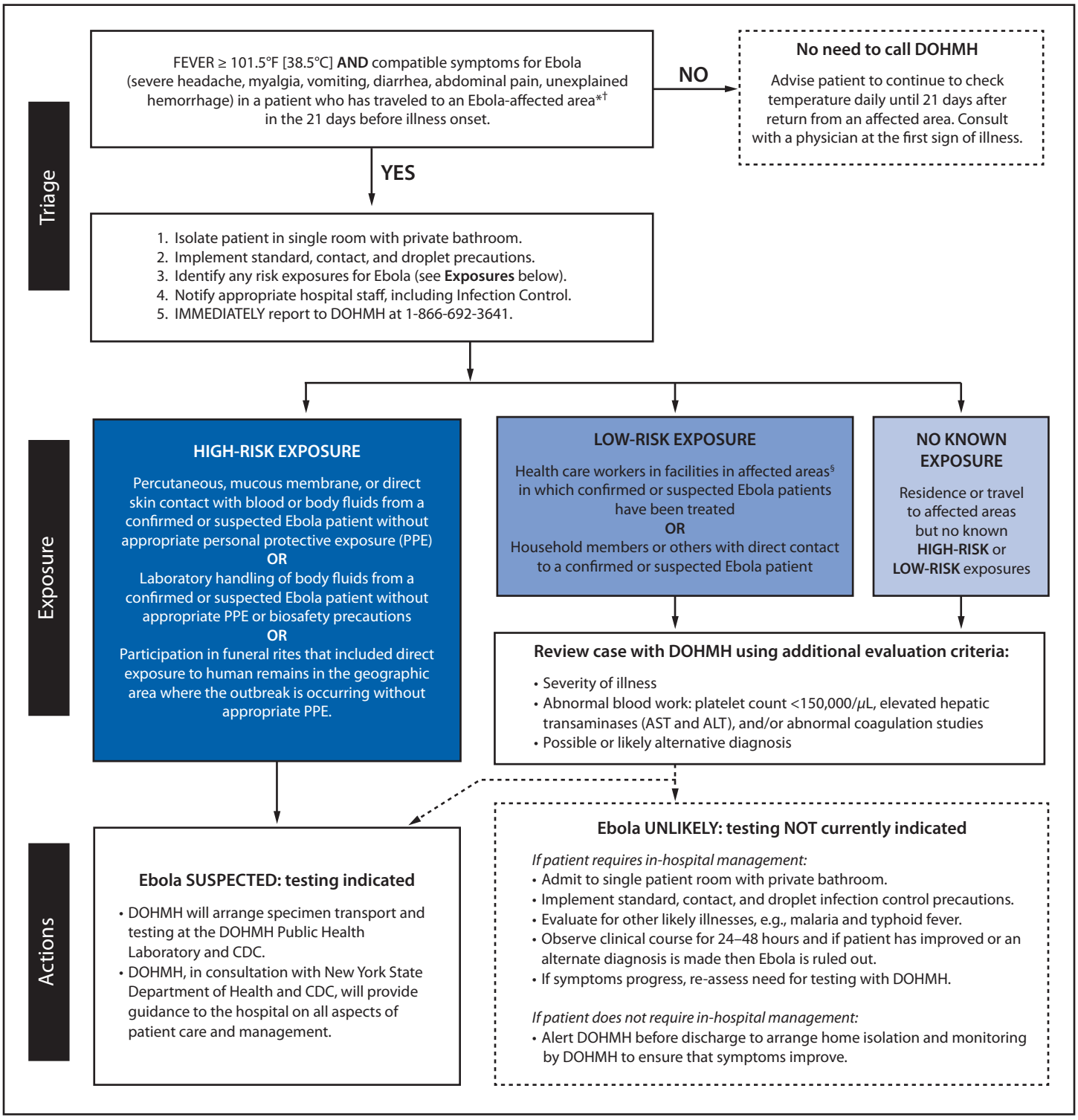
The guidance instructed clinicians to call DOHMH immediately after identifying any patient meeting the CDC definition for a person under investigation (PUI): a person who traveled to an Ebola-affected area within 21 days of onset of symptoms and had fever >101.5º F [38.5º C] and compatible symptoms such as severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained bleeding (Figure) (*2,3*).* The guidance provided a link to the CDC website for information on the current list of affected areas (*4*). DOHMH also assisted area hospitals in planning for isolation and management of PUIs or confirmed Ebola patients. DOHMH distributed posters for health care facilities to post in emergency departments to encourage patients to report recent travel history to an Ebola-affected country upon arrival.† DOHMH medical epidemiologists were available at all hours to respond to clinician and hospital questions about PUIs or other persons suspected of having Ebola, using guidance largely consistent with CDC's risk categories. Under the system, patients with high-risk or low-risk exposure to Ebola would be transferred to another hospital if there was concern about the ability of the reporting hospital to manage the patient; Ebola testing, if indicated and after consultation with CDC, could be performed at DOHMH with confirmatory testing at CDC. Patients should also undergo evaluation for alternate diagnoses. The protocol included consideration of laboratory studies such as complete blood count, coagulation studies, liver function tests, and malaria testing, to assist in determining the need for Ebola testing. Patients not needing hospitalization could remain isolated at home, with daily monitoring by telephone by medical epidemiologists until the patient's symptoms improved such that Ebola was no longer of concern, or until worsening or persistent symptoms prompted repeat evaluation for Ebola or an alternate diagnosis.

As of October 6, 2014, DOHMH had received inquiries from health care providers about 88 patients: 49 (56%) had not been in an affected area in the 21 days before symptom onset, and 28 (32%) met travel criteria but not clinical criteria. Of the 11 (12%) who met PUI criteria, none had any high-risk or low-risk exposure factors. One was tested for Ebola, and the test result was negative. Alternate diagnoses included malaria (8 patients) and typhoid fever (one patient); two others had no clear diagnosis. Two patients were discharged home while

* On October 9, DOHMH revised its reporting criteria to include fever or other compatible symptoms.

† A sample poster is available at http://www.nyc.gov/html/doh/downloads/pdf/em/hospital-signs-tabloid.pdf.

FIGURE. Ebola virus disease (Ebola) evaluation algorithm — New York City Department of Health and Mental Hygiene (DOHMH), September 3, 2014



Abbreviations: AST = aspartate aminotransferase; ALT = alanine aminotransferase.

* The current list of affected areas is available at http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/distribution-map.html.

† On October 9, DOHMH revised its reporting criteria to include fever or other compatible symptoms.

§ In the CDC algorithm, health care workers using appropriate PPE in facilities with Ebola patients are classified as having no known exposure, but, according to DOHMH guidance, if they develop fever and compatible symptoms in the 21 days after residence in or travel to an Ebola-affected area, they are considered to have had low-risk exposure.

febrile and remained isolated at home for several days; all of the patients recovered. Some patients had potential delays in diagnosis because of hesitancy by health care providers to examine patients or by laboratory workers to handle specimens.

These experiences demonstrated the feasibility of rapidly implementing enhanced surveillance for Ebola-like illness. A second electronic health alert, sent on September 3, highlighted the need to obtain a full travel history from febrile patients and consider alternate diagnoses particularly in patients with no known exposure and emphasized that no added precautions are needed to perform laboratory studies on those patients (*5,6*).

NYC has previously faced threats to human health from outbreaks occurring overseas, including from plague, severe acute respiratory syndrome, measles, novel influenza strains with pandemic potential, and more recently Middle East respiratory syndrome (*7*). The need to take a full travel history on any patient presenting with a febrile illness, and to remain aware of current overseas outbreaks, is not new. Provider awareness and media attention peak when an emerging threat is first recognized, but such threats can persist for months. The recent diagnosis of Ebola in a person in the United States who had traveled from an affected area underscores the need for health departments to prepare to rapidly respond to imported cases. It is challenging for health officials and health care providers to stay vigilant for high-consequence but low-likelihood events and to maintain a high level of preparedness for managing such events safely. Critical elements highlighted in this report include the development of clear reporting criteria, building and maintaining relationships and preparedness capacity in the local health care system, and rapid, frequent and responsive communication with the health care community and the public to identify and address concerns.

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References

1. New York City Department of Health and Mental Hygiene. 2014 Alert #22: Evaluating patients for Ebola virus disease in New York City. Available at https://a816-health29ssl.nyc.gov/sites/nychan/lists/alertupdateadvisorydocuments/nyc%20dohmh%20ebola%20health%20alert__8_11_14%20final.pdf.
2. New York City Department of Health and Mental Hygiene. 2014 Ebola virus disease evaluation algorithm. Available at http://www.nyc.gov/html/doh/downloads/pdf/cd/ebola-eval-algorithm.pdf.
3. CDC. Ebola (Ebola virus disease): signs and symptoms. US Department of Health and Human Services, CDC, 2014. Available at http://www.cdc.gov/vhf/ebola/symptoms/index.html.
4. CDC. 2014 Ebola outbreak in West Africa - outbreak distribution map. US Department of Health and Human Services, CDC, 2014. Available at http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/distribution-map.html.
5. New York City Department of Health and Mental Hygiene. 2014 Alert #27: Update: Ebola virus disease outbreak in West Africa. Available at https://a816-health29ssl.nyc.gov/sites/nychan/lists/alertupdateadvisorydocuments/nyc%20dohmh%20ebola%20health%20alert__9_3_14%20w%20algorithm.pdf.
6. New York State Department of Health. 2014. Revised NYS NYC laboratory guidelines for handling specimens from cases or suspected cases of Ebola virus disease. Available at http://www.nyc.gov/html/doh/downloads/pdf/cd/ebola-lab-guidelines.pdf.
7. CDC. Emerging infectious diseases: detection of notifiable diseases through surveillance for imported plague—New York, September–October 1994. MMWR 1994;43:805–7.

Notes from the Field

Increase in Gonorrhea Cases in Counties Associated with American Indian Reservations — Montana, January 2012–August 2014

Randall J. Nett, MD[1,2], Peter Choi[2], Cara Murolo[2], James S. Murphy[2] (Author affiliations at end of text)

In May 2012, the Montana Department of Public Health and Human Services noted that 23 cases of gonorrhea were reported in Roosevelt County during October 2011–March 2012, compared with only three cases during January–September 2011. An analysis of surveillance data for Roosevelt County and the six other Montana counties most closely associated with American Indian (AI) reservations showed that, during 2000–2011, the annual incidence rates in the seven counties ranged from 9–43 cases per 100,000, compared with 4–19 cases per 100,000 for all the remaining 49 Montana counties, and 98–129 cases per 100,000 for the United States. Since May 2012, the rates have continued to increase in the seven counties. The 2012 and 2013 incidence rates in counties associated with AI reservations were 74 and 131 cases per 100,000, respectively, compared with four and 10 cases per 100,000 in the remaining counties, and 108 cases per 100,000 in the United States during 2012. This increase in gonorrhea incidence in counties associated with AI reservations began in 2012. During January 2012–August 2014, of the 553 gonorrhea cases reported in Montana, 315 (57%) had a race classification of AI/Alaska Native (AN). In comparison, 6.5% of Montana's population is classified as AI/AN. Cases were concentrated in few of Montana's 56 counties; 327 (59%) occurred among residents of seven counties associated with AI reservations that are the home of just 9.8% of Montana's population. Among all reported Montana cases, the median patient age was 24 years (range = 12–70 years), and 258 (47%) occurred among males. Gonorrhea incidence in Montana counties associated with AI reservations is now comparable to U.S. incidence rates.

Gonorrhea is a sexually transmitted disease (STD) caused by *Neisseria gonorrhoeae* that can cause serious complications in both men and women (*1,2*).* Sexually active persons at increased risk for gonorrhea are especially those with new or multiple sexual partners, those who use condoms inconsistently or not at all, and those who engage in illicit drug use. Both sexually active females and sexually active males at increased risk for gonorrhea who live in areas of increased transmission should be screened for gonorrhea (*1,2*). Patients diagnosed with gonorrhea should be treated according to current CDC guidelines (*3*). Ceftriaxone 250 mg administered intramuscularly in a single dose plus azithromycin (1g) administered orally in a single dose is the preferred treatment regimen for uncomplicated gonorrhea. Sexual contacts of persons with gonorrhea should be identified, examined, tested for the presence of *N. gonorrhoeae* infection, and treated (*2*).

In response to the increased number of gonorrhea cases, tribal health departments and the Indian Health Service (IHS) have worked to improve STD testing practices in clinical settings; however, further efforts in community outreach and STD testing in nonclinical settings might be required. Challenges to controlling gonorrhea transmission in counties associated with AI reservations include varying coordination of outbreak investigation activities, insufficient staffing and staff turnover, and limited application of STD testing and contact investigation practices.

Steps to reduce gonorrhea transmission in Montana counties associated with AI reservations could include an evaluation and clarification of response roles and training needs among tribal, county, and state health departments, and IHS, and consideration of conducting gonorrhea screening in venues outside of traditional medical clinics (e.g., jails, drug treatment facilities, homes, and schools) (*4–7*).

* Additional information available at http://www.cdc.gov/std/gonorrhea.

Acknowledgments

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References

1. CDC. 2012 sexually transmitted diseases surveillance. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. Available at http://www.cdc.gov/std/stats12/gonorrhea.htm.
2. CDC. Sexually transmitted diseases treatment guidelines, 2010. MMWR 2010;59(No. RR-12):49–55.
3. CDC. Update to CDC's sexually transmitted diseases treatment guidelines, 2010: oral cephalosporins no longer a recommended treatment for gonococcal infections. MMWR 2012;61:590–4.
4. Barry PM, Kent CK, Scott KC, Goldenson J, Klausner JD. Is jail screening associated with a decrease in chlamydia positivity among females seeking health services at community clinics?—San Francisco, 1997–2004. Sex Transm Dis 2009;36(Suppl):S22–8.
5. Reagan MM, Xu H, Shih SL, Secura GM, Peipert JF. A randomized trial of home versus clinic-based STD screening among men. Sex Transm Dis 2012;39:842–7.
6. Graseck AS, Secura GM, Allsworth JE, Madden T, Peipert JF. Home screening compared with clinic-based screening for sexually transmitted infections. Obstet Gynecol 2010;115:745–52.
7. Cohen DA, Nsuami M, Martin DH, Farley TA. Repeated school-based screening for sexually transmitted diseases: a feasible strategy for reaching adolescents. Pediatrics 1999;104:1281–5.

Announcement

National Teen Driver Safety Week — October 19–25, 2014

During 2003–2012, the number of teens aged 13–19 years who died in motor vehicle crashes declined by 50%, from 5,718 to 2,823 (*1*). During the same period, the rate of passenger vehicle drivers aged 16–19 years involved in fatal crashes decreased by 52%, from 35.1 to 16.8 per 100,000 persons (*1*). Despite these encouraging trends, motor vehicle crashes remain the leading cause of death for teens. Among teens who died in passenger vehicle crashes in 2012, approximately 60% were not wearing a seat belt (*1*). Parents can be good role models by always wearing their seat belts and insisting that their teen drivers and all of their passengers always buckle up.

Graduated driver licensing (GDL) programs are widely credited with contributing to declines in teen crash deaths. Evaluations of GDL programs have demonstrated a 20%–40% reduction in crash risk among the youngest drivers (*2,3*). GDL programs provide longer practice periods, limit driving under high-risk conditions for newly licensed drivers, and require greater participation of parents in their teen's learning-to-drive process.

This year, during National Teen Driver Safety Week, CDC is releasing an updated Parents Are the Key campaign website, available at http://www.cdc.gov/parentsarethekey. Using the science behind GDL, Parents Are the Key provides families with tools and tips to help keep their teen drivers safe, including a parent-teen driving agreement. Additional information regarding National Teen Driver Safety Week is available from the National Highway Traffic Safety Administration at http://www.trafficsafetymarketing.gov/teens.

References

1. Insurance Institute for Highway Safety. Fatality facts 2010: teenagers 2012. Arlington, VA: Insurance Institute for Highway Safety; 2014. Available at http://www.iihs.org/iihs/topics/t/teenagers/fatalityfacts/teenagers/2012.
2. Shope J. Graduated driver licensing: review of evaluation results since 2002. J Safety Res 2007;38:165–75.
3. Zhu M, Cummings P, Zhao S, Coben JH, Smith GS. The association of graduated driver licensing with miles driven and fatal crash rates per miles driven among adolescents. Inj Prev 2014; February 13, 2014 [Epub ahead of print].

Erratum

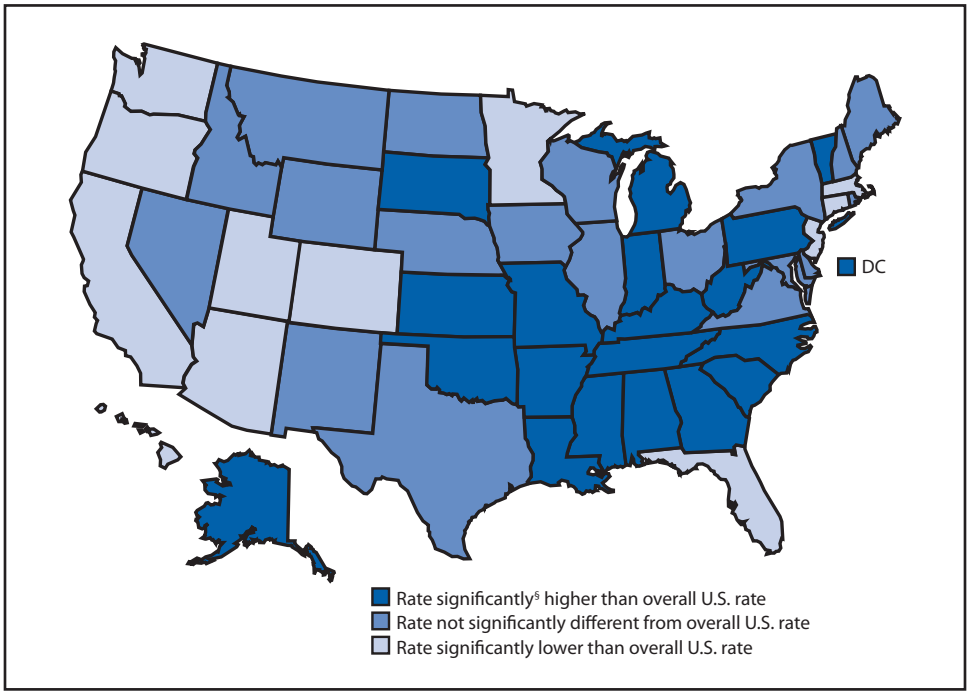
Vol. 63, No. 40

In the Notice to Readers, "*MMWR* in Brief Republished in *American Journal of Public Health*," on page 908, in the second paragraph, the first Internet link in the third sentence was incorrect. The sentence should read as follows: "That summary was republished online by *AJPH* on October 8 (available at **http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2014.10411e13**), along with an editorial describing the collaboration (available at http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2014.302321)."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Rates* of Death from Fire or Flames,† by State — National Vital Statistics System, United States, 2007–2011



* Age adjusted, per 100,000 standard population.
† Based on *International Classification of Diseases, 10th Revision* codes X00–X09, X76, X97, and Y26, which include deaths from all intents (i.e., unintentional, suicide, homicide, and undetermined).
§ To identify state rates that were significantly higher or lower than the overall U.S. rate of 1.0 deaths per 100,000 population, differences between the U.S. and state estimates were evaluated using two-sided significance tests at the $p<0.05$ level.

During 2007–2011, age-adjusted rates for deaths from fire and flames varied widely by state, ranging from 0.3 per 100,000 population in Hawaii to 2.9 in Mississippi. In 18 states and the District of Columbia, the age-adjusted death rate was significantly higher than the overall U.S. rate of 1.0 per 100,000 population. Rates were higher than the U.S. rate in most of the southeastern states. In addition to Mississippi, the states with the highest death rates were Alaska (2.1), Alabama (2.0), Arkansas (2.0), and Oklahoma (2.0). The six states with the lowest death rates were Hawaii (0.3), Massachusetts (0.5), Arizona (0.6), California (0.6), Colorado (0.6), and Utah (0.6).

Source: National Vital Statistics System mortality data. Available at http://www.cdc.gov/nchs/deaths.htm. Rates of death from fire or flames, by state of residence, available at http://www.cdc.gov/nchs/pressroom/states/fire_flames.pdf.

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ISSN: 0149-2195