Acute Occupational Pesticide-Related Illness and Injury — United States, 2007–2010

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Preface

CDC's National Institute for Occupational Safety and Health (NIOSH) collects data on acute pesticide-related illnesses and injuries reported by 11 states (California, Florida, Iowa, Louisiana, Michigan, North Carolina, New Mexico [2007–2008 only], New York, Oregon, Texas, and Washington). This report summarizes data on illnesses and injuries arising from occupational exposure to conventional pesticides during 2007–2010. This report is a part of the first-ever *Summary of Notifiable Noninfectious Conditions and Disease Outbreaks*, which encompasses various surveillance years but is being published in 2015 (*1*). The *Summary of Notifiable Noninfectious Conditions and Disease Outbreaks* appears in the same volume of *MMWR* as the annual *Summary of Notifiable Infectious Diseases* (*2*).

Background

Pesticides are substances or mixtures of substances intended to prevent, destroy, repel, or mitigate pests (e.g., insects, rodents, fungi, and weeds). In 2007, the year with the most currently available data, an estimated 2.1 billion pounds of conventional pesticides were used in the United States (*3*), which represents approximately 22% of the entire worldwide use of these pesticides. Conventional pesticides include insecticides, herbicides, fungicides, and fumigants and exclude chlorine, hypochlorites, and biocides.

The toxicity of pesticides continues to raise public concern and is the focus of much media attention. The benefits of pesticides are well recognized and primarily include their role in protecting the food supply and in controlling disease vectors (*4*). However, no form of pest control is perfectly safe. Tracking the associated health effects of pesticides can help ensure that no pesticides pose an unreasonable burden (*5*). As such, public health surveillance of acute pesticide-related illness and injury serves a vital societal role by assessing the magnitude and characteristics of this condition. Surveillance of acute pesticide-related illness and injury has been endorsed by several professional organizations and federal agencies including the American Medical Association (*6*), the Council of State and Territorial Epidemiologists (*7*), NIOSH (*8*), and the U.S. Government Accountability Office (*9*). To address the need for public health surveillance of acute pesticide-related illness and injury, NIOSH established such a surveillance program in 1987.

Pesticide products must pass an extensive battery of testing prior to being registered by the U.S. Environmental Protection

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Agency (EPA). This testing forms the basis for the human health and environmental risk assessments conducted by EPA that guide identification of the conditions under which a pesticide can be used. These conditions of use are reflected in pesticide product labeling. Compliance with these use conditions are expected to prevent unreasonable adverse effects to human health and the environment. To verify the real-world effectiveness of pesticide product labeling in preventing adverse human health effects, findings from acute pesticide-related illness and injury surveillance systems are reviewed. These surveillance data assist EPA to determine whether labeling is effective or if labeling improvements are needed. When adverse health effects occur despite adherence to label instructions, and if EPA determines the magnitude to be unreasonable, EPA requires that interventions be instituted that involve changing pesticide use practices and/or modifying regulatory measures (*10*). Acute pesticide-related illness and injury also can occur because of a lack of compliance with existing pesticide regulations. The appropriate interventions for these cases include enhanced education and enforcement.

Data Sources

Since 1987, NIOSH has conducted surveillance of acute occupational pesticide-related illness and injury through the Sentinel Event Notification System for Occupational Risks (SENSOR)–Pesticides program. Detailed information on this program is available at http://www.cdc.gov/niosh/topics/pesticides/overview.html. During 2007–2010, a total of 11 states (California, Florida, Iowa, Louisiana, Michigan, North Carolina, New Mexico [2007–2008 only], New York, Oregon, Texas, and Washington) participated in the SENSOR-Pesticides program.

Case ascertainment sources used by the state programs include poison control centers, other government agencies (e.g., state departments of agriculture), workers' compensation documents, and physician reports. In some states, other sources (e.g., medical record reviews, news reports, and reports from worker representatives) infrequently identify cases (*11*). Staff from some state surveillance programs attempt to interview persons with illness or injury to obtain more details about the event. All states use standardized variables to code available information about a case systematically (*11*).

Persons are considered to have a pesticide-related illness or injury if they became ill or injured soon (i.e., within seconds to hours) after exposure to one or more pesticides. An illness and injury is considered occupational if the pesticide exposure occurred at the affected person's place of work. Agricultural cases are defined as cases occurring among persons employed in an industry with one of the following Census Industry Codes (CICs): agricultural production, excluding livestock (1990 CIC: 010; 2002 CIC: 0170); agricultural production, including livestock (1990 CIC: 011; 2002 CIC: 0180); and agricultural services (1990 CIC: 030; 2002 CIC: 0290). All other occupational cases with a known industry code are defined as "nonagricultural" cases.

The SENSOR-Pesticides case definition has been described in detail elsewhere (*11*). The definition requires information about pesticide exposure and health effects, which is compared with the known toxicology of the pesticide. Cases in the SENSOR-Pesticides program are categorized as definite, probable, possible, and suspicious on the basis of the level of known detail on the case. Cases are defined as definite exclusively on the basis of objective data about exposure and health effects (e.g., residues were measured to confirm exposure and health effects were observed by the examining clinician). Cases are defined as probable on the basis of a mix of objective and self-reported data. Cases are defined as possible on the basis of self-reported exposure and health effects data. Suspicious cases arise when the toxicologic information is insufficient to determine a causal relationship between pesticide exposure and illness, often because the given pesticide is relatively new and limited toxicologic data involving humans exist. Often reports of illness and injury are not categorized as definite, probable, possible, or suspicious because insufficient information is available about the circumstances of the exposure event or because the available evidence suggests that the pesticide exposure was either unrelated to or was unlikely to have caused the observed health effects. These "insufficient information," "unrelated," and "unlikely" exposures are not included in the analysis of confirmed illness and injury cases provided in this report.

Illness and injury severity was categorized into four groups using standardized criteria for state-based surveillance programs (*11*). In low-severity cases, the condition usually resolves without treatment and <3 days are lost from work. In moderate-severity cases, the condition is not life-threatening but does require medical treatment, no residual impairment is expected, and time lost from work is ≤5 days. In high-severity cases, the condition is life-threatening, requires hospitalization, often has >5 days lost from work, and might result in permanent impairment. Fatal cases of pesticide poisoning were placed in a separate category.

To calculate incidence rates (IRs) of acute occupational pesticide-related illness and injury, NIOSH obtained denominator data (i.e., hours worked) from the U.S. Current Population Survey (CPS) (*12*). These data were used to derive full time equivalent (FTE) estimates, with one FTE equal to 2,000 hours worked. Denominator data correspond to the states and time periods of numerator availability.

This report includes only acute pesticide-related illness and injury arising from occupational exposures. Furthermore,

nine occupational cases involving exposures with suicidal or homicidal intent were excluded. During 2007–2010, of the 6,841 cases reported to SENSOR-Pesticides, 2,014 (29%) were from occupational exposures and are included in the analyses.

Interpreting Data

For multiple reasons, the counts and rates provided in this report (Tables 1 and 2) are likely to be underestimates of the actual magnitude of acute occupational pesticide-related illness and injury (*13*). Many cases of persons with pesticide-related illness or injury are never ascertained because they neither seek medical care nor call appropriate authorities. Furthermore, because the signs and symptoms of acute pesticide-related illnesses are not pathognomonic, and because most health-care professionals are not acquainted with the recognition and management of these illnesses, many persons who seek medical care might not receive an accurate diagnosis. Even among those who do receive an accurate diagnosis, many are not reported to state surveillance systems, despite the fact that the participating states all have mandatory reporting requirements for occupational pesticide-related illness and injury (*5*). For these reasons, the counts and rates provided in this report must be considered minimum estimates. In contrast, some persons might have been categorized incorrectly as having acute occupational pesticide-related illness because symptoms for acute illnesses associated with pesticides are nonspecific and not pathognomonic, and diagnostic tests are either not available or rarely performed. In addition, rates of pesticide illness and injury might have been affected by inaccurate estimates of the agricultural industry population. Many workers in this industry are difficult to count because of the transient employment of seasonal and migrant farmworkers, and those with undocumented U.S. immigrant status tend to avoid government contact (*14*). Furthermore, the denominator inaccuracies might vary across states because some states might be more likely to have agricultural workers whose usual residence is elsewhere. Agricultural workers are not included in CPS state population estimates of those states in which they reside only temporarily (*15*).

Although the incidence rates for acute occupational pesticide-related illness and injury were highest in Washington, this finding might not necessarily mean that pesticide exposures are more hazardous or more prevalent in that state. Washington has stronger protections for agricultural workers and a larger and more robust pesticide illness and injury surveillance

TABLE 1. Distribution of cases of acute occupational pesticide-related illness and injury, full time equivalent estimates, and incidence rates per 100,000 FTEs by industrial sector, state, sex, and year of exposure — SENSOR-Pesticides program, United States, 2007–2010

	Industrial sector (CIC codes)								
	All			Agricultural (010–030)			Nonagricultural (all other codes)		
Characteristic	No.*	FTE estimates†	Incidence rate§	No.	FTE estimates†	Incidence Rate§	No.	FTE estimates†	Incidence rate§
State									
California	638	62,551,316	1.0	228	1,193,212	19.1	377	61,358,104	0.6
Florida	99	32,131,463	0.3	9	164,260	5.5	33	31,967,203	0.1
Iowa	138	5,984,592	2.3	81	275,240	29.5	17	5,709,352	0.3
Louisiana	89	7,577,948	1.2	14	74,288	18.8	35	7,503,660	0.5
Michigan	153	16,224,188	0.9	17	217,330	7.8	126	16,006,858	0.8
New Mexico	9	1,767,303	0.5	0	47,773	0	4	1,719,530	0.2
New York	25	33,947,898	<0.1	3	178,485	1.7	16	33,769,413	<0.1
North Carolina	138	15,977,020	0.9	40	169,553	23.6	91	15,807,467	0.6
Oregon	35	6,610,282	0.5	7	215,746	3.3	21	6,394,536	0.3
Texas	337	43,414,155	0.8	23	709,702	3.2	260	42,704,453	0.6
Washington	353	11,900,137	3.0	222	255,341	86.9	128	11,644,796	1.1
Sex									
Male	1356	135,950,614	1.0	494	2,774,545	17.8	673	133,176,069	0.5
Female	654	102,135,688	0.6	150	726,385	20.7	434	101,409,303	0.4
Year									
2007	614	61,979,631	1.0	194	876,815	22.1	327	61,102,816	0.5
2008	541	61,751,566	0.9	191	909,306	21.0	287	60,842,260	0.5
2009	429	57,059,520	0.8	123	831,358	14.8	263	56,228,162	0.5
2010	430	57,295,585	0.8	136	883,451	15.4	231	56,412,134	0.4
Total	**2,014**	**238,086,302**	**0.8**	**644**	**3,500,930**	**18.4**	**1,108**	**234,585,372**	**0.5**

Abbreviations: CIC = U.S. Bureau of the Census industry codes; FTE = full time equivalent; SENSOR = Sentinel Event Notification System for Occupational Risks.
* Information on industry was missing for 262 (13%) persons with cases of pesticide-related illness.
† Estimates were derived from the hours worked data obtained from the U.S. Current Population Survey (CPS) and summed for the years 2007–2010 (*8*).One FTE equals 2,000 hours worked. Denominator data correspond to the states and time periods of numerator availability.
§ Incidence rate per 100,000 FTEs.

TABLE 2. Distribution of cases of acute occupational pesticide-related illness and injury by industrial sector, pesticide functional class, and illness and injury severity — SENSOR-Pesticides program, United States, 2007–2010

	Industrial sector (CIC codes)					
	All		Agricultural (010–030)		Nonagricultural (all other codes)	
Characteristic	No.	(%)	No.	(%)	No.	(%)
Pesticide functional class						
Insecticides	739	(37)	162	(25)	447	(40)
Herbicides	358	(18)	111	(17)	201	(18)
Fungicides	103	(5)	65	(10)	33	(3)
Fumigants	152	(8)	68	(11)	77	(7)
Insecticides + fungicides	116	(6)	77	(12)	30	(3)
Other*	314	(16)	43	(7)	230	(21)
Multiple†	232	(12)	118	(18)	90	(8)
Illness and injury severity category						
Low	1,641	(81)	528	(82)	894	(81)
Moderate	346	(17)	105	(16)	202	(18)
High and death	27	(1)	11	(2)	12	(1)
Total	**2,014**	**(100)**	**644**	**(100)**	**1,108**	**(100)**

Abbreviations: CIC = U.S. Bureau of the Census industry codes; SENSOR = Sentinel Event Notification System for Occupational Risks.
* Includes plant growth regulators, insect growth regulators, wood treatment products, preservatives, and insect repellants.
† Exposed to pesticide products that were classified into more than one functional class or to more than one pesticide product with each having a different functional class.

program than other states, thereby accounting for some of the differences in incidence rates. As an example of stronger worker protections, Washington gives farmworkers the right to organize and bargain collectively and requires cholinesterase monitoring for some pesticide handlers (*10*). These protections might make farmworkers in Washington less hesitant to seek medical care for pesticide illness and injury. In addition, Washington has a larger number of surveillance program staff (3.75 FTEs versus an average of 1.3), and all but one are bilingual Spanish/English speakers. The odds of identifying agricultural worker cases might be improved when surveillance programs have a bilingual staff of ample size because agricultural workers are often Spanish-speaking. Although workers' compensation systems can be an important source of case reports, only two states (California and Washington) received reports from this source during 2007–2010. The workers' compensation system can be an especially useful reporting source when it is organized as in Washington. For example, Washington is the only state whose workers' compensation system covers the first visit for any suspected work-related illness or injury, even if the illness or injury is determined not to be work-related. In addition, unless Washington employers are able to self-insure, workers' compensation insurance is provided by an exclusive state-fund operated by the state's Department of Labor and Industries. There are no other private workers' compensation insurers in the state. This avoids problems that can occur in other states when state authorities either do not receive information from private workers' compensation insurers or process such information incorrectly. No other SENSOR-Pesticides state provides workers' compensation insurance through an exclusive state fund. For all these reasons, case estimates from Washington might be more accurate than those in other states, although even these estimates likely underestimate the actual level of occupational pesticide-related illness and injury.

The pesticides most often implicated in acute occupational pesticide-related illness and injury are listed (Table 3). Data are stratified by whether the affected person was exposed to a single substance (i.e., active ingredient). When affected persons were exposed to a single substance, it is very likely that that substance was responsible for illness or injury. However, this might not be so for persons who were exposed to multiple substances because one of the other substances might have produced the illness or injury. Furthermore, pesticide products also contain solvents and other nonactive ingredients, some of which might produce illness. Because the identity of inert ingredients present in pesticide products is almost never available, attribution of illness to these ingredients is not possible. In addition, only illnesses and injuries caused by exposure to conventional pesticides are included in this report. Illnesses and injuries caused by chlorine, hypochlorites, and other disinfectants are not included in this report because not all states capture such illnesses (often because of resource constraints) and therefore including them would make the rate estimates not comparable across the 11 states.

Methods for Identifying Acute Occupational Pesticide-Related Illness and Injury

All 11 states that participate in the SENSOR-Pesticides program require physicians to report confirmed and suspected cases of pesticide-related illness and injury to state health

TABLE 3. Pesticides most often implicated in acute occupational pesticide-related illness and injury and number of cases — SENSOR-Pesticides program, United States, 2007–2010

Pesticide category	Pesticide functional class	Exposed to single substance*		Exposed to multiple substances†		All cases (single and multiple exposure)†	
		No.	(%)	No.	(%)	No.	(%)
Pyrethroids	Insecticide	244	(59)	172	(41)	**416**	**(21)**
Organophosphorous compounds	Insecticide	160	(59)	111	(41)	**271**	**(13)**
Glyphosate	Herbicide	105	(64)	58	(36)	**163**	**(8)**
Pyrethrins	Insecticide	68	(49)	71	(51)	**139**	**(7)**
Sulfur compounds	Insecticide/Fungicide	66	(50)	65	(50)	**131**	**(7)**
Organochlorine compounds	Insecticide	12	(17)	60	(83)	**72**	**(4)**
N-methyl carbamates	Insecticide	42	(72)	16	(28)	**58**	**(3)**
Phosphorus	Fumigant	52	(95)	3	(5)	**55**	**(3)**
Dipyridyls	Herbicide	28	(52)	26	(48)	**54**	**(3)**
Thiocarbamates/Dithiocarbamates	Fumigant	41	(79)	11	(21)	**52**	**(3)**
Pyraclostrobin	Fungicide	32	(74)	11	(26)	**43**	**(2)**
Chloropicrin	Fumigant	3	(8)	35	(92)	**38**	**(2)**
Fipronil	Insecticide	5	(14)	30	(86)	**35**	**(2)**
Imidacloprid	Insecticide	1	(3)	28	(97)	**29**	**(1)**
Triazines	Herbicide	12	(50)	12	(50)	**24**	**(1)**
All other		419	(52)	392	(48)	**811**	**(40)**
Total		**1,290**	**(64)**	**724**	**(36)**	**2,014**	**(100)**

Abbreviation: SENSOR = Sentinel Event Notification System for Occupational Risks
* A pesticidal active ingredient.
† Because some persons who were exposed to multiple substances appear in the totals of more than one pesticide category, the sum of the pesticide categories in this column exceeds the number of individual persons.

authorities. Besides identifying, classifying, and tabulating pesticide poisoning cases, states periodically perform in-depth investigations of pesticide-related events, and develop interventions aimed at particular industries or pesticide hazards.

Publication Criteria

Persons meet the publication criteria if they met the case definition and were exposed to conventional pesticides at their place of work during January 1, 2007–December 31, 2010.

Highlights

During 2007–2010, a total of 2,014 cases of acute occupational pesticide-related illness and injury were identified in 11 states (Table 1). Rates of illness and injury among agricultural industry workers (18.4/100,000) were 37 times greater than the rates for nonagricultural workers (0.5/100,000). Rates were found to be highest in Washington. Most affected persons were exposed to insecticides or herbicides (Table 2). Among persons who were exposed to insecticides, the chemical classes most often involved were pyrethroids, organophosphates, and pyrethrins (Table 3). Among persons exposed to herbicides, the specific herbicides most commonly involved were glyphosate and the dipyridyls (i.e., paraquat and diquat). A total of 81% of cases were classified as low severity, 17% were moderate severity, and 1% were high severity. One affected person died.

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Introduction to the Summary of Notifiable Noninfectious Conditions and Disease Outbreaks — United States

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Preface

With this 2015 *Summary of Notifiable Noninfectious Conditions and Disease Outbreaks — United States*, CDC is publishing official statistics for the occurrence of nationally notifiable noninfectious conditions and disease outbreaks for the first time in the same volume of *MMWR* as the annual *Summary of Notifiable Infectious Diseases* (*1*).

This two-part publication provides the opportunity for readers to review information on all of the nationally notifiable conditions identified by the Council of State and Territorial Epidemiologists (CSTE) in collaboration with CDC. This combined publication is the result of a February 2013 request by CSTE for CDC to present surveillance data on all nationally notifiable conditions and disease outbreaks in the same publication. In recent years, CSTE formalized and expanded the list of nationally notifiable conditions to include foodborne and waterborne disease outbreaks and four noninfectious conditions: acute pesticide-related illness and injury, cancer, silicosis, and elevated blood lead levels.* After discussion within the organization and with subject matter experts at CDC, CSTE concluded that inclusion of information on all nationally notifiable conditions in the same *MMWR* annual surveillance summary of nationally notifiable conditions would be useful and important for the public and public health professionals.

This *Summary of Notifiable Noninfectious Conditions and Disease Outbreaks* includes six chapters treating the following subjects: acute pesticide-related illness and injury arising from occupational exposure (*2*), cancer (*3*), elevated blood lead levels among employed adults (*4*), elevated blood lead levels among children (*5*), silicosis (*6*), and foodborne and waterborne disease outbreaks (*7*). Information about nonoccupational acute pesticide-related illness could not be included this year because the data were not ready for publication. However, the CDC programs involved in pesticide-related illness surveillance activities plan to include these data in the 2016 *MMWR* publication of the annual *Summary of Notifiable Noninfectious Conditions and Disease Outbreaks*.

Information on elevated lead exposure is provided in two separate chapters because the sources of lead exposure differ between children and adults. Lead exposure among children is caused principally by deteriorated lead paint found in homes whereas lead exposure among adults occurs principally in the workplace. CDC's National Center for Environmental Health (NCEH) has primary responsibility for preventing disease from environmental (principally nonoccupational) hazards, and CDC's National Institute of Occupational Safety and Health (NIOSH) is responsible for preventing disease from workplace hazards. Because of the separate delegation of responsibilities and differences in sources of lead exposure, CDC has a linked surveillance system for lead exposure with NCEH responsible for the Childhood Blood Lead Surveillance (CBLS) system (*5*) and with NIOSH responsible for the Adult Blood Lead Epidemiology and Surveillance system (ABLES) (*4*).

Each of the six chapters in this *Summary* (*Noninfectious*) presents the most recent statistics available to the CDC program. Local, state, and territorial public health departments and other agencies within those jurisdictions (e.g., departments of labor, environmental protection agencies, cancer registries, and their agents) submit data on these conditions and outbreaks to CDC programs at the National Center for Chronic Disease Prevention and Health Promotion, the National Center for Emerging and Zoonotic Infectious Diseases, NCEH, and NIOSH. Previously, the programs compiled and published surveillance data on these noninfectious conditions and disease outbreaks periodically in multiple venues with variable timeframes and formats.

The Center for Surveillance, Epidemiology, and Laboratory Services (CSELS) coordinated the development and publication of this summary. Comments and suggestions from readers on this new combined publication are encouraged, including ones about whether the information presented could be made more useful. Comments should be sent to NNDSSweb@cdc.gov.

* CDC designated these conditions nationally notifiable as a result of CSTE position statements in the following years: foodborne and waterborne disease outbreaks in 2010, acute pesticide-related illness and injury in 1999, cancer in 1997, silicosis in 2009, and elevated blood lead levels for adults and children in 1995.

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Background

As with nationally notifiable infectious diseases, nationally notifiable noninfectious conditions and disease outbreaks require regular, frequent, and timely information for prevention and control. A brief history of the reporting of nationally notifiable conditions in the United States is available at http://wwwn.cdc.gov/nndss/case-definitions-history.html. In 1961, responsibility for the collection of data on nationally notifiable diseases and deaths in 122 U.S. cities was transferred from the National Office of Vital Statistics to CDC.

CDC's collection of data on nationally notifiable noninfectious conditions and disease outbreaks is based on surveillance conducted at the local, state, and territorial levels by health departments and other agencies on reportable conditions in each jurisdiction. Legislation, regulation, or other rules in those jurisdictions require health-care providers, hospitals, laboratories, and others to provide information on reportable conditions to public health authorities or their agents. The list of reportable conditions in each jurisdiction varies over time and across jurisdictions; more information is available at http://www.cste.org/?SRCA. Public health surveillance of noninfectious conditions and disease outbreaks at the local, state, and territorial levels protects the public's health by ensuring the proper identification of diseases and health hazards. Public health officials use these data to monitor trends in these conditions, identify populations or geographic areas at high risk, plan prevention and control policies and other interventions, allocate resources effectively, coordinate activities, and assess the effectiveness of their efforts.

A selected set of reportable conditions is designated as nationally notifiable, and case notifications for those conditions are submitted to CDC by state, local, and territorial health departments. Public health officials at state, local, and territorial health departments and CDC collaborate in identifying conditions to consider for national notification. During annual meetings, CSTE, in consultation with CDC, recommends revisions to the list of nationally notifiable conditions. Conditions are added as new pathogens, environmental hazards, or conditions emerge as public health concerns, and conditions are deleted when surveillance is found not to be useful. CDC uses these data to monitor trends at the national level, develops and implements programs, allocates resources, and assesses the effectiveness of national efforts at prevention and control. Current and historic national public health surveillance case definitions used for classifying and counting cases consistently at the national level across jurisdictions are available at http://wwwn.cdc.gov/nndss/case-definitions.html. National surveillance case definitions for noninfectious nationally notifiable conditions and disease outbreaks were added to this website in 2010.

Although reporting of conditions at the local, state, and territorial levels is mandated by legislation or regulations at those levels, submission of case notifications to CDC is voluntary. Under-reporting of noninfectious conditions and disease outbreaks to local and state health departments occurs, and completeness of reporting, and therefore of notifications to CDC, varies by condition (*2*–*13*). A 2002 publication reported similar findings for reporting and notifications of infectious conditions (*14*).

Although the sources of data for nationally notifiable infectious diseases and for nationally notifiable noninfectious conditions and disease outbreaks are the same (i.e., local, state, and territorial jurisdictions' data on reportable conditions), and the purpose is the same (i.e., monitoring and responding to the condition to improve population health), there are a number of variations and differences among the conditions in this summary (*1*–*7*). Case-based surveillance of such nationally notifiable conditions as acute pesticide-related illness or injury, silicosis, and cancer is focused on detecting persons who have a condition that meets the criteria specified in national disease-specific case definitions and on collecting information about those persons' conditions. In contrast, surveillance of outbreaks of foodborne and waterborne illness seeks to identify clusters of sick persons with a common exposure (as opposed to specific diseases). Foodborne disease outbreaks are defined as two or more cases of similar illness resulting from common ingestion of a food, and waterborne disease outbreaks are defined as two or more cases of a similar illness resulting from common exposure to water or water-associated chemicals volatized into the air (http://wwwn.cdc.gov/nndss/conditions/notifiable/2014/outbreaks). Information is collected about the characteristics of the disease outbreaks, including data from epidemiologic and environmental investigations. Even among conditions for which case-based surveillance methods are used, there is substantial variation in what a condition means. For example, for a condition such as elevated blood lead levels, surveillance identifies persons who have been exposed to a hazard on the basis of a laboratory test, but does not necessarily identify persons with a diagnosis of lead poisoning. In contrast, for many other conditions, a diagnosis is needed to meet the case definition for case notification to CDC (http://wwwn.cdc.gov/nndss/conditions/notifiable/2014/noninfectious).

Among the topics treated in this summary, the definitions of the characteristics of the conditions and populations covered also differ. This variability makes it challenging for readers to compare statistics easily across conditions and geographic locations and for public health and medical professionals to develop automated electronic health information systems based on common national standards to improve sharing of information on state-reportable conditions and nationally notifiable conditions.

The meaning of the date of the occurrence of the condition varies among the conditions. For infectious diseases, the meaning of the date varies across jurisdictions as well as by condition, and might be a date of symptom or disease onset, diagnosis, or laboratory result; the date the case was reported to a jurisdiction; the date CDC was notified of a case; the date the criteria in the national surveillance case definition were met; or the date of death (http://wwwn.cdc.gov/nndss/document/MMWR_Week_overview.pdf). For cancer, as for some infectious diseases, including the arboviral diseases, tuberculosis, and human immunodeficiency virus infection diagnosis, it is the date the condition is diagnosed. For silicosis, it is the date of the initial report (e.g., the date of a hospital discharge report, clinician report, or a workers' compensation claim). For lead screening test results, it is the date of a test. For acute pesticide-related illness and injury, it is the date of the pesticide exposure that led to acute illness/injury. For disease outbreaks, it is the date of the illness onset of the first case in the outbreak.

The source and definitions of race and ethnicity vary over time and among conditions. For example, information about race and ethnicity for lead exposure is based on self-report whereas for cancer incidence, it is based on medical records, which might not be based on self-report, or from matching the names of persons with cancer with lists of surnames for different ethnic groups or with tribal registries. For silicosis, race and ethnicity are based on self-report, report from next-of-kin, or from medical records. Race- and ethnicity-specific information among the conditions also might vary depending on differences in the jurisdictions' systems for submitting notifications to CDC and the need to protect confidentiality of private health information.

The chapters in this summary use U.S. Census Bureau data sets for the denominators in the rate estimates. However, there is variation across the chapters in which specific U.S. Census Bureau data sets are used.

There are additional notable differences among the chapters in this annual summary concerning the criteria used by CDC programs to determine which case notifications are summarized and published annually in *MMWR* (i.e., publication criteria). For data on both infectious or noninfectious conditions to be submitted to CDC from states, territories, or cities, the condition or disease must have been designated as a reportable condition in that jurisdiction for the year of notification to CDC. However, CDC publishes information on foodborne and waterborne disease outbreaks in this annual summary even if the outbreak was not on the jurisdiction's reportable conditions list. Additional criteria, based on characteristics that define the conditions and disease outbreaks (http://wwwn.cdc.gov/nndss/case-definitions.html), are used in making a final determination on publication in this annual summary (Box).

Data Sources

Final data for nationally notifiable noninfectious conditions and disease outbreaks are derived from the surveillance systems of the CDC Centers listed below. Requests for further information regarding these data should be directed to the appropriate Center or program.

- National Center for Chronic Disease Prevention and Health Promotion
  - National Program of Cancer Registries (cancer)
- National Center for Emerging and Zoonotic Infectious Diseases
  - Foodborne Disease Outbreak Surveillance System (foodborne disease outbreaks)
  - Waterborne Disease and Outbreak Surveillance System (waterborne disease outbreaks)
- National Center for Environmental Health
  - Childhood Blood Lead Surveillance (lead exposure test results in children)
- National Institute for Occupational Safety and Health
  - Sentinel Event Notification System for Occupational Risks (SENSOR)-Pesticides Program (acute pesticide related illness)
  - Adult Blood Lead Epidemiology and Surveillance (ABLES) Program (lead exposure test results in adults)
  - State-Based Silicosis Surveillance (silicosis)

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BOX. Criteria defining nationally notifiable conditions and disease outbreaks used to determine whether notifications to CDC are published in the annual *Summary of Notifiable Noninfectious Conditions and Disease Outbreaks*

Condition/Outbreak	Classification
Acute pesticide-related illness	Definite, probable, possible, and suspicious
Cancer	Confirmed
Lead exposure test results in children	Confirmed
Lead exposure test results in adults	Confirmed
Silicosis	Confirmed
Foodborne disease outbreak	Two or more cases of a similar illness resulting from the ingestion of the same food
Waterborne disease outbreak	Two or more cases of a similar illness linked epidemiologically by time and location to exposure to water or water-associated chemicals volatized into the air

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