

Invasive Cancer Incidence and Survival — United States, 2012

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Many factors contribute to changes in cancer incidence, including changes in risk exposures or changes in the use of cancer screening tests (1). To monitor changes in cancer incidence and assess progress toward achieving *Healthy People 2020* objectives,* CDC analyzed data from U.S. Cancer Statistics (USCS) for 2012, the most recent data available. USCS includes high quality incidence data from CDC's National Program of Cancer Registries (NPCR) and the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program, survival data from NPCR, and mortality data from the National Vital Statistics System (2). In 2012, a total of 1,529,078 invasive cancers were reported to cancer registries in the United States (excluding Nevada), for an annual incidence rate of 440 cases per 100,000 persons. Cancer incidence rates were higher among males (483) than females (412), highest among blacks (446), and ranged by state, from 371 to 515 per 100,000 persons (355 in Puerto Rico). The proportion of persons with cancer who survived ≥ 5 years after diagnosis was 66%. The proportion was the same for males and females (66%) but lower among blacks (60%) compared with whites (66%). These cancer incidence, survival, and mortality surveillance data are continually tracked and used by states to effectively plan health care allocation and support services.

Invasive cancers are all cancers excluding in situ cancers (except in the urinary bladder) and basal and squamous cell skin cancers. Data on new cases of invasive cancer diagnosed in 2012 (the most recent year available) were obtained from population-based cancer registries affiliated with NPCR and SEER programs in each state, the District of Columbia (DC), and Puerto Rico (2). For comparability with past estimates, data for the United States were restricted to the states and

DC, and data for Puerto Rico were analyzed separately. Data from DC and all states except Nevada met USCS publication criteria for 2012[†]; consequently, incidence data in this report cover 99% of the U.S. population. Cases were first classified by anatomic site using the *International Classification of Diseases for Oncology, Third Edition*.[§] Cases with hematopoietic histologies were further classified using the *World Health Organization Classification of Tumours of Haematopoietic and Lymphoid Tissues, Fourth Edition*.[¶] Breast cancers were characterized by stage at diagnosis using SEER *Summary Staging Manual 2000*^{**}; late-stage cancers included those diagnosed after they had spread regionally or metastasized.

[†] Cancer registries demonstrated that cancer incidence data were of high quality by meeting the six USCS publication criteria: 1) case ascertainment $\geq 90\%$ complete; 2) $\leq 5\%$ of cases ascertained solely on the basis of death certificate; 3) $\leq 3\%$ of cases missing information on sex; 4) $\leq 3\%$ of cases missing information on age; 5) $\leq 5\%$ of cases missing information on race; and 6) $\geq 97\%$ of registry's records passed a set of single-field and inter-field computerized edits that test the validity and logic of data components. Additional information available at <http://www.cdc.gov/uscs>.

[§] Additional information available at <http://codes.iarc.fr/>.

[¶] Additional information available at <http://www.bloodjournal.org/content/117/19/5019?ssoc-checked=true#T1>.

^{**} Additional information available at <http://seer.cancer.gov/tools/ssm>.

* As of 2015, *Healthy People 2020* objectives included improving the proportion of persons surviving ≥ 5 years after cancer diagnosis to 71.7%, reducing colorectal cancer incidence to 39.9 per 100,000 persons, reducing late-stage breast cancer incidence to 42.1 per 100,000 females, and reducing cervical cancer incidence to 7.2 per 100,000 females. Additional information available at <http://www.healthypeople.gov/2020/topicsobjectives2020/default.aspx>.

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Population denominators for incidence rates were race-, ethnicity-, and sex-specific county population estimates from the U.S. Census, as modified by SEER and aggregated to the state and national level.^{††} Annual incidence rates per 100,000 population were age-adjusted to the 2000 U.S. standard population.

A subset of the USCS data set includes the 5-year relative survival rate, defined as the proportion of persons surviving ≥ 5 years after cancer diagnosis compared with the proportion of survivors expected in a comparable group of cancer-free persons. These estimates were based on data from NPCR-funded states that met USCS publication criteria and conducted active case follow-up or linkage with CDC's National Center for Health Statistics National Death Index (3). For this report, 27 states met these criteria, covering 59% of the U.S. population. The 5-year relative survival rates were calculated for cases of cancer diagnosed during 2001–2011 with follow-up through 2011.^{§§}

In 2012, a total of 1,529,078 invasive cancers were diagnosed and reported to central cancer registries in the United States (excluding Nevada), including 767,366 among males and 761,712 among females (Table 1). The age-adjusted annual incidence for all cancers was 440 per 100,000 population: 483 per 100,000 in males and 412 per 100,000 in females. Among

^{††} Population estimates incorporate bridged single-race estimates derived from the original multiple race categories in the 2010 U.S. Census. Additional information available at <http://seer.cancer.gov/popdata/index.html> and <http://www.census.gov/popest/methodology/index.html>.

^{§§} Calculated using the Ederer II Actuarial method, which allows more recent diagnosis years to be included and adjusts for the shorter follow-up time.

persons aged < 20 years, 14,748 cancers were diagnosed in 2012 (Table 1). The rate per 100,000 persons for cancers diagnosed in 2012 increased with increasing age group (Table 1).

By cancer site, rates were highest for cancers of the female breast (122 per 100,000 females); prostate (105 per 100,000 males); lung and bronchus (60 per 100,000 persons); and colon and rectum (39 per 100,000 persons) (Table 1). These four sites accounted for approximately half of cancers diagnosed in 2012, including 224,147 female breast cancers, 177,489 prostate cancers, 210,828 lung and bronchus cancers, and 134,784 colon and rectum cancers. In 2012, cervical cancer incidence was 7 per 100,000 females, representing 12,042 reported cancers.

By state, in 2012, all-sites cancer incidence rates ranged from 371 to 515 per 100,000 persons (Figure). State site-specific cancer incidence rates ranged from 70 to 157 per 100,000 males for prostate cancer, 107 to 141 per 100,000 females for female breast cancer, 30 to 92 per 100,000 persons for lung cancer, 30 to 49 per 100,000 persons for colorectal cancer, and 4 to 10 per 100,000 females for cervical cancer (Figure). The *Healthy People 2020* target for reducing colorectal cancer incidence (≤ 39.9 per 100,000 persons) was reached in 30 states and the target for reducing cervical cancer incidence (≤ 7.2 per 100,000 females) was reached in 27 states. Compared with the states and DC, cancer incidence rates in Puerto Rico in 2012 were lower for all-sites cancer (355 per 100,000 persons), lung cancer (18 per 100,000 persons), and female breast cancer (93 per 100,000 females), but higher for prostate cancer

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TABLE 1. Number and annual age-adjusted rate,* of invasive cancers,† by sex, cancer site, race/ethnicity,§ and age group — National Program of Cancer Registries, and Surveillance, Epidemiology, and End Results Program, United States,¶ 2012

Characteristic	Overall		Males		Females	
	Rate	No. (%)	Rate	No. (%)	Rate	No. (%)
All sites	440.3	1,529,078 (100)	483.0	767,366 (100)	411.7	761,712 (100)
Prostate	—**	177,489 (12)	105.3	177,489 (23)	—	—
Female breast	—	224,147 (15)	—	—	122.2	224,147 (29)
Late-stage female breast	—	75,376	—	—	41.9	75,376
Lung and bronchus	60.4	210,828 (14)	71.6	111,395 (15)	52.1	99,433 (13)
Colon and rectum	38.9	134,784 (9)	44.8	70,204 (9)	34.1	64,580 (8)
Cervix uteri	—	12,042 (1)	—	—	7.4	12,042 (2)
Race/Ethnicity						
White	440.4	1,282,703 (84)	477.2	643,537 (84)	416.7	639,166 (84)
Black	446.1	165,559 (11)	528.2	83,484 (11)	391.5	82,075 (11)
American Indian/Alaska Native	269.0	8,139 (1)	273.8	3,729 (<1)	268.8	4,410 (1)
Asian and Pacific Islander	285.7	45,364 (3)	292.1	19,906 (3)	284.9	25,458 (3)
Hispanic	340.5	111,815 (7)	369.7	52,619 (7)	325.3	59,196 (8)
Age group (yrs)						
<20	18.0	14,748 (1)	18.8	7,881 (1)	17.1	6,867 (1)
20–49	155.2	189,203 (12)	113.7	69,673 (9)	196.3	119,530 (16)
50–64	798.3	498,286 (33)	841.7	255,904 (33)	758.7	242,382 (32)
65–74	1,765.3	414,745 (27)	2,095.7	229,303 (30)	1,477.9	185,442 (24)
≥75	2,171.8	412,096 (27)	2,707.1	204,605 (27)	1,817.2	207,491 (27)

* Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.

† Excludes basal and squamous cell carcinomas of the skin except when these occur on the skin of the genital organs, and in situ cancers except urinary bladder.

§ Racial categories are not mutually exclusive from Hispanic ethnicity; rates are not presented for cases with unknown or other race.

¶ Compiled from cancer registries in 49 states and the District of Columbia that meet the data quality criteria for all invasive cancer sites combined (covering approximately 99% of the U.S. population).

** Not applicable.

(151 per 100,000 males), colorectal cancer (43 per 100,000 persons), and cervical cancer (11 per 100,000 females) (Figure).

Among persons with cancer diagnosed during 2001–2011, the 5-year relative survival rate was 66% (Table 2). This percentage was similar for males and females. The 5-year relative survival was highest among persons who received a diagnosis of cancer before age 45 years (81%) and decreased with increasing age (Table 2). Among the most common cancer sites, 5-year relative survival was highest for prostate cancer (97%) and female breast cancer (88%), intermediate for colorectal cancer (64%), and lowest for lung cancer (18%) (Table 2). The 5-year relative survival after any cancer diagnosis was lower for blacks (60%) than for whites (66%), particularly black females (57%) compared with white females (66%) (Table 2).

Discussion

This report provides estimates of cancer incidence for 2012 in the United States and shows that *Healthy People 2020* targets were achieved in 30 states for reduced colorectal cancer incidence and 27 states for reduced cervical cancer incidence. Compared with 2011 (2), fewer prostate cancer cases were reported to cancer registries in 2012, resulting in lower prostate cancer incidence rates and lower all-sites cancer incidence rates. Decreases in prostate cancer incidence likely reflect decreased use of the prostate-specific antigen (PSA) test, following the U.S. Preventive Services Task Force recommendation in 2008 against the use of this test for prostate

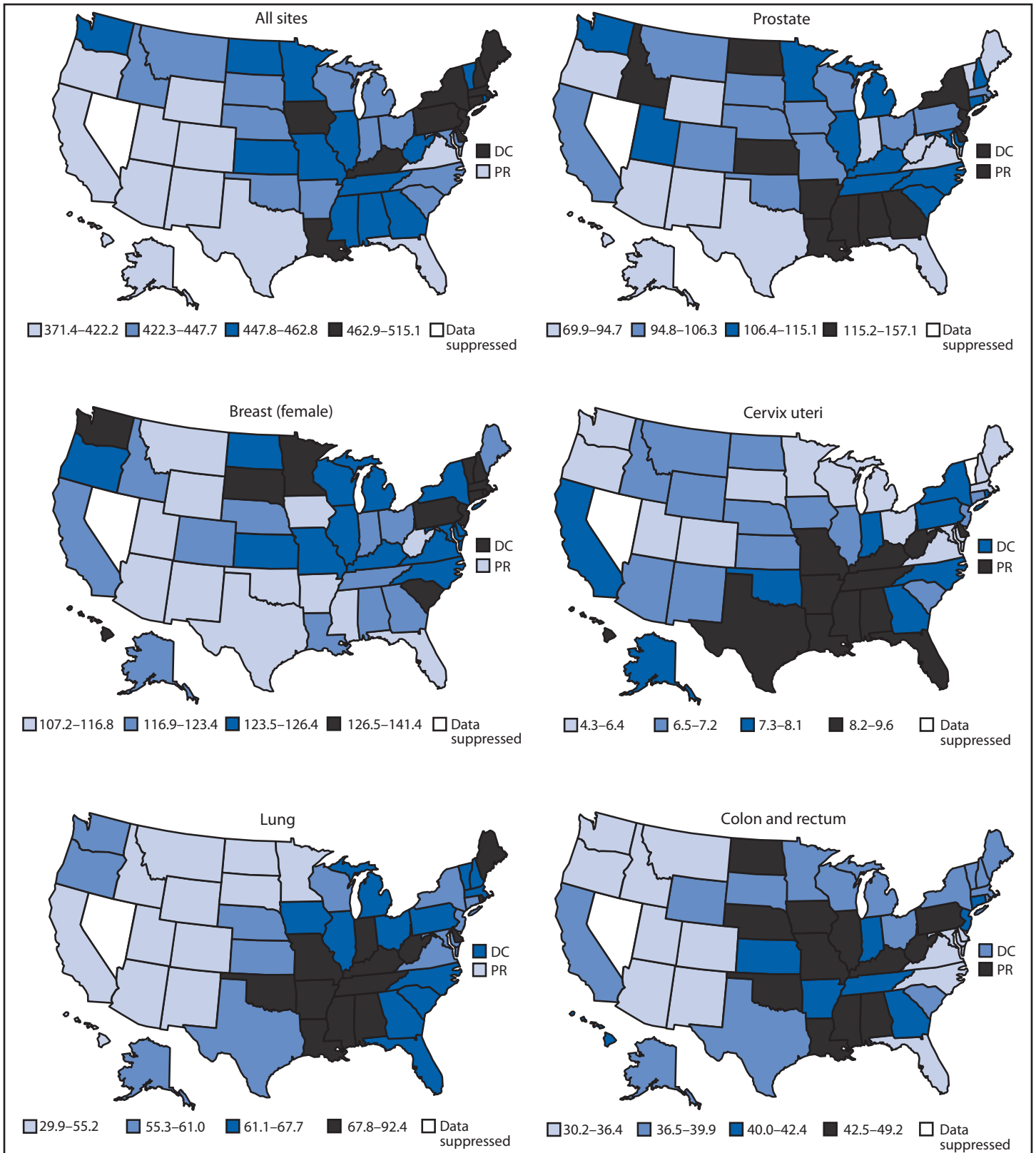
cancer screening for men aged ≥75 years and the expansion of this recommendation in 2012 to men of all ages (4). On the basis of data from the National Health Interview Survey, in 2008, 32% of men had a PSA test in the past year compared with 24% in 2013 (5). PSA-based prostate cancer screening increases the probability of overdiagnosis, leading to unnecessary treatment (4). In this report, 97% of men who received a diagnosis of prostate cancer survived ≥5 years after diagnosis.

As of 2015, the U.S. Preventive Services Task Force recommends population-based screening for colorectal, female breast, and cervical cancers among persons at average risk and for lung cancer in persons at high risk, and recommends against population-based screening for prostate, ovarian, pancreatic, and testicular cancers among persons at average risk.¶¶ Even with efforts to deliver screening services at appropriate intervals, some persons do not follow recommended cancer screening guidelines, either receiving screening when it is not recommended or not getting screened as frequently, or at all, as recommended (6). Health care providers play an important role in ensuring that all persons receive the screening tests they need at the right time.*** Evidence-based public health approaches are available to increase both patient and provider

¶¶ Additional information available at <http://www.uspreventiveservicestaskforce.org/Page/Name/recommendations>.

*** Additional information available at <http://www.thecommunityguide.org/cancer/screening/client-oriented/index.html>.

FIGURE. Age-adjusted rate* of invasive cancer by cancer site and jurisdiction — National Program of Cancer Registries and Surveillance, Epidemiology, and End Results Program, 50 States, the District of Columbia (DC), and Puerto Rico (PR), 2012



* Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.

TABLE 2. Five-year relative survival rates after cancer diagnosis,* by race, sex, cancer site, and age group — National Program of Cancer Registries, 27 States, 2001–2011†

Cancer site/Age group	Survival rates (%)								
	All races			Whites			Blacks		
	Overall	Males	Females	Overall	Males	Females	Overall	Males	Females
All sites	66	66	66	66	66	66	60	62	57
Prostate	— [§]	97	—	—	98	—	—	95	—
Female breast	—	—	88	—	—	90	—	—	79
Lung and bronchus	18	15	21	18	15	21	15	13	18
Colon and rectum	64	63	64	64	64	64	57	56	59
Cervix uteri	—	—	68	—	—	70	—	—	58
Age group (yrs)[¶]									
<45	81	76	84	82	78	85	70	63	74
45–54	72	67	77	74	68	78	63	60	65
55–64	69	69	69	69	69	70	63	65	58
65–74	64	67	61	65	67	61	60	66	52
≥75	52	55	49	53	55	50	45	51	40

* Based on cases of cancer diagnosed during 2001–2011 and follow-up of patients through 2011.

† Compiled from 27 cancer registries that met data quality criteria for survival analysis, covering approximately 59% of the U.S. population.

§ Not applicable.

¶ Age when cancer diagnosed.

Summary

What is already known on this topic?

Many factors contribute to changes in cancer incidence, including changes in risk exposures or changes in the use of cancer screening tests.

What is added by this report?

In 2012, a total of 1,529,078 new invasive cancers were diagnosed in the United States (excluding Nevada), for an annual incidence of 483 per 100,000 among males and 412 among females. All-sites cancer incidence rates ranged by state, from 371 to 515 per 100,000 persons, and was 355 per 100,000 persons in Puerto Rico. Fewer prostate cancer cases were reported to cancer registries in 2012 than in 2011, resulting in lower prostate cancer incidence rates and lower all-sites cancer incidence rates. *Healthy People 2020* targets for reducing cancer incidence rates were reached in 30 states for colorectal cancer and 27 states for cervical cancer. Approximately two of three persons survived ≥5 years after cancer diagnosis.

What are the implications for public health practice?

Public health officials use population-based cancer surveillance data to monitor cancer incidence, mortality, and survival to guide the planning of health care allocation and support services. Maximizing efforts to prevent cancer, to improve adherence to cancer screening recommendations, and to assure timely and appropriate cancer care for all persons is needed to achieve the national cancer objectives set forth in *Healthy People 2020*.

adherence to screening recommendations, access to appropriate screening, and timely follow-up of abnormal results (6).

Cancer incidence and survival data guide the planning and evaluation of cancer prevention and control programs. For example, in Indiana, cancer registry data were used to highlight

an increase in cancers related to obesity, underscoring the need to increase opportunities for physical activity through built environment strategies and school-based policy and systems change (7). These data also assist long-term planning for cancer diagnostic and treatment services. For example, linking Nebraska Cancer Registry data with Nebraska hospital discharge data found that lung cancer patients with multiple chronic conditions had lower survival, suggesting that these patients might need more intensive management of, and appropriate treatment for, both their cancer and other conditions (8). Finally, these data help public health officials set priorities for allocating health resources. For example, the Cancer Data Registry of Idaho indicated that colorectal and lung cancer incidence rates were higher in census tracts with a high proportion of uninsured persons, emphasizing the importance of reducing the number of persons who are uninsured in these areas (9). CDC annually provides cancer surveillance via several products, including USCS, CDC WONDER, State Cancer Facts, CDC's National Center for Health Statistics Research Data Centers, and the CDC Chronic Disease Indicators webtool.†††

The findings in this report are subject to at least three limitations. First, analyses based on race and ethnicity might be biased if race and ethnicity were systematically misclassified; ongoing efforts are made to ensure that this information is as accurate as possible.§§§ Second, delays in cancer reporting

††† Additional information available at <http://www.cdc.gov/cancer/npcr/database.htm>; <http://wonder.cdc.gov>; <http://www.statecancerprofiles.cancer.gov/incidencrates/index.php>; <http://www.cdc.gov/rdc/b1datatype/dt131.htm>; and <http://www.cdc.gov/cdi>.

§§§ Additional information available at http://www.cdc.gov/cancer/npcr/uscs/technical_notes/interpreting/race.htm.

might result in an underestimation of certain cancers; reporting delays are more common for cancers such as melanoma and prostate cancer that are diagnosed and treated in nonhospital settings such as physicians' offices (10). Finally, relative survival rates could only be calculated for white and black racial groups because accurate life tables were not available for other racial/ethnic groups.

Public health officials use population-based cancer surveillance data to monitor cancer incidence, mortality, and survival to help guide the planning of health care allocation and support services. Maximizing efforts to prevent cancer, improve adherence to cancer screening recommendations, and assure timely and appropriate cancer care for all persons is needed to achieve the national cancer objectives set forth in *Healthy People 2020*.

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State, regional, and Puerto Rico cancer registry personnel.

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Rabies in a Dog Imported from Egypt with a Falsified Rabies Vaccination Certificate — Virginia, 2015

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Canine rabies virus variant has been eliminated in the United States and multiple other countries. Globally, however, dogs remain the principal source for human rabies infections (1). The World Health Organization recommends that when dogs cross international borders, national importing authorities should require an international veterinary certificate attesting that the animal did not show signs of rabies at the time of shipment, was permanently identified, vaccinated, or revaccinated, and had been subjected to a serologic test for rabies before shipment (1). On June 8, 2015, an adult female dog that had recently been picked up from the streets of Cairo, Egypt, and shipped by a U.S. animal rescue organization to the United States was confirmed to have rabies by the Virginia Department of General Services Division of Consolidated Laboratory Services (DCLS). This dog was part of a large shipment of dogs and cats from Egypt that rescue organizations had distributed to multiple states for adoption. During the investigation, public health officials learned that the rabies vaccination certificate used for entry of the rabid dog into the United States had intentionally been falsified to avoid exclusion of the dog from entry under CDC's current dog importation regulations. This report underscores the ongoing risk posed by U.S. importation of domestic animals that have not been adequately vaccinated against rabies.

Case Report

On May 30, 2015, a shipment of eight dogs and 27 cats arrived at John F. Kennedy International Airport in New York City from Cairo, Egypt. The animals were distributed to several animal rescue groups and one permanent adoptive home in New Jersey, Pennsylvania, Maryland, and Virginia. Four dogs from the shipment arrived in Virginia on May 31, 2015, and were distributed to three foster homes associated with a Virginia-based rescue group (animal rescue group A).

On June 3, an adult female street dog (dog A) imported by animal rescue group A became ill. The dog had been imported with an unhealed fracture of the left forelimb, and 4 days after arrival at a foster home in Virginia, developed hypersalivation, paralysis, and hyperesthesia. Because of concern about rabies, a veterinarian euthanized the dog on June 5 and submitted brain tissue for rabies testing at DCLS. On June 8, DCLS confirmed rabies infection by direct fluorescent antibody testing

and contacted CDC to coordinate shipment of specimens to assist with variant typing. CDC determined that the variant was consistent with canine rabies virus circulating in Egypt.

Public Health Investigation

After DCLS confirmed the rabies diagnosis, the Virginia Department of Health, the New Jersey Department of Health, the New York City Department of Health and Mental Hygiene, and CDC initiated human and domestic animal rabies exposure assessments associated with the entire animal shipment. The infectious period for dog A was considered to have begun 10 days before symptom onset and continued until death (i.e., from May 24 to June 5) (2). The investigation also involved the Maryland Department of Health and Mental Hygiene, the Pennsylvania Department of Health, U.S. Customs and Border Protection, the foreign airline that transported the animals, the Egyptian Ministry of Health and Population, and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service.

Potential human exposures were identified by interviewing U.S.-based airline cargo staff members, the U.S. transporter, dog A's caretaker, and volunteers and employees associated with animal rescue group A. Upon the shipment's arrival in New York, eight persons were involved in moving the dogs and cats from the plane onto a transport trailer and then into the U.S. transporter's vehicle. The New York City Department of Health and Mental Hygiene interviewed these eight persons; all reported having worn leather gloves while handling the crates and having had no direct contact with the animals. Public health investigators determined that the animals did not have contact with each other during transport except for dog A and her puppy aged 10 weeks (dog B), which were transported in the same crate. Both dogs had reportedly been collected off the streets of Cairo 5 days before shipment.

Among the eight dogs in the Egyptian shipment, only dog A and two dogs aged 6 months (dogs F and G) had certificates indicating rabies vaccination at or after age 3 months and ≥ 30 days before arrival at a U.S. port of entry (Table), as required by CDC dog importation regulations (3). Following dog A's rabies diagnosis, rescue workers reported that the dog's vaccination certificate had been intentionally predated in Egypt.

TABLE. Age and reported rabies vaccination or revaccination dates for eight dogs shipped from Egypt to the United States on May 30, 2015

Dog	Information provided on Egyptian rabies vaccination certificate		Final U.S. destination	Vaccination or revaccination after arrival in the United States	
	Age or date of birth	Date of rabies vaccination		Date of U.S. rabies vaccination or revaccination	End of confinement period*
A	2 yrs	April 25, 2015	Virginia	Not applicable	Not applicable
B	10 wks	Not vaccinated	Virginia	June 9, 2015 and July 31, 2015	September 1, 2015 [†] and November 30, 2015
C	4 mos	May 24, 2015	Virginia	June 11, 2015	September 9, 2015
D	4 mos	May 24, 2015	Virginia	June 11, 2015	September 9, 2015
E	01/15/2015	Unknown	New Jersey	June 13, 2015	November 30, 2015
F	6 mos	April 5, 2015	New Jersey	June 13, 2015	November 30, 2015
G	6 mos	April 6, 2015	New Jersey	June 13, 2015	November 30, 2015
H	2013	Unknown	New Jersey	June 13, 2015	November 30, 2015

* Includes CDC confinement period of 30 days following initial vaccination or revaccination against rabies. Rabies postexposure quarantine regulations vary among states.

[†] Initial 90-day period, when dog B was in strict isolation.

The Virginia investigation focused on contact with dog A after departing the airport cargo area through the time of the veterinary assessment in Virginia. Health department personnel in Virginia evaluated 30 persons for possible rabies exposure; no bite exposures were reported. Eighteen persons initiated rabies postexposure prophylaxis (PEP), including 10 who were considered to have been exposed and eight who requested PEP despite reporting no clear rabies exposure. Eight of the 18 persons receiving PEP reported having previously received rabies preexposure prophylaxis.

Domestic animal exposure investigations revealed that all animals in the Egyptian shipment, except for dogs A and B, had been crated individually in the airplane's cargo hold and held separately after arriving in the United States, until delivered to their final destinations. Investigators thought it unlikely that the cats in this shipment had interacted with dog A, even while in Egypt. CDC's cat importation regulations do not require that cats be vaccinated against rabies; therefore, the cats were not required under federal regulations to be confined, vaccinated, or revaccinated against rabies.

The Virginia Department of Health considered that the only dog among the animals in the Egyptian shipment to have been exposed to dog A during the rabies infectious period was her puppy, dog B. Dog A's caretaker was pet sitting a neighbor's dog and providing care within her household for eight other dogs, as well as nine other animals. The Virginia Department of Health identified seven dogs in dog A's caretaker's home as having been exposed to rabies. (Dog B was housed with a different caretaker.) The local health department determined that all of the exposed dogs except dog B had current rabies vaccination certificates from licensed veterinary hospitals. The dogs with current certificates received a rabies booster vaccination followed by 45 days of confinement at their owners' homes, as recommended by the Compendium of Animal Rabies Prevention and Control (4). Dog B, who was aged <12 weeks at the time and had not received an initial dose of

rabies vaccine, was vaccinated against rabies and placed in strict isolation* for 90 days, followed by 90 days of home confinement (Table). To ensure that the dog was vaccinated according to the vaccine manufacturer's label specifications (at age ≥ 3 months), another dose of rabies vaccine was administered to dog B 1 month before release from strict isolation (Table). Dogs C and D each received a booster dose of rabies vaccine, followed by 90 days of home confinement.

The New Jersey Department of Health interviewed volunteers from a canine rescue group in New Jersey (animal rescue group B) that had received four of the eight dogs from the Egyptian shipment. All four dogs received either their initial rabies vaccination or a rabies booster vaccination and were ordered to be confined in their owners' homes for 6 months (Table).

Discussion

Rabies, the deadliest of all zoonotic diseases, accounts for an estimated 59,000 human deaths globally each year (5). The virus can infect any mammal, and once symptoms appear, the disease is almost invariably fatal (6). Importation of rabid animals into the United States has broad public health implications. The reintroduction of a canine rabies virus variant[†] or introduction of any nonendemic rabies viruses into a naïve animal population has the potential to change the epizootiology of rabies in the United States, leading to severe health consequences and economic losses (7).

To prevent human rabies exposures and introduction of rabies viruses, U.S. federal and state regulations place strict rabies vaccination requirements on dogs. Current CDC dog

* Isolation in this context refers to confinement in an enclosure that precludes direct contact with humans and other animals. In Virginia, this means that an animal is placed in a double walled enclosure that allows for feeding, watering, cleaning, and general care but will not allow for any person or other domestic animal to have contact with the isolated animal.

[†] In this incident, the phylogenetic reconstruction based on the complete nucleoprotein gene is closely related to a canine rabies virus variant circulating in domestic dogs in Egypt (Africa 4 clade).

importation regulations require that dogs being imported from countries not considered rabies-free[§] be accompanied by a valid rabies vaccination certificate (3). A valid rabies vaccination certificate documents a rabies vaccination for a dog aged ≥ 3 months that was administered ≥ 30 days before arrival in the United States (3). State regulations often are more strict. For example, all dogs and cats imported into Virginia by rescue groups must be accompanied by a Certificate of Veterinary Inspection issued by a veterinarian in the state or country of origin no fewer than 10 days before the animal enters Virginia. In addition, if the animal (i.e., a dog or cat) is aged ≥ 4 months, it must be vaccinated against rabies.

These importation regulations are difficult to enforce because of limited resources at U.S. ports of entry to inspect dog shipments. This report details the fourth known instance of a rabid dog imported from a non-U.S. territory since 2004 and the second instance of importation by a rescue organization of a rabid dog from the Middle East (4,8). However, other cases might have gone unreported because rabies can have a variable clinical course (4) that might not prompt animal owners or veterinarians to seek postmortem rabies testing.

CDC and state agencies have previously received reports of invalid or questionable health and rabies vaccination certificates for imported dogs (9); in at least one reported case, a veterinarian issued a Certificate of Veterinary Inspection for a dog that was already showing signs of rabies infection (10). CDC has attempted to address mounting concerns about importation of inadequately vaccinated dogs, either resulting from inaccurate rabies vaccination certificates or from legal importation under an existing mechanism allowing exceptions to CDC's regulatory requirement (i.e., issuance of a dog confinement agreement that serves as a legal and binding agreement between CDC and the importer and lists requirements for vaccination and confinement of the animal).

In May 2014, CDC issued the health alert notification "Imported Dogs with Questionable Documents" specifically because of ongoing concerns with dogs' entry documents listing incorrect ages and rabies vaccination status. In addition, in July 2014, CDC published the notice "Issuance and Enforcement Guidance for Dog Confinement Agreements"[¶] in the Federal Register clarifying that entry into the United States of dogs that are inadequately vaccinated against rabies and coming from countries where rabies is endemic would only be allowed on a limited and case-by-case basis. In the incident described in this report, under the criteria outlined

Summary

What is already known on this topic?

Canine rabies virus variant has been eliminated from the United States. Rabies vaccination programs in the United States have eliminated domestic dogs as a reservoir of rabies. In contrast, domestic dogs worldwide continue to pose the greatest threat for rabies transmission to humans.

What is added by this report?

Importations of dogs, and potentially other domestic animals that are inadequately vaccinated against rabies, from countries where rabies is endemic continues to present a risk to an unaware U.S. public. Officials, veterinarians, and caretakers might be unable to verify the validity of rabies vaccination certificates issued before an animal's importation.

What are the implications for public health practice?

To eliminate domestic dogs as the principal source for rabies transmission to humans, efforts need to focus on rabies elimination programs worldwide. Domestic animals moving across borders should be adequately protected against and screened for rabies infections.

in the Federal Register notice, CDC would ordinarily have excluded five of the eight dogs in the shipment (dogs B, C, D, E, and H). However, CDC was not notified of the arrival of these dogs until after the dogs had already been admitted into the United States and left the port of entry. Because dog A was accompanied by a rabies vaccination certificate that only later was reported to have been falsified, CDC would most likely have admitted dog A.

This report underscores the current difficulties in verifying any imported dog's rabies vaccination certificate and health status. The United States also is vulnerable to an increasing risk for rabies introduction and spread from other imported domestic animals, such as cats and ferrets. Considering the public health risk posed by importation of animals for the purposes of placing them in adoptive homes in the United States, and the current oversupply of adoptable animals already in the United States, persons and organizations involved with importing pets for the purposes of adoption should consider reevaluating, and potentially redirecting, their current efforts. Globally, animal welfare stakeholders should consider focusing their efforts on supporting local organizations that provide adoptive homes, along with health care services, for street animals in their own countries. In addition, although this report focuses on imported dogs and rabies, all animals pose a risk for transmission of zoonotic diseases (e.g., brucellosis, leishmaniasis, campylobacteriosis, leptospirosis, giardiasis, and cutaneous or visceral larva migrans). Documentation of overall health status, not just rabies vaccination, is critical to minimizing the risk from importing animals carrying zoonotic diseases.

[§] Additional information available at <http://www.cdc.gov/importation/rabies-free-countries.html>.

[¶] Available at <http://www.cdc.gov/importation/laws-and-regulations/dog-confinement-agreements.html>.

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Notes from the Field

Injection Safety and Vaccine Administration Errors at an Employee Influenza Vaccination Clinic — New Jersey, 2015

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On September 30, 2015, the New Jersey Department of Health (NJDOH) was notified by an out-of-state health services company that an experienced nurse had reused syringes for multiple persons earlier that day. This occurred at an employee influenza vaccination clinic on the premises of a New Jersey business that had contracted with the health services company to provide influenza vaccinations to its employees. The employees were to receive vaccine from manufacturer-prefilled, single-dose syringes. However, the nurse contracted by the health services company brought three multiple-dose vials of vaccine that were intended for another event. The nurse reported using two syringes she found among her supplies to administer vaccine to 67 employees of the New Jersey business. She reported wiping the syringes with alcohol and using a new needle for each of the 67 persons. One of the vaccine recipients witnessed and questioned the syringe reuse, and brought it to the attention of managers at the business who, in turn, reported the practice to the health services company contracted to provide the influenza vaccinations.

Reuse of syringes for multiple patients, with or without reuse of needles, is recognized as a serious infection control breach that poses risks for bloodborne pathogen transmission (1–3). Upon investigation additional concerns regarding vaccine administration and storage and handling were identified for this event. The nurse used only two multiple dose vials of vaccine (10 doses/vial) to administer vaccines to 67 adult participants; thus, participants did not receive the recommended dose of influenza vaccine. The health services company had shipped the vaccine to the nurse's home, where it was stored in her home refrigerator without temperature monitoring until the event. Vaccine doses were then transported from the nurse's home to the vaccination site using a styrofoam container and cold packs. After the event, unused vaccine doses were transported back to the nurse's home and stored in her refrigerator before being shipped back to the health services company in a container with cold packs.

In response to these injection safety and vaccine administration errors, the NJDOH, in consultation with CDC, recommended notification and testing of the New Jersey business employees who participated in the vaccination clinic

for human immunodeficiency virus (HIV), hepatitis C virus, and hepatitis B virus. Postexposure prophylaxis with hepatitis B vaccine and readministration of influenza vaccination were also recommended. NJDOH sent an e-mail on October 2, informing the participants of the potential bloodborne pathogen exposures and recommendations for testing and vaccination. Certified follow-up letters also were sent. A dedicated NJDOH phone number and e-mail address were created to assist the affected patients. The West Windsor Health Department collaborated with an urgent care center to perform blood draws and administer the vaccines on October 5 and 6; HIV and mental health counselors were available on-site. NJDOH also provided letters for participants to bring to their private physicians outlining the situation, risk assessment, and public health recommendations. Forty-seven of 67 participants received services through the urgent care center and the West Windsor Health Department; an unknown number of participants received treatment from their private health care providers. Follow-up clinics were arranged at 1 month and at 4 months for hepatitis B vaccination and testing.

Recommendations for appropriate injection safety and vaccine storage, handling, and administration were not followed at the influenza vaccination clinic (1–6). Response to this event required rapid and extensive communication and coordination among public health partners, including CDC, NJDOH, the New Jersey State Board of Nursing, and the West Windsor Health Department, as well as private entities. The contracted nurse voluntarily surrendered her license within 1 week of the initial report.

Approximately 17% of adults receive an annual influenza vaccine at their workplace (7,8). Influenza vaccination has been demonstrated to reduce illnesses, medical provider visits, lost work days, and antibiotic use among working adults (7,9). Although vaccination events outside of traditional health care settings can increase access to vaccines, training and oversight of health care personnel, and vaccine storage and handling can present special challenges. Companies providing vaccination services should ensure their employees and contracted staff adhere to established guidelines for infection prevention, and vaccine storage, handling, and administration (1–6). CDC recommends that, if possible, vaccine be delivered directly to the vaccination clinic site. If this is not possible, CDC recommends transporting influenza vaccine using a suitable portable refrigerator or a passive cooling system specifically designed and tested to maintain appropriate temperatures. A calibrated temperature monitoring device with a current and

valid certificate of calibration testing and continuous monitoring and recording capabilities should be used to monitor the temperature of the storage unit or transport container (4). The temperature of the vaccine should be regularly monitored and recorded at appropriate intervals based on the type of vaccine storage unit and method of transport.

Many different presentations of influenza vaccine are available, including manufacturer-prefilled syringes for single-dose administration, which might reduce the opportunity for vaccination errors. When multiple-dose influenza vaccine vials are used, vaccinators should ensure that they administer the correct vaccine dosage; in addition, no more than 10 doses should be drawn up immediately before administering vaccine (4). Safe injection practices, including the correct site identification and needle length, should be followed (1,3,5,6). Providers should review additional guidance in the Vaccine Storage and Handling Toolkit (4) and General Recommendations on Immunizations Recommendations of the Advisory Committee on Immunization Practices (ACIP) (6). Businesses should familiarize themselves with recommended guidelines and ensure that these guidelines are followed by the immunization service provider they choose. The Vaccine Adverse Event Reporting System (<https://vaers.hhs.gov/index>) accepts reports of adverse events that occur after vaccination, including reports of vaccination errors.

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Notes from the Field

Acute Mercury Poisoning After Home Gold and Silver Smelting — Iowa, 2014

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In March 2014, a man, aged 59 years, who lived alone and had been using different smelting techniques viewed on the Internet to recover gold and silver from computer components, was evaluated at a local emergency department for shortness of breath, tremors, anorexia, and generalized weakness. During the smelting processes, he had used hydrogen peroxide, nitric acid, muriatic acid, and sulfuric acid purchased from local stores or Internet retailers. For protection, he wore a military gas mask of unknown type. The mask was used with filter cartridges, but their effectiveness against chemical fumes was not known.

On the day he developed symptoms, he was using a technique that he had learned by watching a documentary on cable television, which used mercury to separate gold from soil. After purchasing elemental mercury through Internet retailers, he used a frying pan to smelt gold from computer chips using mercury on his kitchen stove. Approximately 5 minutes after starting, he developed throat irritation and changed the mask filter cartridge before resuming smelting. After an additional 5 minutes, he developed shortness of breath, weakness, and tremors, at which point he sought medical care. He was admitted to the intensive care unit at the local hospital with a diagnosis of acute respiratory failure associated with chemical pneumonitis. His condition subsequently deteriorated, and he received a diagnosis of acute respiratory distress syndrome, which required intubation and mechanical ventilation until his pulmonary function recovered.

On the seventh hospital day, testing for exposure to heavy metals, including arsenic, lead, and mercury, was performed, and the patient was found to have a blood mercury level of 86 $\mu\text{g/L}$ (testing commercial laboratory reference value: $<10 \mu\text{g/L}$). No further heavy metal testing was performed, and chelation therapy was not prescribed. After 4 weeks, the patient was discharged to a long-term-care facility on supplemental oxygen because his chemical pneumonitis was not fully resolved.

The elevated blood mercury level was reported to the Iowa Department of Public Health by the testing laboratory on the 18th hospital day. The Iowa Department of Public Health immediately initiated an investigation to identify the source of exposure and potential risk to others; however, public health officials were unable to obtain exposure information from the

acute care facility. Approximately 1 month after the exposure, public health officials interviewed the patient at the long-term-care facility; he described the smelting activities he had conducted in the home, as well as the cleanup that was being arranged by family members. The local fire department was consulted to assess the home for residual mercury contamination and the potential for risk to others.

Thirty-four days after the exposure, the fire department's hazardous materials team assessed the house using a portable mercury vapor detector; the kitchen's air mercury level was 0.8 $\mu\text{g/m}^3$ (Environmental Protection Agency [EPA] reference concentration: $<0.3 \mu\text{g/m}^3$) (1,2). Remediation included cleaning kitchen surfaces with chemical wipes, and heating and ventilating the kitchen with a negative pressure fan venting outside until air levels of mercury were $<0.3 \mu\text{g/m}^3$. All contaminated materials, including furniture, clothing, air system filters, and utensils, as well as remaining liquid mercury and other chemicals, were removed and disposed of according to EPA-recommended guidelines (3). No other person was reportedly exposed.

Mercury exists as elemental mercury and is found in inorganic mercury compounds and organic forms. Adverse health effects of mercury exposure depend on the chemical form, dosage, route and duration of exposure, and age and health of the exposed person (4). The major route of elemental mercury exposure of health concern is vapor inhalation. Symptoms resulting from acute exposures include shortness of breath, chest pain and pulmonary congestion, tremors, nausea, vomiting, and weakness. Respiratory symptoms can progress to chemical pneumonitis, pulmonary edema, respiratory failure, and death (5,6). Treatment of acute mercury exposure typically consists of removal of the patient from further exposure, followed by support of respiratory and cardiovascular function. Chelation therapy should be considered for any symptomatic patient with a clear history of acute elemental mercury exposure; however, the decision to treat should be made by experienced professionals, preferably in consultation with the regional poison control center (5).

Many Internet resources describe processes to extract precious metals from various substances. These include approximately 12,000 videos that demonstrate home smelting techniques to recover gold and precious metals from computer parts, and cable television documentaries presenting gold mining processes, some using mercury to recover gold from soil. An Internet search identified approximately 200,000 websites purporting to describe how mercury can be used to extract

gold from computer parts. Among a convenience sample of 30 Internet videos viewed by one of the authors, only five mentioned potential dangers involved in handling smelting chemicals or advised smelting in open areas, or using fume hoods, gloves, or unspecified types of respirators.

Electronics recycling for precious metals recovery by persons lacking the proper training, equipment and facilities can result in exposure to and illness caused by chemicals, including mercury. Health care providers should include mercury poisoning in the differential diagnosis when assessing patients who have symptoms of heavy metal exposure and a history of smelting activities, and should report known or suspected exposures to poison control centers and local or state public health officials to ensure appropriate and timely intervention.

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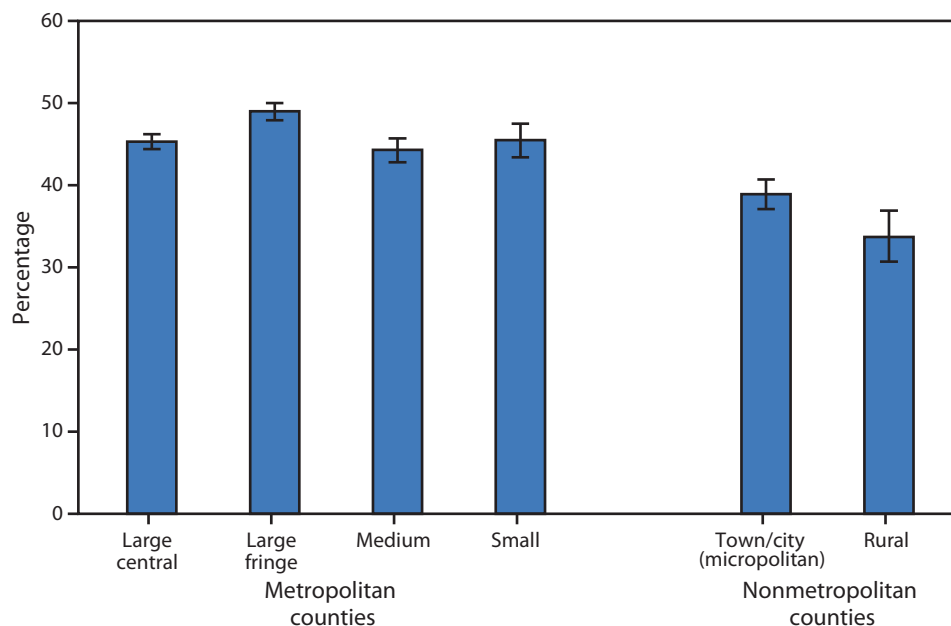
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QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

QuickStats: Percentage* of U.S. Adults Who Looked up Health Information on the Internet in the Past Year,[†] by Type of Locality[§] — National Health Interview Survey, 2012–2014[¶]



* With 95% confidence intervals.

[†] Based on sample adult's response to a question asking if, during the past 12 months, the person ever used computers to look up health information on the Internet. Responses were not limited to those who indicated that they had Internet access.

[§] Counties were classified into urbanization levels based on a classification scheme developed by the National Center for Health Statistics, CDC, that considers metropolitan/nonmetropolitan status, population, and other factors.

[¶] Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey sample adult questionnaire.

During 2012–2014, the percentage of adults aged ≥ 18 years who reported looking up health information on the Internet during the previous 12 months was lower among those residing in nonmetropolitan counties (33.7%–38.9%) than among those residing in metropolitan counties (44.3%–49.0%). The percentage was lowest among adult residents of rural counties (33.7%) and highest among adult residents of large fringe metropolitan counties (49.0%). Adult residents of large central, medium, and small metropolitan counties reported similar usage (44.3%–45.5%).

Sources: National Health Interview Survey. Available at <http://www.cdc.gov/nchs/nhis.htm>. Ingram DD, Franco SJ. NCHS urban-rural classification scheme for counties. National Center for Health Statistics. Vital Health Stat 2012;2(154).

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