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Self-Reported Increased Confusion or Memory Loss and Associated Functional Difficulties Among Adults Aged ≥60 Years — 21 States, 2011

Declines in cognitive function vary among persons and can include changes in attention, memory, learning, executive function, and language capabilities that negatively affect quality of life, personal relationships, and the capacity for making informed decisions about health care and other matters (*1*). Memory problems typically are one of the first warning signs of cognitive decline, and mild cognitive impairment might be present when memory problems are greater than normal for a person's age but not as severe as problems experienced with Alzheimer's disease (*2,3*). Some, but not all, persons with mild cognitive impairment develop Alzheimer's disease; others can recover from mild cognitive impairment if certain causes (e.g., medication side effects or depression) are detected and treated (*3*). In 2012, the U.S. Department of Health and Human Services published the *National Plan to Address Alzheimer's Disease,* calling for expanding data collection and surveillance efforts to track the prevalence and impact of Alzheimer's and other types of dementia (*4*). To estimate the prevalence of self-reported increased confusion or memory loss and associated functional difficulties among adults aged ≥60 years, CDC analyzed data from 21 states that administered an optional module in the 2011 Behavioral Risk Factor Surveillance System (BRFSS) survey. The results indicated that 12.7% of respondents reported increased confusion or memory loss in the preceding 12 months. Among those reporting increased confusion or memory loss, 35.2% reported experiencing functional difficulties. These results provide baseline information about the number of noninstitutionalized older adults with increased confusion or memory loss that is causing functional difficulties and might require services and supports now or in the future.

BRFSS consists of annual state-based telephone surveys of randomly selected noninstitutionalized U.S. adults aged ≥18 years regarding health practices and risk behaviors linked to chronic diseases, injuries, and preventable infectious diseases.* In 2011, all 50 states and the District of Columbia conducted the BRFSS survey by landline and cellular telephones, and the median survey response rate was 49.7%. In 2011, 21 states† included a 10-question optional cognitive impairment module§ in their BRFSS surveys. Because only seven of the 21 states conducted cell phone interviews in addition to landline telephone interviews, this analysis was restricted to landline respondents aged ≥60 years from the 21 states.¶ The median landline response rate among the 21 states was 53.4%, and the rates ranged from 37.4% in California to 66.0% in Nebraska.** This analysis was

* Additional information, including complete survey questions, available at http://www.cdc.gov/brfss.

† Arkansas, California, Florida, Hawaii, Illinois, Iowa, Louisiana, Maryland, Michigan, Nebraska, New Hampshire, New York, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Utah, Washington, West Virginia, and Wisconsin.

§ Additional information available at http://www.cdc.gov/aging/healthybrain/brfss-faq.htm.

¶ Excluded were 2.8% of otherwise eligible participants from the seven states.

** Response rates for BRFSS are calculated using standards set by American Association of Public Opinion Research response rate formula no. 4, available at http://www.aapor.org/standard_definitions2.htm. The response rate is the number of respondents who completed the survey as a proportion of all eligible and likely eligible persons.

INSIDE

351 Racial/Ethnic Disparities in the Awareness, Treatment, and Control of Hypertension — United States, 2003–2010
356 Prevention and Control of Influenza with Vaccines: Interim Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2013
357 Vital Signs: Evaluation of Hepatitis C Virus Infection Testing and Reporting — Eight U.S. Sites, 2005–2011
362 Testing for HCV Infection: An Update of Guidance for Clinicians and Laboratorians
366 Emergence of Avian Influenza A(H7N9) Virus Causing Severe Human Illness — China, February–April 2013
372 Announcement
374 QuickStats

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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further limited to the 59,852 adults aged ≥60 years with nonmissing responses to the first question in the module.

Respondents who answered affirmatively to the question, "During the past 12 months, have you experienced confusion or memory loss that is happening more often or is getting worse?" were categorized as reporting increased confusion or memory loss. Functional difficulties were identified among these persons if they responded, "always," "usually," or "sometimes" to one of two questions about whether confusion or memory loss interfered with their "ability to work, volunteer, or engage in social activities," or caused them to "give up household activities or chores" that they "used to do." Additional questions addressed the need for assistance, getting care or assistance from a family member or friend, and discussing increased confusion or memory loss with a health-care provider. Respondents who declined to answer, had a missing answer, or who answered "don't know/not sure" were excluded from the analyses involving those variables.

Respondents were categorized by age group, sex, race/ethnicity,[††] education level, disability status,[§§] veteran status, and employment status. BRFSS landline weights were used to adjust for the probability of selection and to reflect the total adult population in each state by age group, race/ethnicity, education level, marital status, and home ownership status. To account for the complex sampling design, weighted data were analyzed using statistical software.

In 2011, 12.7% of respondents reported increased confusion or memory loss during the preceding 12 months, and 35.2% of those persons reported functional difficulties (Table 1). The percentage reporting confusion or memory loss was significantly higher among the following: persons aged ≥85 years (15.6%) compared with those aged 60–64 years (12.0%) and 65–74 years (11.9%); Hispanics or Latinos (16.9%) compared with whites (12.1%); persons with less than a high school education (16.2%) compared with persons with more education; persons who reported they were disabled (20.2%) compared with persons who were not disabled (7.5%); and persons who were unable to work (28.3%) compared with those who were employed (7.8%), unemployed (16.4%), homemakers (11.8%), students (3.9%), and retirees (12.3%) (Table 1).

Among those reporting increased confusion or memory loss, significant differences in the percentage with functional difficulties were found among the same demographic groups, although in some cases the patterns differed. For example, the percentage with functional difficulties was significantly higher among adults aged 60–64 years (44.7%) compared with 65–74 years (29.0%) and 75–84 years (32.6%) and among blacks or African Americans (61.6%) compared with whites (29.1%) and Asians/Native Hawaiians or Other Pacific Islanders (16.2%)

[††] Race/ethnicity was coded into six mutually exclusive categories: white, black or African American, Hispanic or Latino, Asian/Native Hawaiian or Pacific Islander, American Indian/Alaska Native, and other race/multiracial. Persons who self-identified as Hispanic might be of any race. Persons who self-identified as any of the other five categories were non-Hispanic.

[§§] Respondents indicated limitation in any way in activities because of physical, mental, or emotional problems, or indicated use of special equipment such as a cane or wheelchair.

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TABLE 1. Self-reported increased confusion or memory loss (CML) and associated functional difficulties among adults aged ≥60 years, by selected characeristics — Behavioral Risk Factor Surveillance System, 21 states, 2011

Characteristic	Increased CML				Functional difficulties among those with increased CML			
	Unweighted no. in sample	Unweighted no. with increased CML	Weighted % reporting increased CML	(95% CI)	Unweighted no. in sample	Unweighted no. with increased CML	Weighted % reporting increased CML	(95% CI)
21 states overall	**59,852**	**6,807**	**12.7**	**(12.1–13.3)**	**6,654**	**2,254**	**35.2**	**(32.7–37.8)**
Age group (yrs)								
60–64	14,943	1,507	12.0	(10.8–13.2)	1,469	611	44.7	(39.2–50.2)
65–74	24,383	2,505	11.9	(11.0–12.8)	2,444	742	29.0	(25.4–32.9)
75–84	15,718	2,058	14.0	(12.9–15.2)	2,022	618	32.6	(28.0–37.5)
≥85	4,808	737	15.6	(13.7–17.7)	719	283	37.8	(31.1–44.9)
Sex								
Men	21,550	2,677	13.4	(12.4–14.4)	2,606	827	34.5	(30.5–38.7)
Women	38,302	4,130	12.1	(11.4–12.9)	4,048	1,427	35.9	(32.8–39.2)
Race/Ethnicity*								
White	49,365	5,475	12.1	(11.5–12.7)	5,346	1,615	29.1	(26.7–31.6)
Black or African American	4,697	529	11.8	(9.9–14.0)	522	287	61.6	(52.9–69.6)
Hispanic or Latino	1,621	232	16.9	(13.8–20.6)	229	118	56.2	(45.3–66.5)
Asian/NHOPI	1,536	161	13.8	(8.4–21.9)	160	50	16.2	(4.6–43.8)
AI/AN	465	73	13.7	(7.8–22.9)	71	38	45.2	(21.6–71.2)
Other race/Multiracial	1,388	218	15.3	(11.2–20.4)	215	86	39.4	(26.1–54.5)
Education level								
Less than high school diploma	6,791	1,019	16.2	(14.4–18.2)	988	522	52.9	(46.5–59.3)
High school diploma	19,580	2,234	12.5	(11.5–13.6)	2,194	756	35.3	(30.6–40.3)
Some college	15,279	1,738	12.1	(11.2–13.2)	1,702	524	28.3	(24.5–32.5)
College graduate	18,077	1,803	10.9	(9.9–12.0)	1,757	446	24.2	(20.0–28.9)
Disability status								
Disabled	24,339	4,363	20.2	(19.1–21.3)	4,263	1795	44.4	(41.1–47.7)
Not disabled	35,254	2,410	7.5	(6.9–8.1)	2,357	451	18.3	(15.3–21.7)
Veteran status								
Veteran	12,061	1,610	13.9	(12.6–15.2)	1,566	480	34.4	(29.1–40.2)
Not a veteran	47,764	5,193	12.3	(11.7–13.0)	5,085	1,773	35.5	(32.7–38.5)
Employment status								
Employed/Self-employed	12,447	920	7.8	(6.9–8.9)	899	174	24.4	(18.7–31.2)
Unemployed	1,426	200	16.4	(12.7–20.9)	196	87	49.1	(35.5–62.8)
Homemaker	4,097	457	11.8	(10.0–14.0)	453	141	34.5	(26.1–43.9)
Student	61	7	3.9	(1.5–10.0)	6	2	—	—
Retired	37,781	4,198	12.3	(11.5–13.0)	4,104	1,219	27.7	(24.7–30.8)
Unable to work	3,846	989	28.3	(25.1–31.7)	961	612	65.0	(58.5–71.0)

Abbreviations: CI = confidence interval; NHOPI = Native Hawaiian or Other Pacific Islander; AI/AN = American Indian/Alaska Native.

* Race/ethnicity was coded into six mutually exclusive categories: white, black or African American, Hispanic or Latino, Asian/NHOPI, AI/AN, and other race/multiracial. Persons who self-identified as Hispanic might be of any race. Persons who self-identified as any of the other five categories were all non-Hispanic.

(Table 1). By state, the percentage reporting increased confusion or memory loss ranged from 6.4% in Tennessee to 20.0% in Arkansas. Among those with increased confusion or memory loss, the percentage with functional difficulties ranged from 21.3% in Wisconsin to 52.2% in West Virginia (Table 2).

Among persons reporting increased confusion or memory loss, those with functional difficulties were significantly more likely than those without functional difficulties to report needing help (81.0% compared with 38.2%), getting help from a family member or friend (46.5% compared with 6.0%), and discussing their increased confusion or memory loss with a health-care provider (32.6% compared with 12.1%). In addition, those who reported functional difficulties were more likely to report being unable to work (32.8% compared with 9.6%) (Table 3).

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TABLE 2. Self-reported increased confusion or memory loss (CML) and associated functional difficulties among adults aged ≥60 years, by state — Behavioral Risk Factor Surveillance System, 21 states, 2011

State	Increased CML				Functional difficulties among those with increased CML			
	Unweighted no. in sample	Unweighted no. with increased CML	Weighted % reporting increased CML	(95% CI)	Unweighted no. in sample	Unweighted no. with increased CML	Weighted % reporting associated difficulties	(95% CI)
21 states overall	**59,852**	**6,807**	**12.7**	**(12.1–13.3)**	**6,654**	**2,254**	**35.2**	**(32.7–37.8)**
Arkansas	2,127	374	20.0	(17.9-22.3)	371	135	38.6	(32.5-45.0)
California	2,073	328	17.0	(14.9–19.3)	328	95	30.0	(23.9–36.9)
Florida	5,194	651	13.8	(12.2–15.7)	637	232	42.0	(34.7–49.8)
Hawaii	3,108	335	9.2	(8.0–10.6)	333	115	38.4	(31.2–46.2)
Illinois	2,193	241	11.4	(9.7–13.4)	241	80	39.1	(30.6–48.3)
Iowa	2,827	233	9.0	(7.8–10.4)	232	62	31.1	(23.8–39.4)
Louisiana	4,424	303	7.3	(6.2–8.5)	297	122	43.4	(35.4–51.8)
Maryland	1,805	168	9.5	(7.6–11.7)	165	40	24.7	(16.6–35.0)
Michigan	1,461	208	13.9	(11.4–16.9)	208	57	31.2	(21.6–42.8)
Nebraska	4,705	578	12.0	(10.8–13.4)	576	211	33.3	(28.3–38.7)
New Hampshire	2,447	262	11.0	(9.6–12.6)	183	58	33.6	(26.1–42.1)
New York	1,232	131	10.6	(8.6–13.0)	129	42	39.5	(29.1–51.0)
North Carolina	4,618	393	8.5	(7.3–9.8)	385	153	43.3	(35.7–51.3)
Oklahoma	1,810	212	12.1	(10.5–14.0)	210	70	35.7	(28.3–43.8)
South Carolina	5,062	610	13.7	(12.1–15.4)	598	248	39.7	(33.3–46.4)
Tennessee	2,586	159	6.4	(5.2–7.7)	148	68	47.1	(36.7–57.7)
Texas	2,922	394	12.6	(10.8–14.6)	391	138	37.8	(30.3–45.9)
Utah	973	166	17.0	(14.4–19.9)	164	42	30.2	(22.2–39.6)
Washington	4,360	697	15.7	(14.4–17.1)	695	154	22.3	(18.5–26.5)
West Virginia	2,061	156	8.3	(7.0–9.9)	155	78	52.2	(43.1–61.2)
Wisconsin	1,864	208	11.1	(9.0–13.5)	208	54	21.3	(14.8–29.6)

Abbreviation: CI = confidence interval.

Editorial Note

Age is the best-known risk factor for Alzheimer's disease (the most common cause of dementia), and more than 90% of cases occur in persons aged ≥60 years (*2*). Research shows that Alzheimer's disease causes changes in the brain years and even decades before the first symptoms appear, and a better understanding about normal age-related cognitive decline could provide important insights for future prevention efforts (*1,2*). A systematic review found that among the primary care populations studied, as many as 66% of all dementia cases were undiagnosed, with the majority of missed cases classified as mild to moderate (*5*). Missed or delayed diagnosis impedes the ability to identify and intervene for treatable causes and to provide timely and accurate information and resources to patients and their families.

Public health surveillance provides the ability to track and monitor trends and identify health disparities to understand the magnitude of the problem, plan for future resource and service needs, inform interventions, and guide research efforts. However, public health surveillance of dementia is limited and complicated by methodologic challenges associated with identifying cases in the community (*6*). For these reasons, one suggestion is that public health surveillance of these conditions be broadly focused and address outcomes related to functional impairment rather than etiology (*6*). BRFSS provides an opportunity to respond to the national call for expanded surveillance efforts by tracking self-reported confusion or memory loss that is currently causing functional difficulties among noninstitutionalized adults and could progress to a more serious state of impairment.

The BRFSS results for 21 states described in this report indicate that 12.7% of persons aged ≥60 years report increased confusion or memory loss in the preceding year, and among these persons, 35.2% report functional difficulties. The findings show that increased confusion or memory loss generally increased with age, but the percentage reporting functional difficulties among persons aged 60-64 years was as great as among persons aged ≥85 years and greater than among persons aged 65–84. These findings suggest a need for future studies to examine the relationship of age and functional difficulties caused by increased confusion or memory loss. For example, younger persons might face challenges obtaining diagnostic testing because health-care professionals might not suspect symptoms, or access to employer-sponsored benefits could be placed in jeopardy if employed persons lose their jobs or are unable to work (*7*).

Among persons reporting functional difficulties, only 32.6% report discussing their symptoms with a health-care provider. Early and accurate diagnosis provides opportunities for individuals and families to initiate financial planning, develop

TABLE 3. Selected characteristics of adults aged ≥60 years with self-reported increased confusion or memory loss (CML), with and without associated functional difficulties — Behavioral Risk Factor Surveillance System, 21 states, 2011

Characteristic	Those with self-reported increased CML		Those with CML and any functional difficulty		Those with CML and without functional difficulty		p value
	%	(95% CI)	%	(95% CI)	%	(95% CI)	
Total no. of respondents per category	**6,654**		**2,254**		**4,400**		
Needs help*	53.1	(50.5–55.7)	81.0	(77.3–84.3)	38.2	(35.3–41.2)	<0.001
Always, usually or sometimes receives help from family member or friend	20.1	(17.9–22.5)	46.5	(41.8–51.3)	6.0	(4.6–7.6)	<0.001
Discussed increased CML with health-care provider	19.3	(17.3–21.4)	32.6	(28.3–37.3)	12.1	(10.3–14.1)	<0.001
Unable to work	17.8	(15.7 – 20.0)	32.8	(28.4 – 37.5)	9.6	(7.8 – 11.7)	<0.001
Lives alone	34.6	(32.4–36.8)	38.7	(34.6–42.9)	32.4	(29.9–35.0)	0.011

Abbreviation: CI = confidence interval.
* Respondents indicated that they needed help in one of the following areas as a result of their increased confusion or memory loss: safety, transportation, household activities, personal care, or needs assistance in some other area.

What is already known on this topic?

Cognitive decline can negatively affect a person's life and might progress into a more serious state of impairment or dementia. Memory problems typically are one of the first warning signs of cognitive decline, and up to two thirds of conditions that meet the criteria for dementia are undiagnosed.When diagnosed early and accurately, opportunities exist to treat potentially reversible causes, initiate financial planning, develop advance directives, enroll in clinical trials, and anticipate care needs. National plans call for expanding data and surveillance efforts to track dementia and its impact on individual and population health in the United States.

What is added by this report?

Approximately one in eight adults aged ≥60 years surveyed from 21 states reported increased confusion or memory loss in the preceding year. Among these persons, 35.2% experienced difficulties resulting from confusion or memory loss. Wide variation in these results was found across the 21 states. Respondents who reported functional difficulties were significantly more likely than those who did not to report needing help (81.0% compared with 38.2%), getting help from a family member or friend (46.5% compared with 6.0%), and talking with a health-care provider about their increased confusion or memory loss (32.6% compared with 12.1%).

What are the implications for public health practice?

These findings underscore the need to facilitate discussions with health-care and service providers so that linkages can be made to accurate information and needed services. They also indicate the importance of state-based surveillance to estimate the magnitude of the problem among older adults living in the community.

advance directives, enroll in clinical trials and anticipate care needs. Some causes for cognitive decline are reversible (e.g., depression, infections, medication side effects, or nutritional deficiencies), but they can be serious and should be treated by a health-care provider as soon as possible (*2*). Misperceptions about dementia-related conditions might lead to delayed diagnosis (*4*), and understanding cultural beliefs and public perception is important for meeting national goals for increasing awareness. For example, studies conducted with diverse groups of older adults found that terminology used to describe brain health and beliefs about cognition varied among racial/ethnic populations (*9*). Increased confusion or memory loss and functional difficulties were reported among all racial/ethnic groups in this analysis, with persons identifying themselves as black or African American reporting the highest levels of functional difficulties compared with other groups.

Among those reporting increased confusion or memory loss and functional difficulties, 81.0% report needing assistance, and only 46.5% report getting help from a family member or friend. The need for care could precede or follow a diagnosis of dementia and escalates over time (*8*). Care could be provided by family members and friends or through paid services. Understanding who is at risk for requiring care now or in the future can help with anticipating needs and associated costs.

Wide variation observed among the 21 states might be the result of different cultural or other factors and indicates the importance of state-based data on this subject. Understanding cultural and social contexts is important when communicating public health messages (*8*). Future studies of state-specific data examining associations between increased confusion or memory loss and potential risk factors for dementia such as cardiovascular disease, diabetes, depression, or physical inactivity (*3*) might provide more insights that could also help explain the variations observed across states.

The findings in this report are subject to at least five limitations. First, data are self-reported, not validated by any clinical measurement, and might be subject to recall bias. Second, the survey design is cross-sectional, and causality of specific diseases or conditions cannot be inferred. Third, although questions underwent multiple rounds of cognitive testing to ensure that respondents understood the questions, given misperceptions surrounding dementia (*4,7,8*), respondents might provide the most "socially acceptable" answer, which could vary by

race/ethnicity or geography, and could account in part for the variability observed among states. For example, blacks or African Americans might be less likely than whites to report cognitive decline (*10*). Furthermore, whether increased confusion or memory loss interferes with a respondent's ability to accurately describe functional difficulties is unknown. Fourth, these results might underestimate confusion or memory loss and functional difficulties because BRFSS does not include residents of nursing homes or other facilities where a high percentage of people with cognitive impairment reside, and results were limited to landline telephone survey responses and did not include cell phone respondents. Finally, response rates among the 21 states were low and varied widely, ranging from 37.4% to 66.0%.

In May 2012, The U.S. Department of Health and Human Services released the *National Plan to Address Alzheimer's Disease* (*4*), which includes a call to strengthen data and surveillance efforts. CDC's Healthy Brain Initiative is working with the Alzheimer's Association and numerous other national, state, and local partners to develop a set of public health actions to promote cognitive health as a vital, integral, component of public health and also to address issues related to cognitive impairment for persons living in the community and their care partners (i.e., informal and paid caregivers and health-care providers). This report provides a baseline estimate of the extent of self-reported increased confusion or memory loss and functional difficulties occurring in the preceding year among noninstitutionalized persons aged ≥60 years who might require services and supports now or in the future. The findings underscore the need to facilitate timely discussions with health-care and service providers so that linkages can be made to accurate information and needed services.

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Racial/Ethnic Disparities in the Awareness, Treatment, and Control of Hypertension — United States, 2003–2010

Hypertension is a leading cause of cardiovascular disease and affects nearly one third of U.S. adults (*1,2*). Because the risk for cardiovascular disease mortality increases as blood pressure increases, clinical recommendations for persons with stage 2 hypertension (systolic blood pressure [SBP] ≥160 mmHg or diastolic blood pressure [DBP] ≥100 mmHg) include a more extensive treatment and follow-up regime than for those with stage 1 hypertension (SBP 140–159 mmHg or DBP 90–99 mmHg) (*3*). Although racial/ethnic disparities in the prevalence of hypertension have been well documented (*4*); ethnic disparities in the awareness, treatment, and control within blood pressure stages have not. To examine racial/ethnic disparities in awareness, treatment, and control of high blood pressure by hypertension stages, CDC analyzed data from the National Health and Nutrition Examination Survey (NHANES) for the period 2003–2010. This report describes the results of that analysis, which indicated that the proportion of Mexican-Americans and blacks with stage 1 and stage 2 hypertension was greater than for whites.* Among those with stage 1 hypertension, treatment with medication was significantly lower for Mexican-Americans compared with their non-Hispanic counterparts. Although treatment among persons with stage 2 hypertension did not differ by race/ethnicity, less than 60% of those with stage 2 hypertension were treated with medication. More efforts are needed to reduce barriers to accessing health care and low-cost medication, as well as increasing clinicians' hypertension treatment knowledge and adherence to clinical guidelines.

NHANES is an ongoing, stratified, multistage probability sample of the noninstitutionalized U.S. civilian population.† Interviews and detailed physical examinations are performed. To obtain statistically stable estimates within racial/ethnic groups, CDC analyzed data from four 2-year cycles (2003–2010). Examination response rates ranged from 75% to 77% during this period, resulting in a total of 22,992 adult (aged ≥18 years) participants. The analysis excluded women who were pregnant (n = 732), participants without a blood pressure measurement (n = 1,339), other Hispanics and persons of other race or of multiple race (n = 2,693), and persons without hypertension (n = 14,313). Some participants were excluded based on more than one criterion, yielding a final study sample of 6,632 participants. Hypertension was defined as an average SBP ≥140 mmHg or DBP ≥90 mmHg, based on the average of up to three blood pressure measurements,§ or self-report of currently using blood pressure–lowering medication. Hypertension treatment was identified as the use of blood pressure–lowering medication and did not include lifestyle or dietary approaches. Hypertension stages were classified as stage 1 hypertension (SBP 140–159 mmHg or DBP 90–99 mmHg) and stage 2 hypertension (SBP ≥160 mmHg or DBP ≥100 mmHg) (*3*). Blood pressure control was defined as an SBP <140 mmHg and DBP <90 mmHg among those with hypertension. Hypertension awareness was determined based on whether a participant was ever told they had high blood pressure by a health-care provider. Health-care coverage was categorized into three groups: 1) Medicare, 2) private insurance, or 3) public insurance, which included Medicaid, a military health plan, or a state-sponsored plan.

All analyses were performed using statistical software to account for sampling weights and adjust variance estimates for the complex sampling design. A univariate chi-square test of independence was used to determine statistically significant ($p<0.05$) differences across racial/ethnic groups. Because multiple NHANES cycles were combined, trends over time could not be examined, and prevalence estimates could not be age adjusted. Population counts were estimated using the Current Population Surveys provided from NHANES by averaging the population during the period coinciding with the four NHANES cycles.¶

Among those with hypertension, the proportion of persons who were aged <65 years was greater for blacks (74.1%) and Mexican-Americans (71.9%) compared with whites (57.4%) (Table 1). Hypertension awareness, treatment, and control were lowest among Mexican-Americans (68.7%, 58.7%, and 35.5%, respectively) compared with whites (aware: 79.1%, treated: 71.2%, and controlled: 48.6%) and blacks (aware: 80.8%, treated: 71.9%, and controlled: 43.0%).

Among those with uncontrolled hypertension, awareness and treatment was greater for blacks (66.3% and 50.7%, respectively) compared with whites (aware: 59.4%, treated: 44.0%) and Mexican-Americans (aware: 51.4%, treated: 35.9%) (Table 2). Blacks with stage 1 hypertension had greater awareness (61.3%) and treatment (47.4%) compared with whites (awareness: 57.4%, treatment: 42.1%) and Mexican-Americans (awareness: 45.2%, treatment: 30.0%). Among those with stage 2 hypertension, blacks had greater awareness (77.6%) compared with whites (65.7%) and Mexican-Americans (66.0%); however, no difference was observed in hypertension treatment by race/ethnicity. Health-care coverage for those with uncontrolled hypertension was lowest for

* For this report, all persons of black or white race are non-Hispanic. Mexican-Americans might be of any race.

† Additional information available at http://www.cdc.gov/nchs/nhanes.htm.

§ Additional information available at http://www.cdc.gov/nchs/nhanes.htm.

¶ Additional information available at http://www.cdc.gov/nchs/nhanes/response_rates_cps.htm.

TABLE 1. Prevalence of selected characteristics among adults aged ≥18 years with hypertension,* by race/ethnicity — National Health and Nutrition Examination Survey, United States, 2003–2010†

Characteristic	Mexican-American N = 1,062				White, non-Hispanic N = 3,766				Black, non-Hispanic N = 1,804				p-value§
	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	
Sex													
Male	505	52.4	(49.4–55.4)	1.6	1,945	49.2	(47.6–50.7)	22.4	855	42.8	(40.4–45.2)	3.7	<0.001
Female	557	47.6	(44.6–50.6)	1.4	1,821	50.8	(49.3–52.4)	23.1	949	57.2	(54.8–59.6)	5.0	
Age group (yrs)													
18–44	121	25.0	(20.7–29.4)	0.8	370	13.4	(11.6–15.2)	6.1	284	21.4	(19.2–23.6)	1.9	
45–64	488	46.9	(43.3–50.6)	1.4	1,207	44.0	(42.1–46.0)	20.0	869	52.7	(50.4–55.0)	4.6	<0.001
≥65	453	28.0	(25.3–30.7)	0.8	2,189	42.6	(40.4–44.8)	19.4	651	25.9	(23.2–28.7)	2.2	
Education (respondents aged ≥25 yrs)													
Less than high school diploma	677	57.7	(52.7–62.8)	1.7	869	17.9	(15.2–20.6)	8.1	618	31.6	(28.5–34.7)	2.7	
High school diploma	170	19.3	(16.2–22.4)	0.6	1,116	29.9	(27.8–32.0)	13.5	431	24.8	(22.4–27.2)	2.1	<0.001
Some college	141	15.2	(11.4–19.0)	0.4	1,014	29.2	(27.2–31.2)	13.2	489	29.7	(27.5–31.9)	2.5	
College degree or higher	58	7.8	(5.3–10.3)	0.2	737	23.1	(20.4–25.7)	10.4	235	13.9	(12.0–15.9)	1.2	
Poverty-to-income ratio¶													
<100%	298	27.0	(21.6–32.4)	0.8	403	7.2	(5.9– 8.6)	3.3	336	18.5	(16.1–20.8)	1.6	
100%–299%	474	43.1	(38.6–47.6)	1.3	1,642	36.8	(34.2–39.4)	16.8	795	43.7	(40.9–46.4)	3.8	<0.001
300%–499%	126	13.9	(10.6–17.2)	0.4	782	25.3	(23.0–27.6)	11.5	320	18.0	(15.7–20.4)	1.6	
≥500%	164	16.0	(11.9–20.1)	0.5	939	30.6	(27.6–33.6)	13.9	353	19.8	(17.6–22.0)	1.7	
Hypertension awareness**													
Aware	768	68.7	(64.9–72.4)	2.1	2,996	79.1	(77.3–80.9)	36.0	1,486	80.8	(78.2–83.4)	7.0	<0.001
Unaware	294	31.3	(27.6–35.1)	0.9	770	20.9	(19.1–22.7)	9.5	318	19.2	(16.6–21.8)	1.7	
Hypertension treatment††													
Treated	674	58.7	(53.7–63.6)	1.8	2,725	71.2	(68.9–73.4)	32.4	1,335	71.9	(68.9–74.9)	6.2	<0.001
Untreated	386	41.3	(36.4–46.3)	1.2	1,035	28.8	(26.6–31.1)	13.1	469	28.1	(25.1–31.1)	2.4	
Hypertension controlled§§													
Yes	402	35.5	(32.7–38.3)	1.1	1,795	48.6	(46.3–50.8)	22.1	786	43.0	(40.3–45.7)	3.7	<0.001
No	660	64.5	(61.7–67.3)	1.9	1,971	51.4	(49.2–53.7)	23.4	1,018	57.0	(54.3–59.7)	4.9	
Blood pressure stages¶¶													
Normal	127	12.0	(10.1–14.0)	0.4	660	17.8	(16.5–19.1)	8.1	286	16.5	(14.8–18.1)	1.4	
Pre-hypertension	275	23.5	(21.0–26.0)	0.7	1,135	30.8	(28.9–32.6)	14.0	500	26.5	(24.3–28.7)	2.3	<0.001
Stage 1 hypertension	435	45.3	(41.3–49.2)	1.4	1,429	39.2	(36.9–41.4)	17.8	699	39.3	(36.9–41.8)	3.4	
Stage 2 hypertension	225	19.2	(16.1–22.2)	0.6	542	12.3	(11.1–13.4)	5.6	319	17.7	(15.6–19.8)	1.5	
Health-care coverage***													
No	302	35.0	(31.1–38.9)	1.1	289	8.1	(6.8– 9.3)	3.7	254	16.8	(14.5–19.0)	1.5	<0.001
Yes	760	65.0	(61.1–68.9)	2.0	3,477	91.9	(90.7–93.2)	41.8	1,550	83.2	(81.0–85.5)	7.2	
Health-care coverage type†††													
Medicare	204	19.6	(14.9–24.3)	0.4	645	13.0	(11.5–14.5)	5.4	280	14.3	(12.7–16.0)	1.0	
Private	344	53.3	(47.3–59.4)	1.0	2,215	72.1	(69.9–74.3)	30.2	874	59.3	(56.5–62.2)	4.3	<0.001
Public	212	27.0	(22.2–31.9)	0.5	617	14.9	(13.3–16.6)	6.2	396	26.4	(23.3–29.4)	1.9	
Routine place for health care§§§													
Yes	909	81.1	(78.1–84.0)	2.4	3,592	94.8	(93.9–95.7)	43.1	1,721	94.7	(93.4–95.9)	8.2	<0.001
No	153	18.9	(16.0–21.9)	0.6	174	5.2	(4.3– 6.1)	2.4	83	5.3	(4.1– 6.6)	0.5	
No. of times received health care in past year¶¶¶													
0	151	18.0	(14.8–21.2)	0.5	190	5.5	(4.4– 6.7)	2.5	132	8.5	(7.1–10.0)	0.7	
1	139	14.8	(11.7–17.8)	0.4	387	12.3	(10.9–13.6)	5.6	181	10.5	(9.0–12.1)	0.9	<0.001
≥2	772	67.2	(62.8–71.6)	2.0	3,187	82.2	(80.6–83.8)	37.4	1,487	80.9	(79.2–82.7)	7.0	

Abbreviation: CI = confidence interval.

* Defined as systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg or currently using blood pressure–lowering medication.

† Adult participants with no blood pressure measurement, self-reported race/ethnicity as "other/multiracial," and pregnant women were excluded.

§ Pearson chi-squared statistic, corrected for survey design.

¶ Ratio of family income to poverty as defined by the U.S. Census Bureau. Information available at http://www.census.gov/hhes/www/poverty/methods/definitions.html#ratio of income to poverty.

** Based on responses to the following questions, "Have you ever been told by a doctor or other health-care professional that you had hypertension, also called high blood pressure?" and "Were you told on two or more different visits that you had hypertension or high blood pressure?"

†† Based on whether the participant answered "yes" to both of the following questions: "Because of your high blood pressure, have you ever been told to take prescribed medicine?" and "Are you now taking prescribed medicine for high blood pressure?"

§§ Based on blood pressure measurements for those with hypertension: controlled (SBP <140 and DBP <90) and uncontrolled (SBP ≥140 or DBP ≥90).

¶¶ Classified as normal (SBP <120 and DBP <80), pre-hypertension (SBP 120–139 or DBP 80–89), stage 1 hypertension (SBP 140–159 or DBP 90–99), and stage 2 hypertension (SBP ≥160 or DBP ≥100).

*** Participants were asked, "Are you covered by health insurance or some other health-care plan?"

††† Health-care coverage types reported were Medicare, private insurance, and/or public health insurance (Medicaid, Children's Health Insurance Program [CHIP], state or other government sponsored health plan, or military health plan).

§§§ Based on response to the question, "Is there a place that you usually go when sick or need advice about health?"

¶¶¶ Based on response to the question, "During the past 12 months, how many times have you seen a doctor or other health-care professional about your health, not including being hospitalized overnight?"

TABLE 2. Prevalence of selected characteristics among adults aged ≥18 years with uncontrolled hypertension,* by stage of hypertension† — National Health and Nutrition Examination Survey, United States, 2003–2010

	All uncontrolled hypertension												
	Mexican-American (n = 660)				White, non-Hispanic (n = 1,971)				Black, non-Hispanic (n = 1,018)				
Characteristic	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	p-value§
Sex													
Male	321	53.9	(49.7–58.2)	1.0	1,009	49.9	(47.9–51.8)	11.7	523	48.0	(44.9–51.2)	2.4	0.139
Female	339	46.1	(41.8–50.3)	0.9	962	50.1	(48.2–52.1)	11.7	495	52.0	(48.8–55.1)	2.6	
Age group (yrs)													
18–44	97	31.8	(27.1–36.5)	0.6	218	14.9	(12.5–17.3)	3.5	197	25.4	(22.3–28.4)	1.3	
45–64	271	39.6	(34.8–44.5)	0.8	587	42.0	(39.4–44.7)	9.8	477	50.4	(47.6–53.1)	2.5	<0.001
≥65	292	28.6	(24.8–32.3)	0.6	1,166	43.0	(40.3–45.8)	10.1	344	24.3	(21.0–27.5)	1.2	
Hypertension awareness¶													
Aware	366	51.4	(46.8–56.0)	1.0	1,201	59.4	(56.7–62.0)	13.9	700	66.3	(62.6–70.1)	3.3	<0.001
Unaware	294	48.6	(44.0–53.2)	0.9	770	40.6	(38.0–43.3)	9.5	318	33.7	(29.9–37.4)	1.7	
Hypertension treatment**													
Treated	274	35.9	(30.1–41.7)	0.7	936	44.0	(41.3–46.7)	10.3	549	50.7	(46.6–54.8)	2.5	0.001
Untreated	386	64.1	(58.3–69.9)	1.2	1,035	56.0	(53.3–58.7)	13.1	469	49.3	(45.2–53.4)	2.4	
Health-care coverage††													
Yes	441	59.3	(55.1–63.5)	1.2	1,783	89.4	(87.6–91.1)	20.9	825	77.7	(74.7–80.7)	3.8	<0.001
No	219	40.7	(36.5–44.9)	0.8	188	10.6	(8.9–12.4)	2.5	193	22.3	(19.3–25.3)	1.1	
Routine place for health care§§													
Yes	524	73.5	(69.1–77.9)	1.4	1,824	91.4	(89.7–93.2)	21.4	946	91.9	(89.7–94.1)	4.5	<0.001
No	136	26.5	(22.1–30.9)	0.5	147	8.6	(6.8–10.3)	2.0	72	8.1	(5.9–10.3)	0.4	
No. of times received health care in past year¶¶													
0	136	25.5	(21.6–29.4)	0.5	175	10.0	(7.9–12.0)	2.3	125	14.2	(11.7–16.7)	0.7	
1	109	18.6	(14.5–22.7)	0.4	253	15.8	(14.1–17.6)	3.7	135	13.7	(11.1–16.3)	0.7	<0.001
≥2	415	55.9	(51.0–60.8)	1.1	1,542	74.2	(71.9–76.5)	17.4	757	72.1	(69.0–75.2)	3.6	

	Stage 1 hypertension												
	Mexican-American (n = 435)				White, non-Hispanic (n = 1,429)				Black, non-Hispanic (n = 699)				
Characteristic	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	p-value§
Sex													
Male	227	57.1	(50.7–63.4)	0.8	779	52.9	(50.5–55.3)	9.4	381	50.4	(46.5–54.2)	1.7	0.212
Female	208	42.9	(36.6–49.3)	0.6	650	47.1	(44.7–49.5)	8.4	318	49.6	(45.8–53.5)	1.7	
Age group (yrs)													
18–44	81	37.4	(31.3–43.5)	0.5	190	17.3	(14.5–20.2)	3.1	157	28.3	(24.5–32.2)	1.0	
45–64	184	38.7	(32.8–44.6)	0.5	478	45.0	(41.9–48.0)	8.0	333	50.8	(47.0–54.5)	1.7	<0.001
≥65	170	23.9	(19.7–28.1)	0.3	761	37.7	(35.0–40.4)	6.7	209	20.9	(16.8–25.0)	0.7	
Hypertension awareness¶													
Aware	212	45.2	(40.5–50.0)	0.6	839	57.4	(54.3–60.5)	10.2	450	61.3	(57.4–65.2)	2.1	<0.001
Unaware	223	54.8	(50.0–59.5)	0.7	590	42.6	(39.5–45.7)	7.6	249	38.7	(34.8–42.6)	1.3	
Hypertension treatment**													
Treated	153	30.0	(24.6–35.4)	0.4	644	42.1	(39.1–45.2)	7.5	358	47.4	(43.5–51.4)	1.6	<0.001
Untreated	282	70.0	(64.6–75.4)	1.0	785	57.9	(54.8–60.9)	10.3	341	52.6	(48.6–56.5)	1.8	
Health-care coverage††													
Yes	287	58.4	(53.5–63.4)	0.8	1,279	88.9	(86.9–90.8)	15.8	576	79.4	(76.1–82.6)	2.7	<0.001
No	148	41.6	(36.6–46.5)	0.6	150	11.1	(9.2–13.1)	2.0	123	20.6	(17.4–23.9)	0.7	
Routine place for health care§§													
Yes	342	72.7	(66.9–78.5)	1.0	1,314	91.0	(88.9–93.0)	16.2	650	92.1	(89.7–94.4)	3.1	<0.001
No	93	27.3	(21.5–33.1)	0.4	115	9.0	(7.0–11.1)	1.6	49	7.9	(5.6–10.3)	0.3	
No. of times received health care in past year¶¶													
0	95	26.9	(22.3–31.4)	0.4	128	10.0	(7.8–12.1)	1.8	80	13.7	(11.0–16.4)	0.5	
1	75	18.9	(14.2–23.6)	0.3	194	16.4	(14.3–18.4)	2.9	96	14.3	(11.3–17.3)	0.5	<0.001
≥2	265	54.2	(48.2–60.2)	0.7	1,106	73.6	(71.1–76.2)	13.1	522	72.0	(68.7–75.3)	2.5	

See table footnotes on page 354.

Mexican-Americans (59.3%) compared with blacks (77.7%) and whites (89.4%). However, among all persons with uncontrolled hypertension who were treated, the proportion who had health-care coverage was lower for Mexican-Americans (75.0%) compared with blacks (86.9%) and whites (94.4%). Awareness and treatment increased from stage 1 to stage 2 hypertension across all racial/ethnic groups.

TABLE 2. (*Continued*) Prevalence of selected characteristics among adults aged ≥18 years with uncontrolled hypertension,* by stage of hypertension† — National Health and Nutrition Examination Survey, United States, 2003–2010

	Stage 2 hypertension												
	Mexican-American (n = 225)				White, non-Hispanic (n = 542)				Black, non-Hispanic (n = 319)				
Characteristic	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	Sample size	%	(95% CI)	No. in population (in millions)	p-value§
Sex													
Male	94	46.6	(39.9–53.2)	0.3	230	40.1	(36.3–44.0)	2.2	142	42.8	(37.0–48.5)	0.7	0.310
Female	131	53.4	(46.8–60.1)	0.3	312	59.9	(56.0–63.7)	3.3	177	57.2	(51.5–63.0)	0.9	
Age group (yrs)													
18–44	16	18.7	(11.4–26.1)	0.1	28	7.1	(4.0–10.3)	0.4	40	18.7	(13.4–24.1)	0.3	
45–64	87	41.8	(34.6–49.0)	0.2	109	32.7	(28.4–37.0)	1.8	144	49.5	(44.1–54.9)	0.8	<0.001
≥65	122	39.5	(32.2–46.8)	0.2	405	60.2	(55.5–64.8)	3.4	135	31.8	(26.9–36.6)	0.5	
Hypertension awareness¶													
Aware	154	66.0	(55.7–76.2)	0.4	362	65.7	(61.6–69.7)	3.7	250	77.6	(71.8–83.4)	1.2	0.010
Unaware	71	34.0	(23.8–44.3)	0.2	180	34.3	(30.3–38.4)	1.9	69	22.4	(16.6–28.2)	0.3	
Hypertension treatment**													
Treated	121	49.9	(39.6–60.3)	0.3	292	49.9	(44.9–54.9)	2.8	191	58.0	(51.0–65.0)	0.9	0.163
Untreated	104	50.1	(39.7–60.4)	0.3	250	50.1	(45.1–55.1)	2.8	128	42.0	(35.0–49.0)	0.6	
Health-care coverage††													
Yes	154	61.3	(54.2–68.4)	0.4	504	90.9	(87.5–94.3)	5.1	249	74.1	(68.5–79.7)	1.1	<0.001
No	71	38.7	(31.6–45.8)	0.2	38	9.1	(5.7–12.5)	0.5	70	25.9	(20.3–31.5)	0.4	
Routine place for health care§§													
Yes	182	75.4	(68.3–82.5)	0.4	510	92.8	(90.3–95.2)	5.2	296	91.6	(87.2–96.0)	1.4	<0.001
No	43	24.6	(17.5–31.7)	0.1	32	7.2	(4.8–9.7)	0.4	23	8.4	(4.0–12.8)	0.1	
No. of times received health care in past year¶¶													
0	41	22.3	(16.7–27.9)	0.1	47	10.0	(7.0–13.0)	0.6	45	15.3	(11.2–19.4)	0.2	
1	34	17.9	(10.8–24.9)	0.1	59	14.0	(9.6–18.3)	0.8	39	12.5	(8.8–16.1)	0.2	0.005
≥2	150	59.8	(53.9–65.8)	0.3	436	76.0	(71.1–80.9)	4.2	235	72.3	(66.7–77.9)	1.1	

Abbreviation: CI = confidence interval.

* Defined as an average systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg.

† Stages of hypertension were stage 1 hypertension (SBP 140–159 or DBP 90–99) and stage 2 hypertension (SBP ≥160 or DBP ≥100).

§ Pearson chi-squared statistic, corrected for survey design.

¶ Based on responses to the following questions, "Have you ever been told by a doctor or other health-care professional that you had hypertension, also called high blood pressure?" and "Were you told on two or more different visits that you had hypertension or high blood pressure?"

** Based on whether the participant answered "yes" to both of the following questions: "Because of your high blood pressure, have you ever been told to take prescribed medicine?" and "Are you now taking prescribed medicine for high blood pressure?"

†† Participants were asked, "Are you covered by health insurance or some other health-care plan?"

§§ Based on response to the question, "Is there a place that you usually go when sick or need advice about health?"

¶¶ Based on response to the question, "During the past 12 months, how many times have you seen a doctor or other health-care professional about your health, not including being hospitalized overnight?"

Reported by

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Editorial Note

The results presented in this report indicate that during 2003–2010, racial/ethnic disparities existed among U.S. adults with hypertension and within hypertension stages for age, awareness, treatment, and health-care coverage. Mexican-Americans and blacks with hypertension were significantly younger than whites. This might reflect earlier onset of hypertension among these racial/ethnic groups (*5*). Awareness and treatment was highest among blacks. This association is consistent with previous studies (*6,7*) and might be a result of efforts to reduce the persistent high prevalence of hypertension among blacks. Although no significant difference was observed in hypertension treatment by race/ethnicity among those with stage 2 hypertension, treatment was low overall (50%–58%) in this high-risk group, for whom clinical guidelines recommend a two-drug combination (*3*). Data on the number or type of medication used by participants, including two-drug combinations, were not examined in this report. A greater proportion of blood pressure control among those treated for hypertension has been observed among Mexican-Americans (74%) and whites (75%) compared with blacks (62%) (*6*). To improve treatment and achieve the *Healthy People 2020* goal of blood pressure control in 61.2% of persons with hypertension (*8*) across all race/ethnic groups, targeted implementation of demonstrated, evidence-based community and clinical strategies is necessary (*1*).

In this study, the proportion of persons with health-care coverage was lowest among Mexican-Americans. Lack of health-care coverage has been associated with lower rates of

What is already known on this topic?

It has been previously reported that one in three U.S. adults had high blood pressure during 2009–2010, and approximately half (53.3%) had their condition under control. The prevalence of high blood pressure differs by race/ethnicity, with the condition being more common among blacks (40.4%) compared with whites (27.4%) and Mexican-Americans (26.1%).

What is added by this report?

Based on data from the National Health and Nutrition Examination Survey for the period 2003–2010, high blood pressure control differed for whites (48.6%), blacks (43.0%), and Mexican-Americans (35.5%). Among those with hypertension, the proportion with stage 2 hypertension was greater for Mexican-Americans (19.2%) and blacks (17.7%) compared with whites (12.3%).

What are the implications for public health practice?

To reduce the prevalence of uncontrolled high blood pressure and the associated racial/ethnic disparities, efforts are needed to increase hypertension awareness and hypertension treatment and adherence, especially in the Mexican-American population. The Million Hearts initiative focuses on addressing these issues by presenting a multifactorial approach focusing on reducing cardiovascular risk factors, such as high blood pressure, and tailoring this approach to effectively reach different racial/ethnic populations.

hypertension awareness, treatment, and control (*9*). This might partially explain the observed lower treatment and awareness of hypertension among Mexican-Americans in this report.

The findings in this report are subject to at least five limitations. First, although the focus of the study was to investigate racial/ethnic disparities within blood pressure stages, CDC did not consider other racial/ethnic groups or respondents who were multiracial because sample sizes were too small for meaningful analysis. Similarly, the study could not consider other Hispanic subpopulations or Hispanics as a whole because of differences in NHANES sample design between the 2003–2006 and 2007–2010 cycles. Second, hypertension awareness and treatment as well as other covariates were self-reported and subject to recall bias. Third, hypertension treatment was based only on medication use, not accounting for participants who were using lifestyle or dietary approaches to reduce blood pressure, which might have resulted in an underestimation of proportion of adults with hypertension who received "treatment." Fourth, because of a limited number of participants with stage 2 hypertension within each cycle of NHANES, changes over time in the estimates were not evaluated. Finally, NHANES examination response rates ranged from 75% to 77%.

Racial/ethnic disparities exist in blood pressure, awareness, treatment, and control, with Mexican-Americans having a lower awareness and treatment of hypertension, as well as less health-care coverage, compared with blacks and whites. Multiple national efforts target improvements in high blood pressure prevention, treatment, and control (*3*). The Million Hearts initiative, co-led by CDC and the Centers for Medicare and Medicaid Services, is focusing efforts on preventing 1 million heart attacks and strokes by 2017, partially achieved by increasing blood pressure control for 10 million persons in the United States (*10*).** Million Hearts is working to reduce cardiovascular disease risk factors through parallel efforts aimed at clinical settings and communities with a focus on the "ABCS" (i.e., appropriate aspirin use for those at risk, blood pressure control, cholesterol management, and smoking cessation). The initiative aims to improve prescription and patient adherence to appropriate medications for the ABCS, promote a heart-healthy lifestyle, and refine access to effective care, while bringing clinicians' attention to cardiovascular disease prevention, including appropriate drug regimens. Million Hearts also provides communities and clinical settings with resources and materials that are tailored for different racial/ethnic populations.

** Additional information available at http://millionhearts.hhs.gov/index.html.

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Prevention and Control of Influenza with Vaccines: Interim Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2013

This report summarizes recommendations approved on February 21, 2013, by the Advisory Committee on Immunization Practices (ACIP) for the use of influenza vaccines. An expanded 2013 ACIP influenza vaccination recommendation statement is scheduled to be published in *MMWR Recommendations and Reports* before the start of the 2013–14 influenza season. Providers should consult the expanded 2013 ACIP influenza vaccination statement for complete and updated information.

Vaccine Recommendations

Routine annual influenza vaccination is recommended for all persons aged ≥6 months. Immunization providers should consult Food and Drug Administration–approved prescribing information for 2013–14 influenza vaccines and the 2013–14 ACIP influenza recommendation statement for the most current information concerning indications, contraindications, and precautions.

Available Influenza Vaccines for 2013–14

Influenza vaccines that are currently licensed and expected to be available for the 2013–14 season and their approved age indications are summarized in a table available at http://www.cdc.gov/flu/professionals/acip/2013-interim-recommendations.htm#table1. The information in the table is current as of April 15, 2013. Any changes in product availability or other information will be reflected in the expanded 2013–14 ACIP influenza recommendations statement. The table lists four newly licensed influenza vaccines that are expected to be available during the 2013–14 influenza season. These vaccines are acceptable alternatives to other licensed products listed in the table, to the extent that their specific indications allow. For persons for whom more than one type of vaccine is appropriate and available, ACIP does not express a preference for use of any particular product over another.

Recommendations for routine use of vaccines in children, adolescents and adults are developed by the Advisory Committee on Immunization Practices (ACIP). ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the Director of the Centers for Disease Control and Prevention (CDC) on use of vaccines and related agents for the control of vaccine-preventable diseases in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), and the American College of Obstetrics and Gynecology (ACOG). Recommendations for routine use of vaccines in adults are harmonized with recommendations of AAFP, ACOG, and the American College of Physicians (ACP). ACIP recommendations adopted by the CDC Director become agency guidelines on the date published in the *Morbidity and Mortality Weekly Report* (*MMWR*). Additional information regarding ACIP is available at http://www.cdc.gov/vaccines/acip.

Note on Influenza Vaccine Abbreviations

Certain U.S. vaccine abbreviations have been revised by ACIP to refer to currently available influenza vaccines.* The revisions are as follows:

- The abbreviation TIV (trivalent influenza vaccine, previously used for inactivated influenza vaccines) has been replaced with the abbreviation IIV (inactivated influenza vaccine). For 2013–14, IIVs as a class will include 1) egg-based and cell culture-based trivalent inactivated influenza vaccine (IIV3), and 2) egg-based quadrivalent inactivated influenza vaccine (IIV4).
- RIV refers to recombinant hemagglutinin influenza vaccine, which will be available as a trivalent formulation (RIV3) for 2013–14.
- LAIV refers to live, attenuated influenza vaccine, which will be available as a quadrivalent formulation (LAIV4) for 2013–14.
- LAIV, IIV, and RIV denote vaccine categories; a numeric suffix specifies the number of influenza virus antigens contained in the vaccine.
- Where necessary to refer specifically to cell culture-based vaccine, the prefix "cc" is used (e.g., "ccIIV3").

Reported by

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Members of the Advisory Committee on Immunization Practices. Roster for July 2012–June 2013 available at http://www.cdc.gov/vaccines/acip/committee/members-archive/members-07-2012-06-2013.html.

*Additional information available at http://www.cdc.gov/vaccines/acip/committee/guidance/vac-abbrev.html.

Vital Signs: Evaluation of Hepatitis C Virus Infection Testing and Reporting — Eight U.S. Sites, 2005–2011

On May 7, 2013, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Abstract

Background: Hepatitis C virus (HCV) infection is a serious public health problem. New infections continue to occur, and morbidity and mortality are increasing among an estimated 2.7–3.9 million persons in the United States living with HCV infection. Most persons are unaware of their infection status. Existing CDC guidelines for laboratory testing and reporting of antibody to HCV do not distinguish between past infection that has resolved and current infection that requires care and evaluation for treatment. To identify current infection, a test for HCV RNA is needed.

Methods: Surveillance data reported to CDC from eight U.S. sites during 2005–2011 were analyzed to determine the proportion of persons newly reported on the basis of a positive test result for HCV infection. Persons reported with a positive result from an HCV antibody test only were compared with persons reported with a positive result for HCV RNA and examined by birth cohort (1945–1965 compared with all other years), surveillance site, and number of reported deaths. Annual rates of persons newly reported with HCV infection in 2011 also were calculated for each site.

Results: Of 217,755 persons newly reported, 107,209 (49.2%) were HCV antibody positive only, and 110,546 (50.8%) were reported with a positive HCV RNA result that confirmed current HCV infection. In both groups, persons were most likely to have been born during 1945–1965 (58.5% of those who were HCV antibody positive only; 67.2% of those who were HCV RNA positive). Among all persons newly reported for whom death data were available, 6,734 (3.4%) were known to have died; deaths were most likely among persons aged 50–59 years. In 2011, across all sites, the annual rate of persons newly reported with HCV infection (positive HCV antibody only and HCV RNA positive) was 84.7 per 100,000 population.

Conclusions: Hepatitis C is a commonly reported disease predominantly affecting persons born during 1945–1965, with deaths more frequent among persons of relatively young age. The lack of an HCV RNA test for approximately one half of persons newly reported suggests that testing and reporting must improve to detect all persons with current infection.

Implications for Public Health: In an era of continued HCV transmission and expanding options for curative antiviral therapies, surveillance that identifies current HCV infection can help assess the need for services and link persons with infection to appropriate care and treatment.

Introduction

In the United States, hepatitis C virus (HCV) infection is a common bloodborne infection. Based on data from national surveys, an estimated 3.2 (95% confidence interval [CI] = 2.7–3.9) million persons in the United States are living with hepatitis C (*1*). Once infected, approximately 80% of persons remain infected (i.e., chronically infected) and are at risk for substantial morbidity and mortality in later life (*2*). Although treatment can be curative, an estimated 45%–85% of infected persons are unaware of their HCV infection (*3*). HCV infection is a major cause of liver disease, including cirrhosis and liver cancer (*4–7*), and in the United States, is the leading indication for liver transplantation (*8*). Moreover, rates of liver cancer and deaths from HCV infection have increased over time; approximately 15,000 HCV-associated deaths were recorded in 2007 (*4,9*). In addition, considerable costs are associated with HCV infection, both in lost productivity and health-care expenditures (*10–11*).

CDC guidelines for HCV laboratory testing and reporting, published in 2003, do not focus on identifying persons with current infection (*12*); therefore, depending on the HCV test used, reports to surveillance programs can include persons with a test result indicating past HCV infection that has resolved and also persons with a test result that identifies current HCV infection. Analysis of state and local surveillance data can be used to assess the proportion of persons who might need additional testing to discriminate previous resolved infection from current infection. Analysis of such data also can estimate the number of persons with current HCV infection requiring clinical assessment for treatment, as well as guide prevention

strategies. In addition, these surveillance data can serve as a baseline for indirectly evaluating use of the recent HCV testing recommendations to identify HCV infection among persons born during 1945–1965, a group that demonstrates the highest prevalence of infection, compared with those born in other years (*3*). Finally, examining mortality patterns among persons reported with current HCV infection can improve understanding of the natural history of the disease.

Methods

In 2011, CDC supported surveillance for HCV infection at eight U.S. sites (Colorado, Connecticut, Minnesota, New Mexico, New York City, New York state, Oregon, and San Francisco). CDC began receiving data in 2005 from four sites (Colorado, Minnesota, New York state and Oregon), one site in 2006 (New Mexico), two sites in 2008 (New York City and San Francisco), and one site in 2009 (Connecticut). For all sites, clinical laboratories reported only positive test results of HCV infection (i.e., from HCV antibody testing or from HCV RNA testing); health departments did not require reporting of negative results. Reports were reviewed and de-duplicated to ensure that persons with newly reported positive HCV test results were included only once in the surveillance database.

For this analysis, persons reported to CDC during 2005–2011 were categorized as 1) reported with only a positive test result for HCV antibody (HCV antibody positive only) or 2) reported with a positive HCV RNA result from HCV nucleic acid testing or HCV genotyping (HCV RNA positive). Persons who tested HCV antibody positive only were considered as having had a past HCV infection that had resolved, a false-positive test result, or current HCV infection. Persons who tested HCV RNA positive were considered currently HCV infected. Although no laboratory test exists to distinguish acute from chronic HCV infection, for the purpose of this study all persons determined to be currently infected were considered to have chronic infection.

Each group (HCV antibody positive only and HCV RNA positive) was examined by birth cohort (1945–1965 compared with all other birth years) and surveillance site. Annual rates of all persons newly reported per 100,000 population in 2011 also were calculated for each site using denominators available from U.S. Census population estimates (available at http://www.census.gov/compendia/statab). In addition, seven of the sites reported the frequency of known deaths from any cause among persons newly reported with HCV infection. Sites matched their hepatitis C databases with vital records at the person level. Death status was examined by sex, age group, birth cohort, and type of test result (HCV antibody positive only or HCV RNA positive).

Results

During 2005–2011, among the eight sites, a total of 217,755 persons were newly reported with a positive test result for HCV infection. Of these, 107,209 (49.2%) were HCV antibody positive only and 110,546 (50.8%) were HCV RNA positive. In both groups, persons were more likely born during 1945–1965. Persons born during these years accounted for 58.5% of those who were HCV antibody positive only and 67.2% of those who were HCV RNA positive (Table 1). The distribution of persons reported on the basis of positive HCV antibody only varied by site, ranging from 76% in New Mexico to 23% in Minnesota (Figure). Among sites reporting deaths, 6,734 (3.4%) of 197,844 persons newly reported with HCV infection were known to have died. The highest percentage of these deaths occurred among persons aged 50–59 years (44.8%), and most deaths (71.5%) were among those born during 1945–1965, compared with other years. The percentage of deaths among persons reported with HCV antibody positive only (4.6%) was significantly higher than among those reported as HCV RNA positive (2.4%; $p<0.01$). In 2011, the annual rate of all persons newly reported with HCV infection (positive HCV antibody only and HCV RNA positive) across all sites was 84.7 per 100,000 population (range: 36.0 in Minnesota to 239.2 in San Francisco) (Table 2).

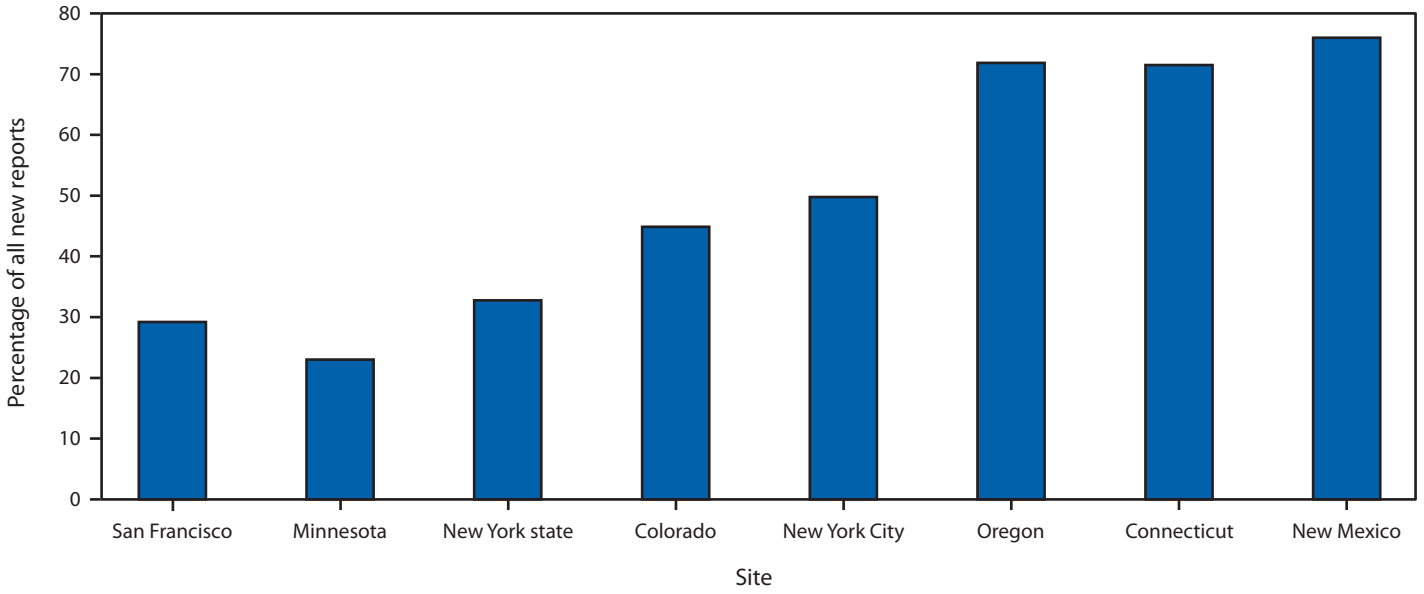
Conclusions and Comment

These data show that approximately one half of persons newly reported with HCV infection to state or local authorities at eight surveillance sites did not have a report of a positive HCV RNA test; thus, it was not possible to determine whether the reports indicated past resolved HCV infection or current HCV infection. Previous studies have shown similar results. A separate analysis of surveillance data reported for 2006–2007 found that 47.3% of persons reported with

TABLE 1. Percentage of persons newly reported with positive test results for hepatitis C virus (HCV) infection, by birth cohort and type of test result — eight U.S. sites, 2005–2011

	HCV antibody positive only		HCV RNA positive		Total	
Birth cohort	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**
Born during 1945–1965	62,728	(58.5)	74,270	(67.2)	**136,998**	**(62.9)**
Born in other years	44,481	(41.5)	36,276	(32.8)	**80,757**	**(37.1)**
Total	**107,209**	**(100.0)**	**110,546**	**(100.0)**	**217,755**	**(100.0)**

FIGURE. Percentage of persons newly reported with a positive result from a hepatitis C virus (HCV) antibody test only among all new reports with positive HCV test results, by site — eight U.S. sites, 2005–2011



positive HCV antibody did not have HCV RNA test results (*13*). A multisite cohort study of patients in care for chronic viral hepatitis revealed that 37.7% of 9,086 patients with a positive HCV antibody test during 2006–2008 had no documented follow-up testing for HCV RNA (*14*). A retrospective study of HCV antibody testing in selected U.S. primary-care settings among persons born during 1945–1965 found that, among patients who were antibody positive, 32% received no follow-up HCV RNA testing (*15*). In New York City, 33% of persons reported through routine surveillance did not have HCV RNA testing (*16*).

Given these findings and recent developments in both HCV testing technologies and clinical care for persons with HCV infection, CDC is amending the guidelines for HCV laboratory testing and result reporting that have been in use since 2003 (*12*). In guidance accompanying this Vital Signs report, CDC recommends following a positive HCV antibody test with HCV RNA testing (*17*). This guidance is also consistent with that provided in the 2012 HCV testing recommendations for persons born during 1945–1965 (*3*). The new guidelines will help identify persons with current HCV infection and provide the data necessary to link those who are infected to care, including preventive services, medical management, and evaluation for antiviral treatment.

An unexpected result was the finding of a significantly greater percentage of deaths among persons who were HCV antibody positive only compared with those who were HCV RNA positive. Because persons in the latter group have demonstrated current infection, they would be expected to fare less well than those who were HCV antibody positive only and might or might not be currently infected. The difference between the groups in the percentage of deaths might be explained by health-care access. HCV RNA testing might not be available in sites providing HCV antibody testing and RNA testing requires successful referral to a health-care provider. Thus, this finding could suggest that persons reported on the basis of a positive HCV antibody test only might have had less opportunity to access health care or might have accessed health care less often than those with current infection.

This study also revealed a high rate of reported HCV infection at these U.S. sites, especially among persons born during 1945–1965. These findings reinforce recent CDC recommendations for HCV antibody testing of persons born during 1945–1965, and linkage to care for those with a follow-up positive result after HCV RNA testing (*3*). These data further showed that deaths were more likely among persons aged 50–59 years and among persons born during 1945–1965 compared

TABLE 2. Number and rate per 100,000 population of persons newly reported with positive test results for hepatitis C virus (HCV) infection (HCV antibody positive only or HCV RNA positive), by site — eight U.S. sites, 2011

Site	No.	Site population	Rate per 100,000
Colorado	2,901	5,116,796	56.7
New Mexico	3,188	2,082,224	153.1
San Francisco	1,944	812,826	239.2
Minnesota	1,925	5,344,861	36.0
New York state	7,047	11,220,287	62.8
Oregon	5,464	3,871,859	141.1
Connecticut	2,898	3,580,709	80.9
New York City	8,749	8,244,910	106.1
Total	**33,919**	**40,274,472**	**84.7**

Key Points

- CDC guidelines for laboratory testing and result reporting of antibody to hepatitis C virus (HCV) published in 2003 and developed in the era of limited treatment options fail to identify many persons with current HCV infection. As such, about one half of persons newly reported with hepatitis C lack HCV RNA results, which are necessary to identify current infection.
- In 2011, the overall annual rate of persons newly reported with hepatitis C was 84.7 per 100,000 population; rates varied by site.
- The highest percentage of persons with current HCV infection and the highest percentage of deaths among all persons newly reported with hepatitis C were among those born during 1945–1965, particularly those aged 50–59 years.
- Additional information is available at http://www.cdc.gov/vitalsigns.

with those born in other years, illustrating the important impact of HCV infection on years of life lost.

The findings in this report are subject to at least five limitations. First, state and local health departments only report positive HCV test results to CDC. Thus, it was not known whether persons who were reported HCV antibody positive only might actually have been tested for HCV RNA with a negative result. Another possibility is that HCV RNA testing was performed with a positive result, but was not reported. Second, some positive HCV antibody test results might have been false-positives. However, the high specificity of 3rd generation HCV antibody assays used during the period of study would have minimized the number of false positives (*18*). Third, among sites, there was variation in reporting by health-care providers, laboratories, and health departments, which might affect the consistency of the information reported. For example, the Connecticut hepatitis C surveillance system did not enter HCV RNA results for persons reported with a positive antibody test that previously had been confirmed to be positive for antibody to HCV by another laboratory test. Fourth, some sites began reporting surveillance data to CDC in 2006 or 2008, and in one case, 2009, thereby underestimating the number of cases reported during the entire 2005–2011 study period. In contrast, the number of deaths reported was from all-cause mortality, and therefore was likely an overestimation of HCV-attributable mortality. Finally, HCV surveillance data might not be representative of all persons with HCV infection, and the findings from these eight sites might not be representative of other U.S. cities and states.

Monitoring current HCV infection in states and localities can help gauge what interventions and services are needed to identify persons with HCV infection and effectively link them to appropriate care and treatment. This is of particular importance now in an era of continued HCV transmission and rapidly improving therapeutic options for persons living with HCV infection. To help identify persons with current HCV infection, public health and clinical care providers can offer HCV antibody testing to persons born during 1945–1965, in addition to those with other HCV risk factors, and test for HCV RNA those persons who test positive for HCV antibody. Laboratories can ensure that test results are reported to state and local health authorities, and health departments can develop strategies to monitor and increase the use of HCV RNA testing of persons who are HCV antibody positive.

Reported by

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Testing for HCV Infection: An Update of Guidance for Clinicians and Laboratorians

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In the United States, an estimated 4.1 million persons have been infected with hepatitis C virus (HCV), of whom an estimated 3.2 (95% confidence interval [CI] = 2.7–3.9) million are living with the infection (*1*). New infections continue to be reported particularly among persons who inject drugs and persons exposed to HCV-contaminated blood in health-care settings with inadequate infection control (*2*).

Since 1998, CDC has recommended HCV testing for persons with risks for HCV infection (*3*). In 2003, CDC published guidelines for the laboratory testing and result reporting of antibody to HCV (*4*). In 2012, CDC amended testing recommendations to include one-time HCV testing for all persons born during 1945–1965 regardless of other risk factors (*1*).

CDC is issuing this update in guidance because of 1) changes in the availability of certain commercial HCV antibody tests, 2) evidence that many persons who are identified as reactive by an HCV antibody test might not subsequently be evaluated to determine if they have current HCV infection (*5*), and 3) significant advances in the development of antiviral agents with improved efficacy against HCV (*6*). Although previous guidance has focused on strategies to detect and confirm HCV antibody (*3,4*), reactive results from HCV antibody testing cannot distinguish between persons whose past HCV infection has resolved and those who are currently HCV infected. Persons with current infection who are not identified as currently infected will not receive appropriate preventive services, clinical evaluation, and medical treatment. Testing strategies must ensure the identification of those persons with current HCV infection.

This guidance was written by a workgroup convened by CDC and the Association of Public Health Laboratories (APHL), comprising experts from CDC, APHL, state and local public health departments, and academic and independent diagnostic testing laboratories, in consultation with experts from the Veterans Health Administration and the Food and Drug Administration (FDA). The workgroup reviewed laboratory capacities and practices relating to HCV testing, data presented at the CDC 2011 symposium on identification, screening and surveillance of HCV infection (*7*), and data from published scientific literature on HCV testing. Unpublished data from the American Red Cross on validation of HCV antibody testing also were reviewed.

Changes in HCV Testing Technologies

Since the 2003 guidance was published (*4*), there have been two developments with important implications for HCV testing:

1. Availability of a rapid test for HCV antibody. The OraQuick HCV Rapid Antibody Test (OraSure Technologies) is a rapid assay for the presumptive detection of HCV antibody in fingerstick capillary blood and venipuncture whole blood. Its sensitivity and specificity are similar to those of FDA–approved, laboratory-conducted HCV antibody assays (*8*). In 2011, a Clinical Laboratory Improvements Amendments waiver was granted to the test by FDA. The waiver provides wider testing access to persons at risk for HCV infection, permitting use of the assay in nontraditional settings such as physician offices, hospital emergency departments, health department clinics, and other freestanding counseling and testing sites.
2. Discontinuation of RIBA HCV. The Chiron RIBA HCV 3.0 Strip Immunoblot Assay (Novartis Vaccines and Diagnostics) that was recommended (*4*) for supplemental testing of blood samples after initial HCV antibody testing is no longer available. As a result, the only other FDA-approved supplemental tests for HCV infection are those that detect HCV viremia.

Identifying Current HCV Infections

In 2011, FDA approved boceprevir (Victrelis, Merck & Co.) and telaprevir (Incivek, Vertex Pharmaceuticals) for treatment of chronic hepatitis C genotype 1 infection, in combination with pegylated interferon and ribavirin, in adult patients with compensated liver disease. Boceprevir and telaprevir interfere directly with HCV replication. Persons who complete treatment using either of these drugs combined with pegylated interferon and ribavirin are more likely to clear virus (i.e., have virologic cure), compared to those given standard therapy based on pegylated interferon and ribavirin (*9*). Viral clearance, when sustained, stops further spread of HCV and is associated with reduced risk for hepatocellular carcinoma (*10*) and all-cause mortality (*11*). Other compounds under study in clinical trials hold promise for even more effective therapies (*6*).

Because antiviral treatment is intended for persons with current HCV infection, these persons need to be distinguished from persons whose infection has resolved. HCV RNA in blood, by nucleic acid testing (NAT), is a marker for HCV viremia and is detected only in persons who are currently infected. Persons with reactive results after HCV antibody testing should be evaluated for the presence of HCV RNA in their blood.

Benefits of Testing for Current HCV Infection

Accurate testing to identify current infection is important to 1) help clinicians and other providers correctly identify persons infected with HCV, so that preventive services, care and treatment can be offered; 2) notify tested persons of their infection status, enabling them to make informed decisions about medical care and options for HCV treatment, take measures to limit HCV-associated disease progression (e.g., avoidance or reduction of alcohol intake, and vaccination against hepatitis A and B), and minimize risk for transmitting HCV to others; and 3) inform persons who are not currently infected of their status and the fact that they are not infectious.

Recommended Testing Sequence

The testing sequence in this guidance is intended for use by primary care and public health providers seeking to implement CDC recommendations for HCV testing (*1,3,4*). In most cases, persons identified with HCV viremia have chronic HCV infection. This testing sequence is not intended for diagnosis of acute hepatitis C or clinical evaluation of persons receiving specialist medical care, for which specific guidance is available (*12*).

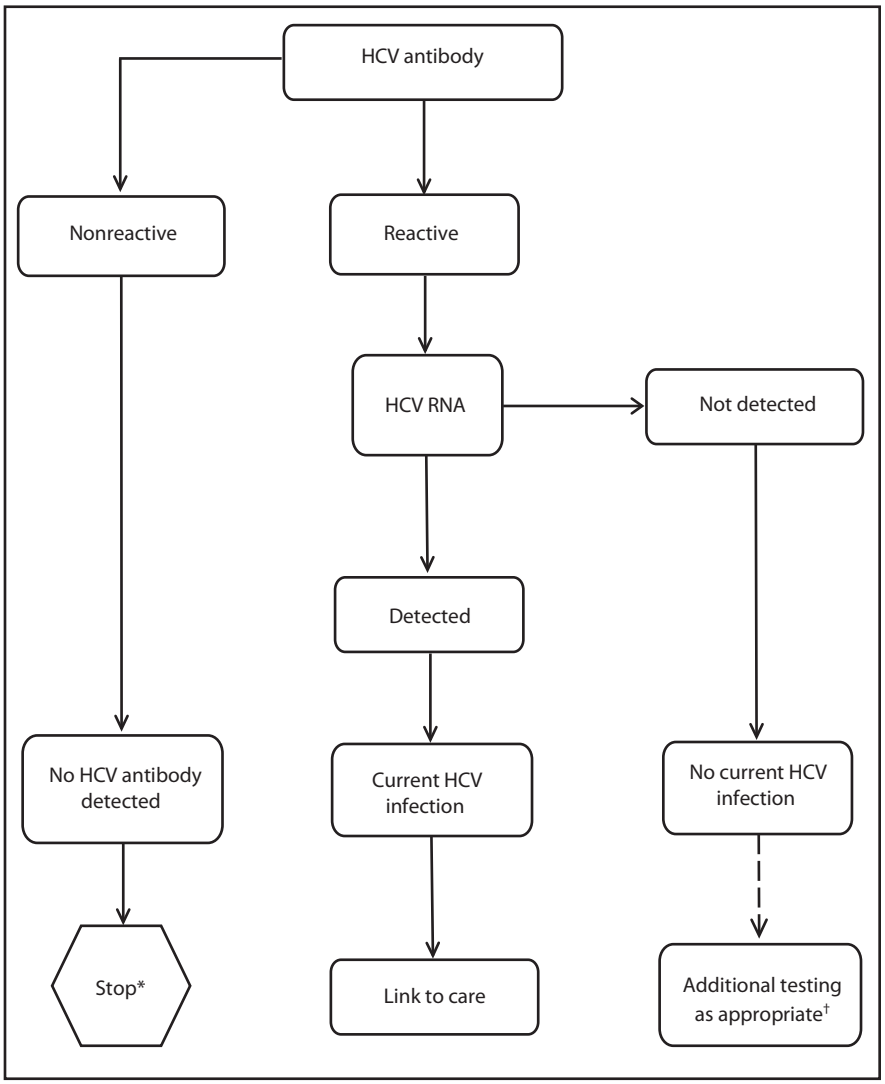
Testing for HCV infection begins with either a rapid or a laboratory-conducted assay for HCV antibody in blood (Figure). A nonreactive HCV antibody result indicates no HCV antibody detected. A reactive result indicates one of the following: 1) current HCV infection, 2) past HCV infection that has resolved, or 3) false positivity. A reactive result should be followed by NAT for HCV RNA. If HCV RNA is detected, that indicates current HCV infection. If HCV RNA is not detected, that indicates either past, resolved HCV infection, or false HCV antibody positivity.

Initial Testing for HCV Antibody. An FDA-approved test for HCV antibody should be used. If the OraQuick HCV Rapid Antibody Test is used, the outcome is reported as reactive or nonreactive. If a laboratory-based assay is used, the outcome is reported as reactive or nonreactive without necessarily specifying signal-to-cutoff ratios.

Testing for HCV RNA. An FDA-approved NAT assay intended for detection of HCV RNA in serum or plasma from blood of at-risk patients who test reactive for HCV antibody should be used. There are several possible operational steps toward NAT after initial testing for HCV antibody:

1. Blood from a subsequent venipuncture is submitted for HCV NAT if the blood sample collected is reactive for HCV antibody during initial testing.
2. From a single venipuncture, two specimens are collected in separate tubes: one tube for initial HCV antibody testing; and a second tube for HCV NAT if the HCV antibody test is reactive.

FIGURE. Recommended testing sequence for identifying current hepatitis C virus (HCV) infection



* For persons who might have been exposed to HCV within the past 6 months, testing for HCV RNA or follow-up testing for HCV antibody is recommended. For persons who are immunocompromised, testing for HCV RNA can be considered.

† To differentiate past, resolved HCV infection from biologic false positivity for HCV antibody, testing with another HCV antibody assay can be considered. Repeat HCV RNA testing if the person tested is suspected to have had HCV exposure within the past 6 months or has clinical evidence of HCV disease, or if there is concern regarding the handling or storage of the test specimen.

3. The same sample of venipuncture blood used for initial HCV antibody testing, if reactive, is reflexed to HCV NAT without another blood draw for NAT (*13*).
4. A separate venipuncture blood sample is submitted for HCV NAT if the OraQuick HCV Rapid Antibody Test for initial testing of HCV antibody has used fingerstick blood.

Supplemental Testing for HCV Antibody

If testing is desired to distinguish between true positivity and biologic false positivity for HCV antibody, then, testing may be done with a second HCV antibody assay approved by FDA for diagnosis of HCV infection that is different from the assay used for initial antibody testing. HCV antibody assays vary according to their antigens, test platforms, and performance characteristics, so biologic false positivity is unlikely to be exhibited by more than one test when multiple tests are used on a single specimen (*14*).

Test Interpretation and Further Action

See Table.

Laboratory Reporting

"Acute hepatitis C" and "hepatitis C (past or present)" are nationally notifiable conditions, and are subject to mandated reporting to health departments by clinicians and laboratorians, as determined by local, state or territorial law and regulation. Surveillance case definitions are developed by the Council of State and Territorial Epidemiologists in collaboration with CDC (*15*). In all but a few jurisdictions, positive results from HCV antibody and HCV RNA testing that are indicative of acute, or past or present HCV infection, are reportable. Specific policies for laboratory reporting are found at health department websites (*16*).

Future Studies

Research, development, validation, and cost-effectiveness studies are ongoing to inform the best practices for detecting HCV viremia and for distinguishing between resolved HCV infection and biologic false positivity for HCV antibody in persons in whom HCV RNA is not detected. Outcomes of these studies will provide comprehensive guidance on testing, reporting, and clinical management, and will improve case definitions for disease notification and surveillance.

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TABLE. Interpretation of results of tests for hepatitis C virus (HCV) infection and further actions

Test outcome	Interpretation	Further action
HCV antibody nonreactive	No HCV antibody detected	Sample can be reported as nonreactive for HCV antibody. No further action required. If recent HCV exposure in person tested is suspected, test for HCV RNA.*
HCV antibody reactive	Presumptive HCV infection	A repeatedly reactive result is consistent with current HCV infection, or past HCV infection that has resolved, or biologic false positivity for HCV antibody. Test for HCV RNA to identify current infection.
HCV antibody reactive, HCV RNA detected	Current HCV infection	Provide person tested with appropriate counseling and link person tested to medical care and treatment.†
HCV antibody reactive, HCV RNA not detected	No current HCV infection	No further action required in most cases. If distinction between true positivity and biologic false positivity for HCV antibody is desired, and if sample is repeatedly reactive in the initial test, test with another HCV antibody assay. In certain situations§ follow up with HCV RNA testing and appropriate counseling.

* If HCV RNA testing is not feasible and person tested is not immunocompromised, do follow-up testing for HCV antibody to demonstrate seroconversion. If the person tested is immunocompromised, consider testing for HCV RNA.
† It is recommended before initiating antiviral therapy to retest for HCV RNA in a subsequent blood sample to confirm HCV RNA positivity.
§ If the person tested is suspected of having HCV exposure within the past 6 months, or has clinical evidence of HCV disease, or if there is concern regarding the handling or storage of the test specimen.

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Emergence of Avian Influenza A(H7N9) Virus Causing Severe Human Illness — China, February–April 2013

On May 1, 2013, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

On March 29, 2013, the Chinese Center for Disease Control and Prevention completed laboratory confirmation of three human infections with an avian influenza A(H7N9) virus not previously reported in humans (*1*). These infections were reported to the World Health Organization (WHO) on March 31, 2013, in accordance with International Health Regulations. The cases involved two adults in Shanghai and one in Anhui Province. All three patients had severe pneumonia, developed acute respiratory distress syndrome (ARDS), and died from their illness (*2*). The cases were not epidemiologically linked. The detection of these cases initiated a cascade of activities in China, including diagnostic test development, enhanced surveillance for new cases, and investigations to identify the source(s) of infection. No evidence of sustained human-to-human transmission has been found, and no human cases of H7N9 virus infection have been detected outside China, including the United States. This report summarizes recent findings and recommendations for preparing and responding to potential H7N9 cases in the United States. Clinicians should consider the diagnosis of avian influenza A(H7N9) virus infection in persons with acute respiratory illness and relevant exposure history and should contact their state health departments regarding specimen collection and facilitation of confirmatory testing.

Epidemiologic Investigation

As of April 29, 2013, China had reported 126 confirmed H7N9 infections in humans, among whom 24 (19%) died (*1*). Cases have been confirmed in eight contiguous provinces in eastern China (Anhui, Fujian, Henan, Hunan, Jiangsu, Jiangxi, Shandong, and Zhejiang), two municipalities (Beijing and Shanghai), and Taiwan (Figure 1). Illness onset of confirmed cases occurred during February 19–April 29 (Figure 2). The source of the human infections remains under investigation. Almost all confirmed cases have been sporadic, with no epidemiologic link to other human cases, and are presumed to have resulted from exposure to infected birds (*3,4*). Among 82 confirmed cases for which exposure information is available, 63 (77%) involved reported exposure to live animals, primarily chickens (76%) and ducks (20%) (*3*). However, at least three family clusters of two or three confirmed cases have been reported where limited human-to-human transmission might have occurred (*3*).

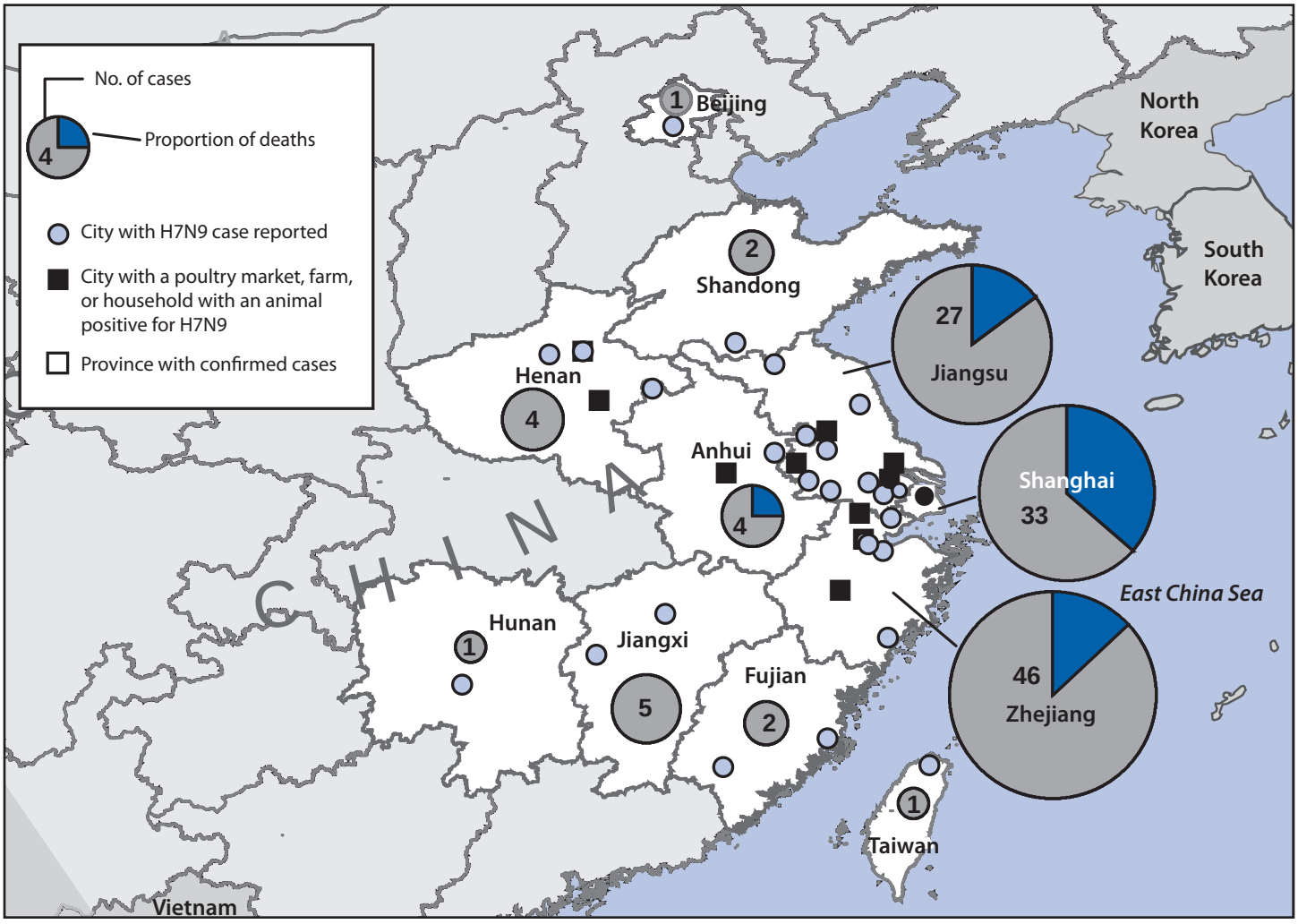
The median age of patients with confirmed infection is 61 years (interquartile range: 48–74); 17 (21%) of the cases are among persons aged ≥75 years and 58 (71%) of the cases are among males. Only four cases have been confirmed among children; in addition, a specimen from one asymptomatic child was positive for H7N9 by real-time reverse transcription–polymerase chain reaction (rRT-PCR). Among the 71 cases for which complete data are available, 54 (76%) patients had at least one underlying health condition (*3*). Most of the confirmed cases involved severe respiratory illness. Of 82 confirmed cases for which data were available as of April 17, 81 (99%) required hospitalization (*3*). Among those patients hospitalized, 17 (21%) died of ARDS or multiorgan failure, 60 (74%) remained hospitalized, and only four (5%) had been discharged (*3*).

Chinese public health officials have investigated human contacts of patients with confirmed H7N9. In a detailed report of a follow-up investigation of 1,689 contacts of 82 infected persons, including health-care workers who cared for those patients, no transmission to close contacts of confirmed cases was reported, although investigations including serologic studies are ongoing (*3*). In addition, influenza surveillance systems in China have identified no sign of increased community transmission of this virus. Seasonal influenza A(pH1N1) and influenza B viruses continue to circulate among persons in areas where H7N9 cases have been detected, and the Chinese Centers for Disease Control and Prevention has reported that rates of influenza-like illness are consistent with expected seasonal levels.

CDC, along with state and local health departments, is continuing epidemiologic and laboratory surveillance for influenza in the United States. On April 5, 2013, CDC requested state and local health departments to initiate enhanced surveillance for H7N9 among symptomatic patients who had returned from China in the previous 10 days (*5*). As of April 29, 37 such travelers had been reported to CDC by 18 states. Among those 37 travelers, none were found to have infection with H7N9; seven had an infection with a seasonal influenza virus, one had rhinovirus, one had respiratory syncytial virus, and 28 were negative for influenza A and B. Among 31 cases with known patient age, seven travelers were aged <18 years, 13 were aged 18–64 years, and 11 were aged ≥65 years. Additionally, influenza activity in the United States is low and continues to decrease, with morbidity and mortality surveillance systems reporting activity below seasonal baseline levels. Although low numbers of influenza viruses are being detected, the majority in recent weeks have been influenza B.*

* Additional information available at http://www.cdc.gov/flu/weekly.

FIGURE 1. Location of confirmed cases of human infection (n = 126) with avian influenza A(H7N9) virus and deaths (n = 24) — China, February 19–April 29, 2013



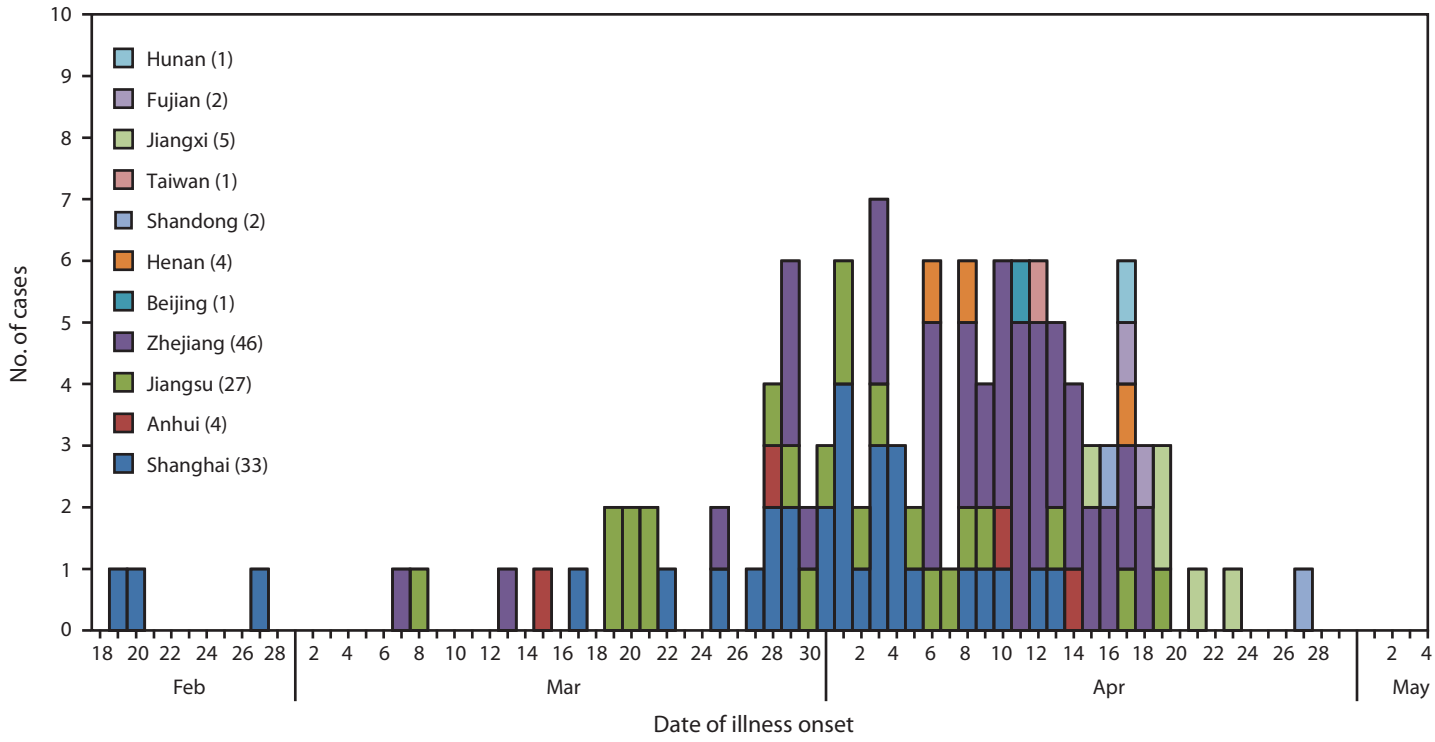
Laboratory Investigation

As of April 30, 2013, Chinese investigators had posted 19 partial or complete genome sequences from avian influenza A(H7N9) viruses to a publicly available database at the Global Initiative on Sharing All Influenza Data (http://www.gisaid.org). Sequences are from viruses infecting 12 humans and five birds, and two are from viruses collected from the environment. These sequences indicate that all eight genes of the H7N9 virus are of avian origin, with the closest phylogenetic relatives from three Eurasian influenza virus lineages (H7N3 from domestic ducks, H7N9 from wild birds, and H9N2 from birds widely distributed throughout East Asia). In addition, genetic changes in the sequences are present that have been associated with adaptations leading to enhanced virus binding to and replication in mammalian respiratory cells and increased severity of infection (*2,4,6*).

CDC's Influenza Division Laboratory has received two H7N9 influenza viruses (A/Anhui/1/2013 and A/Shanghai/1/2013) from the WHO Collaborating Centre for Reference and Research on Influenza at the Chinese Center for Disease Control and Prevention (Figure 3). Full characterization of these viruses is ongoing; however, studies to date have shown robust viral replication in eggs, cell culture, and the respiratory tract of animal models (ferrets and mice). At higher inoculum doses (10^6–10^4 plaque forming units), the virus shows some lethality for BALB/c mice.

Laboratory testing of the A/Anhui/1/2013 virus isolate at the Chinese Center for Disease Control and Prevention, CDC, and other laboratories indicates that this virus is susceptible to oseltamivir and zanamivir, the two neuraminidase-inhibiting (NAI) antiviral drugs licensed in the United States for treatment of seasonal influenza. The genetic sequence of one of the publicly posted H7N9 viruses (A/Shanghai/1/2013) contains a known marker of NAI

FIGURE 2. Number of confirmed cases of human infection with avian influenza A(H7N9) virus (N = 126), by date of onset of illness and province, municipality, or area — China, February 19–April 29, 2013



resistance (*2*). The clinical relevance of this genetic change is under investigation but it serves as a reminder that resistance to antiviral drugs can occur spontaneously through genetic mutations or emerge during antiviral treatment. The genetic sequences of all viruses tested showed a known marker of resistance to the adamantanes, indicating that, although these drugs (amantadine and rimantadine) are licensed for use in the United States, they should not be prescribed for patients with H7N9 virus infection.

Immediately after notification by Chinese health authorities of the H7N9 cases, CDC began development of a new H7 diagnostic test for use with the existing CDC influenza rRT-PCR kit. This test has been designed to diagnose infection with Eurasian H7 viruses, including the recently recognized China H7N9 and other representative H7 viruses from Southeast Asia and Bangladesh. On April 22, this new H7 test was cleared by the Food and Drug Administration for use as an in vitro diagnostic test under an Emergency Use Authorization, thus allowing distribution and use of the test in the United States. The CDC H7 rRT-PCR test is now available to all qualified U.S. public health and U.S. Department of Defense laboratories and WHO-recognized National Influenza Centers globally and can be ordered from the Influenza Reagent Resource (http://www.influenzareagentresource.org). Access to the CDC H7 rRT-PCR test protocol is available at http:/www.cdc.gov/flu/clsis. Guidance on appropriate biosafety levels for working with the virus and suspect clinical specimens is being developed.

Animal Investigation and U.S. Animal Health Preparedness Activities

As of April 26, reports from the China Ministry of Agriculture indicate that 68,060 bird and environmental specimens have been tested, 46 (0.07%) were confirmed H7N9-positive by culture (*7*). The H7N9 virus has been confirmed in chickens, ducks, pigeons (feral and captive), and environmental samples in four of the eight provinces and in Shanghai municipality (Figure 1). As of April 17, approximately 4,150 swine and environmental samples from farms and slaughterhouses were reported to have been tested; all swine samples were negative.[†] The China Ministry of Agriculture is jointly engaged with the National Health and Family Planning Commission in conducting animal sampling to assist in ascertaining the extent of the animal reservoir of the H7N9 virus. Sampling of animals is concentrated in the provinces and cities where human cases have been reported. Poultry markets in Shanghai and other affected areas have been closed temporarily, and some markets might remain closed.

[†] Additional information available at http://www.chinacdc.cn.

The U.S. Department of Agriculture (USDA) has set up a Situational Awareness Coordination Unit with a core team of subject matter experts and other USDA representatives, including the Animal and Plant Health Inspection Service (APHIS), the Agricultural Research Service (ARS), the Food Safety and Inspection Service, and the Foreign Agricultural Service. USDA and CDC are working collaboratively to understand the epidemiology of H7N9 infections among humans and animals in China. To date, no evidence of this strain of avian influenza A(H7N9) virus has been identified in animals in the United States. The U.S. government does not allow importation of live birds, poultry, and hatching eggs from countries affected with highly pathogenic avian influenza. The current U.S. surveillance program for avian influenza in commercial poultry actively tests for any form of avian influenza virus and would be expected to detect avian influenza A(H7N9) if it were introduced to the United States. A screening test for avian influenza is available from the National Animal Health Laboratory Network and the National Veterinary Services Laboratories (NVSL), which can be used together with confirmatory tests at NVSL to detect this strain of avian influenza A(H7N9) in poultry and wild bird samples.

APHIS is working with the U.S. Department of the Interior to prepare a pathway assessment, using current literature, to assess evidence for potential movement of Eurasian avian influenza viruses into North America via wild birds. USDA is conducting animal studies to characterize the virus pathogenicity and transmission properties of this virus in avian and swine species. Preliminary results from studies performed on poultry by ARS in high-containment laboratories indicate that chickens and quail are showing no signs of illness but are shedding avian influenza A(H7N9) virus in these studies (Southeast Poultry Research Laboratory, unpublished data; 2013). ARS also has completed a preliminary antigenic mapping study to help identify virus isolates that could be used to develop a vaccine for poultry if needed.

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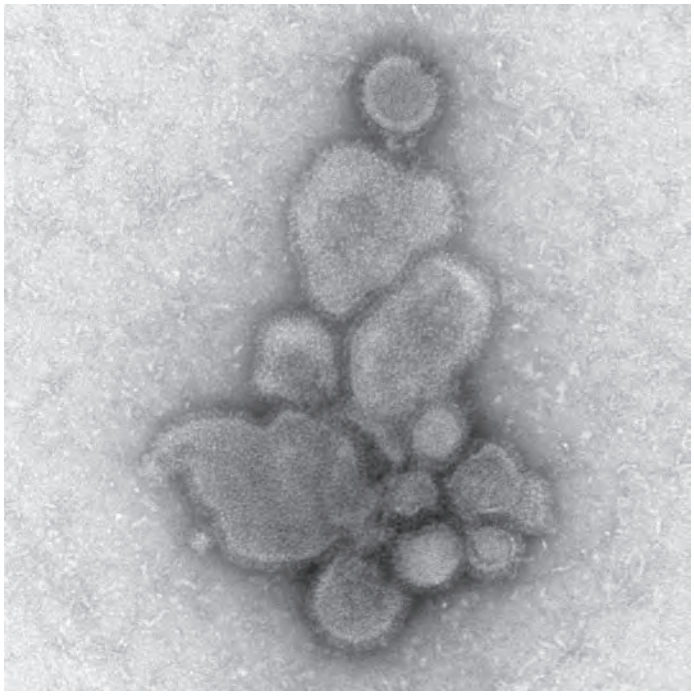
FIGURE 3. Electron micrograph image of influenza A/Anhui/1/2013 (H7N9), showing spherical virus particles characteristic of influenza virions — April 15, 2013



Photo/CDC

Editorial Note

After recognition of the first human infections with avian influenza A(H7N9), Chinese public health officials and scientists rapidly reported information about identified cases and posted whole virus genome sequences for public access. During April, laboratory and surveillance efforts quickly characterized the virus, developed diagnostic tests, generated candidate vaccine viruses, identified cases and contacts, described clinical illness, evaluated animal sources of infection, and implemented control measures. Preliminary investigations of patients and close contacts have not revealed evidence of sustained human-to-human transmission, but limited nonsustained human-to-human H7N9 virus transmission could not be excluded in a few family clusters (*3*). Despite these efforts, many questions remain.

The epidemiology of H7N9 infections in humans so far reveals that most symptomatic patients are older (median age: 61 years), most are male (71%), and most had underlying medical conditions. In comparison, among the 45 avian influenza A(H5N1) cases reported from China during 2003–2013, the median patient age is 26 years (*8*). This difference in median age might represent actual differences in exposure or susceptibility to H7N9 virus infection and clinical illness, or preliminary H7N9 case identification approaches might be more likely to capture cases in older persons. Ongoing surveillance and case-control studies are needed to better understand

What is already known on this topic?

Human infections with a new avian influenza A(H7N9) virus were first reported to the World Health Organization on March 31, 2013. Available information suggests that poultry is the source of infection in most cases. Although no evidence of sustained (ongoing) human-to-human spread of this virus has been identified; small family clusters have occurred where human-to-human spread cannot be conclusively ruled out.

What is added by this report?

By April 29, a total of 126 H7N9 human infections (including 24 deaths) had been confirmed. Although a number of travelers returning to the United States from affected areas of China have developed influenza-like symptoms and been tested for H7N9 infection, no cases have been detected in the United States. Laboratory and epidemiologic evidence suggest that this H7N9 virus is more easily transmitted from birds to humans than other avian influenza viruses. Candidate vaccine viruses are being evaluated and human clinical vaccine trials are forthcoming, but no decision has been made regarding a U.S. H7N9 vaccination program.

What are the implications for public health practice?

State and local health authorities are encouraged to review pandemic influenza preparedness plans to ensure response readiness. Clinicians in the United States should consider H7N9 virus infection in recent travelers from China who exhibit signs and symptoms consistent with influenza. Patients with H7N9 virus infection (laboratory-confirmed, probable, or under investigation) should receive antiviral treatment with oral oseltamivir or inhaled zanamivir as early as possible.

the epidemiology of H7N9 virus infections, and to determine whether younger persons might be more mildly affected, and therefore less likely to be detected via surveillance.

Available animal testing data and human case histories indicate that most human patients have poultry exposure; however, relatively few H7N9 virus–infected birds have been detected. During the month after recognition of H7N9, increasing numbers of infected humans have been identified in additional areas of eastern China, suggesting possible widespread occurrence of H7N9 virus in poultry. Enhanced surveillance in poultry and other birds in China is needed to better clarify the magnitude of H7N9 virus infection in birds and to better target control measures for preventing further transmission.

The emergence of this previously unknown avian influenza A(H7N9) virus as a cause of severe respiratory disease and death in humans raises numerous public health concerns. First, the virus has several genetic differences compared with other avian influenza A viruses. These genetic changes have been evaluated previously in ferret and mouse studies with other influenza A viruses, including highly pathogenic avian influenza A(H5N1) virus, and were associated with respiratory droplet transmission, increased binding of the virus to receptors on cells in the respiratory tract of mammals, increased virulence, and increased replication of virus (*5*). Epidemiologic investigations have not yielded conclusive evidence of sustained human-to-human H7N9 virus transmission; however, further adaptation of the virus in mammals might lead to more efficient and sustained transmission among humans. Second, human illness with H7N9 virus infection, characterized by lower respiratory tract disease with progression to ARDS and multiorgan failure, is significantly more severe than in previously reported infection with other H7 viruses. Over a 2-month period, 24 deaths (19% of cases) have occurred, compared with only one human death attributed to other subtypes of H7 virus reported previously. Third, H7N9-infected poultry are the likely source of infection in humans, but might not display illness symptoms. Consequently, efforts to detect infection in poultry and prevent virus transmission will be challenging for countries lacking a surveillance program for actively identifying low-pathogenicity avian influenza in poultry. In the United States, an active surveillance program is in place that routinely identifies low–pathogenicity viruses. If this newly recognized H7N9 is detected, public health and animal health officials should identify means for monitoring the spread of asymptomatic H7N9 virus infections in poultry and maintain vigilance for virus adaptation and early indications of potential human-to-human transmission.

Beginning in early April 2013, CDC and U.S. state and local health departments initiated enhanced surveillance for H7N9 virus infections in patients with a travel history to affected areas. A new CDC influenza rRT-PCR diagnostic test has been cleared by the Food and Drug Administration under an Emergency Use Authorization and is being distributed to public health laboratories to assist in evaluating these suspect cases. Clinicians should consider the possibility of H7N9 virus infection in patients with illness compatible with influenza who 1) have traveled within ≤10 days of illness onset to countries where avian influenza A(H7N9) virus infection recently has been detected in humans or animals, or 2) have had recent contact (within ≤10 days of illness onset) with a person confirmed to have infection with avian influenza A(H7N9) virus. Because of the potential severity of illness associated with avian influenza A(H7N9) virus infection, CDC recommends that all H7N9 patients (confirmed, probable, or under investigation for H7N9 infection) receive antiviral treatment with oseltamivir or zanamivir as early as possible. Treatment should be initiated even >48 hours after onset of illness. Guidance on testing, treatment, and infection control measures for H7N9 cases has been posted to the CDC H7N9 website (*9*).

On April 5, CDC posted a Travel Notice on the Traveler's Health website informing travelers and U.S. citizens living in China of the current H7N9 cases in China and reminding

them to practice good hand hygiene, follow food safety practices, and avoid contact with animals (*10*). CDC and WHO do not recommend restricting travel to China at this time. If travelers to China become ill with influenza signs or symptoms (e.g., fever, cough, or shortness of breath) during or after returning from their visit, they should seek medical treatment and inform their doctor about their recent travel. Travelers should continue to visit www.cdc.gov/travel or follow @CDCtravel on Twitter for up-to-date information about CDC's travel recommendations.

Given the number and severity of human H7N9 illnesses in China, CDC and its partners are taking steps to develop a H7N9 candidate vaccine virus. Past serologic studies evaluating immune response to H7 subtypes of influenza viruses have shown no existing cross-reactive antibodies in human sera. In addition, CDC has activated its Emergency Operations Center to coordinate efforts. In the United States, planning for H7N9 vaccine clinical trials is under way. Although no decision has been made to initiate an H7N9 vaccination program in the United States, CDC recommends that local authorities and preparedness programs take time to review and update their pandemic influenza vaccine preparedness plans because it could take several months to ready a vaccination program, if one becomes necessary. CDC also recommends that public health agencies review their overall pandemic influenza plans to identify operational gaps and to ensure administrative readiness for an influenza pandemic. Continued collaboration between the human and animal health sectors is essential to better understand the epidemiology and ecology of H7N9 infections among humans and animals and target control measures for preventing further transmission.

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Announcement

National Blood Pressure Education Month — May 2013

May is National Blood Pressure Education Month, dedicated to increasing awareness and educating patients and the public about hypertension and its impact on health. Hypertension, also known as high blood pressure, is a leading risk factor for cardiovascular disease and a major cause of morbidity and mortality (*1*). In the United States, nearly one in three adults (67 million persons) has hypertension. More than half of persons with hypertension do not have it under control, and 14 million adults with uncontrolled hypertension do not know they have hypertension (*2*). Hypertension contributes to nearly 1,000 deaths per day and costs the nation $47.5 billion in direct medical expenses each year (*1*).

Patients can achieve greater hypertension control by taking their medications as directed, measuring their own blood pressure, and eating a lower-sodium diet. Health-care providers and systems can use electronic health records, blood pressure monitoring, and a team-based care approach to help improve their patients' hypertension control (*3*).

Million Hearts, a U.S. Department of Health and Human Services initiative led by CDC and the Centers for Medicare and Medicaid Services, is focusing efforts to prevent 1 million heart attacks and strokes by 2017. Million Hearts is working to reduce hypertension by 1) educating health-care professionals, health systems, insurers, employers, and individuals about the link between blood pressure control and health, and 2) empowering all persons to make healthy choices, such as preventing or quitting tobacco use and reducing salt (sodium) and trans fat consumption, to decrease the number of persons who need medical treatment and to prevent heart attacks and strokes. Additional information about Million Hearts is available at http://millionhearts.hhs.gov. Additional information about hypertension is available from CDC at http://www.cdc.gov/bloodpressure.

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Erratum

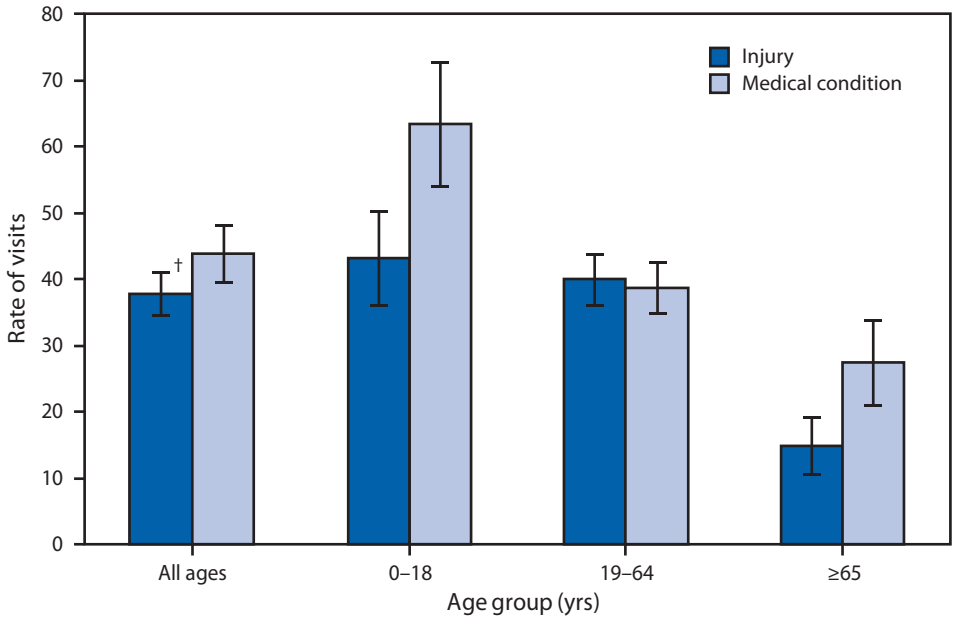
Vol. 62, No. 16

An error occurred on page 301, in the second sentence of the box, "Workers' Memorial Day — April 28, 2013." That sentence should read, "In 2011, a total of **4,609** U.S. workers died from work-related injuries (*1*)." However, this number was based on preliminary data from the Census of Fatal Occupational Injuries, which have since been revised and finalized. The final count of fatal work injuries in the United States in 2011 is **4,693**. Additional information is available at http://www.bls.gov/iif/oshwc/cfoi/cfoi_revised11.pdf.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Average Annual Rate of Eye-Related Emergency Department Visits for Injuries and Medical Conditions,* by Age Group — United States, 2007–2010



* Per 10,000 population, based on 4-year annual average.
† 95% confidence interval.

During 2007–2010, an average of 2.4 million eye-related visits were made to emergency departments (EDs) each year. During this period, 43.7 visits per 10,000 persons were the result of medical conditions, and 37.6 visits per 10,000 persons were the result of injuries. Significant differences in the reason for eye-related ED visits were observed by age group. Children and persons aged ≥65 years were more likely to visit the ED for an eye-related medical condition than an eye injury. The eye-related visit rate for a medical condition was highest among those aged ≤18 years (63.3 per 10,000 persons) and lowest among those aged ≥65 years (27.3).

Source: National Hospital Ambulatory Medical Care Survey. Available at http://www.cdc.gov/nchs/ahcd.htm.

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Data presented by the Notifiable Disease Data Team and 122 Cities Mortality Data Team in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333 or to *mmwrq@cdc.gov.*

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