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Prevalence of Amyotrophic Lateral Sclerosis — United States, 2015

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Amyotrophic lateral sclerosis (ALS), commonly known as Lou Gehrig's disease, is a progressive and fatal neuromuscular disease; the majority of ALS patients die within 2–5 years of receiving a diagnosis (*1*). Familial ALS, a hereditary form of the disease, accounts for 5%–10% of cases, whereas the remaining cases have no clearly defined etiology (*1*). ALS affects persons of all races and ethnicities; however, whites, males, non-Hispanics, persons aged ≥60 years, and those with a family history of ALS are more likely to develop the disease (*2*). No cure for ALS has yet been identified, and the lack of proven and effective therapeutic interventions is an ongoing challenge. Treatments currently available, Edaravone and Riluzole, do not cure ALS, but slow disease progression in certain patients (*3*,*4*). This report presents National ALS Registry findings regarding ALS prevalence in the United States for the period January 1–December 31, 2015. In 2015, the estimated prevalence of ALS cases was 5.2 per 100,000 population with a total of 16,583 cases identified. Overall, these findings are similar to the 2014 ALS prevalence and case count (5.0 per 100,000; 15,927 cases) (*2*). Prevalence rates by patient characteristics (most common in whites, males, and persons aged ≥60 years) and U.S. Census regions are consistent with ALS demographics and have not changed from 2014 to 2015 calendar years. The algorithm used to identify cases from national administrative databases was updated from the *International Classification of Diseases, Ninth Revision* (ICD-9) to the ICD-10 codes for claims starting on October 1, 2015, with no apparent effect on case ascertainment. Data collected by the National ALS Registry are being used to better describe the epidemiology of ALS in the United States and to facilitate research on the genetics, potential biomarkers, environmental pollutants, and etiology for ALS.

In 2008, the U.S. Congress passed the ALS Registry Act, which authorized the creation and maintenance of the National ALS Registry (Registry), and data collection began in 2010.* The Registry's goals and methods were described in detail previously (*5*). Because ALS, like most noncommunicable diseases, is not a nationally notifiable condition, cases in the United States are identified using a novel two-pronged approach. The first approach identifies cases from three large national administrative databases (Medicare, Veterans Health Administration, and Veterans Benefits Administration) by using an algorithm with elements such as the ICD code for ALS, frequency of visits to a neurologist, and prescription drug use. On October 1, 2015, ICD-10 codes were integrated into the algorithm, which categorizes cases in Registry nomenclature as "definite ALS," "possible ALS," and "not ALS" (*6*). Only definite ALS cases are entered into the Registry. The second approach is a secure web portal that

* ALS registry act of 2008, Pub. L. 110–373, 122 Stat 4047 (October 8, 2008). https://www.cdc.gov/als/files/ALS-Registry-Act-Public-Law-110-373.pdf.

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enables persons with ALS to enroll in the Registry, thereby identifying cases not recorded in the national databases. The web portal also allows enrollees the opportunity to complete up to 17 different brief risk-factor modules to describe their experience (e.g., occupational and military histories, smoking and alcohol use, family history of neurologic conditions, and head and neck injuries). Cases from both sources are then merged and deduplicated. Once an ALS case is identified, the patient remains a case until confirmed deceased through the National Death Index. This is referred to as cumulative prevalence of ALS and is calculated from the Registry by using the deduplicated total number of persons with ALS identified through the two-pronged approach for the numerator. The 2015 U.S. Census estimate is used for the denominator and 95% confidence intervals are calculated (*7*).

In 2015, a total of 16,583 persons were identified as having definite ALS by applying the algorithm to the three national databases (62% of ALS cases), by self-report through the web portal registration (19%), and from information in both database and portal (19%) (Table). Overall, 6,250 new ALS cases were identified in 2015, and 5,594 deaths among persons with ALS whose data were included in the Registry during 2014, for a net increase of 656 cases compared with 2014. No apparent difference in the number of ALS cases ascertained in 2014 and 2015 occurred when either ICD-9 or ICD-10 codes were used in each calendar year.

The 2015 estimated prevalence of ALS cases was 5.2 per 100,000 population, which is similar to the 2014 prevalence (5.0). The prevalence across age groups appears to be stable (Figure). The lowest prevalence (0.5 ALS cases per 100,000 population) was among persons aged 18–39 years, and the highest (20.2) was among persons aged 70–79 years (Table). As in 2014, the prevalence in males (6.4 ALS cases per 100,000 population) was higher than that in females (4.0). The ratio of cases in males to females was 1.6:1. The prevalence in whites (5.4 ALS cases per 100,000 population) was more than twice that in blacks (2.3). Prevalence rates were also calculated for the four U.S. Census regions (Northeast, South, Midwest, and West). Rates were highest in the Midwest (5.5 ALS cases per 100,000 population), followed by the Northeast (5.1), the South (4.7), and the West (4.4).

Discussion

Data sources for the Registry remain unchanged; however, the implementation of ICD-10 on October 1, 2015 required that ICD-10 codes be integrated into the validated algorithm without any apparent effect on case ascertainment. The Registry's approach of using national administrative databases is the cornerstone in identifying ALS cases because most of the definite ALS cases from 2010 to 2015 originate from these sources.

ALS has remained more prevalent in whites, males, and persons aged ≥60 years; current patterns are similar to those identified from 2010 to 2014 (*2*–*4*). The prevalence of ALS cases for 2015 appears to be stable (5.2 per 100,000 compared with 5.0 per 100,000 for 2014). The net increase of 656 cases is likely attributable to additional case ascertainment from the

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TABLE. Number and percentage of amyotrophic lateral sclerosis (ALS) cases (N = 16,583) and estimated prevalence, by age group, sex, race and geographic region — National ALS Registry, United States, 2015

Characteristic	Population*	No. (%) cases	Estimated cases per 100,000 population (95% CI)
Age group (yrs)			
18–39	95,782,809	480 (2.9)	0.5 (0.5–0.6)
40–49	41,141,609	1,462 (8.8)	3.6 (3.4–4.1)
50–59	43,712,960	3,214 (19.4)	7.4 (6.9–7.9)
60–69	35,356,070	4,774 (28.8)	13.5 (12.9–14.1)
70–79	19,606,548	3,953 (23.8)	20.2 (19.4–21.3)
≥80	11,892,496	1,522 (9.2)	12.8 (12.3–13.4)
Unknown	—	1,178 (7.1)	—
Sex			
Male	158,138,060	10,098 (60.9)	6.4 (6.2–6.5)
Female	163,280,761	6,458 (38.9)	4.0 (3.9–4.1)
Unknown	—	27 (0.16)	—
Race			
White	243,635,466	13,074 (78.8)	5.4 (5.2–5.6)
Black	44,677,216	1,045 (6.3)	2.3 (2.2–2.5)
Other	—	958 (5.8)	—
Unknown	—	1,503 (9.1)	—
U.S. Census region†			
Midwest	67,907,403	3744 (25.6)	5.5 (5.4–5.6)
Northeast	56,283,891	2881 (17.4)	5.1 (5.0–5.2)
South	121,182,847	5676 (34.2)	4.7 (4.6–4.8)
West	76,044,679	3352 (20.2)	4.4 (4.3–4.5)
Unknown	—	930 (5.6)	—
Total	**321,418,821**	**16,583 (100.0)**	**5.2 (5.1–5.3)**

Abbreviation: CI = confidence interval.
* From 2015 U.S. Census data.
† *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; *South:* Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; *Midwest:* Iowa, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

administrative databases, specifically Medicare, because the accumulation of data over multiple years might be adequate to finally meet the algorithm-based ALS case definition. This slight change in prevalence does not necessarily indicate an increase of ALS cases nationally. Additional years of data are needed to evaluate any possible trends. The Registry continues to evaluate additional data sources for case identification as well as ways to increase self-enrollment through the secure web portal to improve case ascertainment.

Prevalence rates by U.S. Census regions are consistent with ALS demographics and have not changed from 2014 to 2015 calendar years. Overall, whites have a higher prevalence of ALS than do blacks. The higher ALS prevalence in the Midwest and Northeast likely reflects the higher proportion of whites in those regions, compared with that in the South and West. The lowest prevalence in the West Census region is most likely related to the population diversity in states such as California.

Summary

What is already known about this topic?

Amyotrophic lateral sclerosis (ALS) is a progressive and fatal neuromuscular disease with no cure.

What is added by this report?

In 2015, a total of 16,583 persons were identified as having definite ALS. The estimated prevalence of ALS in 2015 was 5.2 per 100,000 population, which is similar to that in 2014 (5.0). Case ascertainment was unaffected by the inclusion of *International Classification of Diseases, Tenth Revision* codes in the algorithm used to identify cases from national databases.

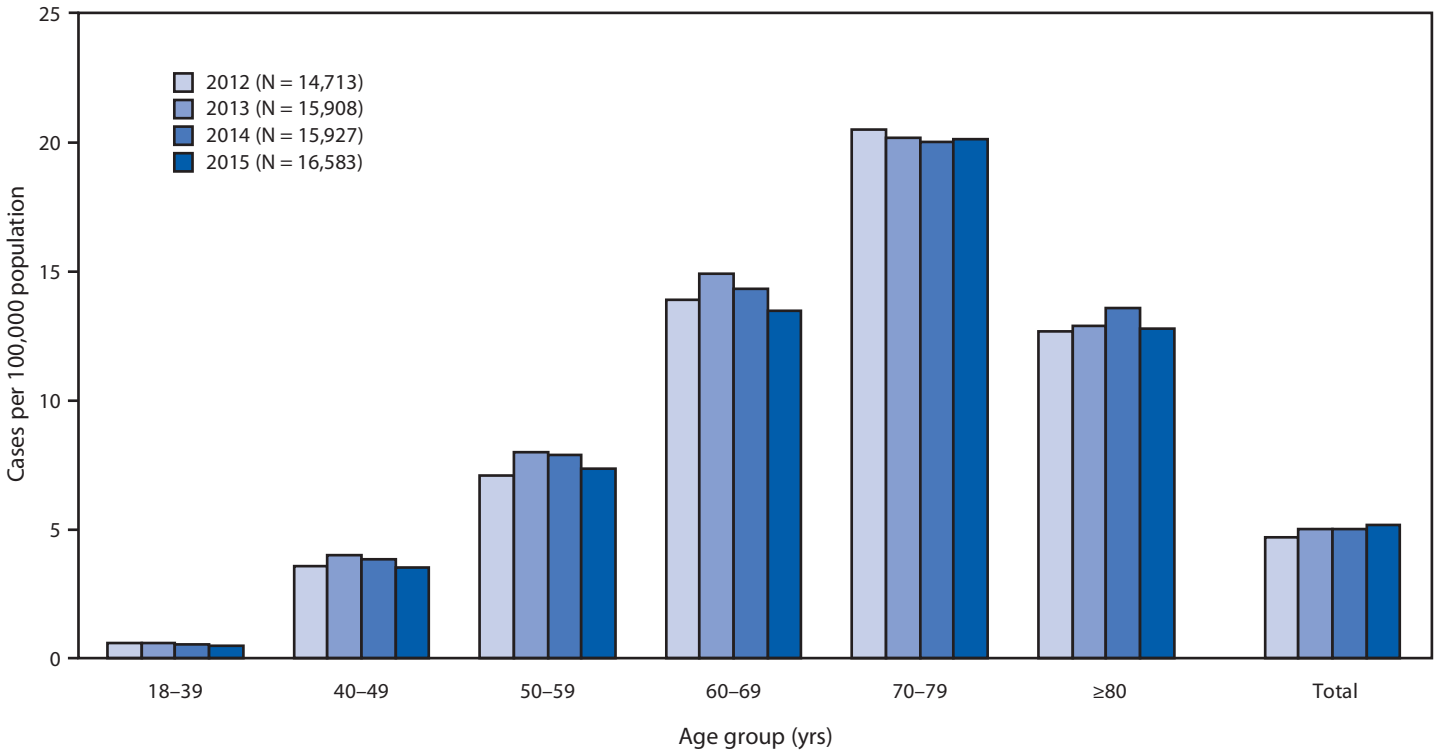
What are the implications for public health practice?

Through ongoing enhancements and expanded outreach and promotion, the National ALS Registry has the potential to facilitate ALS research and better describe the epidemiology of ALS cases in the United States.

In addition to monitoring the epidemiology of the disease, the Registry continues to expand and facilitate ALS research nationally. The National ALS Biorepository (Biorepository), a component of the Registry, collects samples across the United States via an in-home collection (e.g., blood, urine, or saliva) and postmortem collection (e.g., brain, bone, spinal cord, cerebrospinal fluid, muscle, and skin). This Biorepository is one of the largest in the country and collects pristine samples specifically for research; the few other existing ALS biorepositories largely have left-over samples from various clinics, medical practices, or previous clinical trials in the United States. Furthermore, the National ALS Biorepository specimens are collected from a geographically representative sample of Registry enrollees. The intent of the Biorepository is to collect specimens from at least one person per state. In addition, these de-identified samples can be paired with completed risk factor survey data (e.g., occupational and military history) from the Registry. Researchers are able to request samples alone or paired with risk factor data. The availability of additional specimens on a national sample of ALS patients further expands the research potential on the genetics, potential biomarkers, environmental pollutants, and etiology for ALS. Additional information for requesting samples and/or risk factor data is available at https://wwwn.cdc.gov/als/ALSRegistryResearchApplicationInfo.aspx.

The Registry also continues to fund ALS research nationally and internationally and across all disciplines of science to help determine etiology and risk factors. Since 2010, the Registry has funded 16 research projects, with three new R01 grants added in 2018. The goal behind this research portfolio is to better understand ALS in such areas as exposures to environmental pollutants, comparison of epigenetics in different population cohorts, exposure risks of cyanobacteria, and

FIGURE. Estimated prevalence of amyotrophic lateral sclerosis (ALS), by age group — National ALS Registry, United States, 2012–2015*



* Prevalence per 100,000 population using the 2015 U.S. Census estimate.

antecedent medical conditions (e.g., how chronic medical conditions and drugs might affect susceptibility to ALS). A complete list of funded studies is available at https://www.cdc.gov/als/ALSExternalResearchfundedbyRegistry.html#n. In addition, the Registry's research notification system continues to inform and connect patients with clinical trials and epidemiologic studies. To date, approximately 40 institutions have used this system for patient recruitment. Information about this recruitment is available at https://www.cdc.gov/als/ALSResearchNotificationClinicalTrialsStudies.html.

The findings in this report are subject to at least three limitations. First, because ALS is not a nationally notifiable disease, the possibility of underascertainment exists and the three databases from which the majority of cases are identified are not representative of the U.S. population. The databases include a large percentage of persons aged ≥50 years; however, both the U.S. Department of Veterans Affairs and Medicare have special considerations that allow persons with ALS to receive benefits for ALS without waiting periods or meeting age requirements, increasing the likelihood that they are in the databases. In addition, the Registry seeks to use capture/recapture methodology for future reports to estimate the percentage of missing ALS cases, as well as to improve self-enrollment by increasing awareness and outreach in underrepresented populations identified in certain geographic areas (*8*,*9*). Second, although every attempt was made to deduplicate files, differences in fields collected from the various sources, misspellings of names, and data entry errors could have prevented records from merging correctly. However, it is unlikely that this occurred in numbers sufficient to affect the overall conclusions. Finally, the calculation of ALS incidence with Registry data is not possible at this time because the date of diagnosis is not captured through the large administrative database approach, and cases without a date of diagnosis account for 79.6% of cases in the Registry.

The establishment of the National ALS Registry and the National ALS Biorepository fills an important scientific gap by providing estimates of prevalence of this disease and facilitates further study of risk factors and etiology. Furthermore, the enhancements to the Registry also increase its potential for ALS research and detection of more cases. As more persons with ALS enroll and complete surveys, a better understanding of possible risk factors might emerge.

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References

1. Mitsumoto HCD, Pioro EP. Amyotrophic lateral sclerosis. Philadelphia, PA: F.A. Davis Company; 1998.
2. Mehta P, Kaye W, Raymond J, et al. Prevalence of amyotrophic lateral sclerosis—United States, 2014. MMWR Morb Mortal Wkly Rep 2018;67:216–8. https://doi.org/10.15585/mmwr.mm6707a3
3. Bhandari R, Kuhad A, Kuhad A. Edaravone: a new hope for deadly amyotrophic lateral sclerosis. Drugs Today (Barc) 2018;54:349–60. https://doi.org/10.1358/dot.2018.54.6.2828189
4. Dharmadasa T, Kiernan MC. Riluzole, disease stage and survival in ALS. Lancet Neurol 2018;17:385–6. https://doi.org/10.1016/S1474-4422(18)30091-7
5. Mehta P, Antao V, Kaye W, et al. Prevalence of amyotrophic lateral sclerosis—United States, 2010–2011. MMWR Suppl 2014;63(No. SS-7).
6. World Health Organization. The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. Geneva, Switzerland: World Health Organization; 1992. http://www.who.int/classifications/icd/en/GRNBOOK.pdf
7. US Census Bureau. Total population 2015 American community survey 1-year. Washington, DC: US Department of Commerce, US Census Bureau; 2015. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk
8. Kaye WE, Wagner L, Wu R, Mehta P. Evaluating the completeness of the national ALS registry, United States. Amyotroph Lateral Scler Frontotemporal Degener 2018;19:112–7. https://doi.org/10.1080/21678421.2017.1384021
9. Nelson LM, Topol B, Kaye W, et al. Estimation of the prevalence of amyotrophic lateral sclerosis in the United States using national administrative healthcare data from 2002 to 2004 and capture-recapture methodology. Neuroepidemiology 2018;51:149–57. https://doi.org/10.1159/000488798

Lead in Spices, Herbal Remedies, and Ceremonial Powders Sampled from Home Investigations for Children with Elevated Blood Lead Levels — North Carolina, 2011–2018

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The number of pediatric cases of elevated blood lead levels (BLLs) are decreasing in North Carolina. However, one county reported an increase in the number of children with confirmed BLLs ≥5 μg/dL (CDC reference value, https://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm), from 27 in 2013 to 44 in 2017. Many children with elevated BLLs in this county lived in new housing, but samples of spices, herbal remedies, and ceremonial powders from their homes contained high levels of lead. Children with chronic lead exposure might suffer developmental delays and behavioral problems (https://www.cdc.gov/nceh/lead/). In 1978, lead was banned from house paint in the United States (*1*); however, children might consume spices and herbal remedies daily. To describe the problem of lead in spices, herbal remedies, and ceremonial powders, the North Carolina Childhood Lead Poisoning Prevention Program (NCCLPPP) retrospectively examined properties where spices, herbal remedies, and ceremonial powders were sampled that were investigated during January 2011–January 2018, in response to confirmed elevated BLLs among children. NCCLPPP identified 59 properties (6.0% of all 983 properties where home lead investigations had been conducted) that were investigated in response to elevated BLLs in 61 children. More than one fourth (28.8%) of the spices, herbal remedies, and ceremonial powders sampled from these homes contained ≥1 mg/kg lead. NCCLPPP developed a survey to measure child-specific consumption of these products and record product details for reporting to the Food and Drug Administration (FDA). Lead contamination of spices, herbal remedies, and ceremonial powders might represent an important route of childhood lead exposure, highlighting the need to increase product safety. Setting a national maximum allowable limit for lead in spices and herbal remedies might further reduce the risk for lead exposure from these substances.

All BLLs for North Carolina children aged <6 years are required to be reported to NCCLPPP, along with demographic data including race and Hispanic ethnicity of the child. Approximately 51% of North Carolina children are tested during routine well child visits at age 1 or 2 years. Diagnostic testing of a second (preferably venous) blood specimen at a reference laboratory is required to confirm all BLLs ≥5 μg/dL. Since July 1, 2017, a confirmed elevated BLL has been defined in North Carolina as two consecutive test results ≥5 μg/dL within a 12-month period; previously, a confirmed elevated BLL was defined as two consecutive test results ≥10 μg/dL within a 6-month period.*

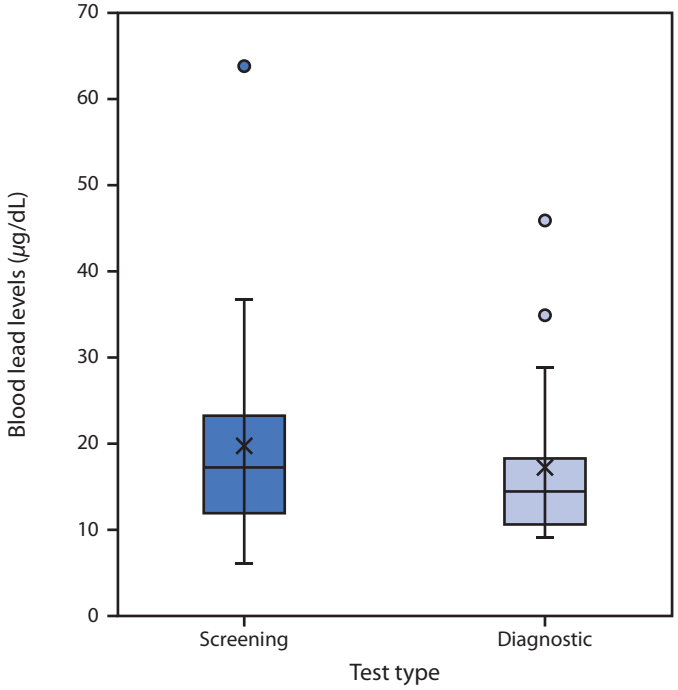
Lead investigators from state and local health departments offer free home investigations for children with confirmed elevated BLLs. Because of the lag time between the initial and diagnostic specimen collection and laboratory result reporting, investigations might be scheduled several months after the initial BLL specimen was collected. During January 2011–January 2018, home lead investigations were conducted at 983 properties in North Carolina. Lead investigators collected information on when the home was built, documented any evidence of lead in the home, and submitted environmental samples of lead paint, water, soil, consumer products, and foods to the North Carolina State Laboratory of Public Health for chemical analysis. All spice, herbal remedy, and ceremonial powder samples were screened for lead with an atomic absorption mass spectrometer by the North Carolina State Laboratory of Public Health; starting in 2011, samples with <15 mg/kg of lead were subsequently analyzed using an inductively coupled plasma mass spectrometer. Lead investigators entered investigation reports and environmental sample data into the North Carolina childhood lead surveillance system and linked investigations to the children's blood lead test results.

For the environmental samples tested, results below the limit of detection (LOD) were replaced by LOD divided by $\sqrt{2}$, an extrapolation technique with low error rates (*2*). Blood lead test results below LOD were standardized to 1 μg/dL. Because information about consumption was not collected for most children, descriptive statistics were calculated for the environmental sample results separately from the child blood lead data. The data analysis and figures for this paper were generated using statistical software.

Among the 61 children included in this report, the average screening (initial) BLL was 17.0 (±9.6) μg/dL (Figure), and the average diagnostic BLL was 15.2 (±7.0) μg/dL. Diagnostic BLLs were drawn between February 28, 2011, and December 5, 2017. The average age of the children at the time of the lead investigation was 2.3 years (range = 0.9 to 6.6 years); investigations for these children were conducted from March 17, 2011, to January 26, 2018.

* Public Health Law of North Carolina §130A-131.5-131.9H. https://www.ncleg.net/EnactedLegislation/Statutes/PDF/ByChapter/Chapter_130A.pdf.

FIGURE. Screening and diagnostic* blood lead levels in children (n = 61) exposed to lead-contaminated spices, ceremonial powders, or herbal remedies — North Carolina, 2011–2017



* Box plots illustrate the distributions of screening (initial) and diagnostic (confirmatory) blood lead levels. The tops of the boxes represent the 75th percentile and the bottoms the 25th percentile. The middle line of the box is the median. X represents the mean. Circles represent outliers. Whiskers indicate the standard deviations.

Information on race was available for 58 (95%) children. Among those with known race, 41 children (67.2%) were identified as Asian (including those of Indian and Pakistani descent); nine children (13%) were identified as black or African American (including two siblings born in West Africa). Among eight children identified as white, one was from Afghanistan. Among 51 children (84%) for whom Hispanic ethnicity was known, seven (11.5%) were Hispanic.

The 59 properties investigated were in eight primarily urban counties; 42 properties (71%) were built after 1978. Among these 42 newer residences, 10 had brass objects, jewelry, cookware, and other consumer items that might have contained lead; 32 (76%) had no evidence of lead in paint, dust, miniblinds, faucets, bathtub glaze, or furniture finish. In seven of these 32 properties, spices, herbal remedies, and ceremonial powders were the only identified risk.

A total of 392 samples of spices, herbal remedies, and ceremonial powders were collected from the 59 properties. Six sample results were excluded because of different sampling and analysis methods. Among the remaining 386 samples included in this report, 344 (89%) were items intended for consumption (food), including spices and herbal remedies; and 42 (11%) were items not intended for consumption (nonfood), including ceremonial powders. Mean lead levels of ≥1 mg/kg were identified in 50 product categories, including 10 nonfood categories and 40 food categories. Among 177 samples included in these 50 product categories, 111 (62.7 %) individual samples were contaminated with ≥1 mg/kg lead, including 76 (22.0%) food items and 35 (83.3%) nonfood items (Table). These 111 contaminated samples represent 28.8% of the 386 samples included. Among nonfood items (ceremonial powders and topical remedies), the highest average lead levels were detected in kumkum (average = 12,185 mg/kg; range = 0.4–140,000), sindoor (average = 41,401 mg/kg; range = 0.1–130,000), and surma (average = 68,000 mg/kg; only one sample collected). Among edible items, saffron supplement (average = 2,764 mg/kg; only one sample collected), Balguti Kesaria (an Ayurvedic medicine) (average = 220 mg/kg; only one sample collected), and turmeric (average = 66 mg/kg; range = 0.1–740) had the highest average lead levels. Country of purchase was recorded for 187 (48%) of the 386 samples; therefore, product origin is largely unknown. Among samples with known origin, 142 (76%) were purchased in the United States.

Discussion

Lead can contaminate spices during many points in the global supply chain. Spices are often grown in countries polluted by leaded gasoline, smelters, battery manufacturing plants, and mines. Lead is deposited in soil and water from airborne pollutants and fertilizer application. Lead dust from grinding machinery can also contaminate spices (*3*). Spices might also be adulterated deliberately with lead to enhance color or increase weight.† Because >95% of spices consumed in the United States are imported,§ recommendations to purchase only locally grown spices are impractical. According to the World Health Organization Codex Standard 193–1995, the permissible limit of lead for infant formula is 0.02 mg/kg lead and for salt is 2 mg/kg. No U.S. permissible limit for lead in spices exists; however, the FDA limit for lead in natural-source food color additives (e.g., paprika, saffron, and turmeric) is 10 mg/kg. The FDA action levels (i.e., the levels at which an investigation is undertaken, or a recall is issued, depending upon the circumstances and findings) for products intended for consumption by children are 0.1 mg/kg for candy and 0.5 mg/kg for other foods¶; however, spices are not considered food intended for consumption by children. The Environmental Protection Agency estimates of consumption

† https://www.astaspice.org/the-american-spice-trade-associations-statement-on-lead-in-turmeric/.
§ https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58398.
¶ https://www.fda.gov/food/foodborneillnesscontaminants/metals/ucm172050.htm.

TABLE. Categories of spices, herbal remedies, and ceremonial powders (N = 177) with average lead level ≥1 mg/kg sampled during lead investigations — North Carolina, 2011–2018

Product category	No. of samples	Average lead level, mg/kg (SD)	Range, mg/kg
Nonfood items			
Ash powder	1	19.0 (N/A)	N/A
Incense	4	7.0 (6.6)	1.9–15.7
Kum kum (powder made from turmeric or other materials, used for social and religious markings in India)	12	12,185.2 (40,276.5)	0.4–140,000.0
Pooja powder (used in Hindu religious worship)	1	65.0 (N/A)	N/A
Rangoli (colored powders used to make designs)	2	2.9 (1.8)	1.6–4.2
Sandal scented pooja powder	2	4.2 (1.6)	3.0–5.3
Sandalwood (chandan) powder	3	8.4 (9.2)	3.0–19.0
Sindoor (traditional red cosmetic powder)	8	41,401.1 (58,540.7)	0.1–130,000.0
Surma (an ore ground into powder, used as an eye cosmetic)	1	68,000.0 (N/A)	N/A
Vibhuti (ash made from burnt dried wood, applied to the skin in religious rituals)	3	80.3 (70.2)	2.9–140.0
Food items			
Spices and condiments			
Anise	4	1.7 (1.9)	0.3–4.4
Bay leaves	1	2.6 (N/A)	N/A
Black seeds	1	2.6 (N/A)	N/A
Cardamom	1	1.4 (N/A)	N/A
Chaat masala	1	1.5 (N/A)	N/A
Chili garlic sauce	1	4.0 (N/A)	N/A
Chili powder/Red pepper	23	12.6 (41.2)	0.1–170.0
Cinnamon	2	2.6 (0.1)	2.5–2.7
Cloves	1	1.4 (N/A)	N/A
Coriander	9	4.8 (12.8)	0.1–39.0
Cumin	17	1.1 (1.5)	0.1–6.4
Cumin and coriander mix	2	1.1 (0.5)	0.7–1.4
Curry leaf powder	1	1.4 (N/A)	N/A
Curry powder	2	1.4 (1.7)	0.2–2.6
Dagad phool (stone flower)	1	2.8 (N/A)	N/A
Fenugreek	1	1.4 (N/A)	N/A
Ginger	3	1.0 (0.5)	0.7–1.6
Lemon powder	1	6.5 (N/A)	N/A
Kabsa spice	1	19.0 (N/A)	N/A
Mint	1	2.0 (N/A)	N/A
Rosemary	1	1.6 (N/A)	N/A
Saffron	2	1.2 (1.4)	0.2–2.2
Shwarma spice	1	6.8 (N/A)	N/A
Spice mix (all purpose)	3	1.8 (2.6)	0.2–4.8
Turmeric	34	66.4 (206.6)	0.1–740.0
Vanilla	1	8.5 (N/A)	N/A
Medications, oils, and supplements			
Balguti Kesaria (Ayurvedic medicine)	1	220.0 (N/A)	N/A
Chamomile oil	1	8.2 (N/A)	N/A
Herbal remedy	1	8.2 (N/A)	N/A
Lime calcium powder	1	1.4 (N/A)	1.4
Nux vomica	1	10.6 (N/A)	N/A
Mojhat ceremonial drink	1	31.0 (N/A)	N/A
Saffron supplement	1	2,764.0 (N/A)	N/A
Prepared foods			
Candy	5	10.6 (14.0)	0.0–25.9
Milk cookie	1	1.4 (N/A)	N/A
Other food products			
Baby cereal	2	17.6 (23.2)	1.2–34.0
Cornstarch	2	5.4 (6. 6)	0.7–10.0
Rice flour	3	4.1 (5.7)	0.1–10.6
Rice with turmeric	1	1.4 (N/A)	N/A
Sugar	3	3.7 (6.0)	0.1–10.6

Abbreviations: N/A = not applicable; SD = standard deviation.

from the What We Eat in America survey are low for many of the spices in question (e.g., 0.09 g/day of cumin, 0.03 g/day of turmeric) (*4*); however, spice consumption might differ for children whose parents emigrated from Southeast Asia (e.g., estimated consumption: 1.22 ± 1.14 g per portion of cumin in dishes prepared daily; 0.60 ± 0.46 g per portion of turmeric in dishes prepared daily), where spices are used in cooking, home remedies, and ceremonial activities (*5*). Use of spices, herbal remedies, and alternative medicines also are increasingly popular among other U.S. residents; spice imports into the United States have increased by approximately 50% since 1998 (*6*). However, their regulation is complicated by Internet sales, international travel, and importation by relatives and friends (*7*).

A large proportion of ceremonial powders, spices, and herbal remedies found during home investigations for children with elevated BLLs in North Carolina were contaminated with lead. Spices and herbal remedies are meant for consumption, used to enhance food flavor and color, and are administered medicinally to persons of all ages. Lead investigators reported that spices and herbal remedies are used by both recent immigrants and U.S.-born children. Although ceremonial powders are not food, they might be accidentally ingested by children.

Most previous reports of childhood lead poisoning from spices are case reports (*7*,*8*). This study includes approximately 7 years of data, environmental investigation results, and clinical findings from 61 children for whom these substances were a suspected source of lead exposure.

Because the level of detail reported on spice sample consumption and product origin was inconsistent among lead investigators, NCCLPPP created a survey tool to guide and encourage lead investigators to collect the details necessary for FDA reporting. This survey tool was piloted during home investigations in one North Carolina county. The survey also was tested for cultural sensitivity, administration time, and ease of understanding through focus groups with Hispanic and

Summary

What is already known about this topic?

No national limit exists for lead contamination in spices. Ingested lead is absorbed quickly by children and causes developmental delays.

What is added by this report?

A North Carolina study of lead content in spices, herbal remedies, and ceremonial powders in homes of children with elevated blood lead levels found that 28.8% of samples contained ≥1 mg/kg lead, suggesting contaminated products might represent an important source of childhood lead exposure. A survey instrument was created to collect information on product origin and consumption.

What are the implications for public health practice?

Spices and herbal remedies are increasingly part of U.S. children's diets and might be a source of lead exposure in children with elevated blood lead levels.

South Asian community members. The survey tool is available online in English** and Spanish.††

New York City, New York State, and California have created their own recall and alert protocols for contaminated products (*9*,*10*). NCCLPPP leads a quarterly, national workgroup to develop standardized protocols for product reporting and data and sample collection. To reduce the time for reporting to FDA, NCCLPPP added a new workflow to the North Carolina childhood lead surveillance system, which lists new lead poisoning cases from consumable items. If the spices or herbal remedies are purchased in the United States, the NCCLPPP epidemiologist will notify the FDA Consumer Safety Officer regional liaison of the findings. In 2017, FDA formed a Toxic Elements Working Group to focus on protecting consumers from heavy metals such as lead in food, cosmetics, and dietary supplements (https://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm604173.htm).

The findings in this report are subject to at least five limitations. First, spices are frequently purchased wholesale and removed from their original containers, so information regarding product origins and lot numbers might have been discarded. Second, many lead investigators did not collect spice and herbal remedy samples. The authors excluded 11 reports from the numerator but not the denominator of the analysis (all lead investigations since January 1, 2011), in which cultural products were not sampled, although they were suspected as a lead exposure hazard, so the number of cases with exposure to these products might be underestimated. Third, until recently, persons with BLLs confirmed between 5–9 μg/dL were only offered education and clinical management unless they lived in a county with a local ordinance triggering home investigation at lower levels than the state guidelines, which also may lead to an underestimation of cases. Fourth, although some individual specimens contained low detectable lead levels, the combined, chronic exposure to these products might increase BLLs in some children. Direct toxicologic modeling cannot be performed using these data because of the large amount of missing information regarding consumption. Finally, the small sample size and the large age range of children would make modeling the effects of these exposures difficult because the metabolism of lead and effect of lead on the development of an infant aged 1 year would be different from that for a child aged 5 years.

Lead poisoning prevention professionals should educate parents about the potential for lead exposure from spices, herbal remedies, and ceremonial powders by making educational materials available in several languages at festivals, places of worship, and other community centers. Keeping ceremonial powders out of reach of children can prevent their accidental consumption, and testing of children who consume spices or herbal remedies regularly might lead to earlier detection of elevated BLLs (https://www.cdc.gov/nceh/lead/tips/folkmedicine.htm). Lead investigators should sample these products during investigations and attempt to document product origin and level of consumption. Increasing testing of spices, herbal remedies, and ceremonial powders for heavy metals by food safety regulators at the port of entry when these substances are imported into the United States might reduce the occurrence of lead poisoning associated with these substances.§§ Because these products are sold nationwide, setting a national maximum allowable limit for lead in spices and herbal remedies might further reduce the risk for lead exposure from them.

** https://ehs.ncpublichealth.com/docs/forms/cehu/SpiceandHomeRemedySurveyFINAL-English.pdf.

†† https://ehs.ncpublichealth.com/docs/forms/cehu/SpiceandHomeRemedySurveyFINAL-Spanish.pdf.

§§ https://www.fda.gov/food/guidanceregulation/importsexports/importing/ and https://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm2006791.htm.

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References

1. US Consumer Product Safety Commission. CPSC announces final ban on lead-containing paint. Bethesda, MD: US Consumer Product Safety Commission; 2016. https://www.cpsc.gov/Recalls/1977/CPSC-Announces-Final-Ban-On-Lead-Containing-Paint/
2. Croghan C, Egeghy P. Methods of dealing with values below the limit of detection using SAS. In: Proceedings of the Southern SAS User Group; September 22–24, 2003; St. Petersburg, Florida; 2003. https://analytics.ncsu.edu/sesug/2003/SD08-Croghan.pdf
3. Woolf AD, Woolf NT. Childhood lead poisoning in 2 families associated with spices used in food preparation. Pediatrics 2005;116:e314–8. https://doi.org/10.1542/peds.2004-2884
4. Food and Drug Administration. FDA draft risk profile: pathogens and filth in spices. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2013. https://www.fda.gov/downloads/Food/FoodScienceResearch/RiskSafetyAssessment/UCM367337.pdf
5. Siruguri V, Bhat RV. Assessing intake of spices by pattern of spice use, frequency of consumption and portion size of spices consumed from routinely prepared dishes in southern India. Nutr J 2015;14:7. https://doi.org/10.1186/1475-2891-14-7
6. Bovay J. FDA refusals of imported food products by country and category, 2005–2013. Washington, DC: US Department of Agriculture; 2016. https://www.ers.usda.gov/publications/pub-details/?pubid=44069
7. Sharma S. Current status of herbal product: regulatory overview. J Pharm Bioallied Sci 2015;7:293–6. https://doi.org/10.4103/0975-7406.168030
8. Lin CG, Schaider LA, Brabander DJ, Woolf AD. Pediatric lead exposure from imported Indian spices and cultural powders. Pediatrics 2010;125:e828–35. https://doi.org/10.1542/peds.2009-1396
9. Hore P, Ahmed M, Nagin D, Clark N. Intervention model for contaminated consumer products: a multifaceted tool for protecting public health. Am J Public Health 2014;104:1377–83. https://doi.org/10.2105/AJPH.2014.301912
10. Handley MA, Nelson K, Sanford E, et al. Examining lead exposures in California through state-issued health alerts for food contamination and an exposure-based candy testing program. Environ Health Perspect 2017;125:104503. https://doi.org/10.1289/EHP2582

Self-Directed Walk With Ease Workplace Wellness Program — Montana, 2015–2017

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Arthritis occurs in 27% of adults in Montana, among whom 50% have activity limitations, 16% have social participation restrictions, and 23% have severe joint pain attributable to arthritis (*1*). Physical activity is beneficial in managing arthritis symptoms and in preventing other chronic diseases (*2*). Walk With Ease is a 6-week evidence-based physical activity program recommended by CDC to increase physical activity and help improve arthritis symptoms (*3*). In 2015, Walk With Ease was added to an ongoing workplace wellness program for Montana state employees; the results for five outcomes (minutes spent walking, engaging in other physical activity [including swimming, bicycling, other aerobic equipment use, and other aerobic exercise], stretching, pain, and fatigue) were analyzed by the Montana Department of Public Health and Human Services and CDC. Outcomes at baseline (pretest), 6 weeks after the program (posttest), and 6 months later (follow-up) were analyzed by self-reported arthritis status at the time the participant enrolled in the program. Significant increases ($p<0.05$) in the mean number of minutes spent per week walking and engaging in other physical activity were observed among participants with and without arthritis at the 6-week posttest. Time spent stretching did not change significantly at posttest for either group. Mean pain levels among participants without arthritis increased significantly both at the 6-week posttest and 6-month follow-up; however, pain and fatigue decreased significantly at posttest and follow-up for participants with or without arthritis who began the program with moderate or severe pain and fatigue levels. The data from these analyses suggest that, as a component of a workplace wellness program, self-directed Walk With Ease might be effective in increasing physical activity not only among adults with arthritis, but also among persons without arthritis.

Walk With Ease is a graduated walking program that can be delivered in an instructor-led group setting or through a self-directed workbook. Self-directed Walk With Ease participants communicate with a trainer by e-mail and walk on their own, reporting activity weekly. The Montana Health Care and Benefits Division has included self-directed Walk With Ease since 2015 in the established state employee wellness program, offering a health insurance premium discount as a financial incentive to participate in and complete the program.

Identical assessment surveys were conducted at the beginning of the program (at which time participants self-reported whether they had arthritis), immediately after the 6-week program, and at a 6-month follow-up. The surveys included questions on time spent engaged in six physical activities as well as levels of pain and fatigue, ranked on a scale of 0–10. The six physical activity questions asked how much time during the past week participants performed 1) stretching or strengthening exercises, 2) walking for exercise, 3) swimming or aquatic exercise, 4) bicycling (including using a stationary bike), 5) exercise using aerobic equipment other than a stationary bike, and 6) other aerobic exercise. Responses for the amount of time that participants engaged in physical activity, including walking and stretching, per week were coded as 0 (none), 1 (<30 minutes), 2 (30–60 minutes), 3 (61–180 minutes), or 4 (>180 minutes); these were converted to minutes (0, 15, 45, 120, and 240), respectively, for the analysis, using the median of each range and four hours for the highest category. Time spent engaged in other physical activity was obtained from the total number of minutes spent swimming, bicycling, using other aerobic equipment, and engaging in other aerobic exercise.

To ascertain pain and fatigue, participants were asked how much pain or fatigue they experienced during the past week, on a scale from 0 (no pain or fatigue) to 10 (severe pain or fatigue), and were grouped into mild (1–3), moderate (4–6), and severe (7–10) categories for analysis. Data were analyzed for the period 2015–2017. Pretest, 6-week posttest, and 6-month follow-up data were compared using paired t-tests, with statistical significance defined as $p<0.05$.

The number of participants increased from 105 in 2015 to 1,343 in 2016, and to 1,622 in 2017. The majority of the 3,070 total participants during 2015–2017 were aged >45 years (75%), white (94%), women (72%), college graduates (63%), and with no disability (90%) or arthritis (76%) (Table 1). Among those participating in the program, 2,598 (85%) completed it by submitting weekly time spent engaged in physical activity during at least 4 of 6 weeks. Overall, 1,936 (63%) and 934 (30%) participants completed the 6-week posttest or 6-month follow-up survey, respectively. Among 743 (24%) persons with arthritis who started the program, 496 (67%) completed the 6-week posttest, and 279 (38%) provided 6-month follow-up data. Of the 2,327 (76%) persons without arthritis who started the program, the 6-week posttest and 6-month follow up was completed by 1,440 (62%) and 655 (28%) participants, respectively. (Table 1).

TABLE 1. Characteristics of state employee Walk With Ease participants (N = 3,070) and percentage completing pretest and 6-week posttest or 6-month follow-up surveys, by arthritis status — Montana, 2015–2017

Characteristic (no. with available information*)	Participants			Participants completing pretest and 6-week posttest		Participants completing pretest and 6-month follow-up	
	No. (%)	With arthritis %	No arthritis %	With arthritis %	No arthritis %	With arthritis %	No arthritis %
Total	**3,070 (100)**	**24.2**	**75.8**	**66.8**	**61.9**	**37.6**	**28.1**
Age group (yrs) (2,970)							
21–34	307 (10)	6.5	93.5	75.0	57.5	45.0	17.8
35–44	452 (15)	11.1	88.9	50.0	54.0	20.0	18.7
45–54	790 (27)	19.6	80.4	64.5	63.3	37.4	32.3
55–64	1,099 (37)	33.5	66.5	66.3	67.4	39.9	34.9
≥65	322 (11)	42.2	57.8	75.0	71.0	34.6	31.7
Sex (2,949)							
Women	2,113 (72)	26.7	73.3	64.4	60.4	39.5	30.0
Men	836 (28)	19.3	80.7	73.9	67.0	31.7	24.4
Education (2,923)							
High school graduate	342 (12)	28.7	71.3	66.3	65.2	34.7	33.6
Some college	761 (26)	28.5	71.5	66.8	63.6	33.2	28.7
College graduate	1,278 (44)	21.8	78.2	66.7	63.7	40.1	29.3
Graduate school	542 (19)	24.9	75.1	65.2	61.7	41.5	25.8
Race (2,994)							
American Indian	78 (3)	38.5	61.5	60.0	58.3	40.0	18.8
White	2,812 (94)	25.1	74.9	67.4	63.6	37.9	29.0
Other race	104 (3)	14.4	85.6	46.7	51.7	33.3	29.2
Disability status (2,767)							
Disability†	269 (10)	48.7	51.3	58.8	65.9	39.7	29.7
No disability	2,498 (90)	21.3	78.7	72.2	65.0	37.3	29.2
Baseline pain (2,909)							
None (0)	817 (28)	6.4	93.6	71.2	64.1	42.3	30.6
Mild (1–3)	1,282 (44)	21.9	78.1	75.4	68.3	40.2	31.8
Moderate (4–6)	617 (21)	44.7	55.3	64.1	63.6	38.8	26.1
Severe (7–10)	193 (7)	61.7	38.3	55.5	56.8	34.5	27.0
Baseline fatigue (2,913)							
None (0)	716 (25)	15.1	84.9	81.5	67.4	44.4	33.4
Mild (1–3)	1,143 (39)	21.4	78.6	67.3	67.4	42.9	31.3
Moderate (4–6)	683 (23)	31.3	68.7	67.8	62.9	35.5	26.2
Severe (7–10)	371 (13)	43.7	56.3	58.6	59.3	34.6	28.2

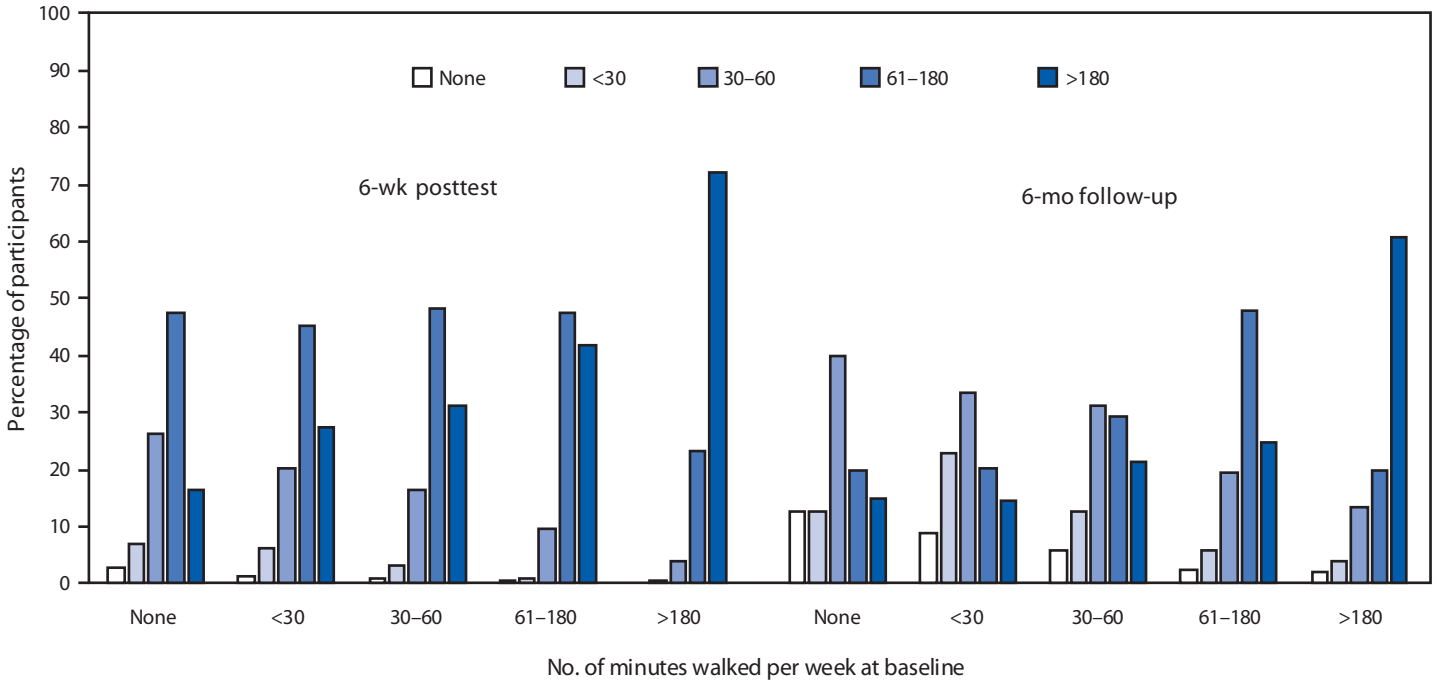
* Participants without available information were as follows: age group, 100 (3.3%); sex, 121 (3.9%); education, 141 (4.6%), and less than high school graduate excluded for six (0.2%); race, 76 (2.5%); disability status, 303 (9.9%); baseline pain, 161 (5.2%); baseline fatigue, 157 (5.1%).
† Based on self-reported hearing, seeing, walking, climbing stairs, or cognitive disability.

Among participants with and without arthritis, the mean number of minutes per week spent walking and engaged in other physical activity significantly increased at posttest. Overall, 73% of persons who walked <30 minutes per week at pretest increased to >60 minutes at posttest. Similarly, the majority of those starting at <30 minutes increased to >30 minutes at the 6-month follow-up (Figure). From a baseline of no walking, 97% were walking at 6 weeks, with 65% walking >60 minutes per week; 87% continued walking at the 6-month follow-up, with 35% walking >60 minutes per week. Among all participants who began the program walking 1–3 hours and >3 hours per week, 89% and 72%, respectively, maintained or increased their time spent walking at posttest. Mean number of minutes spent stretching did not change significantly at posttest. Mean walking and other physical activity did not change significantly at 6-month follow-up, except for a significant increase in walking when considering all participants. Stretching increased significantly at 6 months only for those with no arthritis (Table 2).

Among participants without arthritis, mean reported pain level increased significantly at 6 weeks and 6 months. Mean level of fatigue decreased significantly for both those with arthritis and no arthritis at 6 weeks, but increased significantly for those without arthritis at 6 months.

Among participants who started with moderate or severe pain and fatigue levels, mean pain and fatigue decreased significantly at posttest and 6-month follow-up among participants with and without arthritis (Table 2), whereas among participants starting the program with low levels of pain and fatigue, small but significant increases in mean pain and fatigue at the 6-week posttest and 6-month follow-up occurred for participants with and without arthritis (Table 2).

FIGURE. Percentage of participants, grouped by baseline walking, by number of minutes spent walking per week at the 6-week posttest and 6-month follow-up, among state employees participating in a self-directed Walk With Ease program — Montana, 2015–2017



Discussion

Participants with and without self-reported arthritis in the self-directed Walk With Ease program in Montana experienced significant increases at the 6-week posttest in the mean number of minutes per week spent walking. Increases in the number of minutes spent walking each week were consistent with findings from other evaluations of Walk With Ease, which showed improved performance measures, self-reported outcomes, and well-being among persons with self-reported arthritis (*3*,*4*). The majority of participants who reported little (<30 minutes a week) or no walking at the start were walking >60 minutes at the 6-week posttest and >30 minutes at the 6-month follow-up. Most walkers who started at other levels (>30 minutes a week) also maintained or increased their walking levels. The advances in walking at 6 weeks, however, were diminished at 6 months, suggesting that additional efforts might be needed to sustain program gains.

A notable finding of the analysis of the Walk With Ease program was the increase in time spent walking among persons who were not walking at all at the start of the intervention. The Walk With Ease program has the potential to offer a substantial change for adults with a sedentary lifestyle, who could benefit from public health interventions that encourage and promote a physically active lifestyle.

Lack of significant improvements in pain overall differed from previous findings, which showed that the walking programs reduced pain (*4*–*6*). The significantly increased pain levels among those with no arthritis were partially the result of regression toward the mean, with 48% of the participants starting with mild pain levels and 34% starting with zero pain. Short-term variability in pain scores has been documented, with more than 50% of veterans with chronic pain showing a range of more than two points on the 0–10 numeric rating scale in a given month (*7*). The pattern of worsening pain for

Summary

What is already known about this topic?

The Walk With Ease exercise program can improve arthritis symptoms and increase physical activity.

What is added by this report?

Among Montana state workers with and without self-reported arthritis who participated in self-directed Walk With Ease, walking levels increased significantly. Among participants not walking for exercise at the start of the program, 97% were walking at 6 weeks and 87% at 6 months. Pain and fatigue decreased among those with moderate or severe pain or fatigue at baseline.

What are the implications for public health practice?

Walk With Ease fits in workplace wellness programs, increases physical activity, and might help prevent future chronic diseases. Public health professionals can promote physical activity programs in collaboration with employers to improve worker health.

TABLE 2. Mean changes in minutes walked and pain and fatigue scores* for state employee Walk With Ease participants who completed pretest and 6-week posttest or 6-month follow-up surveys, by arthritis status — Montana, 2015–2017

Variable	With arthritis			No arthritis			Overall		
	Pretest	Posttest/ Follow-up	Change	Pretest	Posttest/ Follow-up	Change	Pretest	Posttest/ Follow-up	Change
6-week posttest									
Physical activity (minutes per week)									
Walking	107.5	156.5	49.1†	119.7	163.6	43.8†	116.6	161.8	45.2†
Other physical activity§	50.3	64.6	14.3†	69.8	88.1	18.3†	64.9	82.2	17.3†
Stretching	51.7	57.2	5.5	55.2	56.5	1.3	54.3	56.7	2.3
Baseline pain level (scale of 0–10)									
all (0–10)	3.77	3.74	-0.03	1.87	2.12	0.25†	2.35	2.53	0.18†
zero (0)	0.00	1.41	1.41†	0.00	1.13	1.13†	0.00	1.15	1.15†
mild (1–3)	2.17	3.00	0.83†	1.92	2.19	0.27†	1.98	2.38	0.40†
moderate (4–6)	4.97	4.36	-0.60†	4.82	3.66	-1.16†	4.89	3.98	-0.91†
severe (7–10)	7.80	5.74	-2.06†	7.57	4.48	-3.10†	7.71	5.25	-2.46†
Baseline fatigue level (scale of 0–10)									
all (0–10)	3.61	3.36	-0.25†	2.50	2.33	-0.18†	2.79	2.59	-0.20†
zero (0)	0.00	1.52	1.52†	0.00	0.93	0.93†	0.00	1.04	1.04†
mild (1–3)	1.95	2.68	0.74†	1.98	2.20	0.22†	1.97	2.30	0.33†
moderate (4–6)	4.90	3.85	-1.05†	4.74	3.49	-1.25†	4.79	3.61	-1.18†
severe (7–10)	7.88	5.48	-2.40†	8.02	4.81	-3.21†	7.96	5.10	-2.86†
6-month follow-up									
Physical activity (minutes per week)									
Walking	106.4	116.9	10.5	126.2	132.0	5.7	120.3	127.5	7.1†
Other physical activity§	53.0	62.3	9.3	68.0	74.6	6.7	63.6	71.0	7.4
Stretching	54.7	59.8	5.1	56.0	62.9	6.9†	55.6	62.0	6.4†
Baseline pain level (scale of 0–10)									
all (0–10)	3.90	3.82	-0.08	1.79	2.24	0.45†	2.42	2.72	0.29†
zero (0)	0.00	1.64	1.64†	0.00	1.52	1.52†	0.00	1.53	1.53†
mild (1–3)	2.26	3.29	1.04†	1.93	2.39	0.46†	2.01	2.63	0.61†
moderate (4–6)	4.93	4.06	-0.87†	4.73	3.26	-1.47†	4.84	3.69	-1.14†
severe (7–10)	7.85	5.85	-2.00†	7.40	3.85	-3.55†	7.70	5.20	-2.51†
Baseline fatigue level (scale of 0–10)									
all (0–10)	3.56	3.69	0.13	2.39	2.66	0.27†	2.74	2.97	0.23†
zero (0)	0.00	2.15	2.15†	0.00	1.22	1.22†	0.00	1.39	1.39†
mild (1–3)	1.89	3.03	1.14†	1.89	2.66	0.77†	1.89	2.76	0.87†
moderate (4–6)	4.97	4.51	-0.46†	4.76	3.93	-0.82†	4.84	4.16	-0.68†
severe (7–10)	7.82	5.14	-2.68†	8.02	4.95	-3.07†	7.92	5.04	-2.88†

* Increasing pain and fatigue were ranked on a 0–10 scale. All (0–10) is the nonstratified mean value. Mean values within subcategories of baseline pain and fatigue were defined as follows: zero = 0, mild = 1–3, moderate = 4–6, and severe = 7–10.
† p-value <0.05
§ Total minutes spent swimming, bicycling, using exercise equipment, or engaged in other aerobic exercise.

those with low starting pain and improvements for those with moderate to severe pain mirrors that found in other research, which documented increased pain among persons starting with low pain and improvement in pain for those starting with moderate to severe pain (*8*,*9*). An improved statistical measure to examine the pain scale when applied to healthier populations with many participants starting with no pain might be needed (*10*).

The findings in this report are subject to at least five limitations. First, Walk With Ease outcomes are based on self-reporting of time engaged in physical activity and pain and fatigue symptoms, which are subject to recall and social desirability biases. Second, pain levels might include a short-term increase of symptoms from new exercise, with later improvement; information on location of pain in the surveys might have improved this. Third, there was no control group to examine whether changes in pain and fatigue resulted from regression to the mean or from the intervention. Fourth, the 6-month follow-up had a low overall completion rate (30%), which could introduce reporting bias if outcomes influenced reporting and if persons who maintain the benefits long-term are more likely to respond. Finally, arthritis was self-reported and not confirmed by medical record review or clinical evaluation, which could have resulted in misclassification of arthritis status.

Self-directed Walk With Ease increased physical activity among adults with and without self-reported arthritis, particularly among persons with low levels of activity at baseline, and decreased pain and fatigue among those reporting moderate or severe pain and fatigue at baseline. Walk With Ease can succeed as a workplace wellness program for employees with

and without arthritis, moving persons from no activity to some activity and promoting the general health benefits from improved physical activity. Public health professionals might consider Walk With Ease and similar fitness programs in collaboration with employers to improve worker health.

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References

1. Barbour KE, Moss S, Croft JB, et al. Geographic variations in arthritis prevalence, health-related characteristics, and management—United States, 2015. MMWR Surveill Summ 2018;67(No. SS-4). https://doi.org/10.15585/mmwr.ss6704a1
2. 2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee scientific report. Washington, DC: US Department of Health and Human Services, 2018.
3. Callahan LF, Shreffler JH, Altpeter M, et al. Evaluation of group and self-directed formats of the Arthritis Foundation's Walk With Ease program. Arthritis Care Res (Hoboken) 2011;63:1098–107. https://doi.org/10.1002/acr.20490
4. Bruno M, Cummins S, Gaudiano L, Stoos J, Blanpied P. Effectiveness of two Arthritis Foundation programs: Walk With Ease, and YOU Can Break the Pain Cycle. Clin Interv Aging 2006;1:295–306. https://doi.org/10.2147/ciia.2006.1.3.295
5. Conte KP, Odden MC, Linton NM, Harvey SM. Effectiveness of a scaled-up arthritis self-management program in Oregon: Walk With Ease. Am J Public Health 2016;106:2227–30. https://doi.org/10.2105/AJPH.2016.303478
6. Katz P, Margaretten M, Gregorich S, Trupin L. Physical activity to reduce fatigue in rheumatoid arthritis: a randomized controlled trial. Arthritis Care Res (Hoboken) 2018;70:1–10. https://doi.org/10.1002/acr.23230
7. Dobscha SK, Morasco BJ, Kovas AE, Peters DM, Hart K, McFarland BH. Short-term variability in outpatient pain intensity scores in a national sample of older veterans with chronic pain. Pain Med 2015;16:855–65. https://doi.org/10.1111/pme.12643
8. Zhao F, Chang VT, Cleeland C, et al. Determinants of pain severity changes in ambulatory patients with cancer: an analysis from Eastern Cooperative Oncology Group trial E2Z02. J Clin Oncol 2014;32:312–9. https://doi.org/10.1200/JCO.2013.50.6071
9. Olsen MF, Bjerre E, Hansen MD, et al. Pain relief that matters to patients: systematic review of empirical studies assessing the minimum clinically important difference in acute pain. BMC Med 2017;15:35. https://doi.org/10.1186/s12916-016-0775-3
10. Goulet JL, Buta E, Bathulapalli H, Gueorguieva R, Brandt CA. Statistical models for the analysis of zero-inflated pain intensity numeric rating scale data. J Pain 2017;18:340–8. https://doi.org/10.1016/j.jpain.2016.11.008

Notes from the Field

Multiple Modes of Transmission During a Thanksgiving Day Norovirus Outbreak — Tennessee, 2017

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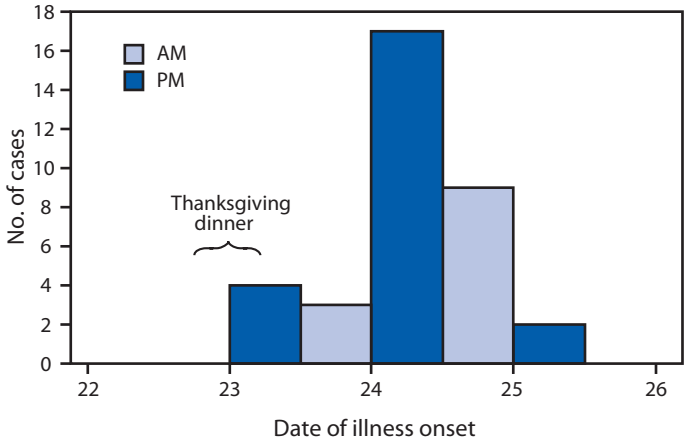
On November 28, 2017, the manager of restaurant A in Tennessee reported receiving 18 complaints from patrons with gastrointestinal illness who had dined there on Thanksgiving Day, November 23, 2017. Tennessee Department of Health officials conducted an investigation to confirm the outbreak, assess exposures, and recommend measures to prevent continued spread.

On November 23, one patron vomited in a private dining room, and an employee immediately used disinfectant spray labeled as effective against norovirus* to clean the vomitus. After handwashing, the employee served family-style platters of food and cut pecan pie. For the November 23 Thanksgiving Day, restaurant A served 676 patrons a limited menu from 11 a.m. to 8 p.m. The manager provided contact information, seating times, and seating locations for 114 patrons with reservations. All patrons with contact information were telephoned, and a questionnaire was used to assess illness and exposures for anyone living in the household who ate at restaurant A on November 23. Stool specimens were requested from ill patrons. Among the 676 patrons, 137 (20%) were enrolled in a case-control study.

A probable case was defined as diarrhea (three or more loose stools in 24 hours) or vomiting within 72 hours of eating at restaurant A on November 23; probable cases with norovirus RNA detected in a stool specimen by real-time reverse transcription–polymerase-chain reaction (RT-PCR) were considered confirmed. On November 30, environmental swabs for norovirus testing were collected in the restaurant. Patient and environmental samples were tested by real-time RT-PCR and sequenced at the Tennessee State Public Health Laboratory.

Thirty-six (26%) case-patients (two confirmed and 34 probable) and 101 (74%) controls were enrolled in the case-control study. Illness onsets occurred during November 23–25, with 17 of 35 (49%) cases occurring on November 24 (Figure). The mean incubation period was 31 hours (range = 2.5–54.5 hours), and the mean illness duration was 3 days (range = 0–6 days). Only one case-patient sought medical care. Diarrhea was reported by 33 (94%) case-patients, fatigue by 29 (83%), nausea and abdominal cramps by 28 (80%), vomiting by 24 (69%), and fever by six (17%).

FIGURE. Cases of gastrointestinal illness among patrons of a restaurant — Tennessee, November 2017*



* N = 35; onset date was not available for one of the laboratory-confirmed cases in the outbreak.

Among menu items, only pecan pie was significantly associated with illness (odds ratio [OR] = 2.6; 95% confidence interval [CI] = 1.1–5.8); however, it was eaten by only 16 (47%) of 34 case-patients. The vomiting event occurred around noon; patrons seated during 11 a.m.–1 p.m. were significantly more likely to become ill than were patrons seated during other times (OR = 6.0; 95% CI = 2.6–15.3). No significant differences between dining locations (i.e., private dining room versus general seating) were identified (OR = 1.4; 95% CI = 0.4–4.3). Logistic regression was used to evaluate the effects of eating pecan pie, seating time, and seating location; only seating time during 11 a.m.–1 p.m. remained statistically significant (OR = 6.0; 95% CI = 2.2–16.5).

Stool specimens from two case-patients identified Norovirus GII.P16-GII.4 Sydney. Norovirus GII was identified in one environmental swab collected from the underside of a table leg adjacent to the vomitus.

A point-source norovirus outbreak occurred after an infected patron vomited in a restaurant. Transmission near the vomiting event likely occurred by aerosol or fomite. Norovirus spread throughout the restaurant could have occurred by aerosol, person-to-person, fomite, or foodborne routes. Inadequate employee handwashing likely facilitated foodborne transmission through servings of pecan pie.

* Active ingredients = n-Alkyl dimethyl benzyl ammonium chlorides and n-Alkyl dimethyl ethylbenzyl ammonium chlorides.

In hospital settings, CDC and the Tennessee Department of Health recommend contact precautions (e.g., gloves and gowns) when personnel have contact with vomitus (*1*). Similarly, the Food and Drug Administration's 2017 Food Code recommends restaurants have a written plan detailing when and how employees should use personal protective equipment for cleaning vomitus (*2*). Reinforcing the need for proper handwashing and performing thorough environmental cleaning with appropriate personal protective equipment in food service establishments can prevent or mitigate future outbreaks.

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References

1. MacCannell T, Umscheid CA, Agarwal RK, Lee I, Kuntz G, Stevenson KB; Healthcare Infection Control Practices Advisory Committee-HICPAC. Guideline for the prevention and control of norovirus gastroenteritis outbreaks in healthcare settings. Infect Control Hosp Epidemiol 2011;32:939–69. https://doi.org/10.1086/662025
2. Food and Drug Administration, Center for Food Safety and Applied Nutrition. FDA food code. Silver Spring, Maryland: US Department of Health and Human Services, Food and Drug Administration; 2017. https://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/

Correction and Republication: Abortion Surveillance — United States, 2014

On November 24, 2017, *MMWR* published "Abortion Surveillance — United States, 2014" (*1*). On August 6, 2018, the authors informed *MMWR* about inadvertent errors in the data that resulted in publication of some erroneous numbers for gestational ages and abortion ratios throughout the report. The authors have corrected these errors and confirm that the interpretation or the conclusions of the original report have not changed. Additional text has been added to clarify how CDC adjusts gestational age data. In accordance with December 2017 guidance from the International Committee of Medical Journal Editors (*2*), *MMWR* is republishing the corrected report. The republished report has supplementary materials that include the original report with these corrections and additional text clearly marked (*3*).

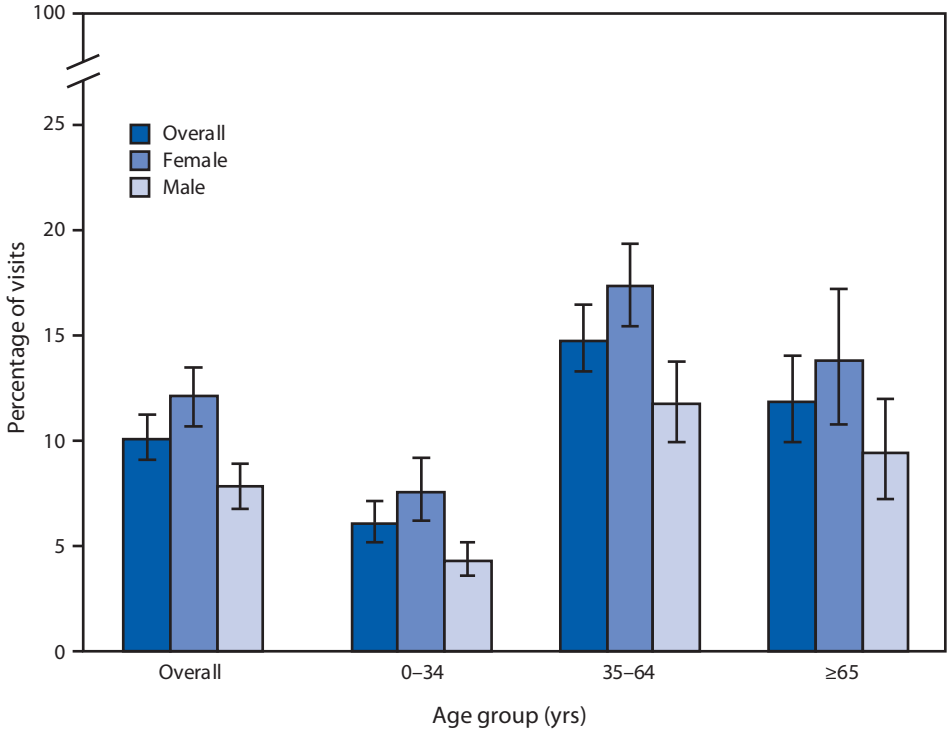
References

1. Jatlaoui TC, Shah J, Mandel MG, et al. Abortion surveillance—United States, 2014. MMWR Surveill Summ 2017;66(No. SS-24). https://doi.org/10.15585/mmwr.ss6624a1
2. International Committee of Medical Journal Editors (ICMJE). Corrections, retractions, republications and version control. Vancouver, British Columbia: International Committee of Medical Journal Editors (ICMJE); 2017. http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/corrections-and-version-control.html
3. Jatlaoui TC, Shah J, Mandel MG, et al. Abortion surveillance—United States, 2014. MMWR Surveill Summ 2018;66(No. SS-25). Corrected and republished from: MMWR Surveill Summ 2017;66(No. SS-24). https://doi.org/10.15585/mmwr.ss6625a1

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of All Emergency Department (ED) Visits† Made by Patients with Diagnosed Depression,§ by Sex and Age Group — National Hospital Ambulatory Medical Care Survey, United States, 2016



* With 95% confidence intervals indicated with error bars.
† Based on a sample of visits to EDs in noninstitutional general and short-stay hospitals, exclusive of federal, military, and Veterans Administration hospitals, located in the 50 states and the District of Columbia.
§ Defined as ED visits made by patients with documentation in their medical record of a diagnosis of depression, regardless of the diagnosis for the current visit.

During 2016, 10.1% of all ED visits in the United States were made by patients with depression documented in their medical record. By age, the highest percentage of ED visits by patients with depression was for visits by patients aged 35–64 years (14.8%), compared with 6.1% for visits by patients aged 0–34 years and 11.9% for patients aged ≥65 years. A higher percentage of visits to the ED were made by females with depression (12.1%) compared with males with depression (7.8%). This same pattern was present for all three age groups.

Source: National Center for Health Statistics, National Hospital Ambulatory Medical Care Survey, 2016.

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