Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 67 / No. 39
October 5, 2018

World Arthritis Day 2018 and National Mental Illness Awareness Week

World Arthritis Day* is October 12, 2018, and National Mental Illness Awareness Week† is October 7–13, 2018. World Arthritis Day encourages organizations and individuals to work toward increasing awareness about arthritis and other rheumatic conditions worldwide. National Mental Illness Awareness Week seeks to educate the public, combat stigma, and provide support to those affected by mental illness.

A report in this issue found that adults with arthritis had higher prevalences of symptoms of anxiety (22.5%) and depression (12.1%) compared with adults without arthritis (*1*). Community-delivered self-management educational programs, such as the Chronic Disease Self-Management Program,§ can increase self-efficacy (confidence) and physical activity (e.g., walking), improve self-rated health, and reduce depression, fatigue, and pain (*2*). CDC works with national and state partners to disseminate these educational programs in communities.

References

1. Guglielmo D, Hootman JM, Boring MA, et al. Symptoms of anxiety and depression among adults with arthritis—United States, 2015–2017. MMWR Morb Mortal Wkly Rep 2018;67:1081–7.
2. Brady TJ, Murphy L, O'Colmain BJ, et al. A meta-analysis of health status, health behaviors, and healthcare utilization outcomes of the Chronic Disease Self-Management Program. Prev Chronic Dis 2013;10:120112. https://doi.org/10.5888/pcd10.120112

* https://www.eular.org/what_we_do_dont_delay_connect_today_2018.cfm.
† https://www.nami.org/Get-Involved/Raise-Awareness/Awareness-Events/Mental-Illness-Awareness-Week.
§ https://www.cdc.gov/arthritis/marketing-support/1-2-3-approach/docs/pdf/provider_fact_sheet_cdsmp.pdf.

Symptoms of Anxiety and Depression Among Adults with Arthritis — United States, 2015–2017

Dana Guglielmo, MPH[1,2]; Jennifer M. Hootman, PhD[1]; Michael A. Boring, MS[1]; Louise B. Murphy, PhD[1]; Kristina A. Theis, PhD[1]; Janet B. Croft, PhD[1]; Kamil E. Barbour, PhD[1]; Patricia P. Katz, PhD[3]; Charles G. Helmick, MD[1]

An estimated 54.4 million (22.7%) U.S. adults have doctor-diagnosed arthritis (*1*). A report in 2012 found that, among adults aged ≥45 years with arthritis, approximately one third reported having anxiety or depression, with anxiety more common than depression (*2*). Studies examining mental health conditions in adults with arthritis have focused largely on depression, arthritis subtypes, and middle-aged and older adults, or have not been nationally representative (*3*). To

INSIDE

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

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

address these knowledge gaps, CDC analyzed 2015–2017 National Health Interview Survey (NHIS) data* to estimate the national prevalence of clinically relevant symptoms of anxiety and depression among adults aged ≥18 years with arthritis. Among adults with arthritis, age-standardized prevalences of symptoms of anxiety and depression were 22.5% and 12.1%, respectively, compared with 10.7% and 4.7% among adults without arthritis. Successful treatment approaches to address anxiety and depression among adults with arthritis are multifaceted and include screenings, referrals to mental health professionals, and evidence-based strategies such as regular physical activity and participation in self-management education to improve mental health.

NHIS is an ongoing, in-person, cross-sectional survey of the civilian, noninstitutionalized U.S. population. CDC analyzed combined NHIS data from 2015, 2016, and 2017 from the Sample Adult component of the survey, in which one adult is randomly selected from each family for whom additional information is collected. Response rates for the 3 years of surveys ranged from 53.0% to 55.2% and produced a 3-year sample of 93,442 participants. A randomly selected subset of approximately half of the sample adults (46,742) completed the Adult Functioning and Disability supplement over the 3-year period. Having arthritis was defined as a "yes" response to the question "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"

The Adult Functioning and Disability supplement included questions about symptoms of anxiety and depression. Respondents were classified as having symptoms of anxiety or depression if they reported the respective symptoms daily or weekly and responded that the last time they experienced symptoms, the intensity was "a lot" or "in between a little and a lot."† These definitions identified adults whose symptoms would likely meet *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V) diagnostic criteria and also would be clinically managed, which are referred to in this report as "clinically relevant," although these definitions are not clinical diagnoses.§,¶ The final unweighted sample sizes for those

* https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm.

† Respondents were classified based on a frequency question (anxiety: "How often do you feel worried, nervous or anxious?" and depression: "How often do you feel depressed?") and an intensity question (anxiety: "Thinking about the last time you felt worried, nervous or anxious, how would you describe the level of these feelings?" and depression: "Thinking about the last time you felt depressed, how depressed did you feel?"). Respondents were classified as having symptoms if they responded "daily" or "weekly" to the frequency question and "a lot" or "in between a little and a lot" to the intensity question. Respondents were classified as not having symptoms if they responded "daily" or "weekly" to the frequency question and "a little" to the intensity question, or if they responded "monthly," "a few times a year," or "never" to the frequency question. For each symptom, the remaining respondents were excluded from the analysis because their symptom status could not be identified.

§ https://dsm.psychiatryonline.org/doi/full/10.1176/appi.books.9780890425596.dsm04.

¶ https://dsm.psychiatryonline.org/doi/full/10.1176/appi.books.9780890425596.dsm05.

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

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR Morb Mortal Wkly Rep 2018;67:[inclusive page numbers].

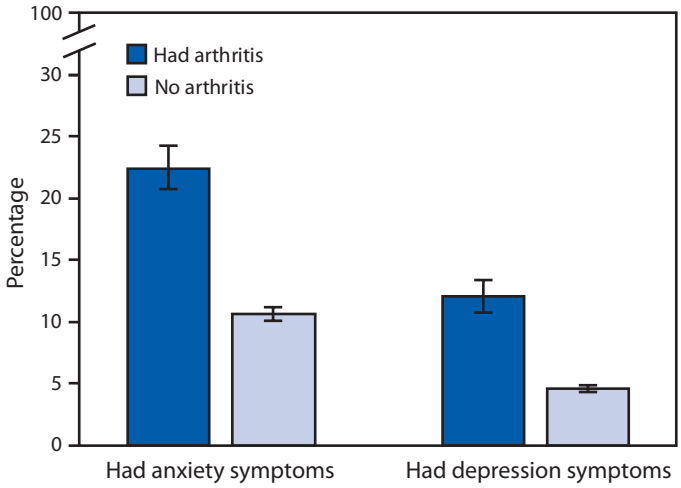
with arthritis who also reported whether they had anxiety or depression symptoms were 12,094 and 12,083, respectively.

Analyses accounted for the complex survey design, including the use of supplement file sampling weights so that weighted estimates derived from the sample were nationally representative. Age-standardized prevalences (using the 2000 projected U.S. population for persons aged 18–44, 45–64, and ≥65 years)** of symptoms of anxiety and depression were calculated for adults with and without arthritis and groups of those with arthritis who had selected sociodemographic and health-related characteristics. Prevalences of speaking with a mental health professional in the past 12 months and currently taking medications for symptoms of anxiety and depression†† also were calculated. T-tests were performed to assess statistical significance ($p<0.05$) when comparing differences.

During 2015–2017, age-standardized prevalences of symptoms of anxiety and depression among adults with arthritis were 22.5% (95% confidence interval [CI] = 20.8–24.3) and 12.1% (CI = 10.8–13.4), respectively. Prevalences among adults without arthritis were 10.7% (CI = 10.2–11.2) and 4.7% (CI = 4.4–5.0), respectively (Figure 1). When weighted estimates were applied, among adults with arthritis, an estimated 10.3 million reported symptoms of anxiety or depression; 4.9 million reported symptoms of anxiety only, 1.3 million reported symptoms of depression only, and 4.1 million reported symptoms of both.

Among adults with arthritis, age-specific prevalences of symptoms of anxiety and depression were higher among adults aged 18–44 years than among those aged ≥65 years; prevalence of symptoms of anxiety was also higher among adults with arthritis aged 18–44 years than adults with arthritis aged 45–64 years (Table). Age-standardized prevalences of symptoms of anxiety and depression were higher among women than among men; among those who were unemployed, unable to work, or disabled compared with employed adults; and among adults who reported their sexual identity as lesbian, gay, bisexual, or "other" than among those who reported being heterosexual. Symptom prevalences were lower among adults with higher educational and income-to-poverty ratios. Higher symptom prevalences were reported by adults with chronic pain and arthritis-attributable activity limitations, and prevalences increased with the number of co-occurring chronic conditions, increasing psychological distress, and declining self-rated health. Adults with arthritis who reported aerobic physical activity had lower anxiety and depression symptom prevalences than did inactive adults. Symptom prevalences also were higher among current cigarette smokers than among those who had never smoked.

FIGURE 1. Age-standardized percentage* of adults reporting symptoms of anxiety and depression,† by arthritis§ status — National Health Interview Survey, 2015–2017



* Estimates age-standardized to the 2000 projected U.S. population aged ≥18 years using three groups (18–44 years, 45–64 years, and ≥65 years).

† Respondents were classified based on a frequency question (anxiety: "How often do you feel worried, nervous or anxious?" and depression: "How often do you feel depressed?") and an intensity question (anxiety: "Thinking about the last time you felt worried, nervous or anxious, how would you describe the level of these feelings?" and depression: "Thinking about the last time you felt depressed, how depressed did you feel?"). Respondents were classified as having symptoms if they responded "daily" or "weekly" to the frequency question and "a lot" or "in between a little and a lot" to the intensity question. Respondents were classified as not having symptoms if they responded "daily" or "weekly" to the frequency question and "a little" to the intensity question, or if they responded "monthly," "a few times a year," or "never" to the frequency question. For each symptom, the remaining respondents were excluded from the analysis because their symptom status could not be identified.

§ Respondents were classified as having arthritis if they responded "yes" to "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"

Taking medications was less common among arthritis patients who had anxiety symptoms (44.3%; CI = 40.4–48.3) than among those with symptoms of depression (57.7%; CI = 52.4–62.9) (Figure 2). Speaking with a mental health professional in the past 12 months was reported by 34.3% (CI = 30.3–38.1) of arthritis patients with anxiety symptoms and 42.8% (CI = 37.7–48.1) of those with symptoms of depression.

Discussion

This report presents national estimates of clinically relevant symptoms of anxiety and depression among U.S. adults with arthritis. In the United States, an estimated 10.3 million adults with arthritis reported symptoms of anxiety, depression, or both. Prevalences of symptoms of anxiety and depression were substantially higher among adults with arthritis than among those without arthritis, and among adults with

** https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

†† Medication use for each of the anxiety or depression symptoms was ascertained from the question, "Do you take medication for these feelings?"

TABLE. Age-standardized prevalence* of anxiety symptoms and depression symptoms† among adults aged ≥18 years with arthritis,§ by selected characteristics — National Health Interview Survey, 2015–2017

Characteristic	Anxiety symptoms			Depression symptoms		
	Sample size	Unweighted no.	% (95% CI)¶	Sample size	Unweighted no.	% (95% CI)¶
Overall	12,094	2,039	22.5 (20.8–24.3)	12,083	1,304	12.1 (10.8–13.4)
Sociodemographic						
Age group (yrs)¶						
18–44	1,390	409	28.3 (25.2–31.5)	1,391	204	13.7 (11.5–16.2)
45–64	4,730	1,034	19.5 (18.1–21.0)	4,718	704	12.5 (11.4–13.8)
≥65	5,974	596	9.7 (8.8–10.7)	5,974	396	6.2 (5.5–7.1)
Sex						
Men	4,604	592	16.0 (13.8–18.5)	4,594	382	9.2 (7.4–11.4)
Women	7,490	1,447	26.9 (24.5–29.4)	7,489	922	14.0 (12.4–15.8)
Race/Ethnicity**						
White	9,195	1,556	23.9 (21.8–26.1)	9,187	953	12.0 (10.5–13.6)
Black	1,392	189	17.8 (13.8–22.7)	1,389	152	13.6 (9.6–18.8)
Hispanic	921	190	20.3 (15.9–25.7)	920	131	12.4 (9.4–16.0)
Asian	285	26	10.6 (4.7–22.0)	285	20	3.4 (1.8–6.1)
American Indian/Alaska Native	87	24	21.7 (10.7–39.1)	87	17	15.4 (7.9–27.7)
Other/Multiple race	214	54	32.3 (21.6–45.4)	215	31	17.4 (8.5–32.1)
Education						
Less than high school graduate	1,784	379	27.9 (22.9–33.4)	1,780	282	19.4 (15.4–24.2)
High school graduate or equivalent	3,347	549	23.1 (19.5–27.2)	3,352	346	12.9 (10.1–16.3)
Technical school/Some college	3,816	676	23.8 (21.2–26.7)	3,804	439	11.8 (9.9–13.9)
College degree or higher	3,108	426	17.9 (15.1–21.2)	3,107	234	8.6 (6.8–10.8)
Employment status						
Employed/Self-employed	4,453	643	17.0 (14.9–19.2)	4,453	323	7.0 (5.9–8.3)
Unemployed	250	86	32.9 (24.9–42.1)	250	56	19.6 (12.8–28.9)
Unable to work/Disabled	6,916	1,197	36.6 (32.0–41.4)	6,910	863	25.9 (21.7–30.7)
Other	472	113	26.9 (21.1–33.7)	467	62	14.9 (10.4–20.9)
Income-to-poverty ratio (IPR)††						
Poor (IPR<100%)	1,796	605	37.0 (32.5–41.7)	1,792	449	27.1 (22.9–31.9)
Near poor (100%≤IPR<125%)	714	159	28.6 (21.4–37.0)	715	99	16.2 (10.6–23.9)
Low income (125%≤IPR<200%)	1,891	319	27.0 (22.2–32.5)	1,889	206	12.7 (9.7–16.5)
Middle income (200%≤IPR<400%)	3,579	542	21.1 (17.7–24.9)	3,579	336	11.2 (9.2–13.5)
High income (IPR≥400%)	4,115	414	15.3 (12.9–18.0)	4,108	214	6.0 (4.6–7.8)
Sexual identity						
Heterosexual	11,625	1,903	21.7 (20.0–23.6)	11,614	1,205	11.6 (10.3–13.0)
Lesbian/Gay/Bisexual/Other	323	104	36.9 (29.0–45.5)	323	76	21.3 (15.7–28.2)
Health-related						
BMI (kg/m^2)						
Underweight/Healthy weight (<25)	3,080	519	24.2 (20.9–27.8)	3,078	312	11.6 (9.5–14.0)
Overweight (25 to <30)	3,866	549	16.6 (14.0–19.6)	3,865	350	9.4 (7.5–11.8)
Obese (≥30)	4,797	912	25.6 (22.8–28.6)	4,785	615	14.2 (12.1–16.5)
No. of co-occurring chronic conditions§§						
0	3,031	435	18.0 (15.6–20.6)	3,029	234	8.1 (6.6–9.8)
1–2	6,358	979	23.6 (20.8–26.5)	6,355	590	13.0 (11.0–15.3)
≥3	2,705	625	40.2 (33.5–47.2)	2,699	480	27.9 (22.0–34.6)
Psychological distress¶¶						
None/Mild (K6≤4)	8,495	388	6.7 (5.4–8.3)	8,487	122	1.6 (1.1–2.3)
Moderate (5≤K6≤12)	2,719	997	40.8 (37.4–44.2)	2,721	594	20.1 (17.5–23.0)
Severe (K6≥13)	817	635	81.9 (77.4–85.7)	813	573	67.6 (60.4–74.0)
Self-rated health						
Excellent/Very good	4,669	424	15.3 (12.9–18.1)	4,659	193	5.5 (4.0–7.5)
Good	4,037	593	20.5 (17.9–23.3)	4,041	339	10.3 (8.5–12.4)
Fair/Poor	3,385	1,020	36.8 (33.0–40.7)	3,380	772	25.1 (21.8–28.8)
Chronic pain***						
No	6,317	592	14.7 (12.6–17.1)	6,310	299	6.0 (4.8–7.6)
Yes	5,765	1,446	31.2 (28.4–34.0)	5,769	1,005	18.7 (16.6–21.0)

See table footnotes on next page.

TABLE. (*Continued*) Age-standardized prevalence* of anxiety symptoms and depression symptoms† among adults aged ≥18 years with arthritis,§ by selected characteristics — National Health Interview Survey, 2015–2017

Characteristic	Anxiety symptoms			Depression symptoms		
	Sample size	Unweighted no.	% (95% CI)¶	Sample size	Unweighted no.	% (95% CI)¶
Arthritis-attributable activity limitations†††						
No	6,667	692	15.6 (13.7–17.7)	6,666	383	7.3 (6.0–8.8)
Yes	5,423	1,346	32.5 (29.5–35.7)	5,413	921	18.9 (16.6–21.5)
Aerobic physical activity level§§§						
Active	4,658	630	18.7 (16.3–21.3)	4,657	330	8.2 (6.9–9.9)
Insufficient	2,708	475	24.5 (20.9–28.5)	2,703	296	12.3 (10.1–15.0)
Inactive	4,572	899	26.8 (23.3–30.6)	4,567	655	18.1 (14.9–21.9)
Smoking status¶¶¶						
Current smoker	1,987	599	31.8 (28.3–35.5)	1,985	430	21.5 (18.6–24.8)
Former smoker	4,080	604	25.2 (21.4–29.5)	4,077	379	10.9 (8.6–13.8)
Never smoker	6,016	832	17.5 (15.3–19.8)	6,009	494	8.6 (7.1–10.3)
Binge drank alcohol in past 30 days****						
No	10,870	1,777	22.3 (20.3–24.3)	10,856	1,157	11.7 (10.3–13.2)
Yes	1,074	227	23.9 (20.2–28.0)	1,075	126	13.5 (10.5–17.3)
Have usual place for care						
No	551	108	22.1 (16.5–28.9)	553	69	11.0 (7.8–15.2)
Yes	11,543	1,931	22.5 (20.7–24.4)	11,530	1,235	12.1 (10.8–13.6)

Abbreviations: BMI = body mass index (kg/m^2); CI = confidence interval; K6 = Kessler-6 score.

* Estimates were age-standardized to the 2000 projected U.S. population aged ≥18 years using three groups (18–44 years, 45–64 years, and ≥65 years).

† Respondents were classified based on a frequency question (anxiety: "How often do you feel worried, nervous or anxious?" and depression: "How often do you feel depressed?") and an intensity question (anxiety: "Thinking about the last time you felt worried, nervous or anxious, how would you describe the level of these feelings?" and depression: "Thinking about the last time you felt depressed, how depressed did you feel?"). Respondents were classified as having symptoms if they responded "daily" or "weekly" to the frequency question and "a lot" or "in between a little and a lot" to the intensity question. Respondents were classified as not having symptoms if they responded "daily" or "weekly" to the frequency question and "a little" to the intensity question, or if they responded "monthly," "a few times a year," or "never" to the frequency question. For each symptom, the remaining respondents were excluded from the analysis because their symptom status could not be identified.

§ Respondents were classified as having arthritis if they responded "yes" to the question "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" Respondents with the values, "don't know," "missing," or "refused," for the arthritis case-finding question were excluded from the analytic sample.

¶ Age group percentages are age-specific, and all other percentages are age-standardized.

** Persons who identified as Hispanic might be of any race. Persons who identified with a racial group were all non-Hispanic.

†† Income-to-poverty ratio was calculated using income data generated using multiple imputation.

§§ Among nine chronic conditions (asthma, cancer, chronic obstructive pulmonary disease, diabetes, heart disease, hepatitis, hypertension, kidney disease, and stroke).

¶¶ Psychological distress was classified using the Kessler-6 scale, a 24-point scale capturing the presence and severity of nonspecific psychological distress symptoms in the past 30 days, as none/mild (Kessler-6 score [K6]≤4), moderate (5≤K6≤12), and severe (K6≥13).

*** Respondents were classified as having chronic pain if they reported having pain most days or every day in the past 3 months.

††† Respondents were classified as having arthritis-attributable activity limitations if they responded "yes" to the question "Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?"

§§§ Respondents were classified as active based on the 2008 Physical Activity Guidelines for Americans if they reported ≥150 minutes of moderate intensity leisure time aerobic physical activity per week, insufficiently active if they reported 1–149 minutes, and inactive if they reported zero minutes. Reported vigorous intensity physical activity minutes were counted double and added to moderate intensity physical activity minutes.

¶¶¶ Respondents were classified as ever having smoked if they had smoked at least 100 cigarettes in their lifetime.

**** Binge drinking was defined as consuming five or more drinks (men) or four or more drinks (women) over a 2-hour period.

arthritis, were substantially higher among younger adults than among older adults.

Similar to previous studies of adults with arthritis overall and for arthritis subtypes (e.g., osteoarthritis or rheumatoid arthritis) (*2*,*4*,*5*), the prevalence of anxiety symptoms exceeded that of symptoms of depression. Despite this, adults with anxiety symptoms less commonly reported taking medications for their symptoms than did those with symptoms of depression; the prevalences among those with either anxiety or depression symptoms were not statistically different for speaking with a mental health professional.

Those with arthritis who were unable to work or were disabled reported higher prevalences of symptoms of anxiety and depression than those who were employed, and adults aged 18–64 years reported higher prevalences of each than those aged ≥65 years. Mental health conditions (i.e., depression, anxiety, or emotional problems) and arthritis were previously reported as two of the top three causes of work disability among adults aged 18–64 years in 2011–2013 (*6*). Concerted efforts to improve arthritis and mental health outcomes could help reduce work disability. Adults with any work disability and employers can consult the Job Accommodation Network, a free service that provides extensive resources on job accommodations and Americans with Disabilities Act compliance.§§

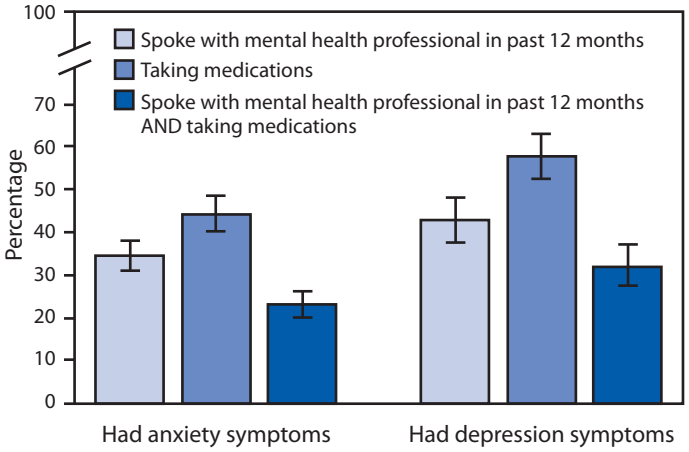
§§ https://askjan.org/.

Among adults with arthritis and chronic pain, symptoms of anxiety and depression were reported among 31.2% and 18.7%, respectively. A potential link exists between chronic pain and anxiety or depression, which might complicate physical and mental health management for persons with arthritis (*7*). Having arthritis has been associated with reduced adherence to treatment for depression (*8*), and in 2000–2001, nearly one in five surveyed persons with arthritis and major depression reported suicidal ideation within the past year (*9*). In clinic-based rheumatic disease studies, both anxiety and depression were associated with reduced response to treatment (*10*) and poorer quality of life (*4*). In addition, the National Institute of Mental Health estimates that only half of persons with a mental health condition receive treatment[¶¶]; the current analysis suggests that treatment prevalence among adults with arthritis might be similar or lower, especially for anxiety.

The occurrence of widespread anxiety and depression symptoms among adults with arthritis points to an unmet need that health care providers can address. The U.S. Preventive Services Task Force recommends depression screening for all adults[***]; the Substance Abuse and Mental Health Services Administration encourages screening persons of all ages for anxiety and depression[†††]; and The Guide to Community Preventive Services recommends collaborative care for depression.[§§§] The National Pain Strategy encourages addressing chronic pain conditions like arthritis with integrated care and self-management education.[¶¶¶] Health care providers can refer their arthritis patients to evidence-based programs like the Chronic Disease Self-Management Program, which has benefits including sustained reductions in depression, fatigue, and pain, and increases in aerobic activity, self-efficacy, and self-rated health.[****,††††] Providers can also suggest physical activity, which can improve symptoms of clinical anxiety and depression and can be as effective as medication or therapy for anxiety and depression.[§§§§] Even those who do not meet the full recommended federal guidelines can still receive physical and psychological benefits from physical activity.[¶¶¶¶]

[¶¶] https://www.nimh.nih.gov/health/statistics/index.shtml.
[***] https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/depression-in-adults-screening1.
[†††] https://www.integration.samhsa.gov/clinical-practice/screening-tools#bmb.
[§§§] https://www.thecommunityguide.org/findings/mental-health-and-mental-illness-collaborative-care-management-depressive-disorders.
[¶¶¶] https://iprcc.nih.gov/sites/default/files/HHSNational_Pain_Strategy_508C.pdf.
[****] https://www.selfmanagementresource.com/programs/.
[††††] https://www.cdc.gov/arthritis/docs/ASMP-executive-summary.pdf.
[§§§§] https://health.gov/paguidelines/second-edition/report/pdf/PAG_Advisory_Committee_Report.pdf.
[¶¶¶¶] https://health.gov/paguidelines/guidelines/chapter4.aspx.

FIGURE 2. Age-standardized percentage* of adults with arthritis† reporting treatment for anxiety symptoms or depression symptoms,§ by type of treatment¶, — National Health Interview Survey, 2015–2017**



* Estimates were age-standardized to the 2000 projected U.S. population aged ≥18 years using three groups (18–44 years, 45–64 years, and ≥65 years).
† Respondents were classified as having arthritis if they responded "yes" to the question "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"
§ Respondents were classified based on a frequency question (anxiety: "How often do you feel worried, nervous or anxious?" and depression: "How often do you feel depressed?") and an intensity question (anxiety: "Thinking about the last time you felt worried, nervous or anxious, how would you describe the level of these feelings?" and depression: "Thinking about the last time you felt depressed, how depressed did you feel?"). Respondents were classified as having symptoms if they responded "daily" or "weekly" to the frequency question and "a lot" or "in between a little and a lot" to the intensity question. Respondents were classified as not having symptoms if they responded "daily" or "weekly" to the frequency question and "a little" to the intensity question, or if they responded "monthly," "a few times a year," or "never" to the frequency question. For each symptom, the remaining respondents were excluded from the analysis because their symptom status could not be identified.
¶ Spoke with a mental health professional in the past 12 months was defined by the question "During the past 12 months, have you seen or talked to a mental health professional such as a psychiatrist, psychologist, psychiatric nurse, or clinical social worker?"
** Taking medications was defined as responding "yes" to the question "Do you take medication for these feelings?" (anxiety) or "Do you take medication for depression?"

The findings in this report are subject to at least three limitations. First, NHIS data are self-reported, and some characteristics might be susceptible to recall and social desirability biases and underreporting because of potential stigma. Second, symptoms of anxiety and depression are not equivalent to clinical diagnoses; the questions ascertaining symptoms have no time frame, the intensity question only refers to the most recent episode, and cases cannot be validated. Finally, NHIS data are cross-sectional, so the temporal sequence of arthritis, anxiety, and depression, and other characteristics cannot be determined.

Summary

What is already known about this topic?

In adults with arthritis, anxiety and depression are associated with poorer overall health and quality of life.

What is added by this report?

Among adults with arthritis, 22.5% reported symptoms of anxiety and 12.1% reported depression. Anxiety and depression symptoms were more common among younger adults, those with chronic pain or comorbid chronic conditions, and those unable to work or who were disabled.

What are the implications for public health practice?

The high prevalence of symptoms of anxiety and depression among adults with arthritis warrants awareness, screening, and subsequent treatment of these conditions. Health care providers can refer patients to mental health professionals and self-management education programs, and encourage physical activity to reduce anxiety and depression symptoms and improve quality of life.

Symptoms of anxiety and depression are common among U.S. adults with arthritis. Whereas groups of adults with arthritis who have the highest prevalences of symptoms of anxiety and depression might be high treatment priorities, the high overall prevalence of each indicator compared with those among adults without arthritis suggests that all adults with arthritis would benefit from mental health screening. Health care providers can help their arthritis patients by screening and considering treating or referring adults with symptoms to mental health professionals or self-management education programs, and encouraging physical activity, which is an effective nonpharmacologic strategy that can help reduce the symptoms of anxiety and depression, improve arthritis symptoms, and promote better quality of life.

Acknowledgments

Rosemarie Kobau, MPH; Susan J. Bartlett, PhD.

Corresponding author: Dana Guglielmo, obx1@cdc.gov, 404-498-5453.

[1]Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee; [3]University of California, San Francisco.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Barbour KE, Helmick CG, Boring M, Brady TJ. Vital signs: prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation—United States, 2013–2015. MMWR Morb Mortal Wkly Rep 2017;66:246–53. https://doi.org/10.15585/mmwr.mm6609e1
2. Murphy LB, Sacks JJ, Brady TJ, Hootman JM, Chapman DP. Anxiety and depression among US adults with arthritis: prevalence and correlates. Arthritis Care Res (Hoboken) 2012;64:968–76.
3. Stubbs B, Aluko Y, Myint PK, Smith TO. Prevalence of depressive symptoms and anxiety in osteoarthritis: a systematic review and meta-analysis. Age Ageing 2016;45:228–35. https://doi.org/10.1093/ageing/afw001
4. Anyfanti P, Gavriilaki E, Pyrpasopoulou A, et al. Depression, anxiety, and quality of life in a large cohort of patients with rheumatic diseases: common, yet undertreated. Clin Rheumatol 2016;35:733–9. https://doi.org/10.1007/s10067-014-2677-0
5. Sambamoorthi U, Shah D, Zhao X. Healthcare burden of depression in adults with arthritis. Expert Rev Pharmacoecon Outcomes Res 2017;17:53–65. https://doi.org/10.1080/14737167.2017.1281744
6. Theis KA, Roblin DW, Helmick CG, Luo R. Prevalence and causes of work disability among working-age U.S. adults, 2011–2013, NHIS. Disabil Health J 2018;11:108–15. https://doi.org/10.1016/j.dhjo.2017.04.010
7. Tunks ER, Crook J, Weir R. Epidemiology of chronic pain with psychological comorbidity: prevalence, risk, course, and prognosis. Can J Psychiatry 2008;53:224–34. https://doi.org/10.1177/070674370805300403
8. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000;160:2101–7. https://doi.org/10.1001/archinte.160.14.2101
9. Fuller-Thomson E, Shaked Y. Factors associated with depression and suicidal ideation among individuals with arthritis or rheumatism: findings from a representative community survey. Arthritis Rheum 2009;61:944–50. https://doi.org/10.1002/art.24615
10. Matcham F, Norton S, Scott DL, Steer S, Hotopf M. Symptoms of depression and anxiety predict treatment response and long-term physical health outcomes in rheumatoid arthritis: secondary analysis of a randomized controlled trial. Rheumatology (Oxford) 2016;55:268–78. https://doi.org/10.1093/rheumatology/kev306

Factors Contributing to Congenital Syphilis Cases — New York City, 2010–2016

Jennifer Sanderson Slutsker, MPH[1]; Robin R. Hennessy, MPH[1,2]; Julia A. Schillinger, MD[1,2]

Congenital syphilis occurs when syphilis is transmitted from a pregnant woman to her fetus; congenital syphilis can be prevented through screening and treatment during pregnancy. Transmission to the fetus can occur at any stage of maternal infection, but is more likely during primary and secondary syphilis, with rates of transmission up to 100% at these stages (*1*). Untreated syphilis during pregnancy can cause spontaneous abortion, stillbirth, and early infant death. During 2013–2017, national rates of congenital syphilis increased from 9.2 to 23.3 cases per 100,000 live births (*2*), coinciding with increasing rates of primary and secondary syphilis among women of reproductive age (*3*). In New York City (NYC), cases of primary and secondary syphilis among women aged 15–44 years increased 147% during 2015–2016. To evaluate measures to prevent congenital syphilis, the NYC Department of Health and Mental Hygiene (DOHMH) reviewed data for congenital syphilis cases reported during 2010–2016 and identified patient-, provider-, and systems-level factors that contributed to these cases. During this period, 578 syphilis cases among pregnant women aged 15–44 years were reported to DOHMH; a congenital syphilis case was averted or otherwise failed to occur in 510 (88.2%) of these pregnancies, and in 68, a case of congenital syphilis occurred (eight cases per 100,000 live births).* Among the 68 pregnant women associated with these congenital syphilis cases, 21 (30.9%) did not receive timely (≥45 days before delivery) prenatal care. Among the 47 pregnant women who did access timely prenatal care, four (8.5%) did not receive an initial syphilis test until <45 days before delivery, and 22 (46.8%) acquired syphilis after an initial nonreactive syphilis test. These findings support recommendations that health care providers screen all pregnant women for syphilis at the first prenatal care visit and then rescreen women at risk in the early third trimester.

The 2009 U.S. Preventive Services Task Force (USPSTF) Recommendation Statement† and 2015 CDC Sexually Transmitted Disease Treatment Guidelines recommend serologic syphilis screening for all women at first prenatal care visit and additional testing at 28–32 weeks' gestation and at delivery for women at high risk (*4*). Whereas the USPSTF outlines specific groups which might be considered at high risk and recommended for testing during third trimester and at delivery (i.e., uninsured women, women living in poverty, sex workers, illicit drug users, women diagnosed with another sexually transmitted disease, and other women residing in communities with high syphilis morbidity), CDC recommends additional screening for "communities and populations in which the prevalence of syphilis is high and for women at high risk for infection" (*4*). New York State mandates syphilis screening at the first prenatal care examination§ and at delivery (*5*) and recommends repeat testing throughout pregnancy for women at high risk.¶ In NYC, the Health Code requires electronic reporting of reactive syphilis tests, as well as an indicator of pregnancy (known or probable). Women with reactive syphilis serologic tests who are known or suspected to be pregnant are the highest priority for investigation and are monitored throughout pregnancy.

* The number of live births come from NYC Vital Statistics data. https://a816-healthpsi.nyc.gov/epiquery/Birth/index.html.

† The 2009 USPSTF recommendation statement (Grade A) recommended screening all pregnant women for syphilis at the first prenatal care visit. The recommendation included an additional consideration to test women at high risk for syphilis again during the third trimester and at delivery and specifies groups at increased risk as uninsured women, women living in poverty, sex workers, illicit drug users, women diagnosed with another sexually transmitted disease, and women residing in communities with high syphilis morbidity. https://www.uspreventiveservicestaskforce.org/Page/Document/ClinicalSummaryFinal/syphilis-infection-in-pregnancy-screening. The 2018 USPSTF reaffirmation statement recommends screening all pregnant women "when they first present to care" and includes a consideration to rescreen women at high risk for syphilis in early third trimester and at delivery. In the 2018 recommendation, women at high risk include "those living in communities or geographic areas with higher prevalence of syphilis, those living with HIV, and those with a history of incarceration or commercial sex work." https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/syphilis-infection-in-pregnancy-screening1.

§ New York Public Health Law Section 2308 mandates syphilis screening at the first prenatal care examination. https://www.nysenate.gov/legislation/laws/PBH/2308.

¶ New York State recommends repeat testing throughout pregnancy for women at high risk, including patients in "communities and populations with high syphilis prevalence or for patients at high risk." https://www.health.ny.gov/diseases/communicable/syphilis/treatment_guidelines/guidelines.htm.

DOHMH reviewed records of all pregnant women with reported syphilis (any stage) during 2010–2016, and all congenital syphilis cases that met surveillance case definitions for confirmed congenital syphilis, probable congenital syphilis, or syphilitic stillbirth.** The probable congenital syphilis definition includes infants with clinical findings suggesting congenital syphilis (infant criteria), infants born to women who received a diagnosis of syphilis during pregnancy and did not initiate penicillin-based treatment ≥30 days before delivery (maternal criteria), or both. Data on patients with congenital syphilis and their mothers were abstracted from DOHMH's surveillance and case management registry and reviewed to determine whether prenatal care, syphilis screening, and treatment occurred early enough to prevent congenital syphilis. Both prenatal care and testing were defined as timely if received ≥45 days before delivery, the assumption being that 15 days is sufficient time for providers and DOHMH to follow up on reactive serology results and ensure treatment initiation ≥30 days before delivery, thereby preventing a probable congenital syphilis case.

During 2010–2016, a total of 578 syphilis infections were reported among women aged 15–44 years who were noted to be pregnant: six (1.0%) primary, 15 (2.6%) secondary, 126 (21.8%) early nonprimary nonsecondary, and 431 (74.6%) unknown duration or late. A total of 510 syphilis infections (88.2%) were not known to result in a congenital syphilis case. During this period, 68 congenital syphilis cases were reported. A median of eight cases were reported per year, with an increase to 19 cases in 2014 that was not sustained. Half of the 68 women who delivered an infant with congenital syphilis were aged 20–29 years, 53 (77.9%) were non-Hispanic black or Hispanic, and 31 of 56 (55.4%) with known country of origin were born outside the United States (Table 1).

Among these 68 mothers, 21 (30.9%) did not receive prenatal care or a syphilis test ≥45 days before delivery (Figure). Although DOHMH does not routinely record the reason why pregnant women with syphilis do not access prenatal care, 16 (76.2%) of 21 women had documented obstacles to accessing health care, such as substance use, mental health disorders, recent arrival in the United States, or unstable housing. During case investigation, five (23.8%) women cited lack of health care coverage as a reason for not seeking prenatal care.

Four (5.9%) of the 68 women received timely prenatal care but were not tested for syphilis ≥45 days before delivery

** During 2010–2016, cases of congenital syphilis were categorized in accordance with the Council of State and Territorial Epidemiologists case definitions. https://wwwn.cdc.gov/nndss/conditions/congenital-syphilis.

TABLE 1. Demographic and clinical characteristics of mothers of infants with congenital syphilis cases (n = 68) — New York City, 2010–2016

Characteristic	No. (%)
Age group (yrs)	
15–19	5 (7.4)
20–29	34 (50.0)
30–39	24 (35.3)
40–49	5 (7.4)
Race/Ethnicity	
Black, non-Hispanic	29 (42.7)
Hispanic	24 (35.3)
White, non-Hispanic	5 (7.4)
Asian, non-Hispanic	3 (4.4)
Other	7 (10.3)
Area-based poverty level*	
Low (<10% below poverty)	6 (8.8)
Medium (10% to <20%)	18 (26.5)
High (20% to <30%)	17 (25.0)
Very high (≥30%)	27 (39.7)
Country of birth†	
Foreign-born	31 (55.4)
U.S.-born	25 (44.6)
Syphilis stage§	
Primary	2 (3.0)
Secondary	1 (1.5)
Early, non-primary, non-secondary	37 (56.1)
Unknown duration or late	26 (39.4)
STIs reported before pregnancy¶	
Syphilis only	11 (16.2)
Chlamydia only	9 (13.2)
Gonorrhea only	1 (1.5)
>1 previously reported STI	6 (8.8)
None	41 (60.3)
STIs reported during pregnancy**	
Chlamydia	6 (8.8)
None	62 (91.2)

Abbreviation: STI = sexually transmitted infection.

* Area-based poverty level categories are based on the percentage of the population in each zip code tabulation area with a household income below the poverty threshold set by the federal government. In alignment with local area-based poverty guidelines, five-year American Community Survey poverty data from 2011 to 2015 were used to divide zip code tabulation areas into four categories indicating the percentage of residents living below the federal poverty limit: low (<10 %), medium (10 to <20%), high (20% to <30%), and very high (≥30%). Pregnant women were assigned to a zip code tabulation area based on zip code of residence at the time of reporting.

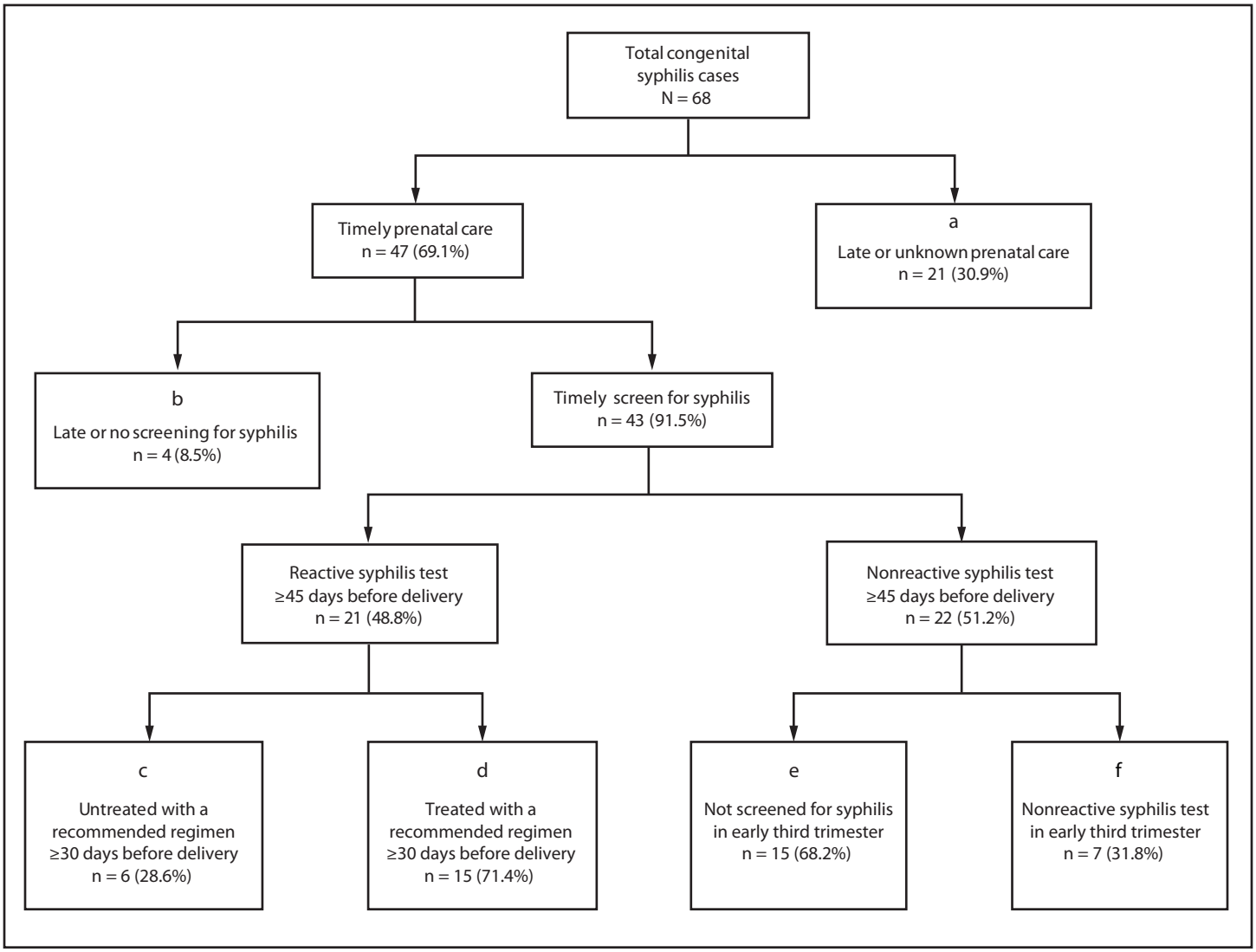
† Calculation of the percent of pregnant women by country of birth excludes women for whom country of birth was unknown.

§ Calculation of the percentage of pregnant women by syphilis stage excludes two pregnant women who did not meet the maternal criteria for reporting a congenital syphilis case. CDC case definitions were used to assign a syphilis stage to each pregnant woman (https://wwwn.cdc.gov/nndss/conditions/syphilis/case-definition/2018/).

¶ STIs reported before pregnancy include confirmed cases of syphilis (all stages), chlamydia, and gonorrhea reported to the New York City Department of Health and Mental Hygiene before each pregnant woman's estimated last menstrual period.

** STIs reported during pregnancy include confirmed cases of chlamydia reported to the New York City Department of Health and Mental Hygiene between each pregnant woman's estimated last menstrual period and delivery date. No pregnant woman in this investigation was reported with gonorrhea during this time.

FIGURE. Clinical care and public health management of pregnancies among women who delivered an infant with congenital syphilis — New York City, 2010–2016*,†,§



* Box a includes pregnant women with no documentation of prenatal care or syphilis screening ≥45 days before delivery. Box b includes pregnant women with prenatal care documented ≥45 days before delivery but no documentation of syphilis screening ≥45 days before delivery. Box c includes pregnant women with documentation of a reactive test for syphilis ≥45 days before delivery and documentation of adequate treatment initiated <30 days before delivery or no documentation of adequate treatment initiated before delivery. Box e includes pregnant women with documentation of a nonreactive test for syphilis ≥45 days before delivery, no documentation of syphilis screening between 28 weeks' gestation (estimated) and ≥45 days before delivery, and documentation of a reactive test <30 days before or at delivery such that infection was believed to have been acquired just before delivery.

† Box d includes pregnant women who had a documented reactive test for syphilis, initiated adequate treatment ≥30 days before delivery, but nonetheless had changes in serologic tests indicating reinfection late in pregnancy (e.g., increased nontreponemal titers). Box f includes pregnant women with documentation of a nonreactive test for syphilis between 28 weeks' gestation (estimated) and ≥45 days before delivery and documentation of a reactive test <30 days before or at delivery such that infection was believed to have been acquired just before delivery.

§ Box d includes two pregnant women who had stable nontreponemal titers during pregnancy (and therefore did not meet maternal criteria for reporting a congenital syphilis case), but who delivered an infant with signs and symptoms that met the infant criteria for a probable congenital syphilis case.

(Figure). Investigation revealed informatics errors as the reason two of these women were not screened (e.g., syphilis serologies were not included when programming a prenatal "lab order set" into a new laboratory ordering system). These errors occurred in different health systems. One of these women's infant died shortly after birth.

Among the 68 women, 22 (32.4%) had a time-appropriate, nonreactive test and subsequently acquired syphilis during pregnancy (Figure). Among these women, 15 (68.2%) did not have a documented syphilis test during the early third trimester (Figure), including 12 (80.0%) who had at least one characteristic indicating risk for syphilis: 10 lived in a

high-morbidity neighborhood,[††] 11 resided in a high-poverty neighborhood,[§§] one received a diagnosis of chlamydia during pregnancy, and two had syphilis before pregnancy. One woman who had a nonreactive test in the second trimester was not screened again until delivery, despite being seen in an emergency department with syphilis symptoms during the third trimester; her infant was stillborn.

The remaining 21 (30.9%) women had a reactive syphilis test ≥45 days before delivery. Six (28.6%) of these women had inadequate maternal treatment (Figure) because treatment was initiated too late or not at all. For one woman with inadequate treatment, investigation was delayed because pregnancy status was not known to DOHMH; for another woman, a provider advised delaying treatment, and the woman was not treated until <30 days before delivery. The remaining 15 (71.4%) initiated treatment ≥30 days before delivery but had stable or increasing nontreponemal titers consistent with reinfection or persistent infection close to delivery (Figure).

Among the 68 congenital syphilis cases were one syphilitic stillbirth (1.5%) and another confirmed case (1.5%) in an infant who later died. The remaining 66 congenital syphilis cases were probable; two (3.0%) met only infant criteria, 19 (28.8%) met both infant and maternal criteria, and 45 (68.2%) met only maternal criteria (Table 2). Many of the 45 infants who met only maternal criteria lacked documentation of a thorough congenital syphilis examination, 25 (55.6%) lacked long-bone radiograph results, and 26 (57.8%) lacked cerebrospinal fluid white blood cell count and protein analysis findings.

TABLE 2. Case definition criteria* associated with 66† reported probable congenital syphilis cases — New York City, 2010–2016

Characteristic	Maternal criteria only (N = 45) No. (%)	Infant criteria only (N = 2) No. (%)	Maternal and infant criteria (N = 19) No. (%)
Physical sign	0 (—)	0 (—)	1 (5.3)
Long-bone radiograph			
Changes consistent with CS	0 (—)	1 (50.0)	1 (5.3)
No signs of CS	20 (44.4)	1 (50.0)	15 (78.9)
Not done	20 (44.4)	0 (—)	3 (15.8)
Unknown	5 (11.1)	0 (—)	0 (—)
CSF VDRL analysis			
Reactive	0 (—)	0 (—)	2 (10.5)
Nonreactive	34 (75.6)	2 (100.0)	15 (78.9)
Not done	9 (20.0)	0 (—)	1 (5.3)
Unknown	2 (4.4)	0 (—)	1 (5.3)
CSF WBC and protein			
Either elevated	3 (6.7)	2 (100.0)	18 (94.7)
Neither elevated	16 (35.6)	0 (—)	1 (5.3)
Not done	16 (35.6)	0 (—)	0 (—)
Unknown	10 (22.2)	0 (—)	0 (—)

Abbreviations: CS = congenital syphilis; CSF = cerebrospinal fluid; VDRL = venereal disease research laboratory nontreponemal serologic syphilis test; WBC = white blood cell.

* The probable CS case definition includes infants with clinical findings suggesting CS (infant criteria), infants born to women who received a diagnosis of syphilis during pregnancy and did not initiate penicillin-based treatment ≥30 days before delivery (maternal criteria), or both. Clinical signs of CS included are the indicators outlined in the infant/child criteria for reporting a CS case (https://wwwn.cdc.gov/nndss/conditions/congenital-syphilis/).

† One confirmed case of CS in an infant who later died and one syphilitic still birth are excluded from this table.

Discussion

Approximately 88% of syphilis infections among NYC women noted to be pregnant during 2010–2016 did not result in congenital syphilis, presumably because of early screening and treatment, underscoring the critical role that provider and public health systems play in preventing congenital syphilis. Nevertheless, 68 congenital syphilis cases were reported during this period, and analysis of these cases provides insight into factors contributing to these preventable infections.

In approximately one third of congenital syphilis cases, the major contributing factor was late initiation of prenatal care; lack of health care coverage was often cited by patients as a barrier to seeking care. Citywide in 2015, 83.2% of new mothers initiated prenatal care during the first trimester,[¶¶] reflecting the expanded health insurance options available to pregnant women in New York, regardless of immigration status, through Medicaid and the New York health insurance marketplace.[***] Absent or late prenatal care among mothers of infants with congenital syphilis suggests that pregnant women with syphilis might be unaware of available services or face barriers to obtaining prenatal care; this might be particularly applicable for women born outside the United States.

[††] Pregnant women were assigned to one of the 42 United Hospital Fund (UHF) neighborhoods in NYC and also to a zip code tabulation area based on their zip code at the time of report. UHF neighborhoods are ranked on an annual basis according to the case rate of early latent syphilis among females. Pregnant women were defined as living in a high morbidity neighborhood if they resided in a UHF neighborhood that ranked among the 10 neighborhoods with the highest early latent syphilis case rates among females (top 23.8% neighborhoods) in the year of their syphilis diagnosis.

[§§] Neighborhood poverty categories were assigned in alignment with local area-based poverty guidelines. Pregnant women were defined as living in a high poverty neighborhood if they resided in a zip code tabulation area that was categorized as having high or very high poverty. https://www1.nyc.gov/assets/doh/downloads/pdf/epi/epiresearch-SES-measure.pdf.

[¶¶] Data on health insurance coverage and prenatal care come from the Pregnancy Risk Assessment Monitoring System, an ongoing population-based survey of new mothers in NYC designed to monitor maternal experiences and behaviors before, during, and after pregnancy. These data are representative of NYC resident women who had a live birth in 2015.

[***] Information on expanded health insurance options for pregnant women in New York. https://www1.nyc.gov/site/ochia/find-what-fits/pregnant.page.

CDC identified improvement of electronic medical records as an essential area for reversing increases in congenital syphilis.[†††] This investigation found two women with timely prenatal care who were not screened for syphilis because of errors in electronic systems, one of whose pregnancy resulted in an infant death. These cases emphasize the importance of data system functionality, such as clinical decision support tools and automated ordering of prenatal laboratory test panels aimed at ensuring syphilis screening in early pregnancy.

Testing all pregnant women early in pregnancy and retesting women at high risk at 28–32 weeks' gestation and at delivery is recommended by CDC (*4*) and the USPSTF. In this investigation, few mothers of infants with congenital syphilis who acquired syphilis after an initial nonreactive test were screened in the early third trimester, despite that most (80%) could be considered at increased risk for syphilis. This finding points to the need for local guidance and provider training regarding characteristics that indicate a high risk for infection and a need for third-trimester screening. To encourage early detection of syphilis in pregnant women, some states have mandated screening at the first prenatal care examination and during the early third trimester. Universal third-trimester screening effectively prevented most congenital syphilis cases in Florida and Louisiana (*6*); however, this strategy might not be cost-effective in low-morbidity areas (*7*).

Finally, only two cases met the definition for a confirmed case or syphilitic stillbirth. Among probable cases, most met the surveillance definition solely by maternal criteria and had minimal signs of disease. These cases highlight the challenges inherent in both defining and diagnosing congenital syphilis. The surveillance definition for congenital syphilis intentionally values sensitivity at the expense of specificity, with the goal of maximizing identification of infants potentially infected with syphilis, an important compromise given that the laboratory and radiologic tests required for diagnosis might not be collected, and infants might be asymptomatic at birth (*8*).

The findings in this report are subject to at least two limitations. First, data came from DOHMH's surveillance registry, and some are missing or incomplete. Second, NYC has a relatively small number of congenital syphilis cases[§§§] and a syphilis epidemic that is largely driven by men who have sex with men (*9*), and results might not be generalizable to other jurisdictions.

Although no sustained increase in congenital syphilis occurred in NYC during 2010–2016, analysis of 68 cases identified areas where prevention measures might be enhanced. Syphilis screening during pregnancy is critical to preventing congenital syphilis. Health care systems can support screening by ensuring that syphilis tests can be electronically ordered, tracked, received, and flagged for review when results are missing or reactive. In addition, clear guidance regarding third-trimester screening could help identify and treat pregnant women who acquire syphilis during pregnancy.

Summary

What is already known about this topic?

Cases of congenital syphilis are increasing in the United States and often represent missed opportunities for prevention.

What is added by this report?

During 2010–2016, 578 New York City women with syphilis infection were noted to be pregnant, and in 510 (88.2%) pregnancies congenital syphilis did not occur. In the majority of the 68 congenital syphilis cases, maternal syphilis diagnosis occurred too late to prevent congenital syphilis.

What are the implications for public health practice?

Provider and public health systems play a critical role in preventing congenital syphilis through screening and treating pregnant women for syphilis; these systems need to be maintained and strengthened.

Acknowledgments

Sarah Kidd, Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC; Pricila Mullachery, Bureau of Maternal, Infant and Reproductive Health, New York City Department of Health and Mental Hygiene; Annot Pierrot-Cox, Bureau of Sexually Transmitted Infections, New York City Department of Health and Mental Hygiene; CDC CSTE MMWR Intensive Writing Training Program.

Corresponding author: Jennifer Sanderson Slutsker, jsanderson@health.nyc.gov, 347-396-7535.

[1]Bureau of Sexually Transmitted Infections, New York City Department of Health and Mental Hygiene; [2]Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

[†††] Ensuring that electronic medical records support syphilis screening is included in CDC Call to Action: Let's Work Together to Stem the Tide of Rising Syphilis in the United States. https://www.cdc.gov/std/syphilis/syphiliscalltoactionapril2017.pdf.

[§§§] The rate of congenital syphilis in NYC in 2016 was 9.2 per 100,000 live births, which is less than the national congenital syphilis rate in 2016 of 16.2 per 100,000 live births. https://www1.nyc.gov/assets/doh/downloads/pdf/std/std-quarterlyreport2017-4.pdf.

References

1. American Academy of Pediatrics. Red book: 2018–2021 report of the Committee on Infectious Diseases. Elk Grove Village, IL: American Academy of Pediatrics; 2012.
2. CDC. Sexually transmitted disease surveillance 2017. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://www.cdc.gov/std/stats
3. Kidd S, Bowen VB, Torrone EA, Bolan G. Use of national syphilis surveillance data to develop a congenital syphilis prevention cascade and estimate the number of potential congenital syphilis cases averted. Sex Transm Dis 2018;45(Suppl 1):S23–8. https://doi.org/10.1097/OLQ.0000000000000838
4. Workowski KA, Bolan GA. Sexually transmitted diseases treatment guidelines, 2015. MMWR Recomm Rep 2015;64(No. RR-3).
5. Cord blood test for syphilis. New York codes, rules and regulations. Title 10, section 69-2.2; 1989. https://regs.health.ny.gov/content/section-69-22-cord-blood-test-syphilis
6. Matthias JM, Rahman MM, Newman DR, Peterman TA. Effectiveness of prenatal screening and treatment to prevent congenital syphilis, Louisiana and Florida, 2013–2014. Sex Transm Dis 2017;44:498–502. https://doi.org/10.1097/OLQ.0000000000000638
7. Albright CM, Emerson JB, Werner EF, Hughes BL. Third-trimester prenatal syphilis screening: a cost-effectiveness analysis. Obstet Gynecol 2015;126:479–85. https://doi.org/10.1097/AOG.0000000000000997
8. Zenker PN, Berman SM. Congenital syphilis: reporting and reality. Am J Public Health 1990;80:271–2. https://doi.org/10.2105/AJPH.80.3.271
9. Schillinger JA, Slutsker JS, Pathela P, et al. The epidemiology of syphilis in New York City: historic trends and the current outbreak among men who have sex with men, 2016. Sex Transm Dis 2018;45(Suppl 1):S48–54. https://doi.org/10.1097/OLQ.0000000000000796

Rates of Carpal Tunnel Syndrome in a State Workers' Compensation Information System, by Industry and Occupation — California, 2007–2014

Rebecca Jackson, MPH[1]; John Beckman[1,2]; Matt Frederick[1,2]; Kristin Musolin, DO[3]; Robert Harrison, MD[1]

Carpal tunnel syndrome (CTS) occurs when the median nerve becomes compressed as it passes through the wrist within the carpal tunnel, resulting in pain, tingling, weakness, or numbness in the hand or the wrist. Occupational risk factors for CTS include engaging in work activities that require forceful, repetitive tasks, prolonged use of the hands or wrists in an awkward posture, or vibration (*1*). To assess trends and identify high-risk industries and occupations for CTS, the California Department of Public Health (CDPH) analyzed California workers' compensation claims for CTS by industry (2007–2014) and occupation (2014) and calculated rates per full-time equivalent (FTE) worker. During 2007–2014, a total of 139,336 CTS cases were reported (incidence = 6.3 cases per 10,000 FTE) in California workers; the rate among women (8.2) was 3.3 times higher than that among men (2.5). Industries with the highest rates of CTS were textile, fabric finishing, and coating mills (44.9), apparel accessories and other apparel manufacturing (43.1), and animal slaughtering and processing (39.8). Industries with high rates of CTS should consider implementing intervention measures, including ergonomic evaluations and development of tools and instruments that require less repetition and force and that correct awkward postures.

In California, workers' compensation insurance companies are required to electronically report to the Department of Industrial Relations all workers' compensation claims for occupational injuries or illnesses that cause lost time beyond the day of injury or medical care beyond first aid. During 2007–2014, an average of 637,672 workers' compensation claims were submitted annually (*2*). CDPH previously identified probable and possible CTS cases among these claims during 2007–2008 but undertook no further analysis of demographics or risk factors (*3*). For this analysis, all CTS cases with a date of injury during 2007–2014 were assigned a 2010 Census Industry Code by trained industry coders. CTS cases in 2014 were assigned a 2010 Census Occupation Code as a pilot of the National Institute for Occupational Safety and Health (NIOSH) Industry and Occupation Computerized Coding System computer-assisted auto-coder.* Industry- and occupation-specific rates were calculated using data from the California sample of the American Community Survey for FTE workers overall and by age group and sex.† An FTE is equal to the total number of hours worked divided by 2,000 hours, which is equivalent to 50 work weeks at 40 hours per week. This accounts for different patterns of part-time work and overtime in different industries or occupations and is a measure of the risk for injury per hours worked. Changes over time were measured using rate ratios comparing industry rates during 2007–2010 and 2011–2014.

The CDPH identified 139,336 probable and possible cases of CTS; the overall rate of CTS among workers was 6.3 cases per 10,000 FTE (Table 1). The rate decreased during the study period from 6.7 during 2007–2010 to 5.9 during 2011–2014. The rate of CTS was highest among persons aged 45–54 years (8.4); the rate among women (8.2) was 3.3 times higher than that among men (2.5).

Among the 20 industries with the highest rates of CTS (Table 2), three industries had CTS rates approximately six times the average rate: textile, fabric finishing, and coating mills (44.9); apparel accessories and other apparel manufacturing (43.1); and animal slaughtering and processing (39.8). Among industries with high rates of CTS, the largest numbers of CTS claims were in public administration (8,713 cases), insurance carriers (4,836), grocery stores (4,630), wired and wireless communication (3,412), and employment services (2,763). Seven industries had higher rates during 2011–2014 compared with 2007–2010; the industries with the highest relative risks during 2011–2014 compared with 2007–1010 were commercial and service industry machinery manufacturing (3.6) and knitting fabric mills (2.4).

The occupation categories with the highest CTS rates were production (14.0), material moving (13.4), and office and administrative support (13.0) (Table 3). The Census Occupation Codes with the highest rate of CTS were telephone operators (90.3); cafeteria, food concession, and coffee shop counter attendants (66.0); and electrical, electronics, and electromechanical assemblers (46.2).

*https://wwwn.cdc.gov/niosh-nioccs/.

†https://www.census.gov/programs-surveys/acs/.

TABLE 1. Characteristics of carpal tunnel syndrome cases reported, by workers' compensation claims — California, 2007–2014

Characteristic	No. of cases (%)	Rate*	Rate ratio (95% CI)
Total	**139,336 (100)**	**6.3**	—
Age group (yrs)			
15–24	7,143 (5)	3.1	Referent
25–34	28,583 (6)	5.0	1.6 (0.6–2.6)
35–44	35,658 (26)	6.6	2.1 (1.1–3.1)
45–54	42,682 (31)	8.4	2.7 (1.7–3.7)
55–64	22,753 (16)	7.6	2.5 (1.5–3.5)
≥65	2,240 (2)	3.6	1.2 (0.2–2.2)
Sex			
Male	38,403 (27)	2.5	Referent
Female	99,727 (72)	8.2	3.3 (2.3–4.3)
Period			
2007–2010	73,986	6.7	Referent
2011–2014	65,350	5.9	0.88 (0.85–0.91)

Abbreviations: CI = confidence interval; FTE = full-time equivalent.
* Carpal tunnel syndrome cases per 10,000 FTE.

Discussion

In this examination of statewide trends in demographic and occupational risk factors for CTS during 2007–2014 using California's workers' compensation claims, the overall incidence of CTS was 6.3 per 10,000 FTE, and the rate was approximately three times higher in women than in men. The rate decreased over time; however, this trend also mirrors a decrease in all-cause workers' compensation claims and could be related to delayed diagnosis and reporting of CTS to workers' compensation insurers or insurers' misclassification of workers' compensation CTS claims. Improved workplace ergonomic designs and employment demographic shifts might have contributed to this trend. Industries with high rates of CTS included those that manufacture apparel, process food, and perform administrative work. The occupation groups with the highest rates included production workers, material moving workers, and office and administrative support workers. Workers in these occupations are often required to perform forceful or repetitive tasks with their hands (e.g., sewing clothing, butchering meat, or repeatedly lifting heavy items), or maintain an awkward posture on the job (e.g., driving a motor vehicle, working on a production line, or computer work), all known risk factors for CTS.

These findings are consistent with those previously reported using data from the 2010 National Health Interview Survey, which estimated that the prevalence of CTS was higher among women, and that the highest ratios of CTS cases to percentage of workforce were among production, office and administrative support, and personal care and service occupations (2.5%, 1.66%, and 1.53%, respectively) (*4*). A study using Washington State workers' compensation claims reported an annual decrease of 6.2% CTS incidence during 2002–2013, similar to the decrease in this analysis (*5*). A pooled analysis of six prospective cohorts documented CTS incidence among 50 workgroups of 2.3 cases per 100 person-years, which is higher than the incidence estimates in this analysis (*6*). This could indicate that CTS is underdiagnosed or underreported by

TABLE 2. Number and rate of carpal tunnel syndrome (CTS) cases and relative risk, by Census Industry Code for 20 industries with the highest rates of CTS — California, 2007–2014

Industry	No. of cases.	Rate*			Relative risk† (95% CI)
		All years	2007–2010	2011–2014	
Textile and fabric finishing and coating mills	66	44.9	40.9	51.7	1.3 (1.1–1.4)
Apparel accessories and other apparel manufacturing	37	43.1	40.5	47.7	1.2 (1.0–1.3)
Animal slaughtering and processing	636	39.8	48.3	32.5	0.7 (0.6–0.8)
Public administration	8,713	37.5	40.3	34.8	0.9 (0.7–1.0)
Sugar and confectionery products	225	36.2	40.8	32.2	0.8 (0.7–0.9)
Employment services	2,763	36.0	31.6	39.8	1.3 (1.1–1.5)
Navigational, measuring, electro-medical, and control instruments manufacturing	979	35.1	42.4	28.4	0.7 (0.6–0.8)
Wired and wireless telecommunications	3,412	32.9	37.3	28.0	0.8 (0.6–0.9)
Aluminum production and processing	103	29.2	30.5	27.9	0.9 (0.8–1.1)
Knitting fabric mills	32	28.7	18.8	44.8	2.4 (2.0–2.8)
Insurance carriers and related activities	4,836	26.9	30.5	23.2	0.8 (0.6–0.9)
Pottery, ceramics, and plumbing fixture manufacturing	40	26.6	33.2	16.6	0.5 (0.4–0.6)
Power companies	1,701	24.3	25.4	23.3	0.9 (0.8–1.1)
Pharmaceutical and medicine manufacturing	1,229	24.2	27.7	20.9	0.8 (0.6–0.9)
Bakeries, except retail	502	22.7	24.8	21.0	0.8 (0.7–1.0)
Foundries	98	22.5	20.6	24.4	1.2 (1.0–1.4)
Software publishers	415	22.4	25.5	19.9	0.8 (0.6–0.9)
Bus service and urban transit	977	22.3	28.5	15.7	0.6 (0.5–0.7)
Dry cleaning and laundry services	572	22.1	18.9	26.0	1.4 (1.1–1.7)
Commercial and service industry machinery manufacturing	155	21.7	12.2	43.7	3.6 (2.9–4.3)

Abbreviations: CI = confidence interval; FTE = full time equivalent.
* CTS cases per 10,000 FTE.
† The relative risk is calculated as the risk during 2011–2014 relative to the risk during 2007–2010.

TABLE 3. Rates of carpal tunnel syndrome (CTS), by occupation category and the Census Occupation Code within that category with the highest CTS rate — California, 2007–2014

Occupation category	No. of cases	Rate*	Census Occupation Code	No. of cases	Rate*
Production†	1,235	14.0	Electrical, electronics, and electromechanical assemblers§	**97**	**46.2**
Material moving†	558	13.4	Refuse and recyclable material collectors	22	32.2
Office and administrative support†	2,372	13.0	Telephone operators§	**14**	**90.3**
Healthcare support	315	11.9	Massage therapists	25	22.6
Building and grounds cleaning and maintenance	576	11.9	Maids and housekeeping cleaners	194	17.6
Community and social services	242	10.0	Probation officers and correctional treatment specialists	37	44.4
Protective service	316	9.6	First-line supervisors of police and detectives	28	26.2
Food preparation and serving	723	9.5	Cafeteria, food concession, and coffee shop counter attendants§	**67**	**66.0**
Healthcare practitioners	673	9.1	Dental hygienists	20	18.7
Legal	120	7.1	Miscellaneous legal support workers	25	13.9
Business and financial	502	6.6	Tax examiners and collectors, and revenue agents	14	35.1
Sales and related	853	6.0	Travel agents	10	15.7
Transportation and material moving	286	5.7	Bus drivers	60	14.8
Life, physical, and social science	86	5.4	Environmental scientists and geoscientists	8	13.5
Farming, fishing, and forestry	147	4.9	Graders and sorters, agricultural products	48	22.6
Installation, maintenance, and repair	198	4.9	Radio and telecommunications equipment installers and repairers	36	23.4
Computer, engineering, and science	213	4.0	Operations research analysts	48	28.3
Architecture and engineering	132	3.9	Engineering technicians, except drafters	47	9.9
Arts, design, entertainment, sports, and media	112	3.6	Miscellaneous media and communication workers	11	12.0
Construction and extraction occupations	235	3.6	Highway maintenance workers	8	19.0
Personal care and service occupations	162	3.6	Baggage porters, bellhops, and concierges	14	18.3
Management occupations	571	3.5	Medical and health services managers	53	7.7
Education, training, and library occupations	181	2.4	Library technicians	9	21.9

Abbreviation: FTE = full-time equivalent.
* CTS cases per 10,000 FTE.
† Occupation categories with the three highest rates of CTS.
§ Census Occupation Codes with the three highest rates of CTS.

workers or employers, or that health care providers outside of the workers' compensation system are treating cases of work-related CTS. Costs for CTS medical care are estimated to be $2 billion annually in the United States, primarily from surgical releases; nonmedical costs (e.g., for mental or psychological health treatment, loss of earnings and productivity, and costs for legal services) are estimated to be much higher (*7*).

These results suggest that workers' compensation claims data can be a useful tool to identify industries and occupations where workers are at risk for developing CTS. Workers' compensation data can help describe work-related injuries like CTS that might be underreported in other systems and provide case-level demographic and risk factor data that might not be available from other estimates (*8*). Workplace ergonomic interventions that modify tasks, workstations, tools, and equipment can decrease known ergonomic hazards and prevent workplace injuries, including CTS. However, it is not known whether ergonomic interventions were implemented or maintained within the industries with high rates of CTS during the study period.

The findings in this report are subject to at least four limitations. First, inconsistent industry coding and lack of standard occupation coding create difficulties in identifying risk factors within workers' compensation systems. As noted, the NIOSH Industry and Occupation Computerized Coding System auto-coder, first released for public use in December 2012, facilitated the occupation coding used in this analysis. As auto-coding algorithms improve, more rapid identification of industries and occupations will be possible. Second, because the California workers' compensation claims system does not collect race and ethnicity data, it was not possible

Summary

What is already known about this topic?

Carpal tunnel syndrome (CTS) is an important contributor to work-related disability.

What is added by this report?

Workers' compensation claims of CTS in California during 2007–2014 overall were 6.3 per 10,000 full-time equivalent workers. Female workers and workers in industries that manufacture apparel, process food, and perform administrative work were at highest risk for CTS. The highest rates of CTS were among telephone operators; cafeteria, food concession, and coffee shop counter attendants; and electrical, electronics, and electromechanical assemblers.

What are the implications for public health practice?

Industries with high rates of CTS should consider implementing intervention measures, including ergonomic evaluations and development of tools and instruments that require less repetition and force and correct awkward postures.

to calculate rates for these important demographic variables. Third, California does not collect the number of employees' hours worked by industry, so the American Community Survey was used to calculate FTEs. Using FTEs is a more accurate representation of the risk in these industries than number of workers because it includes time at risk for injury similarly in industries with different percentages of part-time and overtime workers. These three limitations present challenges to analyzing a data set designed for administrative rather than public health surveillance use. Finally, only 1 year of data (2014) was occupation coded because of the time and resources necessary to code occupation, even with the assistance of the NIOSH Industry and Occupation Computerized Coding System. Whether the occupations at risk for CTS changed over time is not addressed by this analysis.

Analysis of workers' compensation records is helpful for understanding the industries and occupations that are at a higher risk for CTS and for determining allocation of limited resources for prevention. Industries and occupations identified with high rates of CTS should consider implementing intervention measures, including ergonomic evaluations and development of tools and instruments that require less repetition and force and correct awkward postures. States could use their workers' compensation data to identify cases of CTS and use this information to target prevention activities.

Acknowledgment

Glenn Shor, California Department of Industrial Relations.

Corresponding author: Rebecca Jackson, rebecca.jackson@cdph.ca.gov, 510-620-5726.

[1]Division of Environmental and Occupational Disease Control, California Department of Public Health, Richmond, California; [2]Public Health Institute, Oakland, California; [3]Hazard Evaluations and Technical Assistance Branch, National Institute for Occupational Safety and Health, CDC, Cincinnati, Ohio.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Bernard B, Putz-Anderson V. Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work related musculoskeletal disorders of the neck, upper extremity, and lower back. Atlanta, GA: US Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health; 1997. https://www.cdc.gov/niosh/docs/97-141/
2. State of California, Department of Industrial Relations. Table 9: FROI and SROI data summary, by year of injury, 2000–2016. Oakland, CA: California Department of Industrial Relations; 2017. https://www.dir.ca.gov/dwc/wcis/WCIS_tables/TABLE9-14/2016/Table_9.pdf
3. Joe L, Roisman R, Beckman S, et al. Using multiple data sets for public health tracking of work-related injuries and illnesses in California. Am J Ind Med 2014;57:1110–9. https://doi.org/10.1002/ajim.22361
4. Luckhaupt SE, Dahlhamer JM, Ward BW, Sweeney MH, Sestito JP, Calvert GM. Prevalence and work-relatedness of carpal tunnel syndrome in the working population, United States, 2010 National Health Interview Survey. Am J Ind Med 2013;56:615–24. https://doi.org/10.1002/ajim.22048
5. Marcum J, Adams D. Work-related musculoskeletal disorder surveillance using the Washington state workers' compensation system: recent declines and patterns by industry, 1999-2013. Am J Ind Med 2017;60:457–71. https://doi.org/10.1002/ajim.22708
6. Dale AM, Harris-Adamson C, Rempel D, et al. Prevalence and incidence of carpal tunnel syndrome in US working populations: pooled analysis of six prospective studies. Scand J Work Environ Health 2013;39:495–505. https://doi.org/10.5271/sjweh.3351
7. Palmer DH, Hanrahan LP. Social and economic costs of carpal tunnel surgery. Instr Course Lect 1995;44:167–72.
8. Boden LI, Ozonoff A. Capture-recapture estimates of nonfatal workplace injuries and illnesses. Ann Epidemiol 2008;18:500–6. https://doi.org/10.1016/j.annepidem.2007.11.003

Outbreak of *Salmonella* Chailey Infections Linked To Precut Coconut Pieces — United States and Canada, 2017

Sarah Luna, PhD[1]; Marsha Taylor, MSc[2]; Eleni Galanis, MD[2]; Rod Asplin[3]; Jasmine Huffman[4]; Darlene Wagner, PhD[5]; Linda Hoang, MD[2]; Ana Paccagnella[2]; Susan Shelton[6]; Stephen Ladd-Wilson[7]; Sharon Seelman, MS[8]; Brooke Whitney, PhD[8]; Elisa Elliot, PhD[8]; Robin Atkinson[9]; Katherine Marshall, MPH[4]; Colin Basler, DVM[4]

Foodborne salmonellosis causes an estimated 1 million illnesses and 400 deaths annually in the United States (*1*). In recent years, salmonellosis outbreaks have been caused by foods not typically associated with *Salmonella*. On May 2, 2017, PulseNet, CDC's national molecular subtyping network for foodborne disease surveillance, identified a cluster of 14 *Salmonella* Chailey isolates with a rare pulsed-field gel electrophoresis (PFGE) pattern. On May 29, Canadian health officials informed CDC that they were also investigating a cluster of five *Salmonella* Chailey infections in British Columbia with the same PFGE pattern. Nineteen cases were identified and investigated by CDC, U.S. state health departments, the Public Health Agency of Canada, and the British Columbia Centre for Disease Control. Isolates from all cases were highly related by whole genome sequencing (WGS). Illness onset dates ranged from March 10 to May 7, 2017. Initial interviews revealed that infected persons consumed various fresh foods and shopped at grocery chain A; focused questionnaires identified precut coconut pieces from grocery chain A as a common vehicle. The Canadian Food Inspection Agency (CFIA) and the U.S. Food and Drug Administration (FDA) conducted a traceback investigation that implicated a single lot of frozen, precut coconut as the outbreak source. Grocery chain A voluntarily removed precut coconut pieces from their stores. This action likely limited the size and scope of this outbreak.

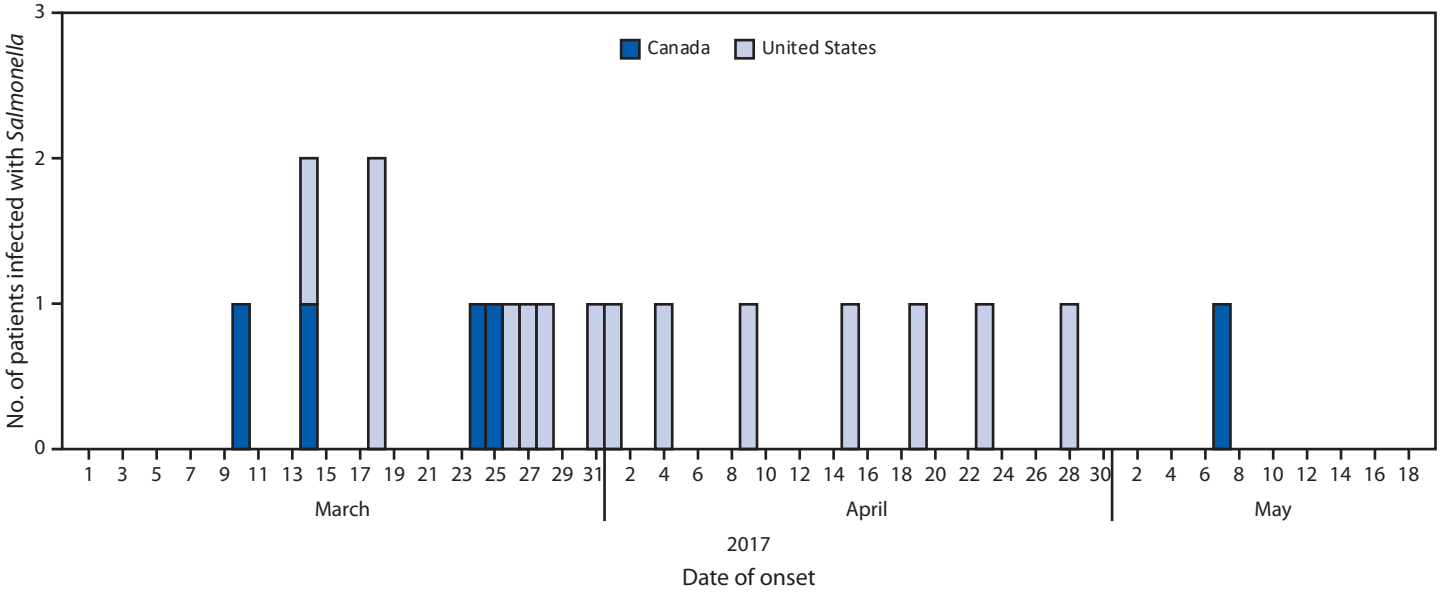
Epidemiologic Investigation

A case was defined as infection with *Salmonella* Chailey with the outbreak PFGE pattern with illness onset during March 10–May 7, 2017, and highly related by WGS to other cases. Nineteen cases were identified: 14 in seven U.S. states (one case each in Colorado and Kansas, two each in Oregon, Pennsylvania, Utah, and Washington, and four in Texas) and five cases in British Columbia, Canada (Figure). Infected persons ranged in age from <1 to 87 years (median = 57 years), including two aged <5 years; nine persons were female. Among 17 persons for whom information on hospitalization was known, three were hospitalized; no deaths occurred.

Infected persons in the United States were initially interviewed using state-developed questionnaires or CDC's National Hypothesis Generating Questionnaire; both collected information on foods consumed and locations where food was purchased during the 7 days before illness onset. Review of data collected using these questionnaires revealed that among nine persons with information on grocery stores, seven reported shopping at grocery chain A, which comprises health food stores. Other commonly reported foods consumed included oranges (six persons), strawberries (five), tomatoes (four), kale, tuna, zucchini, almonds (three each), and shrimp (two). The tuna and other seafood exposures were noteworthy because a strain with the outbreak PFGE pattern had been isolated from yellowfin tuna imported from Indonesia in 2010. Because of the strong fresh-foods signal from the initial information, open-ended interviews were conducted to obtain more information about foods purchased from grocery chain A and other fresh foods that were not included on the standard National Hypothesis Generating Questionnaire (*2*) used during the initial interviews. Open-ended, iterative interviews were conducted by a single interviewer to gather more detailed information about foods persons ate before they became ill. Interviews were completed for eight persons, including five who had already been interviewed with a standard questionnaire. One person reported eating precut coconut pieces from grocery chain A, two persons reported drinking coconut water, two reported eating sushi, seven reported eating oranges, and three reported eating seaweed snacks. Because open-ended interviews did not identify a single food item of interest, a focused questionnaire was developed. The focused questionnaire included detailed, open-ended questions about food items purchased from grocery chain A, as well as specific questions asking about consumption of coconut, coconut water, other fruits, vegetables, nuts, seaweed, sushi, and other fish.

At the same time, Canadian investigators used a centralized interviewer approach to interview all five infected persons in Canada using a modified version of CDC's focused questionnaire. All five persons reported shopping at grocery chain A locations in Canada and consuming precut coconut pieces purchased there. Eleven infected persons in the United States were reinterviewed with the focused questionnaire, and six reported eating precut coconut pieces from grocery chain A. In total, 16 persons in the United States and Canada were reinterviewed, and 11 reported consuming precut coconut pieces from grocery chain A.

FIGURE. Number of persons infected with the outbreak strain of *Salmonella* Chailey (N = 19), by date of illness onset — United States and Canada, 2017



CDC and the British Columbia Centre for Disease Control requested consumer purchase information from grocery chain A to continue to generate hypotheses while reinterviewing persons. Because grocery chain A did not have a shopper card program, consenting persons were asked to share the purchase dates, total purchase dollar amounts, store location, and the first six digits and last four digits of the credit card used at time of purchase. Grocery chain A used this information to retrieve receipts.

Seven persons provided information to retrieve receipts from six grocery chain A locations in British Columbia, Oregon, and Texas. Receipts were retrieved for all seven persons, four of whom (one person in the United States, who initially did not report coconut exposure, and three persons in Canada) had precut coconut pieces listed on their receipts (purchase dates March 7–15, 2017). Another person who did not provide information to retrieve receipts reported purchasing precut coconut pieces on April 13. A total of 12 persons reported eating precut coconut pieces or had receipts verifying the purchase of precut coconut pieces from grocery chain A.

Laboratory Investigation

Clinical isolates were characterized by WGS. Whole genome, high-quality single nucleotide polymorphism (hqSNP) analysis* indicated that the 19 clinical isolates differed by 0–4 hqSNPs, indicating high genetic relatedness. An additional two *Salmonella* Chailey isolates with the same PFGE pattern from persons in the United States and Canada with illness onset dates consistent with this outbreak were excluded, as they differed from the rest of the isolates by approximately 100 hqSNPs. The isolates from yellowfin tuna imported from Indonesia in 2010 were 19 hqSNPs different from the clinical isolates and were also considered to be not closely related genetically.

Inspections and Traceback

Canadian officials conducted an inspection at a location of grocery chain A and reported that frozen, vacuum-packed coconut pieces were received at the store every other day. These were thawed at the store and repacked into smaller plastic tubs for sale in the produce area, with a 5-day shelf life applied. Grocery store A headquarters communicated to U.S. officials that all of their stores thaw and repack this product in the store. FDA visited three U.S.-based, FDA-regulated firms associated with the import and repackaging of this product and identified no objectionable conditions.

CFIA and FDA conducted a traceback investigation for nine persons in the United States and Canada who all reported consuming precut coconut pieces sold by grocery chain A. These locations received product from three distribution centers located in three states that obtained frozen precut coconut pieces from the same U.S. firm. Records collected by FDA and CFIA at grocery chain A locations, distribution centers, and the processor suggested that a single lot of frozen precut coconut pieces imported from Indonesia was the outbreak source. FDA tested environmental and coconut samples from processing and

*Whole genome, high-quality single nucleotide polymorphism analysis was performed using the Lyve-SET hqSNP pipeline. https://github.com/lskatz/lyve-SET.

distribution centers, but no *Salmonella* was detected. However, coconut from the suspected lot was not available for testing.

Public Health Response

Based on the results of the epidemiologic investigation, grocery chain A voluntarily removed thawed, precut coconut pieces from store shelves, which included all precut coconut pieces from the lot identified by the traceback investigation. No public communication was issued, given that this action, combined with the 5-day shelf life of thawed precut coconut pieces, made it unlikely that contaminated precut coconut pieces were still available for purchase or in customers' homes.

Discussion

International collaboration on the epidemiologic and laboratory investigation was important for identifying that the Canadian and U.S. cases were part of the same cluster. This allowed investigators to focus on food purchased at grocery chain A and to identify frozen precut coconut pieces as the outbreak source.

Early communication and collaboration with grocery chain A assisted the investigation through the collection of detailed purchase history information and facilitated a rapid removal of precut coconut from stores. The timely action of grocery chain A likely limited the size and scope of this outbreak.

In recent years, salmonellosis outbreaks have been caused by foods not typically associated with *Salmonella*. This was the first time that coconut has been associated with an outbreak of *Salmonella* in the United States or Canada (*3*). Cases were reported throughout the United States and Canada that were associated with different grocery chain A locations, supplied by different distribution centers. The single lot of imported, precut coconut pieces was processed over many months but remained frozen and minimally manipulated once in the United States. Therefore, contamination likely occurred in the country of origin, Indonesia. Furthermore, the frozen yellowfin tuna with the same PFGE pattern was imported from Indonesia in 2010, providing support for the hypothesis that a food product from Indonesia could be the source of the outbreak.

This was a complicated investigation, and it required considerable time and effort by investigators in two countries to identify the food product ultimately responsible for the outbreak. Although no coconut from the suspected lot was available for laboratory sampling, epidemiologic and traceback information indicates that frozen precut coconut pieces were the source of the outbreak. In light of this finding, public health officials might consider raw coconut in investigations of *Salmonella* outbreaks among consumers of fresh foods.

Summary

What is already known about this topic?

Foodborne salmonellosis causes an estimated one million U.S. illnesses and 400 deaths annually.

What is added by this report?

During March–May 2017, an outbreak of 19 cases of *Salmonella* Chailey associated with precut coconut pieces from a single grocery store chain occurred in the United States and Canada. The chain voluntarily recalled precut coconut pieces. This was the first time that coconut has been associated with a *Salmonella* outbreak in the United States or Canada.

What are the implications for public health practice?

In recent years, salmonellosis outbreaks have been caused by foods not typically associated with *Salmonella*. Raw coconut should now be considered in investigations of *Salmonella* outbreaks among fresh food consumers.

Acknowledgments

State public health departments of Colorado, Kansas, Oregon, Pennsylvania, Texas, Utah, and Washington; Outbreak Management Division at The Public Health Agency of Canada; Vancouver Coastal Health Authority; Canadian Food Inspection Agency British Columbia Operations Branch.

Corresponding author: Sarah Luna, svluna@anthc.org, 907-729-1575.

[1]Epidemic Intelligence Service, CDC; [2]British Columbia Centre for Disease Control, Vancouver, British Columbia; [3]Fraser Health Authority, Delta, British Columbia; [4]Division of Foodborne, Waterborne, and Environmental Diseases, CDC; [5]IHRC Inc., Atlanta, Georgia; [6]Washington State Department of Health; [7]Oregon Health Authority; [8]Food and Drug Administration, Washington, DC; [9]Canadian Food Inspection Agency, Ottawa, Ontario.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Scallan E, Hoekstra RM, Angulo FJ, et al. Foodborne illness acquired in the United States—major pathogens. Emerg Infect Dis 2011;17:7–15. https://doi.org/10.3201/eid1701.P11101
2. CDC. Foodborne disease outbreak investigation and surveillance tools. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://www.cdc.gov/foodsafety/outbreaks/surveillance-reporting/investigation-toolkit.html
3. CDC. Foodborne outbreak online database. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. https://wwwn.cdc.gov/foodborneoutbreaks

Notes from the Field

Multiple Cyclosporiasis Outbreaks — United States, 2018

Shannon M. Casillas, MPH[1]; Carolyne Bennett, MPH[1]; Anne Straily, DVM[1]

Cyclosporiasis is an intestinal illness caused by the parasite *Cyclospora cayetanensis* through ingestion of fecally contaminated food or water. Symptoms of cyclosporiasis might include watery diarrhea (most common), loss of appetite, weight loss, cramping, bloating, increased gas, nausea, and fatigue. Typically, increased numbers of cases are reported in the United States during spring and summer; since the mid-1990s, outbreaks have been identified and investigated almost every year. Past outbreaks have been associated with various types of imported fresh produce (e.g., basil, cilantro, and raspberries) (*1*). There are currently no validated molecular typing tools* to facilitate linking cases to each other, to food vehicles, or their sources. Therefore, cyclosporiasis outbreak investigations rely primarily on epidemiologic data.

The 2018 outbreak season is noteworthy for multiple outbreaks associated with different fresh produce items and the large number of reported cases. Two multistate outbreaks resulted in 761 laboratory-confirmed illnesses. The first outbreak, identified in June, was associated with prepackaged vegetable trays (containing broccoli, cauliflower, and carrots) sold at a convenience store chain in the Midwest; 250 laboratory-confirmed cases were reported in persons with exposures in three states (illness onset mid-May–mid-June) (*2*). The supplier voluntarily recalled the vegetable trays (*3*). The second multistate outbreak, identified in July, was associated with salads (containing carrots, romaine, and other leafy greens) sold at a fast food chain in the Midwest; 511 laboratory-confirmed cases during May–July occurred in persons with exposures in 11 states who reported consuming salads (*4*). The fast food chain voluntarily stopped selling salads at approximately 3,000 stores in 14 Midwest states that received the implicated salad mix from a common processing facility (*5*). The traceback investigation conducted by the Food and Drug Administration (FDA) did not identify a single source or potential point of contamination for either outbreak.

In addition to the multistate outbreaks, state public health authorities, CDC, and FDA investigated cyclosporiasis clusters associated with other types of fresh produce, including basil and cilantro. Two basil-associated clusters (eight confirmed cases each) were identified among persons in two different states who became ill during June. Investigation of one cluster, for which the state health department conducted an ingredient-specific case-control study, found consumption of basil to be significantly associated with illness. A formal analytic study was not conducted for the other cluster, but all patients reported consuming basil. Three clusters associated with Mexican-style restaurants in the Midwest have resulted in reports of 53 confirmed cases in persons who became ill during May–August. Analytic studies were conducted for two clusters; consumption of cilantro was found to be significantly associated with illness in both. Although a formal analytic study was not possible for the third cluster, all 32 identified patients reported consuming cilantro at the restaurant. FDA traceback of the basil and cilantro from these clusters is ongoing. Additional clusters associated with Mexican-style restaurants were identified in multiple states; but investigations to determine a single vehicle of infection were unsuccessful because of small case counts, limited exposure information, or because fresh produce items (including cilantro) were served as components of other dishes (e.g., in salsa).

Many cases could not be directly linked to an outbreak, in part because of the lack of validated molecular typing tools for *C. cayetanensis.* As of October 1, 2018, a total of 2,299 laboratory-confirmed cyclosporiasis cases† have been reported by 33 states in persons who became ill during May 1–August 30 and did not have a history of international travel§ during the 14 days preceding illness onset. Approximately one third of these cases were associated with either the convenience store chain outbreak or the fast food chain outbreak (Figure). The median patient age was 49 years (range = <1–103 years) and 56% were female (1,288 of 2,285). At least 160 patients were hospitalized; no deaths have been reported.

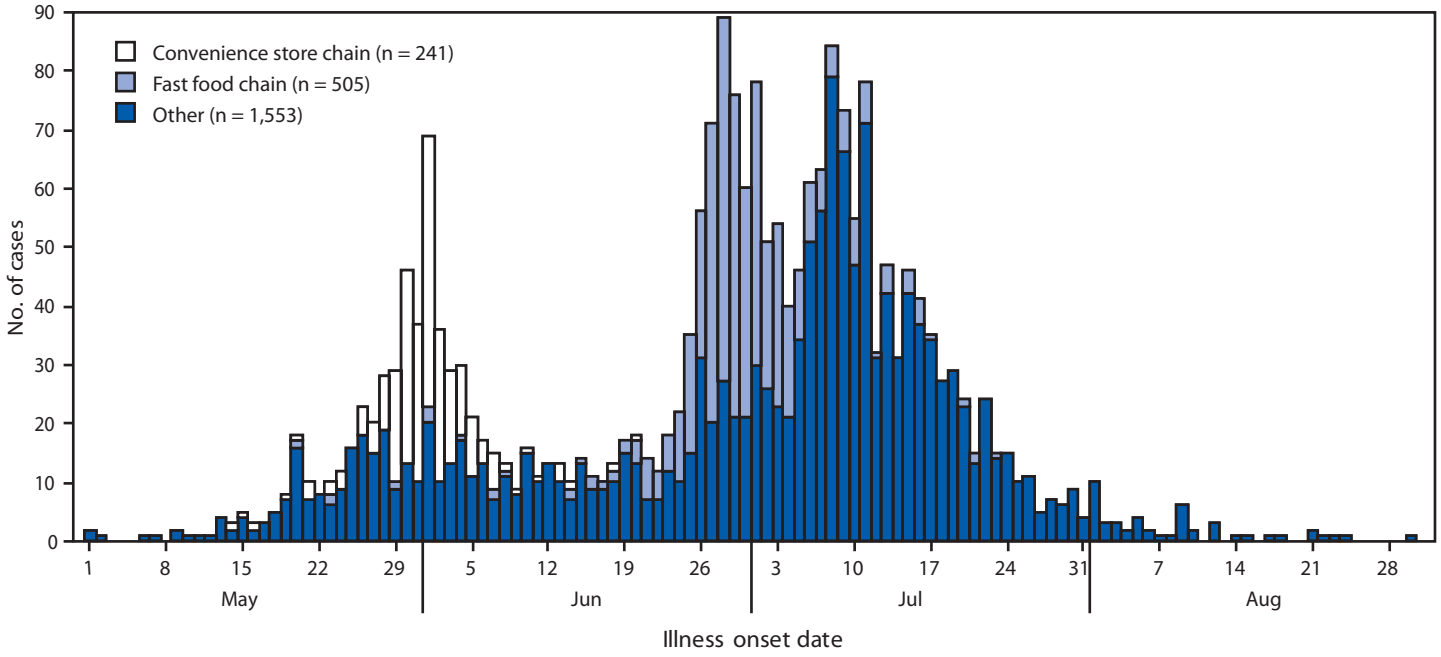
The 2,299 domestically acquired, laboratory-confirmed cases reported in persons who became ill during May–August 2018 are markedly higher than the numbers of cases reported for the same period in 2016 (174) and 2017 (623). This increase might be due, in part, to changes in diagnostic testing practices, including increased use of gastrointestinal molecular testing

*CDC scientists are currently working to develop and validate genetic typing markers for *Cyclospora*; such markers could facilitate linking cases of cyclosporiasis to each other and to food vehicles and their sources.

† For 2018, the numbers of cases reported by states might change as investigations are finalized.

§ International travel was defined as travel outside of the United States or Canada.

FIGURE. Reported cases of laboratory-confirmed, nontravel-associated cyclosporiasis, by illness onset date and outbreak association — United States, May–August, 2018*,†



* N = 2,299. Data are current as of October 1, 2018 (1 p.m. EDT). Data are preliminary and subject to change. These cases occurred in persons with no history of travel outside of the United States or Canada in the 14 days before onset of illness.
† Case counts for outbreaks differ from what was posted in the text because of incomplete reporting of travel history (convenience store chain, n = 7; fast food chain, n = 6) or illness onset date (convenience store chain, n = 2).

panels.¶ CDC is working with state public health partners to determine whether and to what extent changes in testing practices might have contributed to increased case detection and reporting.

Consumers should continue to enjoy fresh produce as part of a well-balanced diet. To reduce risk from most causes of foodborne illness and other contaminants, CDC recommends washing fresh fruits and vegetables with clean running water; however, washing, including use of routine chemical disinfection or sanitizing methods, is unlikely to kill *C. cayetanensis*. Persons with diarrheal illness that lasts >3 days or who have any other concerning symptoms should see a health care provider if they think they might have become ill from eating contaminated food.

¶ Historically, the standard laboratory method used for diagnosing *Cyclospora* infection was an Ova and Parasite (O&P) examination; routine O&P examination typically does not detect *Cyclospora*, so health care providers must specifically request testing for the parasite. In 2014, the first FDA-cleared gastrointestinal polymerase chain reaction panel with a target for *Cyclospora* became commercially available; this testing method is more sensitive than traditional O&P examination and has the potential to improve case detection.

Acknowledgments

Contributing state and local public health department personnel; Food and Drug Administration

Corresponding author: Shannon M. Casillas, yqj1@cdc.gov, 404-718-1057

[1]Parasitic Diseases Branch, Division of Parasitic Diseases and Malaria, Center for Global Health, CDC.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. CDC. U.S. foodborne outbreaks of cyclosporiasis—2000–2016. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://www.cdc.gov/parasites/cyclosporiasis/outbreaks/foodborneoutbreaks.html
2. CDC. Multistate outbreak of cyclosporiasis linked to Del Monte fresh produce vegetable trays—United States, 2018. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://www.cdc.gov/parasites/cyclosporiasis/outbreaks/2018/a-062018/index.html
3. Food and Drug Administration. Del Monte Fresh Produce N.A., Inc. voluntarily recalls limited quantity of vegetable trays in a multistate outbreak of *Cyclospora* illnesses in select retailers in Illinois, Indiana, Iowa, Michigan, Minnesota, and Wisconsin, because of possible health risk. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2018. https://www.fda.gov/Safety/Recalls/ucm610992.htm
4. CDC. Multistate outbreak of cyclosporiasis linked to Fresh Express salad mix sold at McDonald's restaurants—United States, 2018. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://www.cdc.gov/parasites/cyclosporiasis/outbreaks/2018/b-071318/index.html
5. Food and Drug Administration. FDA investigates multistate outbreak of *Cyclospora* illnesses linked to Fresh Express salad mix served at McDonald's. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2018. https://www.fda.gov/food/recallsoutbreaksemergencies/outbreaks/ucm613513.htm

Notes from the Field

Lead Exposures Among Employees at a Bullet Manufacturing Company — Missouri, 2017

David A. Jackson, MD[1,2]; Gregory A. Burr[2]; Carol R. Braun[3]; Marie A. de Perio, MD[2]

Lead is toxic to all human organ systems, resulting in adverse health effects that include impaired kidney function, elevated blood pressure, and neurologic health effects (*1*). Lead primarily enters the body through inhalation and ingestion, but direct absorption through the skin can occur (*2*). According to 2014 national lead surveillance data, >94% of the 3,616 U.S. adults with elevated blood lead levels (BLLs) whose exposure source was known were exposed at work (*3*).

Because of concerns about employees' occupational lead exposures, a Missouri bullet manufacturing company that melts lead ingots and casts them into bullets asked CDC's National Institute for Occupational Safety and Health (NIOSH) to conduct a health hazard evaluation. In October 2017, NIOSH visited the worksite to determine the routes and extent of lead exposure among employees and the prevalence of elevated BLLs and to assess controls in place to protect employees from lead exposure.

Full-shift personal air samples and blood specimens for lead were collected from 10 of 11 employees. All 11 employees were interviewed and provided lead hand wipe samples before lunch and at the end of their work shift after washing their hands. Work practices and conditions were also observed. An elevated BLL was defined as ≥5 μg/dL, the CDC adult blood lead reference level (*3*,*4*). Lead air sample results were compared with occupational exposure limits.

Among 10 tested employees, the median BLL was 8.5 μg/dL (range = 4–35 μg/dL). Of these employees, nine had an elevated BLL, including packaging and shipping employees. The three employees with the highest BLLs worked in the casting and coating areas. All lead air concentrations were below the Occupational Safety and Health Administration (OSHA) permissible exposure limit of 50 μg/m^3 of air. Lead air concentrations measured in the casting and coating areas were the highest. All employees had lead on their hands after washing them. Interviews revealed inconsistent glove use and handwashing with lead removal soap and lack of clothes or shoes dedicated only to use at the worksite, as well as reports of dry sweeping the floors. Food and beverages were observed in work areas. Skin lesions were observed on the arms of casting area employees, who reported that these lesions were caused by molten lead.

Almost all employees at this worksite had elevated BLLs. Although personal airborne lead exposures were below the OSHA permissible exposure limit, lack of a workplace lead control program likely resulted in employee lead exposures through inhalation, ingestion, and dermal absorption. Education and training to improve work practices are needed to reduce employee lead exposures. Such improved work practices would include consistently wearing disposable nonlatex gloves in bullet production areas and handwashing with lead removal soap; using HEPA-filtered vacuums for surface cleaning; eliminating food and drink storage and consumption from bullet production areas; and wearing heat-resistant gloves, sleevelets, or both in the casting area to protect skin. The company was also advised to start a comprehensive lead program that incorporates elements of the OSHA lead standard, including training of workers and medical surveillance (*5*).

Corresponding author: David A. Jackson, DJackson10@cdc.gov, 513-841-4340.

[1]Epidemic Intelligence Service, CDC; [2]Division of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC; [3]Missouri Department of Health and Senior Services.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. National Toxicology Program. NTP monograph: health effects of low-level lead. Washington, DC: US Department of Health and Human Services, National Toxicology Program; 2012. https://ntp.niehs.nih.gov/ntp/ohat/lead/final/monographhealtheffectslowlevellead_newissn_508.pdf
2. Filon FL, Boeniger M, Maina G, Adami G, Spinelli P, Damian A. Skin absorption of inorganic lead (PbO) and the effect of skin cleansers. J Occup Environ Med 2006;48:692–9. https://doi.org/10.1097/01.jom.0000214474.61563.1c
3. CDC. Adult Blood Lead Epidemiology and Surveillance (ABLES) Program. Cincinnati, OH: US Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health; 2015. https://www.cdc.gov/niosh/topics/ables/description.html
4. CDC. National Notifiable Diseases Surveillance System: lead, elevated blood levels. 2016 case definition. Atlanta, GA: US Department of Health and Human Services, CDC; 2016. https://wwwn.cdc.gov/nndss/conditions/lead-elevated-blood-levels/case-definition/2016/
5. Occupational Safety and Health Administration. Lead standards: general industry. Standard no. 1910.1025. Washington, DC: US Department of Labor, Occupational Safety and Health Administration; 2018. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10030

Notes from the Field

Spatially Associated Coincident and Noncoincident Cases of La Crosse Encephalitis — North Carolina, 2002–2017

Brian D. Byrd, PhD[1]; Carl J. Williams, DVM[2]; J. Erin Staples, MD, PhD[3]; Kristen L. Burkhalter[3]; Harry M. Savage, PhD[3]; Michael S. Doyle, MS[2]

La Crosse virus (LACV) is the most common cause of pediatric arthropod-borne viral (arboviral) encephalitis in the United States (*1*). It is a California serogroup bunyavirus primarily transmitted by the eastern tree-hole mosquito (*Aedes triseriatus*) (*2*). LACV encephalitis is a reportable condition in North Carolina and is a nationally notifiable disease. In North Carolina, LACV encephalitis is the most common endemic arboviral disease reported in humans, with seven western counties accounting for approximately 80% of confirmed cases since 2003 (*3*). The fatality rate for LACV encephalitis is <1%, with most patients recovering without overt clinical sequelae; however, long-term neurologic sequelae reported in some patients include recurrent seizures, hemiparesis, and cognitive and neurobehavioral abnormalities (*4*).

In August 2017, the North Carolina Department of Public Health (NCDPH) was notified of a suspected LACV encephalitis case in a boy aged 2 years from western North Carolina. The following day, NCDPH was notified that the patient's brother, aged 11 years, was also ill with symptoms consistent with viral meningoencephalitis. Laboratory testing confirmed that both siblings had evidence of recent LACV infection (Table).

An interagency environmental assessment team who visited the siblings' residence identified multiple risk factors associated with increased risk for LACV transmission (*5*). Water-filled artificial containers containing *Aedes* mosquito larvae (*Ae. triseriatus*, *Ae. albopictus*, and *Ae. japonicus*) were found on the premises, multiple windows and doors lacked effective screens, and the yard was within close proximity (<50 m) to a mixed hardwood forest. Additional mosquito samples (adult mosquitoes collected by large-bore aspirator and mosquitoes reared from eggs collected by ovitraps) were obtained; mosquitoes from egg collections were tested for LACV infection by real-time reverse transcription–polymerase chain reaction (RT-PCR) (*6*) and adult mosquitoes were tested by virus isolation attempts in cell culture; no virus was detected (*7*). The sibling pair was known to play outdoors daily and received mosquito bites during the expected incubation period (5–15 days) before disease onset.

To identify additional LACV patients among two or more persons residing at the same location, 331 confirmed or probable LACV case reports meeting the case definition* were reviewed in the North Carolina Electronic Disease Surveillance System. Three additional coincident patient pairs (two sibling pairs and one caregiver/child pair), linked spatially by place of residence and occurring during the same or sequential epidemiologic weeks, were identified (Table). In addition, three instances of confirmed LACV encephalitis were identified in children residing at the same residence, but during different years (spatially linked noncoincident cases). In one instance, the patients had no familial relationship but were linked by residence (residence F) after a change in home ownership. Three additional cases (one coincident sibling pair and one noncoincident case) were linked by residence within the same multibuilding apartment cluster (residence C).

These identified cases indicate that LACV disease risk can occur coincidently or noncoincidentally in time in persons at the same physical residence and further support surveillance data indicating that the disease is highly focal, occurring in a limited geographic area (*8*). This finding suggests that environmental assessments and modifications (e.g., filling tree holes, installing and repairing window or door screens, and removing water-filled containers) at locations where cases occur could help reduce the risk for this disease. In addition, persons living at the residence of a patient with a newly identified case of LACV disease or in an area where the virus is known to occur should be advised of the risk and measures to reduce risk, such as using Environmental Protection Agency–registered and recommended insect repellents, reducing time outdoors when mosquitoes are active, appropriate environmental modifications, and wearing clothing that prevents mosquito bites. Finally, health care providers should be aware of the potential clustering of LACV disease at a specific location and routinely advise their patients about mosquito prevention measures they can take to lower their risk. Additional information about LACV is available at https://www.cdc.gov/lac/index.html.

*https://wwwn.cdc.gov/nndss/conditions/arboviral-diseases-neuroinvasive-and-non-neuroinvasive/.

TABLE. Coincident or spatially associated noncoincident La Crosse virus neuroinvasive disease cases — North Carolina, 2002–2017

Year (onset week)	Age, yrs (sex)	Association (residence)*	Laboratory evidence†	Outcome
Coincident cases				
2017 (30/31)	2 (M)	Sibling pair, same residence (A)	LACV IgM ELISA positive (CSF and serum)	Survived
	11 (M)		LACV IgM ELISA and PRNT positive (serum)	Survived
2011 (34)	5 (M)	Sibling pair, same residence (B)	LACV IgM ELISA and PRNT positive (CSF and serum)	Survived
	8 (F)		LACV IgM ELISA and PRNT positive (serum) LACV RT-PCR positive (CSF)	Died
2010 (37)	4 (M)	Sibling pair, same residence (C)	LACV IgM ELISA positive (CSF and serum)	Survived
	6 (F)		LACV IgM ELISA positive (CSF and serum)	Survived
2002 (25/26)	8 (F)	Caregiver and child, same residence (D)	LACV IgM and IgG IFA positive (serum)	Survived
	32 (F)		LACV IgM and IgG IFA positive (serum x 2)	Survived
Spatially linked noncoincident cases				
2015 (29)	8 (F)	Sibling pair (E)	LACV IgM ELISA and PRNT positive (serum)	Survived
2011 (36)	6 (M)		LACV IgM ELISA positive (CSF and serum)	Survived
2012 (27)	4 (M)	No family relationship, home ownership changed (F)	LACV IgM ELISA positive (CSF and serum)	Survived
2005 (37)	5 (M)		LACV IgM ELISA positive (CSF and serum)	Survived
2011 (27)	6 (M)	No family relationship, linked to 2010 cases (same multi-building cluster) (C)	LACV IgM ELISA positive (CSF)	Survived

Abbreviations: CSF = cerebrospinal fluid; ELISA = enzyme linked immunosorbent assay; F = female; IFA = immunofluorescent assay; IgG = immunoglobulin G; IgM = immunoglobulin M; LACV = La Crosse virus; M = male; PRNT = plaque reduction neutralization test; RT-PCR = reverse transcription–polymerase chain reaction.
* Letters A–F indicate unique residences.
† Testing performed at North Carolina Department of Public Health Public Health Laboratory and CDC Arbovirus Diagnostic Laboratory.

Acknowledgments

Arbovirus Diagnostic Laboratory staff members, Jennifer Lehman, Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; Felissa Vazquez, Sue Ellen Morrison, Buncombe County Health Department, Asheville, North Carolina; David Buhner, Mission Health System, Asheville, North Carolina.

Corresponding author: Brian D. Byrd, bdbyrd@wcu.edu, 828-227-2607.

[1]Environmental Health Sciences Program, Western Carolina University, Cullowhee, North Carolina, [2]North Carolina Division of Public Health, Raleigh, North Carolina, [3]Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC.

All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

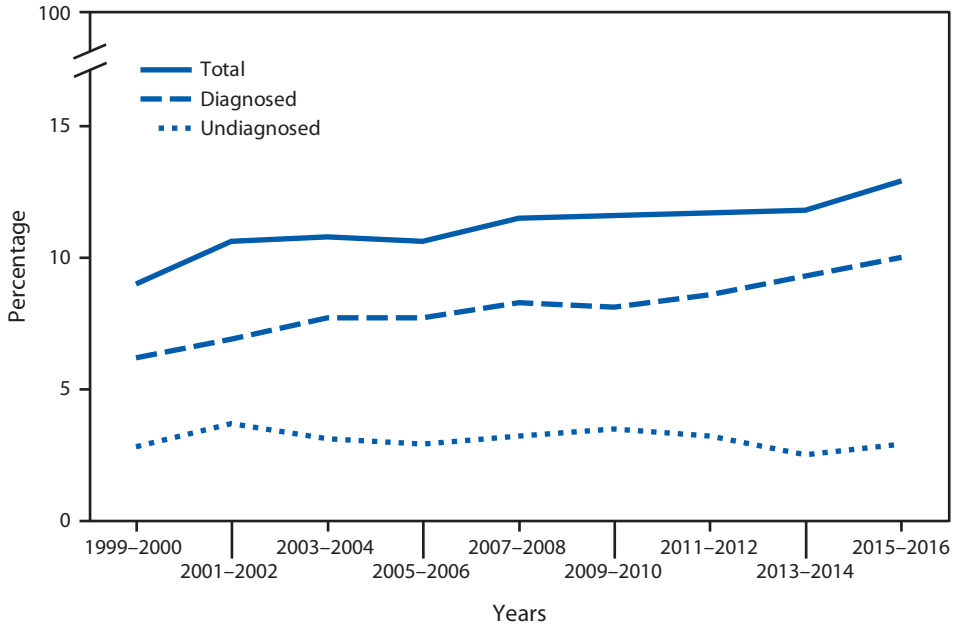
References

1. Gaensbauer JT, Lindsey NP, Messacar K, Staples JE, Fischer M. Neuroinvasive arboviral disease in the United States: 2003 to 2012. Pediatrics 2014;134:e642–50. https://doi.org/10.1542/peds.2014-0498
2. Westby KM, Fritzen C, Paulsen D, Poindexter S, Moncayo AC. La Crosse encephalitis virus infection in field-collected *Aedes albopictus, Aedes japonicus*, and *Aedes triseriatus* in Tennessee. J Am Mosq Control Assoc 2015;31:233–41. https://doi.org/10.2987/moco-31-03-233-241.1
3. CDC. ArboNET disease maps. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://wwwn.cdc.gov/arbonet/maps/ADB_Diseases_Map/index.html
4. CDC. Symptoms and treatment: La Crosse encephalitis. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://www.cdc.gov/lac/tech/symptoms.html
5. Erwin PC, Jones TF, Gerhardt RR, et al. La Crosse encephalitis in eastern Tennessee: clinical, environmental, and entomological characteristics from a blinded cohort study. Am J Epidemiol 2002;155:1060–5. https://doi.org/10.1093/aje/155.11.1060
6. Lambert AJ, Nasci RS, Cropp BC, et al. Nucleic acid amplification assays for detection of La Crosse virus RNA. J Clin Microbiol 2005;43:1885–9. https://doi.org/10.1128/JCM.43.4.1885-1889.2005
7. Beaty BJ, Calisher CH, Shope RE. Arboviruses. In: Lennette EH, Lennette DA, eds. Diagnostic procedures for viral, rickettsial, and chlamydial infections. Washington, DC: American Public Health Association; 1995:189–212.
8. Reimann CA, Hayes EB, DiGuiseppi C, et al. Epidemiology of neuroinvasive arboviral disease in the United States, 1999–2007. Am J Trop Med Hyg 2008;79:974–9. https://doi.org/10.4269/ajtmh.2008.79.974

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Prevalence of Total, Diagnosed, and Undiagnosed Diabetes* Among Adults Aged ≥20 Years — National Health and Nutrition Examination Survey, 1999–2000 to 2015–2016†



* Participants were classified as having diagnosed diabetes based on the question "Other than during pregnancy, have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?" Participants were classified as having undiagnosed diabetes if they did not report a diagnosis of diabetes by a health care provider, and their fasting (8–24 hours) plasma glucose was ≥126 mg/dL or their hemoglobin A1C was ≥6.5%. Total diabetes was the combined prevalence of diagnosed and undiagnosed diabetes.

† Current criteria from the American Diabetes Association were applied to define diabetes for all current and previous years of data. Backward calibration equations were used to adjust for changes in laboratory techniques and procedures over time. All estimates for adults are age-adjusted by the direct method to the projected 2000 U.S. Census population using age groups 20–39, 40–59, and ≥60 years.

From 1999–2000 to 2015–2016, the prevalence of total diabetes increased from 9.0% to 12.9%. The prevalence of diagnosed diabetes increased from 6.2% to 10.0%. The prevalence of undiagnosed diabetes was 2.8% in 1999–2000 and 2.9% in 2015–2016 with no significant change over this period.

Source: CDC/NCHS National Health and Nutrition Examination Survey. https://www.cdc.gov/nchs/nhanes/index.htm.

Reported by: Craig M. Hales, MD, chales@cdc.gov, 301-458-4193; Te-Ching Chen, PhD; Qiuping Gu, MD, PhD; Mark S. Eberhardt, PhD.

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit *MMWR* at *https://www.cdc.gov/mmwr/index.html*.

Readers who have difficulty accessing this PDF file may access the HTML file at *https://www.cdc.gov/mmwr/index2018.html*. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Executive Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30329-4027 or to mmwrq@cdc.gov.

ISSN: 0149-2195 (Print)