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Use of Aspirin for Prevention of Recurrent Atherosclerotic Cardiovascular Disease Among Adults — 20 States and the District of Columbia, 2013

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The effectiveness of regular aspirin therapy in reducing risk (secondary prevention) for myocardial infarction, ischemic stroke, and fatal coronary events among persons with preexisting atherosclerotic cardiovascular disease (ASCVD) is well established (*1*) and recommended in current guidelines (*2*). Reported use of aspirin or other antiplatelet agents for secondary ASCVD prevention has varied widely across settings and data collection methods, from 54% of outpatient visits for those with ischemic vascular disease (*3*) to 98% at the time of discharge for acute coronary syndrome (*4*). To estimate the prevalence of aspirin use for secondary ASCVD prevention among community-dwelling adults, CDC analyzed 2013 Behavioral Risk Factor Surveillance System (BRFSS) data from 20 states and the District of Columbia. Overall, 70.8% of adult respondents with existing ASCVD reported using aspirin regularly (every day or every other day). Within this group, 93.6% reported using aspirin for heart attack prevention, 79.6% for stroke prevention and 76.2% for both heart attack and stroke prevention. Differences in use were found by age, sex, race/ethnicity, and ASCVD risk status, and state. Most of the state differences were not statistically significant; however, these estimates can be used to promote the use of aspirin as a low-cost (*2*) and highly effective intervention (*1*).

BRFSS is an annual telephone survey, conducted by all U.S. states, with guidance and support from CDC. Detailed information regarding the survey can be found online (at http://www.cdc.gov/brfss). In addition to core questions asked by all states, optional BRFSS modules are dedicated to various topic areas. In 2013, 20 states (Arizona, Arkansas, Florida, Georgia, Hawaii, Iowa, Maine, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, Tennessee, Washington, and Wisconsin) and the District of Columbia opted to include the cardiovascular health module in their surveys. This module included questions about regular (every day or every other day) aspirin use. Respondents who answered "no" when asked about regular aspirin use were subsequently asked whether they had any health problem or condition that made taking aspirin unsafe (e.g., a "stomach condition"). Those who answered "yes," to regular aspirin use were asked additional questions to learn the reason for aspirin use (i.e., to reduce the chance of heart attack, to reduce the chance of stroke, and to relieve pain).*

Participants were classified as having preexisting ASCVD if they reported a history of coronary heart disease or stroke, based on their answers to the following questions: "Has a doctor, nurse, or other health professional ever told you that you had 1) a heart attack, also called a myocardial infarction;

*The questions asked were as follows: "Do you take aspirin daily or every other day?" "Do you have a health problem or condition that makes taking aspirin unsafe for you?" "Do you take aspirin to relieve pain?" "Do you take aspirin to reduce the chance of a heart attack?" "Do you take aspirin to reduce the chance of a stroke?"

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2) angina or coronary heart disease; or 3) a stroke?" Self-reported sociodemographic and descriptive characteristics included age, sex, race/ethnicity, education, and selected ASCVD risk factors (hypertension, diabetes, high cholesterol, current smoking). Prevalence of regular aspirin use was estimated only among those with preexisting ASCVD, stratified by sociodemographic characteristics and number of ASCVD risk factors. Age-standardized prevalence of aspirin use among persons with ASCVD by state was estimated using the 2000 U.S. standard population, based on the following age groups: 18–24, 25–44, 45–64 and ≥65 years (*5*).

Overall, 175,523 participants aged ≥18 years from 20 states and the District of Columbia responded to the cardiovascular health module, and 21,682 (12.5%) reported a history of coronary heart disease, stroke, or both. From this group, 3,698 (17.1%) were excluded because of missing sociodemographic and ASCVD risk factor data, resulting in a final analytic sample of 17,984. The number of participants ranged from 387 (District of Columbia) to 4,227 (Florida). The median state response rate, calculated according to guidelines of the American Association of Public Opinion Research, was 44%; response rates among states and the District of Columbia ranged from 31% to 59% (*6*).

Among the eligible respondents with preexisting ASCVD, 70.8% reported regular aspirin use, with 93.6% taking it to prevent a heart attack, 79.6% to prevent a stroke, and 76.2% to prevent both heart attack and stroke (Table 1). Moreover, 14.9% (95% confidence interval [CI]: 13.8%–16.0%) of eligible respondents who reported regular aspirin use and who had ASCVD also reported using aspirin for pain relief, and 4.2% (CI: 3.5%–4.9%) of eligible respondents reported using aspirin for pain relief only. The percentage of aspirin use for prevention of secondary of ASCVD varied by sociodemographic characteristics (Table 1). In general, respondents aged ≥65 years, men, non-Hispanic whites and those with at least two ASCVD risk factors were more likely to use aspirin than other groups.

By state, the age-standardized percentage of regular aspirin use among those with ASCVD ranged from 44.3% (Missouri) to 71.7% (Mississippi) (Table 2) with wide confidence intervals, and most of the observed differences among the states were not statistically significant. No systematic pattern of aspirin use by region was observed (Figure).

Discussion

Overall, 70.8% of adults with preexisting ASCVD in 20 states and the District of Columbia reported regular aspirin use, but differences in aspirin use among various groups were found. Aspirin use for the prevention of recurrent ASCVD is widely promoted across the United States, and is included in national cardiovascular disease prevention programs such as the Million Hearts initiative (*7*) and *Healthy People 2020* (*8*). Furthermore, CDC-funded state programs to prevent and control heart disease and stroke (e.g., State Public Health Actions

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TABLE 1. Age-standardized percentage* of adults taking aspirin for secondary prevention of atherosclerotic cardiovascular disease and reason for taking aspirin, by selected characteristics — Behavioral Risk Factor Surveillance System, 20 states and the District of Columbia, 2013

				Among those using aspirin regularly,† they used it to prevent					
		Total use of aspirin		Heart attack		Stroke		Both heart attack and stroke	
Characteristic	No.	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	**17,984**	**70.8**	**(69.4–72.1)**	**93.6**	**(92.7–94.5)**	**79.6**	**(78.1–81.1)**	**76.2**	**(74.6–77.8)**
Age group (yrs)									
18–64	6,181	65.9	(63.5–68.2)	92.9	(91.2–94.3)	80.8	(78.3–83.1)	77.2	(74.5–79.6)
≥65	1,1803	75.0	(73.5–76.5)	94.2	(93.1–95.1)	78.6	(76.6–80.4)	75.4	(73.4–77.4)
Sex									
Men	8,518	76.2	(74.4–77.9)	95.0	(93.9–95.9)	78.5	(76.2–80.6)	76.2	(73.9–78.3)
Women	9,466	64.4	(62.3–66.3)	91.7	(90.0–93.1)	81.2	(79.2–83.0)	76.3	(74.0–78.4)
Race/Ethnicity§									
White	14,595	73.6	(72.2.74.9)	94.3	(93.4–95.1)	79.6	(78.1–81.1)	76.7	(75.1–78.2)
Black	1,889	63.0	(58.2–67.6)	93.6	(90.6–95.6)	81.5	(76.6–85.6)	77.6	(72.5–82.0)
Hispanic	398	55.6	(45.7–65.1)	83.3	(70.7–91.2)	71.8	(55.4–83.9)	61.9	(46.5–76.3)
Other	1,102	64.7	(58.5–70.5)	92.7	(88.4–95.5)	81.6	(75.0–86.7)	78.4	(71.6–83.9)
Education									
Less than high school diploma	2,469	65.0	(61.1–68.7)	93.0	(90.2–95.0)	78.1	(72.8–82.6)	74.8	(69.5–79.4)
High school diploma	6,066	72.6	(70.3–74.7)	92.7	(90.7–94.3)	79.8	(77.5–81.9)	75.9	(73.3–78.3)
Some college	5,099	69.8	(67.4–72.1)	94.6	(93.2–95.8)	81.1	(78.4–83.5)	78.3	(75.6–80.8)
College degree	4,350	76.7	(74.2–79.0)	94.3	(92.6–95.7)	78.4	(75.6–81.0)	74.9	(71.9–77.6)
No. of cardiovascular risk factors¶									
None	1,359	54.7	(49.4–59.9)	89.6	(85.5–92.7)	72.6	(65.7–78.6)	65.9	(58.9–72.2)
1	4,027	63.4	(60.3–66.4)	90.5	(87.9–92.6)	77.3	(74.2–80.2)	71.4	(67.9–74.7)
2	7,289	74.5	(72.3–76.5)	93.8	(92.2–95.2)	79.7	(77.2–82.0)	76.8	(74.2–79.2)
3	4,662	76.1	(73.7–78.5)	95.9	(84.6–97.0)	81.8	(78.7–84.6)	80.0	(76.8–82.8)
4	647	72.7	(66.2–78.4)	97.1	(94.0–98.6)	84.2	(78.3–88.7)	83.4	(77.5–88.0)

Abbreviation: CI = confidence interval.
* Using the U.S. 2000 standard projected population with age groups of 18–24, 25–44, 45–64 and ≥65 years.
† Every day or every other day.
§ All white, black, and other respondents were non-Hispanic. Hispanic respondents might be of any race.
¶ Hypertension, diabetes, high cholesterol, and current smoking. Risk factors were each given a weight of 1 and totaled.

to Prevent and Control Diabetes, Heart Disease, Obesity and Associated Risk Factors and Promote School Health† and Well-Integrated Screening and Evaluation for Women Across the Nation [WISEWOMAN]§) support states using strategies for cardiovascular disease and risk factors management outlined in the Million Hearts initiative. These include promotion of the "ABCS" of clinical prevention: aspirin use when appropriate, blood pressure control, cholesterol management, and smoking cessation, as well as promoting healthy environments and encouraging a heart-healthy lifestyle.

Although the overall self-reported prevalence of aspirin use among persons with ASCVD in the BRFSS cardiovascular health module was similar to the 70% recently reported for the 2012 National Health Interview Survey (*9*), variations in aspirin use were observed in this analysis among geographic areas and sociodemographic groups. Public health practitioners and clinicians can use data from this report to target resources and interventions to those groups with lower use of aspirin. Promotion of adherence to evidence-based practice guidelines and clinical management algorithms upon discharge after cardiovascular disease events, counseling about aspirin use, and implementation of community-based interventions to champion the benefits of regular aspirin use among those eligible are needed to increase aspirin use (*10*). Further work is needed to assess possible variation in aspirin use at subnational levels and among different risk groups. Although regular aspirin use for pain relief among adults with ASCVD was uncommon, 4.2% of those with ASCVD were using it for pain relief only and not for prevention of heart attack or stroke, receiving the therapeutic benefit of aspirin for secondary ASCVD prevention without realizing it.

The findings in this report are subject to at least five limitations. First, current guidelines recommend aspirin or other antiplatelet medications for prevention of recurrent events; however, data on the use of other antiplatelet medications (as alternatives to aspirin) was not collected by BRFSS. Therefore, the overall use of all antiplatelet medications could not be estimated. Second, the use of aspirin is generally contraindicated after a hemorrhagic stroke (intracerebral hemorrhage and subarachnoid hemorrhage), and BRFSS did not distinguish

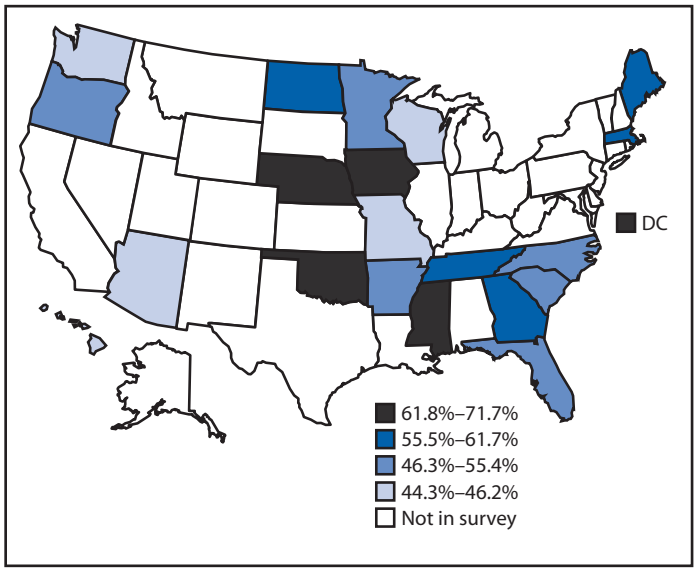
† Available at http://www.cdc.gov/dhdsp/programs/spha/index.htm.
§ Available at http://www.cdc.gov/wisewoman/.

TABLE 2. Age-standardized percentage* of adults taking aspirin for secondary prevention of atherosclerotic cardiovascular disease and reason for taking aspirin, by state — Behavioral Risk Factor Surveillance System, 20 states and the District of Columbia (DC), 2013

				Among those using aspirin regularly,† they used it to prevent					
		Total use of aspirin		Heart attack		Stroke		Both heart attack and stroke	
State/Area	No.	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Arizona	437	44.6	(30.7–59.4)	86.3	(54.9–97.0)	78.8	(52.7–92.5)	75.9	(51.1–90.5)
Arkansas	647	54.9	(43.0–66.3)	89.5	(62.7–97.8)	82.6	(61.9–93.3)	81.4	(61.2–92.4)
DC	378	69.5	(55.4–80.7)	89.8	(76.4–96.0)	83.4	(71.2–91.1)	74.6	(70.0–78.8)
Florida	4227	51.2	(41.6–60.7)	89.3	(77.0–95.4)	67.7	(57.1–76.8)	65.6	(55.1–74.7)
Georgia	729	57.8	(49.0–66.1)	91.6	(77.5–97.2)	82.8	(75.6–88.2)	76.3	(64.5–85.1)
Hawaii	513	46.2	(35.0–57.8)	87.5	(67.4–96.0)	82.2	(64.5–92.1)	79.9	(62.9–90.3)
Iowa	827	71.2	(58.4–81.3)	85.6	(69.2–94.0)	69.9	(53.8–82.2)	59.2	(43.3–73.4)
Maine	497	61.7	(51.3–71.1)	95.3	(83.1–98.8)	70.5	(55.0–82.4)	66.5	(50.7–79.4)
Massachusetts	379	56.5	(35.9–75.1)	95.6	(88.6–98.4)	60.8	(38.3–79.4)	58.2	(36.0–77.6)
Minnesota	1082	55.1	(43.7–66.0)	80.9	(58.9–92.7)	81.0	(65.7–90.5)	68.8	(50.0–82.9)
Mississippi	926	71.7	(59.9–81.0)	92.1	(83.3–96.5)	82.1	(70.4–89.9)	80.5	(69.0–88.5)
Missouri	811	44.3	(35.3–53.6)	92.9	(73.8–98.4)	63.8	(38.6–83.1)	58.4	(37.7–76.5)
Nebraska	850	71.5	(59.7–80.9)	77.3	(68.0–84.5)	56.5	(41.6–70.3)	53.1	(38.4–67.2)
North Carolina	487	47.3	(38.0–56.8)	95.8	(92.4–97.8)	80.9	(62.0–91.6)	78.4	(60.2–89.7)
North Dakota	711	59.2	(45.9–71.2)	88.7	(68.5–96.6)	77.7	(53.5–91.3)	68.1	(46.4–84.1)
Oklahoma	537	67.0	(52.6–78.8)	85.6	(84.7–86.5)	69.9	(58.5–79.3)	69.3	(58.0–78.8)
Oregon	508	50.2	(36.9–63.5)	78.3	(57.6–90.5)	67.4	(48.8–81.7)	61.1	(43.6–76.1)
South Carolina	1148	55.4	(47.4–63.1)	96.5	(94.3–97.8)	89.0	(83.9–92.7)	86.9	(81.6–90.8)
Tennessee	725	58.2	(44.7–70.5)	76.8	(65.2–85.3)	76.2	(67.8–83.0)	70.8	(59.3–80.2)
Washington	1041	44.4	(37.0–52.0)	95.5	(92.7–97.3)	85.5	(78.7–90.4)	83.8	(77.1–88.9)
Wisconsin	524	45.5	(40.0–51.2)	98.3	(96.2–99.2)	87.7	(70.3–95.5)	86.4	(69.7–94.6)

Abbreviation: CI = confidence interval.
* Using the U.S. 2000 standard projected population with age groups of 18–24, 25–44, 45–64 and ≥65 years.
† Every day or every other day.

FIGURE. Age-standardized percentage of aspirin use among persons with preexisting atherosclerotic cardiovascular disease, by quartile — Behavioral Risk Factor Surveillance System — 20 states and the District of Columbia (DC), 2013



between hemorrhagic and ischemic stroke. This may partially account for the lower reported prevalence of regular aspirin use for stroke prevention compared with that for heart attack prevention; however, hemorrhagic stroke accounts only for about 10% of all strokes (*4*). Third, these data are self-reported, and aspirin does not require a prescription for purchase, which might lead to recall bias as well as challenges in identifying the medication. Fourth, because not all states participated in this BRFSS module, the data are not nationally representative. Finally, with relatively small samples of respondents with coronary heart disease or stroke at the state level, confidence intervals for state level estimates were wide.

Although provision of aspirin at discharge following a cardiovascular disease event is high (*4*), reports using community-based data sources find that aspirin use for secondary prevention is suboptimal. Consistent and timely access to health care services encourages the assessment of ASCVD by clinicians, and community-based interventions to promote aspirin use might reach those persons not likely to interact with health care providers on a regular basis. In addition, interventions targeting specific subgroups, such as those younger than age 65 years, women, and black and Hispanic patients might reduce disparities in aspirin use. The use of this low-cost, effective, and generally safe intervention among persons who have existing atherosclerotic cardiovascular disease is supported by multiple evidence-based guidelines, and current data suggest that there is room for increased use in this population.

Summary

What is already known on this topic?

Aspirin and other antiplatelet medications reduce the risk of cardiovascular events among adults with existing atherosclerotic cardiovascular disease (ASCVD).

What is added by this report?

Among persons with preexisting ASCVD in 20 US states and the District of Columbia, 70.8% reported using aspirin regularly for prevention of heart attack and stroke, and differences were observed in reported aspirin use among certain groups.

What are the implications for public health practice?

Clinical and community-based approaches should be used to increase aspirin use among persons with ASCVD to prevent recurrent heart attacks and strokes, with specific attention to groups reporting lower aspirin use.

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Receipt of Selected Clinical Preventive Services by Adults — United States, 2011–2012

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Preventive services are available for nine of the ten leading causes of death in the United States (*1*). The Affordable Care Act (ACA) has reduced cost as a barrier to care by expanding access to insurance and requiring many health plans to cover certain recommended preventive services without copayments or deductibles (*1*). To establish a baseline for the receipt of these services for monitoring the effects of the law after 2012, CDC analyzed responses from persons aged ≥18 years in the National Health Interview Survey (NHIS) for the years 2011 and 2012 combined. NHIS is an in-person interview administered annually to a nationally representative sample of the noninstitutionalized, U.S. civilian population. This report summarizes the findings for nine preventive services covered by the ACA. Having health insurance or a higher income was associated with higher rates of receiving these services, affirming findings of previous studies (*2*). Securing health insurance coverage might be an important way to increase receipt of clinical preventive services, but insurance coverage is not sufficient to ensure that everyone is offered or uses clinical services proven to prevent disease. Greater awareness of ACA provisions among the public, public health professionals, partners, and health care providers might help increase the receipt of recommended services (*3*).

The responses to questions about the receipt of nine clinical preventive services recommended by the U.S. Preventive Services Task Force (USPSTF) or the Advisory Committee on Immunization Practices (ACIP) were analyzed to identify receipt rates for the clinical services (Table 1). The nine preventive services are among dozens of services for adults covered with no copayments or deductibles under certain health plans according to the ACA*†: 1)blood pressure screening, 2) cholesterol screening, 3) colon cancer screening, 4) diet counseling, 5) fasting blood glucose test (diabetes screening), 6) hepatitis A vaccination, 7) hepatitis B vaccination, 8) mammogram (breast cancer screening), and 9) Papanicolaou (Pap) test (cervical cancer screening). While clinical guidelines change over time (i.e., adjusting the recommended periodicity or risk factors for which the service is indicated), it is important to consistently monitor receipt rates for the underlying clinical services for accurate year-to-year comparisons. Asked annually since 2011, the NHIS survey questions used for this analysis are designed to consistently measure receipt of the services each survey year and to improve accuracy of responses by limiting recall of service receipt to 12 months where possible; for hepatitis A and B vaccinations, respondents were asked if they had ever received this service (Table 1). Only 15 preventive services (these nine services and six others previously reported on in 2014 [4]) are included in both the ACA's coverage requirements and the annual NHIS.

To increase sample sizes and improve the reliability of estimates for this analysis, NHIS data from the sample adult core questionnaires in 2011 and 2012 were combined. From within each family in each household identified, one adult (aged ≥18 years) was randomly selected to complete the questionnaire.§ NHIS 2011 and 2012 adult core samples included 33,014 and 34,525 respondents, respectively, and the overall response rates were 66.3% and 61.2%.

Participants were asked whether they had health insurance at the time of the interview. They were considered uninsured if they reported currently not having private health insurance, Medicare, Medicaid, Children's Health Insurance Program, a state-sponsored or other government-sponsored health plan, or a military plan, or if they had only a private plan that paid for one type of service (e.g., injury or dental care) or had only Indian Health Service coverage.¶ Multiple imputations were performed on family income to account for missing responses to income questions.** NHIS data were adjusted for nonresponse and weighted to provide national estimates of insurance status and receipt of preventive care; 95% confidence intervals were calculated that took into account the survey's multistage probability sample design. Generalized linear modeling and t-tests were used to calculate prevalence ratios and determine

* For adults, the Affordable Care Act recognizes the U.S. Preventive Services Task Force (http://www.uspreventiveservicestaskforce.org) and the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/acip), as two of the organizations whose clinical preventive service recommendations receive coverage without copayments and deductibles for certain health plans.

† An interactive tool, available at http://www.cdc.gov/prevention, lets users identify which preventive services are recommended for a particular person and covered by the ACA.

§ Additional information available at http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm.

¶ Consistent with other population surveys conducted by U.S. federal agencies, CDC does not regard Indian Health Service coverage as health insurance for the purpose of identifying uninsured populations.

** Additional information available at http://www.cdc.gov/nchs/nhis/2011imputedincome.htm and http://www.cdc.gov/nchs/nhis/2012imputedincome.htm.

TABLE 1. Comparison of recommendations from the United States Preventive Services Task Force (USPSTF) and the Advisory Committee on Immunization Practices (ACIP) with questions regarding nine recommended clinical preventive services in the National Health Interview Survey (NHIS)—United States, 2011–2012

Clinical preventive service (age group [yrs])	Recommendation	Question to NHIS participants	Key distinctions for this analysis of use of recommended services
Blood pressure screening (≥18)	Screening for high blood pressure is recommended for adults aged ≥18 years. The optimal screening interval is uncertain, but a one- or two-year screening interval, depending on risk factors, is one example highlighted by the USPSTF.*	"During the past 12 months, have you had your blood pressure checked by a doctor, nurse, or other health professional?" Response analyzed for persons aged ≥18 years.	There is no specific recommended screening interval, which differs from the survey question timeframe (12 months). The results of this analysis identify service use and cannot determine adherence to guideline.
Breast cancer screening (women, 50–74)	Screening via mammography every two years is recommended for all women aged 50–74 years.*†	"Have you had a mammogram during the past 12 months?" Response analyzed for women aged 50–74 years.	The recommended screening interval (2 years) differs from the survey question timeframe (12 months). The results of this analysis identify service use and cannot determine adherence to guideline.
Cervical cancer screening (women, 21–65)	Screening via cytology (Pap test) is recommended every three years for women aged 21–65 years. Women aged 30–65 years can be screened every 5 years by adding a human papillomavirus test to the cytology.*§	"Have you had a Pap smear or Pap test During the past 12 months?" Response analyzed for women aged 21–65 years.	The recommended screening interval (three or five years) for cytology differs from the survey question timeframe (12 months). The results of this analysis identify service use and cannot determine adherence to guideline.
Cholesterol screening (men, ≥35)	Screening for lipid disorders via a cholesterol test is recommended for all men aged ≥35 years.¶ The optimal screening interval is uncertain, but the USPSTF states that 5 years is an example of a reasonable interval.*	"During the past 12 months, have you had your blood cholesterol checked by a doctor, nurse, or other health professional?" Response analyzed for men aged ≥35 years.	There is no specific recommended screening interval, which differs from the survey question timeframe (12 months). The results of this analysis identify service use and cannot determine adherence to guideline.
Colon cancer screening (50–75)	Colorectal cancer screening is recommended for all adults aged 50–75 years. Recommended screening interval varies by screening method: 1 year for high-sensitivity fecal occult blood testing (FOBT); five years for sigmoidoscopy with FOBT every 3 years; 10 years for colonoscopy.*	"During the past 12 months, have you had any test done for colon cancer?" Response analyzed for persons aged 50–75 years.	The recommended screening interval (1–10 years) differs from the survey question timeframe (12 months). The results of this analysis identify service use and cannot determine adherence to guideline.
Diabetes screening (≥18)	Screening for type 2 diabetes is recommended for asymptomatic adults with sustained blood pressure greater than 135/80 mmHg. The optimal screening interval is uncertain, but the American Diabetes Association recommends a 3-year interval.*	"Have you had a fasting test for high blood sugar or diabetes during the past 12 months?" Response analyzed for persons aged ≥18 years.	The recommended screening interval is uncertain and the suggested interval (3 years) differs from the survey question timeframe (12 months). Also, fasting blood glucose is just one of three methods recommended for diabetes screening. Further, this analysis identifies the screening rate for all adults and not just those with sustained hypertension. The results of this analysis identify service use and cannot determine adherence to guideline.

See table footnotes on the next page.

statistical significances of differences in receipt of preventive services between persons in three categories: 1) insured versus uninsured, 2) current family incomes >200% of the federal poverty level (FPL)†† versus current family incomes ≤200% of the FPL, and 3) any private health insurance versus only public coverage. Analysis for each service was restricted to persons of the age and sex for who receipt of that service is recommended (Table 1).

For the nine services examined, prevalence of receipt of service in the queried timeframe was as follows: hepatitis A vaccination, 12.7%; colon cancer screening, 23.6%; diet counseling, 26.9%; hepatitis B vaccination, 38.8%; diabetes screening, 45.3%; cervical cancer screening, 59.4%; breast cancer screening, 61.6%; cholesterol screening, 70.0%; and blood pressure screening, 82.9% (Table 2). A statistically significant higher percentage of adults with health insurance received each of nine clinical preventive services compared with those who were uninsured (Table 2). Among the nine services, the service receipt prevalence ratio for those with insurance compared with those without insurance ranged from 1.39 for hepatitis B vaccination to 3.13 for colon cancer screening (Table 2).

Persons with family incomes >200% of the FPL received clinical preventive services at a statistically significant higher

†† In 2012, the FPL for a family of four was $46,100; additional information available at http://aspe.hhs.gov/poverty/12poverty.shtml and http://www.census.gov/hhes/www/poverty/about/overview/measure.html.

TABLE 1. (*Continued*) Comparison of recommendations from the United States Preventive Services Task Force (USPSTF) and the Advisory Committee on Immunization Practices (ACIP) with questions regarding nine recommended clinical preventive services in the National Health Interview Survey (NHIS)—United States, 2011–2012

Clinical preventive service (age group [yrs])	Recommendation	Question to NHIS participants	Key distinctions for this analysis of use of recommended services
Diet counseling (≥18)	Intensive behavioral dietary counseling is recommended for adults with known risk factors for cardiovascular and diet-related chronic disease. The optimal screening and counseling interval is not known.*	"During the past 12 months, has a doctor or other health professional talked to you about your diet?" Response analyzed for persons aged ≥18 years.	The recommended counseling interval is uncertain and differs from the survey question timeframe (12 months). Further, this analysis identifies the counseling rate for all adults and not just those with specific risk factors. Additionally, the survey does not clarify whether the conversation with the health professional met the standard of "intensive behavioral counseling" called for in the recommendation. The results of this analysis identify service use and cannot determine adherence to guideline.
Hepatitis A vaccination (19–49)	Hepatitis A vaccination recommendations are universal for children aged 1 year. The recommendations for adults are limited to high-risk persons and "anyone seeking immunization."**	"How many hepatitis A shots did you receive?"†† (response of greater than two is coded as fully vaccinated)** Response analyzed for persons aged ≥18 years.	The recommendations for adults include those aged ≥19 years. This analysis focuses on those aged 19–49 years for consistency with other CDC reports of hepatitis A vaccination rates among adults.§§ Further, this analysis identifies the vaccination rate for all adults and not just those with specific risk factors. The results of this analysis identify service use and cannot determine adherence to guideline.
Hepatitis B vaccination (19–49)	Hepatitis B vaccination recommendations are universal for children. The recommendations for adults include high-risk persons and "anyone seeking immunization."**	"Did you receive at least three doses of the hepatitis B vaccine, or greater than three doses?"*†† (response of three or greater is coded as fully vaccinated)** Response analyzed for persons aged ≥18 years.	The recommendations for adults include those aged ≥19 years. This analysis focuses on those aged 19–49 years for consistency with other CDC reports of hepatitis B vaccination rates among adults.§§ Further, this analysis identifies the vaccination rate for all adults and not just those with specific risk factors. The results of this analysis identify service use and cannot determine adherence to guideline.

Abbreviation: Pap test = Papanicolaou test.
* Source: USPSTF.
† While the USPSTF currently recommends biennial mammography for women aged 50–74 years, the ACA coverage requirement includes women aged 40–74.
§ The current USPSTF recommendations for cervical cancer screening were released in March 2012, after much of the data for this study were collected. Prior to the 2012 update, the USPSTF recommended only triennial screening via Pap test.
¶ Four groups of persons are recommended for cholesterol screening at grade A and B: 1) men aged ≥35 years; 2) men aged 20–35 years at increased risk for coronary heart disease; 3) women aged ≥45 years at increased risk for coronary heart disease; and 4) women aged 20–45 years at increased risk for coronary heart disease. This report only includes data for men aged ≥35 years because it was not possible to estimate increased risk for coronary heart disease in the study population.
** Source: ACIP.
†† Includes services received at any age.
§§ Williams WW, Lu PJ, O'Halloran A, et al. Noninfluenza vaccination coverage among adults—United States, 2012. MMWR Morb Mortal Wkly Rep 2014;63:95–102.

TABLE 2: Percentage of adults in the recommended populations who received nine clinical preventive services, by health insurance status — National Health Interview Survey, United States, 2011–2012

Clinical preventive service (age group [yrs])	Insured			Uninsured			Prevalence ratio, insured/uninsured*		Total	
	No.	Weighted %	(95% CI)	No.	Weighted %	(95% CI)	Ratio†	(95% CI)	Weighted %	(95% CI)
Blood pressure screening§ (≥18)	54,265	87.9	(87.6–88.3)	11,873	56.3	(55.2–57.5)	1.56	(1.53–1.59)	**82.9**	**(82.5–83.3)**
Breast cancer screening§ (women, 50–74)	11,827	65.4	(64.3–66.4)	1,478	26.4	(23.8–28.9)	2.48	(2.25–2.73)	**61.6**	**(60.5–62.6)**
Cervical cancer screening§ (21–65)	21,932	64.2	(63.4–65.0)	5,649	38.1	(36.6–39.6)	1.68	(1.62–1.75)	**59.4**	**(58.7–60.2)**
Cholesterol screening§ (men, ≥35)	17,704	76.5	(75.7–77.2)	3,330	31.3	(29.5–33.2)	2.44	(2.30–2.59)	**70.0**	**(69.2–70.8)**
Colon cancer screening§ (50–75)	21,958	25.4	(24.7–26.0)	2,844	8.1	(7.0–9.3)	3.13	(2.71–3.61)	**23.6**	**(23.0–24.2)**
Diabetes screening§ (≥18)	53,725	49.9	(49.2–50.6)	11,813	21.4	(20.6–22.2)	2.33	(2.25–2.43)	**45.3**	**(44.7–45.9)**
Diet counseling§ (≥18)	54,210	29.2	(28.7–29.7)	11,875	14.9	(14.2–15.6)	1.97	(1.87–2.06)	**26.9**	**(26.5–27.3)**
Hepatitis A vaccination, full¶ (19–49)	21,883	13.8	(13.1–14.5)	7,746	9.2	(8.3–10.1)	1.49	(1.35–1.65)	**12.7**	**(12.1–13.3)**
Hepatitis B vaccination, full¶ (19–49)	24,046	41.5	(40.6–42.4)	8,367	29.8	(28.5–31.2)	1.39	(1.32–1.46)	**38.8**	**(38.0–39.5)**

Abbreviation: CI = confidence interval.
* Generalized linear modeling was used to identify statistical significance of differences between insured and uninsured persons receiving service.
† $p<0.001$.
§ Service received within preceding 12 months.
¶ Ever received service.

prevalence compared with those with incomes below that threshold for eight of nine services (all but hepatitis A vaccination) (Table 3). Among those eight services, the service receipt prevalence ratio for those with family incomes >200% of the FPL compared with those with incomes ≤200% of the FPL ranged from 1.06 for hepatitis B vaccination to 1.43 for breast cancer screening (Table 3).

Persons with private health insurance received preventive services at a statistically significant higher prevalence for two of nine services, and at a lower prevalence for four of nine services, compared with those with only public insurance (Table 4).

Discussion

During 2011–2012, those with insurance or with higher incomes were more likely than those without coverage or with lower incomes, respectively, to have received nine preventive services during the identified time period. This supports previously published studies, including one that found prevalence ratios in the range of 1–3 for those with insurance receiving preventive services in the prior year compared with those without coverage (*2*,*4*).

This report could serve as a baseline for tracking the effects of some of the ACA's preventive care provisions that might occur after 2012. Since the ACA began to require certain plans to cover clinical preventive services as early as September 2010, the data from the 2011–2012 study period might include some of the early impact of the law. Any early impact included might be limited for several reasons: 1) a high number of persons remained uninsured during 2011–2012; 2) there was little awareness of the preventive care provisions of the new law; and 3) many plans were not yet subject to the preventive services provisions because of grandfathering and other factors (*1*,*5*–*7*). Monitoring the trend of service receipt rates over time could provide insight into how the service receipt gaps relating to income and insurance status might change as more persons gain coverage that includes the ACA's preventive service coverage requirements.

The findings in this report are subject to at least six limitations. First, receipt of preventive services was self-reported and might be subject to recall bias, particularly for lifetime receipt of services like vaccinations that are routinely administered to young children rather than adults. Second, inferences from these results are limited by differences in time between when the questions were asked and when the services were received. For example, NHIS identifies whether the respondent is insured at the time of interview; however, depending on the service, NHIS asks whether the respondent received preventive care in the last 12 months, or ever during their lifetime. Currently uninsured respondents might have received preventive care during a time when they had insurance, or vice versa. Third, some of the services might have been received as diagnostic measures instead of for prevention. Fourth, the results of this analysis identify the rates of service receipt during the 12 months before interview, or ever in life, but cannot be seen as measures of adherence to guidelines because of differences between the annual survey questions and the official recommendation for these nine services. Fifth, this cross-sectional analysis does not demonstrate causation and does not include other possible confounders that might be associated with service receipt rates. For example, those with higher incomes might also be more likely to have health insurance, and vice versa. Finally, NHIS is limited to noninstitutionalized civilians,

TABLE 3: Percentage of adults in the recommended populations who received nine clinical preventive services, by family income level — National Health Interview Survey, United States, 2011–2012

	Income >200% FPL			Income ≤200% FPL			Prevalence ratio, higher income/lower income*	
Clinical preventive service (age [yrs])	No.	Weighted %	(95% CI)	No.	Weighted %	(95% CI)	Ratio	(95% CI)
Blood pressure screening† (≥18)	40,120	86.2	(85.8–86.6)	26,221	76.9	(76.2–77.7)	1.12§	(1.11–1.13)
Breast cancer screening† (women, 50–74)	8,749	67.8	(66.6–69.0)	4,588	47.3	(45.5–49.1)	1.43§	(1.37–1.49)
Cervical cancer screening† (21–65)	16,316	64.4	(63.5–65.3)	11,339	50.9	(49.7–52.0)	1.27§	(1.23–1.30)
Cholesterol screening† (men, ≥35)	14,489	73.6	(72.7–74.5)	6,592	60.6	(59.2–62.0)	1.22§	(1.18–1.25)
Colon cancer screening† (50–75)	16,779	25.1	(24.4–25.8)	8,079	19.8	(18.8–20.9)	1.26§	(1.19–1.34)
Diabetes screening† (≥18)	39,764	48.7	(48.0–49.4)	25,975	39.2	(38.2–40.1)	1.24§	(1.21–1.28)
Diet counseling† (≥18)	40,081	28.2	(27.7–28.7)	26,205	24.7	(24.0–25.3)	1.14§	(1.11–1.18)
Hepatitis A vaccination, full¶ (19–49)	17,023	13.0	(12.3–13.6)	12,703	12.3	(11.3–13.2)	1.06**	(0.97–1.15)
Hepatitis B vaccination, full¶ (19–49)	18,525	39.7	(38.8–40.5)	14,006	37.4	(36.1–38.8)	1.06††	(1.02–1.10)

Abbreviations: CI = confidence interval; FPL = federal poverty level.

* Generalized linear modeling was used to identify statistical significance of differences between persons at higher income level and lower income level receiving service.

† Service received within preceding 12 months.

§ p<0.001.

¶ Ever received service.

** p>0.05.

†† p<0.01.

TABLE 4. Percentage of adults in the recommended populations who received nine clinical preventive services, by source of health insurance coverage — National Health Interview Survey, United States, 2011–2012

Clinical preventive service (age group [yrs])	Private insurance receiving service			Only public insurance receiving service			Prevalence ratio, private/public*	
	No.	Weighted %	(95% CI)	No.	Weighted %	(95% CI)	Ratio	(95% CI)
Blood pressure screening† (≥18)	38,462	87.2	(86.8–87.6)	15,794	90.0	(89.5–90.6)	0.97§	(0.96–0.98)
Breast cancer screening† (women, 50–74)	8,044	68.6	(67.3–69.9)	3,781	57.6	(55.8–59.4)	1.19§	(1.15–1.23)
Cervical cancer screening† (21–65)	16,511	65.8	(64.9–66.6)	5,421	58.3	(56.6–60.1)	1.13§	(1.09–1.16)
Cholesterol screening† (men, ≥35)	12,445	74.6	(73.7–75.6)	5,255	81.4	(80.0–82.7)	0.92§	(0.90–0.94)
Colon cancer screening† (50–75)	14,734	25.0	(24.2–25.8)	7,221	26.3	(25.1–27.5)	0.95¶	(0.90–1.00)
Diabetes screening† (≥18)	38,114	47.6	(46.8–48.4)	15,602	56.3	(55.3–57.3)	0.85§	(0.83–0.87)
Diet counseling† (≥18)	38,426	28.0	(27.5–28.5)	15,774	32.6	(31.6–33.6)	0.86§	(0.83–0.89)
Hepatitis A vaccination, full** (19–49)	17,288	13.8	(13.0–14.5)	4,595	13.9	(12.6–15.1)	0.99¶	(0.90–1.09)
Hepatitis B vaccination, full** (19–49)	18,976	41.8	(40.8–42.8)	5,070	40.3	(38.7–41.8)	1.04¶	(0.99–1.08)

Abbreviation: CI = confidence interval.
* Generalized linear modeling was used to identify statistical significance of differences between persons with private insurance and only public insurance receiving service.
† Service received within preceding 12 months.
§ p<0.001.
¶ p>0.05.
** Ever received service.

Summary

What is already known on this topic?

Rates of receipt of some clinical preventive services by adults are higher for persons with insurance coverage or higher incomes. The Affordable Care Act's expansions of health insurance access and coverage requirements for clinical preventive services were developed to increase access to health services to improve the health of the population.

What is added by this report?

Analysis of combined adult responses to the National Health Interview Survey in 2011 and 2012 indicated that persons with health insurance were more likely to have received preventive services than persons without insurance for each of nine services. Further, persons with higher income were more likely to have received preventive services than persons with lower income for eight of nine services.

What are the implications for public health practice?

Increased insurance coverage could lead to a significant increase in receipt of preventive care and improvements in population health.

excluding certain populations (e.g., the institutionalized and the military) that might be especially likely to receive recommended preventive services.

All new private health plans, alternative benefit plans for the newly Medicaid eligible, and Medicare now provide coverage with no copayments or deductibles for many recommended clinical preventive services as part of the ACA (*1*). These provisions might have the greatest impact for higher-cost services like certain colorectal cancer screening methods. Of the nine services examined, colon cancer screening had the highest service receipt prevalence ratio, 3.13, for those with insurance compared with those without insurance. While insurance coverage is not the only barrier to receiving services, efforts to increase enrollment and coverage retention could help increase receipt of preventive services and reduce avoidable complications from illness, long-term health care costs, and premature deaths (*8*).

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Investigation of Childhood Lead Poisoning from Parental Take-Home Exposure from an Electronic Scrap Recycling Facility — Ohio, 2012

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Lead affects the developing nervous system of children, and no safe blood lead level (BLL) in children has been identified (*1*). Elevated BLLs in childhood are associated with hyperactivity, attention problems, conduct problems, and impairment in cognition (*2*). Young children are at higher risk for environmental lead exposure from putting their hands or contaminated objects in their mouth. Although deteriorating lead paint in pre-1979 housing is the most common source of lead exposure in children, data indicate that ≥30% of children with elevated BLLs were exposed through a source other than paint (*3*). Take-home contamination occurs when lead dust is transferred from the workplace on employees' skin, clothing, shoes, and other personal items to their car and home (*4*). Recycling of used electronics (e-scrap) is a relatively recent source of exposure to developmental neurotoxicants, including lead (*5*). In 2010, the Cincinnati Health Department and Cincinnati Children's Hospital Pediatric Environmental Health Specialty Unit (PEHSU) investigated two cases of childhood lead poisoning in a single family. In 2012, CDC's National Institute for Occupational Safety and Health (NIOSH) learned about the lead poisonings during an evaluation of the e-scrap recycling facility where the father of the two children with lead poisoning worked. This report summarizes the case investigation. Pediatricians should ask about parents' occupations and hobbies that might involve lead when evaluating elevated BLLs in children, in routine lead screening questionnaires, and in evaluating children with signs or symptoms of lead exposure.

In June 2010, a male child aged 1 year and a female child aged 2 years were identified by routine screening to have elevated BLLs of 18 μg/dL and 14 μg/dL, respectively. The children's primary care physician referred them to the Cincinnati Children's Hospital PEHSU, and the Cincinnati Health Department's Childhood Lead Poisoning Prevention Program completed a lead risk assessment at the family's home. The father worked at an e-scrap recycler company (facility A), crushing cathode ray tubes. He did not wear personal protective equipment at work, and he reported playing with his children when he came home. The family reported there was frequently visible dust in his hair, and the children often touched his hair. The father's BLL was 25 μg/dL. The lead risk assessment revealed detectable lead dust on the floor of the home, but no lead-containing paint was detected in the home. The children attended daycare in a building that was built in 1992. The father was advised to notify the Occupational Safety and Health Administration of his BLL; it is not known if he did. The father left his job soon after the elevated BLLs were recognized, and the children's BLLs decreased to 8.7 μg/dL and 7.9 μg/dL, respectively, over the next 3 months.

In 2012, in an activity unrelated to the lead poisoning incident described in this report, NIOSH conducted a health hazard evaluation at facility A, as part of an initiative to learn more about exposures in e-scrap recycling. NIOSH was unaware of the childhood lead poisonings, as was the employer. The PEHSU investigator became aware of the NIOSH evaluation through a notification to a local affiliated occupational medicine training program and contacted the NIOSH investigators to notify them.

NIOSH investigators performed air and surface sampling for lead throughout facility A, which employed approximately 80 persons. Three wipe samples taken from work surfaces in the cathode ray tubes area indicated high levels of lead. Cathode ray tubes are made from leaded glass, with lead concentrations in the funnel glass up to 25% and in the frit (where the panel glass joins the funnel glass) up to 85%. Lower surface lead concentrations were found outside the production area, including in the conference room supply air duct, multiple places in the break room (e.g., floor, tables, and refrigerator handle), and the water fountain near the restrooms. Wipe samples were taken from the hands of 12 employees from the cathode ray tubes processing area and other areas before they left work, using wipes from the SKC Full Disclosure colorimetric test kit. This test kit identifies lead on surface wipe samples through a color change process and has a visual identification limit of 18 μg of lead. The hands of eight of 12 employees tested positive for lead, even though they had washed their hands with soap and water before testing. NIOSH also took a wipe sample from uniforms of employees' front shoulder area. Twelve of 13 uniforms tested positive for lead.

NIOSH investigators noted that the local exhaust ventilation system at the cathode ray tubes crushing operation recirculated potentially contaminated air back into the production area. There were no showers in facility A, and employees used brooms to sweep the work area, creating airborne dust. Because the changing area for employees who broke cathode ray tubes was not adjacent to the cathode ray tubes work area, employees could track lead-containing dust through the facility.

Personal items, food, and work clothing and equipment were stored together in the changing area. All findings from the NIOSH health hazard evaluation were communicated to the employer and employees, along with recommendations to reduce exposure.

Discussion

The U.S. Congress passed the Workers' Family Protection Act in 1992 (*6*). The Act requires NIOSH to study take-home exposure of hazardous chemicals and substances, including lead. NIOSH found evidence that take-home exposure is a widespread problem (*6*). Workplace measures found to be effective in preventing take-home exposures included 1) reducing exposure in the workplace using the hierarchy of controls*; 2) changing clothes and shoes before going home and leaving soiled clothing at work for laundering; 3) storing street clothes in separate areas of the workplace to prevent contamination; 4) showering before leaving work; and 5) prohibiting removal of toxic substances or contaminated items from the workplace. NIOSH noted that preventing take-home exposure is key because decontaminating homes and vehicles is not always effective in the long term. Normal house cleaning and laundry methods are inadequate, and decontamination can potentially lead to hazardous exposures among those workers performing the cleaning activities.

CDC considers a BLL of 5 μg/dL as the upper level of the reference range in children at which public health actions should be initiated (*7*). The National Toxicology Program found sufficient evidence that BLLs <5 μg/dL in children are associated with attention-related behavioral problems and decreased cognitive performance (indicated by lower academic achievement, lower intelligence quotient, and decreases in certain cognitive measures) (*8*). There is limited evidence that BLLs <5 μg/dL are associated with delayed puberty and reduced kidney function in children aged ≥12 years (*8*). There is sufficient evidence that BLLs <10 μg/dL are associated with delayed puberty and decreased postnatal growth, and limited evidence that BLLs <10 μg/dL are associated with increased serum immunoglobulin E and allergy diagnosed by skin prick testing (*8*). The NIOSH Adult Blood Lead Epidemiology and Surveillance System uses a surveillance case definition for an elevated BLL in adults as ≥10 μg/dL. The National Toxicology Program found sufficient evidence that BLLs <5 μg/dL in adults is associated with decreased glomerular filtration rate and reduced fetal growth in pregnant women (*8*). There is sufficient evidence that BLLs <10 μg/dL in adults are associated with increased incidence of essential tremor, increased blood pressure, increased risk for hypertension, and increased risk for spontaneous abortion and preterm birth (*8*). There is limited evidence that BLLs <10 μg/dL in adults are associated with psychiatric effects, decreased hearing, decreased cognitive function, increased incidence of amyotrophic lateral sclerosis, increased cardiovascular mortality, and electrocardiography abnormalities (*8*). However, current occupational exposure levels are not protective of workers.†

The investigation of lead poisoning includes examining common sources of lead exposure, such as deteriorating lead paint, as well as other sources when investigation of the home does not suggest a source. With the increasing use of electronic devices and subsequent disposal and recycling of those devices, exposure to substances such as lead contained within the devices is an emerging occupational health concern in the e-scrap industry. The patchwork of state regulations overseeing e-scrap recycling in the United States addresses possible damage to the environment, but health-based regulations are lacking. Approximately 130 million metric tons of e-scrap were recycled in the United States in 2010 (*9*), and this scrap stream contains many types of toxicants (cadmium, polybrominated diphenyl ethers, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons) that are not routinely screened for in adult workers or children. The cases described in this report

* The first step in the hierarchy is eliminating or substituting hazardous processes or materials, which reduces hazards and protects employees more effectively than other approaches. Prevention through design (e.g., considering elimination or substitution when designing or developing a project) reduces the need for additional controls in the future. The second step is engineering controls, which reduce employees' exposures by removing the hazard from the process or by placing a barrier between the hazard and the employee. Engineering controls protect employees effectively without placing primary responsibility of implementation on the employee. The third step is administrative controls, which refers to employer-dictated work practices and policies to reduce or prevent hazardous exposures. Their effectiveness depends on employer commitment and employee acceptance. Regular monitoring and reinforcement are necessary to ensure that policies and procedures are followed consistently. The last option is personal protective equipment (PPE) because it is the least effective means for controlling hazardous exposures. Proper use of PPE requires a comprehensive program and a high level of employee involvement and commitment. The right PPE must be chosen for each hazard. Supporting programs such as training, change-out schedules, and medical assessment might be needed. PPE should not be the sole method for controlling hazardous exposures; rather, PPE should be used until effective engineering and administrative controls are in place.

† In the United States, employers in general industry are required by law to follow the Occupational Safety and Health Administration lead standard (29 CFR1910.1025). This standard was established in 1978 and has not yet been updated to reflect the current scientific knowledge regarding the health effects of lead exposure. Under this standard, the permissible exposure limit (PEL) for airborne exposure to lead is 50 micrograms per cubic meter of air (μg/m^3) for an 8-hour time-weighted average (TWA). The standard requires lowering the PEL for shifts that exceed 8 hours, medical monitoring for employees exposed to airborne lead at or above the action level of 30 μg/m^3 (8-hour TWA), medical removal of employees whose average BLL is ≥50 μg/dL, and economic protection for medically removed workers. Medically removed workers cannot return to jobs involving lead exposure until their BLL is <40 μg/dL. The PEL might prevent overt symptoms of lead poisoning but does not protect workers from lead's contributions to conditions such as hypertension, renal dysfunction, reproductive effects, and cognitive effects.

Summary

What is already known on this topic?

Lead is a neurodevelopmental toxicant, and no safe blood lead level (BLL) in children has been identified. Parental occupational take-home exposures are a source of lead exposure in children.

What is added by this report?

This report describes a novel source of take-home exposure from a parent who worked in a facility that recycled used electronics (e-scrap).

What are the implications for public health practice?

When evaluating children with elevated BLLs, public health professionals and clinicians should inquire about parental occupations because of the implications of take-home exposure. E-scrap recycling is an emerging area of concern as a source of occupational exposures among workers and a source of take-home exposures.

were uncovered through routine lead screening, but other undetected chemicals might also be coming home from e-scrap worksites. Pediatric health care providers should query parents about their occupations and to assess the risk for exposure to various substances found in occupational settings.

Acknowledgments

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Pertussis and Influenza Vaccination Among Insured Pregnant Women — Wisconsin, 2013–2014

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On February 22, 2013, the Advisory Committee on Immunization Practices (ACIP) revised recommendations for vaccination of pregnant women to recommend tetanus-diphtheria-acellular pertussis vaccine (Tdap) during every pregnancy, optimally at 27–36 weeks of gestation, to prevent pertussis among their newborns (*1*). Since 2004, influenza vaccination has been recommended for pregnant women in any trimester to prevent influenza and associated complications for mother and newborn (*2*). To evaluate vaccination of pregnant women in Wisconsin after the 2013 Tdap recommendation, health insurance claims data for approximately 49% of Wisconsin births were analyzed. The percentage of women who received Tdap during pregnancy increased from 13.8% of women delivering during January 2013 (63.1% of whom received Tdap 2–13 weeks before delivery) to 51.0% of women delivering during March 2014 (90.9% of whom received Tdap 2–13 weeks before delivery). Among women delivering during November 2013–March 2014, 49.4% had received influenza vaccine during pregnancy. After the 2013 recommendation, Tdap vaccination among pregnant women increased but plateaued at rates similar to influenza vaccination rates. Prenatal care providers should implement, evaluate, and improve Tdap and influenza vaccination programs, and strongly recommend that pregnant patients receive these vaccines to prevent severe illness and complications among mothers and infants.

Infants too young for vaccination have the greatest risk for severe pertussis morbidity and mortality. Tdap vaccination of pregnant women stimulates production of maternal anti-pertussis antibodies which are transplacentally transported to the fetus, providing passive protection to newborn infants. Results of studies conducted in the United Kingdom indicate that Tdap vaccination during the third trimester is approximately 90% effective in preventing pertussis among infants aged <2 months (*3*,*4*). ACIP first recommended Tdap during pregnancy in 2011; women who had previously not received Tdap were recommended to receive it, preferably after 20 weeks of gestation (*5*). After the 2011 recommendation, Tdap vaccination rates among pregnant women were low (*6*,*7*), and results of antibody persistence studies suggested that Tdap vaccination before pregnancy or during early pregnancy might not provide sufficient levels of maternal antibodies to the fetus (*8*). Therefore, ACIP revised its recommendation to recommend Tdap during every pregnancy. Additionally, because ≥2 weeks are needed after Tdap vaccination for the mother to mount a maximal immune response and antibody transport across the placenta is greatest after 30 weeks of gestation, ACIP recommended Tdap administration to pregnant women at 27–36 weeks of gestation (*1*).

The Wisconsin Health Information Organization Datamart is a deidentified all-payer claims database that contains a rolling 24 months of medical and pharmacy claims data from Wisconsin Medicaid and most private insurance plans in Wisconsin.* Claims data were extracted from Datamart version 12, which included services during April 2012–March 2014. Pregnant women and their delivery dates were identified using *International Classification of Diseases, Ninth Revision* and *Current Procedural Terminology* (CPT) codes that indicate delivery.† Women aged 11–44 years with deliveries during the January 2013–March 2014 study period were included; each woman was included once. Vaccinations received by these women during April 2012–March 2014 were identified using CPT codes (Tdap, 90715; influenza, 90654–90662, 90672, 90673, 90685–90688, and 90724). Vaccination during the 40 weeks before the delivery date was considered vaccination during pregnancy. Because gestational age data were not available, vaccination 2–13 weeks before delivery was used to evaluate Tdap receipt during the recommended time. Percentages of women who received Tdap, influenza, or both vaccines during pregnancy were calculated by month and year of delivery. During delivery months November 2013–March 2014, an interval during influenza season when vaccination rates were stable, vaccination rates were compared by maternal age, county of residence, delivery provider specialty, and insurance type.

The study population included 40,054 women with deliveries during the study period and represented approximately 49% of deliveries in Wisconsin. Median maternal age was 28 years. Residents of the two most populous counties (Milwaukee and Dane) accounted for 33.9% of the women (Table). Most

* Additional information available at http://wisconsinhealthinfo.org/about.
† Additional information available at http://www.ncqa.org/portals/0/Prenatal%20Postpartum%20Care.pdf.

TABLE Percentage of the study population who received Tdap, influenza, or both vaccines during pregnancy, by maternal and health care provider characteristics and delivery period — Wisconsin, January 2013–March 2014

	Delivery period											
	January 2013–March 2014				November 2013–March 2014							
	Total		Tdap		Total		Tdap		Influenza		Both	
Characteristic	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Total study population	**40,054**	**(100.0)**	**14,033**	**(35.0)**	**12,089**	**(100.0)**	**5,992**	**(49.6)**	**5,970**	**(49.4)**	**4,194**	**(34.7)**
Maternal age at delivery (yrs)												
11–19	**2,604**	**(6.5)**	737	(28.3)	**849**	**(7.0)**	352	(41.5)	392	(46.2)	247	(29.1)
20–24	**9,818**	**(24.5)**	3,070	(31.3)	**2,979**	**(24.6)**	1,308	(43.9)	1,394	(46.8)	942	(31.6)
25–29	**12,482**	**(31.2)**	4,454	(35.7)	**3,801**	**(31.4)**	1,969	(51.8)	1,865	(49.1)	1,328	(34.9)
30–34	**10,276**	**(25.7)**	3,951	(38.4)	**3,029**	**(25.1)**	1,650	(54.5)	1,594	(52.6)	1,174	(38.8)
35–39	**4,069**	**(10.2)**	1,538	(37.8)	**1,203**	**(10.0)**	600	(49.9)	616	(51.2)	431	(35.8)
40–44	**805**	**(2.0)**	283	(35.2)	**228**	**(1.9)**	113	(49.6)	109	(47.8)	72	(31.6)
Maternal county of residence*												
Dane County	**5,075**	**(12.7)**	2,719	(53.6)	**1,614**	**(13.4)**	1,106	(68.5)	1,036	(64.2)	843	(52.2)
Milwaukee County	**8,477**	**(21.2)**	2,382	(28.1)	**2,423**	**(20.0)**	902	(37.2)	1,017	(42.0)	645	(26.6)
All other Wisconsin counties	**26,502**	**(66.2)**	8,932	(33.7)	**8,052**	**(66.6)**	3,984	(49.5)	3,917	(48.6)	2,706	(33.6)
Specialty of delivery provider†												
Family medicine/General practitioner	**5,417**	**(13.5)**	2,202	(40.6)	**1,604**	**(13.3)**	898	(56.0)	928	(57.9)	686	(42.8)
Nurse practitioner/Midwife	**3,150**	**(7.9)**	1,087	(34.5)	**922**	**(7.6)**	403	(43.7)	418	(45.3)	274	(29.7)
Obstetrician/Gynecologist	**30,299**	**(75.6)**	10,396	(34.3)	**9,182**	**(76.0)**	4,522	(49.2)	4,450	(48.5)	3,128	(34.1)
Type of insurance§												
Private	**13,617**	**(34.0)**	5,960	(43.8)	**4,194**	**(34.7)**	2,588	(61.7)	2,324	(55.4)	1,779	(42.4)
Medicaid	**26,337**	**(65.8)**	8,029	(30.5)	**7,880**	**(65.2)**	3,394	(43.1)	3,637	(46.2)	2,406	(30.5)

Abbreviation: Tdap = tetanus-diphtheria-acellular pertussis.

* U.S. Census Bureau estimate of percentage of population under federal poverty level during 2009–2013: Dane County, 12.9%; Milwaukee County, 21.6%; and Wisconsin, 13.0%.

† Data not shown for 1,188 deliveries with unknown provider specialty.

§ Data not shown for deliveries paid for by Medicare (four), the Federal Employee Program (47), or unknown type of insurance (49).

(75.6%) delivery providers were obstetrician/gynecologists; 65.8% of women were insured by Medicaid.

Among the 40,054 women, 14,033 (35.0%) received Tdap during pregnancy. The percentage of women who received Tdap during pregnancy increased from 13.8% among women delivering during January 2013 to 51.0% among women delivering during March 2014 (Figure 1). Among women who received Tdap during pregnancy, the percentage who received Tdap 2–13 weeks before delivery increased from 63.1% among women delivering during January 2013 to 90.9% among women delivering during March 2014 (Figure 2).

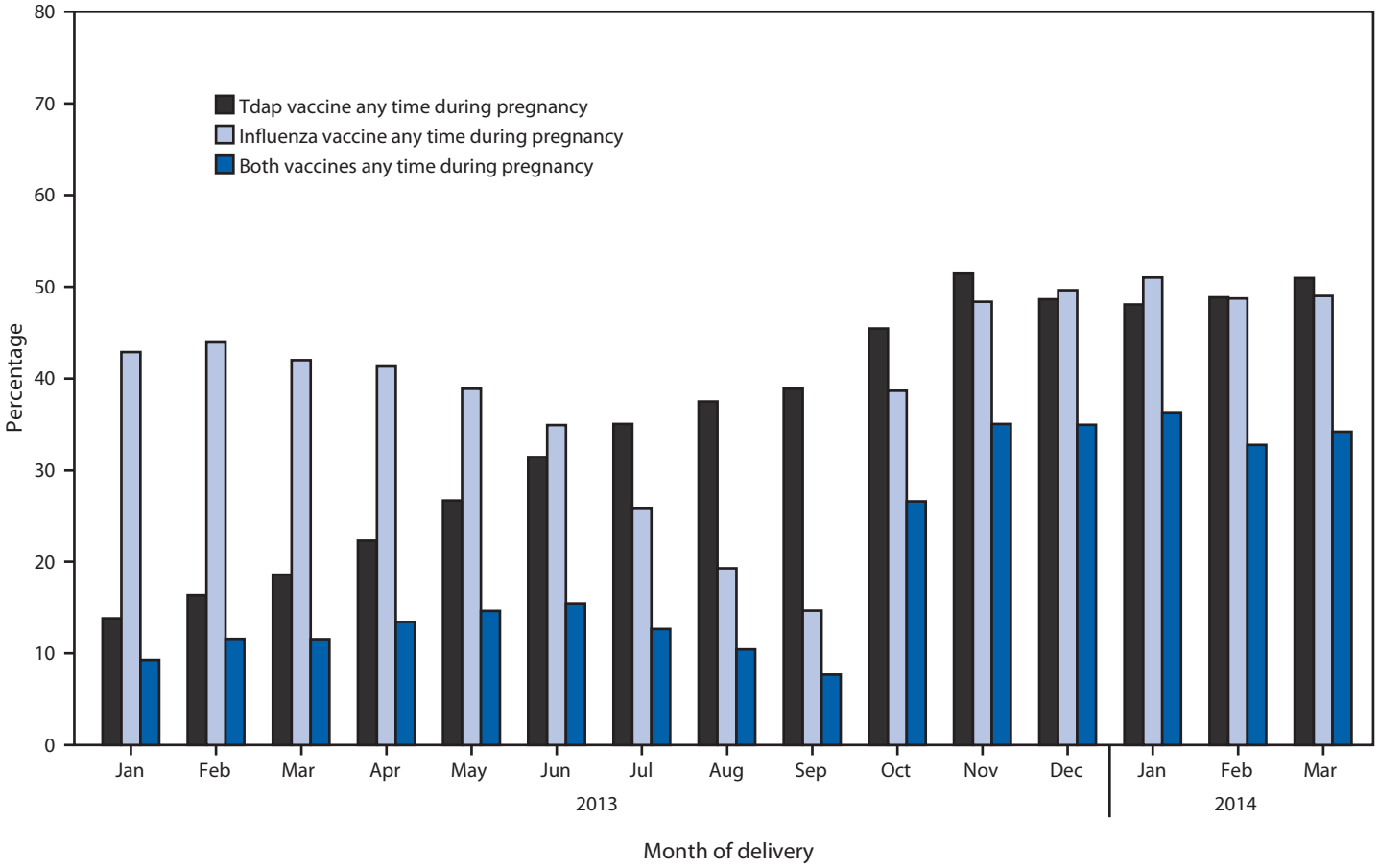
Influenza vaccine was received during pregnancy by 15,501 (38.7%) women. The percentage of women who received influenza vaccine during pregnancy was lowest among women who delivered during July–September 2013 and higher among women who delivered during the 2012–13 and 2013–14 influenza seasons (Figure 1). Among women delivering during November 2013–March 2014, 49.4% received influenza vaccine during pregnancy. Receipt of both Tdap and influenza vaccines during pregnancy increased from 9.3% of women delivering during January 2013 to 34.7% of women delivering during November 2013–March 2014 (Figure 1).

Among 12,089 (30.2%) women delivering during November 2013–March 2014, vaccination rates were highest among women aged 30–34 years and lowest among women aged 11–19 years (Table). Dane County residents had higher vaccination rates than Milwaukee County and other Wisconsin residents. Women delivering to family medicine or general practitioner providers had higher vaccination rates than women delivering to obstetrician/gynecologists or nurse practitioners/midwives. Vaccination rates were higher among women with private insurance than women with Medicaid.

Discussion

After the February 2013 ACIP recommendation, Tdap vaccination of pregnant women in Wisconsin increased steadily but plateaued near 50% during November 2013–March 2014. During this 5-month period coinciding with the 2013–14 influenza season, a similar percentage of pregnant women were reported to have received influenza vaccine during pregnancy. However, only 34.7% received both vaccines during pregnancy. These findings indicate that despite the rapid implementation of Tdap vaccination among pregnant women in Wisconsin, many pregnant women did not receive both recommended

FIGURE 1. Percentage of the study population who received Tdap, influenza, or both vaccines during pregnancy, by month of delivery — Wisconsin, January 2013–March 2014



Abbreviation: Tdap = tetanus-diphtheria-acellular pertussis.

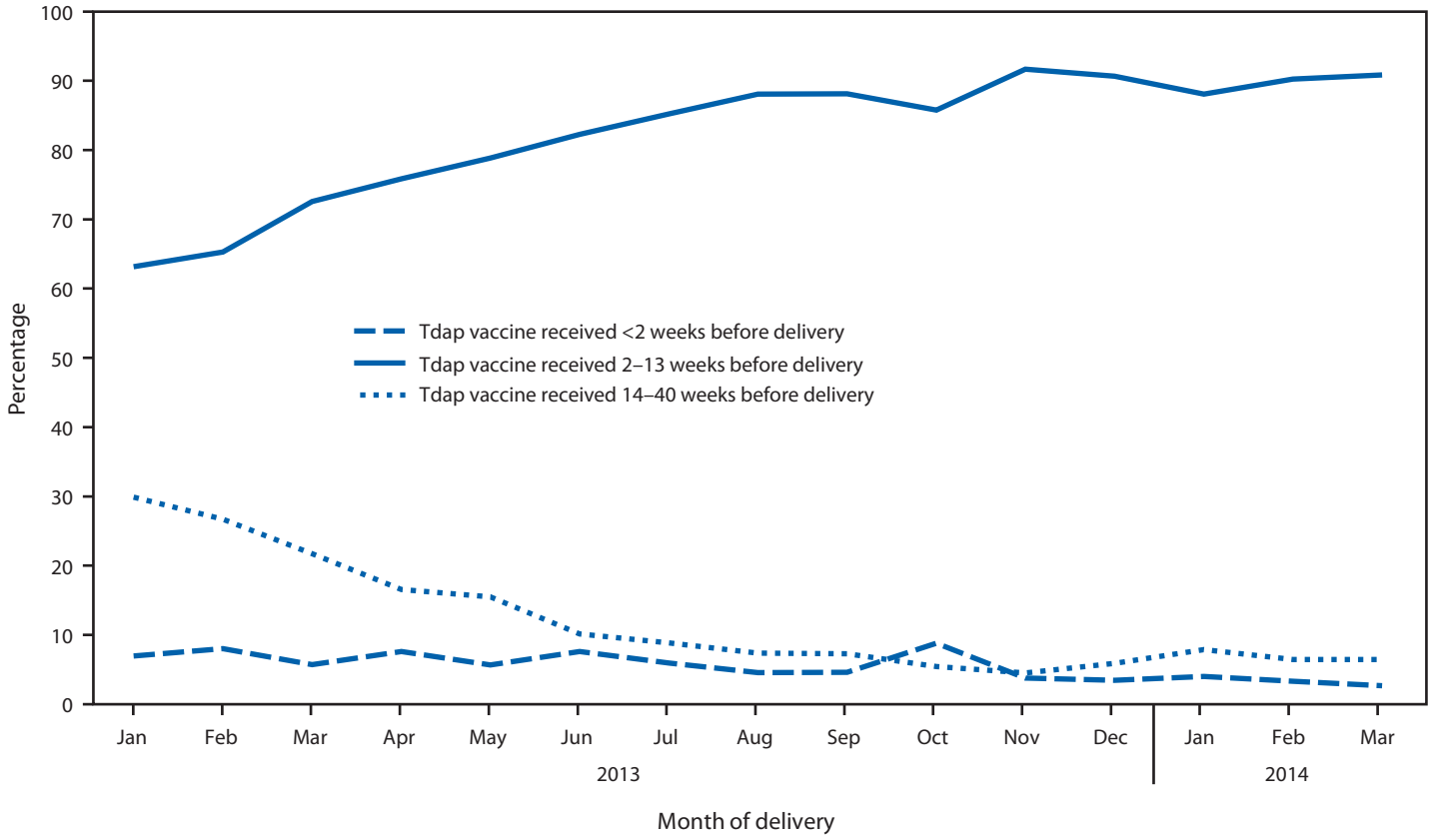
vaccines, including women who demonstrated a willingness to receive at least one other vaccine during pregnancy.

To optimize the concentration of antipertussis antibodies transported across the placenta from mother to infant, ACIP recommends Tdap administration at 27–36 weeks of gestation, during the third trimester and ≥2 weeks before delivery. After the 2013 recommendation, the percentage of women vaccinated 2–13 weeks before delivery increased to 90.9% among Tdap-vaccinated pregnant women who delivered during March 2014. This finding indicates that among women vaccinated with Tdap during pregnancy, Tdap was typically received during the time expected to confer the greatest level of protection to the infant.

This study evaluated implementation of ACIP's 2013 Tdap recommendation among publicly and privately insured pregnant women across multiple health care providers. Tdap vaccination rates among women who delivered during January 2013 were similar to rates reported in other U.S. states before the February 2013 recommendation (*6*,*7*). After the 2013 recommendation, one Massachusetts hospital reported most (81.6%) pregnant patients had received Tdap, but most were vaccinated after 37 weeks of gestation (*9*). Results of a national Internet panel survey demonstrated that among women pregnant anytime during October 2013–January 2014, 34.6% reported receiving influenza vaccine during pregnancy (*10*).

Among characteristics examined in this study, Tdap and influenza vaccination rates during pregnancy were lowest among women who were aged <20 years, resided in Milwaukee County, were insured by Medicaid, and delivered to nurse practitioners or midwives, although nurse practitioners and midwives represented <8% of delivery providers. Previous studies of vaccination rates among pregnant women have identified differences by maternal age, race, poverty level, and prenatal care adequacy (*6*,*7*,*9*,*10*). These differences highlight the importance of public health programs using local data to identify disparities and target interventions to specific populations and health care providers. However, even among women in Wisconsin who delivered to family physicians and general

FIGURE 2. Timing of Tdap vaccine receipt among women in the study population who received Tdap vaccine during pregnancy, by month of delivery — Wisconsin, January 2013–March 2014



Abbreviation: Tdap = tetanus-diphtheria-acellular pertussis.

practitioners, less than half had received both Tdap and influenza vaccine, and among those who delivered to obstetricians and gynecologists, only about one third had received both vaccines during November 2013–March 2014.

The findings in this report are subject to at least two limitations. First, only deliveries and vaccinations properly coded, paid by the insurer, and submitted to the Datamart database were included. Therefore, vaccination rates might be underestimated if vaccinations were received but not paid by the insurer, and the findings in this report are not generalizable to uninsured women, women insured by payers not included in the database, or women outside of Wisconsin. Second, because the database did not include gestational age data, neither the exact week of pregnancy during which Tdap was received nor the effect of preterm birth on vaccination during pregnancy could be evaluated.

Health care provider recommendation and offer of vaccination are among the strongest predictors of whether a woman will be vaccinated during pregnancy (*10*). Health care providers are encouraged to strongly recommend and offer Tdap and influenza vaccination during pregnancy and to use materials developed by CDC[§] to educate patients regarding the importance of vaccination during pregnancy to prevent illness and severe complications among mothers and infants.

[§] Available at http://www.cdc.gov/pertussis/pregnant/index.html and http://www.cdc.gov/pertussis/materials/pregnant.html.

Acknowledgments

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Summary

What is already known on this topic?

Pertussis (whooping cough) incidence is increasing in the United States, including among infants, who are at highest risk for hospitalization and death. To prevent pertussis among newborn infants, pregnant women are recommended to receive tetanus-diphtheria-acellular pertussis vaccine (Tdap) during every pregnancy, a strategy that provides passive protection to the newborn infant. Additionally, pregnant women are recommended to receive influenza vaccine during pregnancy to prevent influenza-associated complications among mothers and infants.

What is added by this report?

After the 2013 Advisory Committee on Immunization Practices guidelines that recommended Tdap vaccination during every pregnancy, Tdap vaccination rates among privately and publicly insured pregnant women in Wisconsin increased quickly but plateaued at rates similar to influenza vaccination rates. Tdap and influenza vaccination rates were lowest among women who were younger, had public insurance, resided in Milwaukee County, and had nurse practitioners or midwives as delivery providers.

What are the implications for public health practice?

Collaboration among public health programs and providers of prenatal care is needed to identify and overcome barriers to improving vaccination rates among pregnant women.

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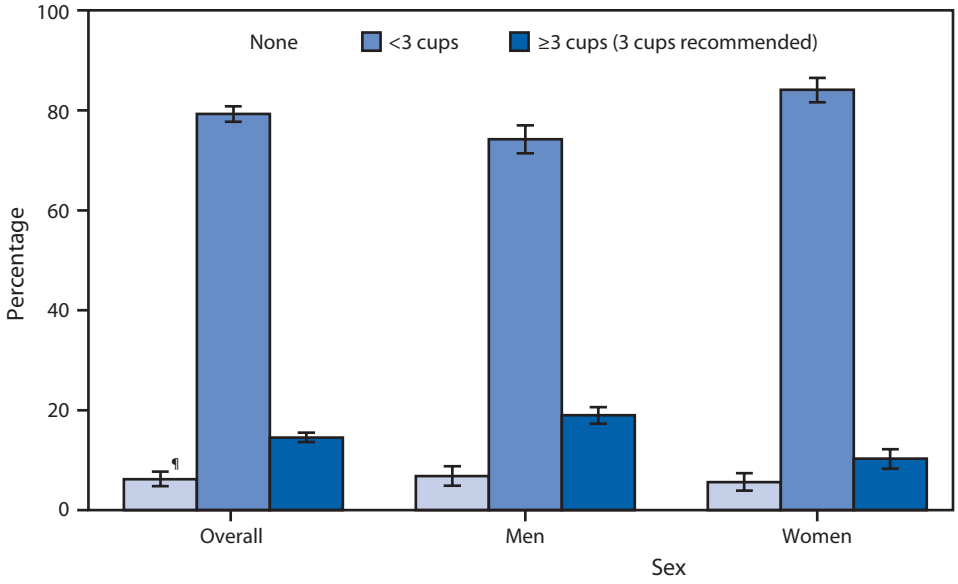
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Adults Aged ≥20 Years Who Consumed Dairy* on a Given Day,† by Amount§ and Sex — National Health and Nutrition Examination Survey, United States, 2011–2012



* Dairy is one of nine "main components" listed in the U.S. Department of Agriculture's Food Patterns Equivalents Database. Dairy consists of milk, yogurt, and cheese. Multi-ingredient foods containing dairy, such as pizza or ice cream, are also assigned to the dairy component, and cup equivalents are calculated for the individual ingredients. Additional information is available at http://www.ars.usda.gov/SP2UserFiles/Place/80400530/pdf/fped/FPED_1112.pdf.

† The National Health and Nutrition Examination Survey asks participants to name all the foods and beverages they consumed in the preceding 24 hours. Data from the Day 1 24-hour recall were used in this analysis.

§ *Dietary Guidelines for Americans*, which is jointly published every 5 years by the U.S. Department of Health and Human Services and the U.S. Department of Agriculture, recommends that adults consume 3 cups of dairy per day.

¶ 95% confidence interval.

During 2011–2012, on a given day, 14.5% of adults aged ≥20 years consumed the U.S. recommended 3 cups of dairy. Most adults (79.3%) consumed some dairy (<3 cups), and 6.2% of adults consumed no dairy. More men (19.0%) than women (10.3%) consumed the recommended 3 cups of dairy.

Source: CDC. National Health and Nutrition Examination Survey Data. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2011–2012. Available at http://www.cdc.gov/nchs/nhanes.htm.

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