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Tobacco Cessation Among Users of Telephone and Web-Based Interventions — Four States, 2011–2012

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Smoking caused an average of 480,000 deaths per year in the United States from 2005 to 2009 (*1*), and three in 10 cancer deaths in the United States are tobacco related (*2*). Tobacco cessation is a high public health priority, and all states offer some form of tobacco cessation service. Quitlines provide telephone-based counseling services and are an effective intervention for tobacco cessation (*3*). In addition to telephone services, 96% of all U.S. quitlines offer Web-based cessation services.* Evidence is limited on the number of tobacco users who use more than one type of service, and studies report mixed results on whether combined telephone and Web-based counseling improves long-term cessation compared with telephone alone (*4,5*). CDC conducted a survey of users of telephone and Web-based cessation services in four states to determine the cessation success of users of these interventions. After adjusting for multiple variables, persons who used both telephone and Web-based services were more likely to report abstinence from smoking for 30 days at follow up (odds ratio = 1.3) compared with telephone-only users and with Web-only users (odds ratio = 1.5). These findings suggest that states might consider offering both types of cessation services to increase cessation success.

All CDC-funded tobacco control programs following North American Quitline Consortium Minimum Dataset requirements† were invited to apply for study participation, and four state-managed tobacco cessation programs (Alabama, Arizona, Florida, and Vermont) were selected by CDC to ensure a diverse mix of geography, tobacco control contexts, and cessation service providers. Participants in these four programs were recruited to participate in the study at the time of service enrollment as part of their first interaction with the service and were offered an incentive of $40 for completed study participation. Participants enrolling in either the state telephone or Web-based service were asked at enrollment during July 2011–February 2012 their age, sex, race/ethnicity, education level, marital status, how old they were when they started smoking, how many cigarettes they smoked per day, whether or not they smoked a cigarette within 5 minutes of waking, and whether or not they lived in a household with another smoker. Information was gathered by a standard questionnaire that could be completed via Web, mail, or telephone. Participants were asked at follow-up 7 months after enrollment whether they had smoked in the past 30 days, and 30-day point prevalence abstinence (PPA) was defined as the proportion answering "no" to this

*Additional information available at http://www.naquitline.org/?page=2012survey.
†Additional information available at http://www.naquitline.org/?page=mdslib.

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question. Participants were also asked whether they had used the other state-provided cessation service (telephone or Web-based); those answering "yes" to this question were categorized as dual-service users.

A total of 16,332 participants were initially eligible for the study, and of those, 7,901 participants completed a follow-up questionnaire, for a response rate of 48%. Participants who completed a follow-up questionnaire >9 months after enrollment, did not give informed consent, or did not report quit attempt status, were excluded from this analysis (n = 2,508). After these exclusions, 5,393 (33%) participants were included in the analytic sample; this included 2,238 telephone, 1,848 Web-based, and 1,307 dual-service users. Bivariable analyses assessed differences in self-reported telephone, Web, and dual-service user groups for demographic and smoking characteristics. Chi-square tests were used to evaluate differences in proportions, and t-tests were used to evaluate differences in means. Multivariable logistic regression was used to identify factors associated with 30-day PPA for dual-service users compared with single-service users. Continuous variables with a nonlinear relationship to 30-day PPA (total interactions with service and cigarettes smoked per day) were modeled using three-knot restricted cubic spline functions (*6*). Statistically significant differences were determined at α=0.05.

Dual-service users were younger than telephone-only users but older than Web-only users (with mean ages of 44 years versus 47 years and 40 years, respectively) (Table 1). Dual-service users also differed in terms of race/ethnicity (p=0.03 to <0.01), with dual-service users more closely resembling telephone-only than Web-only users, and education level (p<0.01), with a higher percentage of dual-users having at least a high school education than telephone-only users but a lower percentage than Web-only users. There were no statistically significant differences between dual-service users compared with telephone-only or Web-only users by sex. For smoking characteristics, dual-service users did not differ significantly from telephone-only or Web-only users for age of smoking initiation or cigarettes smoked per day. They did differ, however, from Web-only users, with a higher percentage of dual-users reporting having their first cigarette within five minutes of waking (p<0.01) and a lower percentage who lived in a household with another smoker (p=0.04). A greater proportion of dual-service users reported abstinence from smoking within the previous 30 days at follow-up 7 months post-enrollment (38%) compared with telephone (34%) and Web-based (29%) users.

In an unadjusted model, dual-users had 1.18 times the odds (95% confidence interval = 1.04–1.34) of being abstinent for the past 30 days versus telephone users and 1.51 times the odds (95% confidence interval = 1.32–1.73) of being abstinent compared with Web-based users (Table 2). When controlling for demographic variables, the interaction of marital status and the presence of another smoker in the household was significant in the model. Participants who were partnered had increased odds of 30-day PPA if no other smokers were present in the household. Furthermore, dual-service users had

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TABLE 1. Demographic and smoking characteristics of users of telephone, Web, and dual (telephone and Web) smoking cessation services — four states, 2011–2012

Characteristic	Dual (n = 1,307)	Telephone (n = 2,238)	p-value	Web (n = 1,848)	p-value
Sex (% female)	61	60	0.48	61	0.78
Mean age (yrs)	44	47	<0.01	40	<0.01
Race/Ethnicity (%)			0.03		<0.01
White, non-Hispanic	75	74		86	
Black, non-Hispanic	10	12		4	
Hispanic	9	7		7	
Other	5	6		3	
Education (%)			<0.01		<0.01
Less than a high school diploma/GED	11	17		7	
High school diploma/GED	28	31		26	
Some college	38	35		41	
College degree or higher	22	17		26	
Marital status (%)			0.01		<0.01
Single	56	60		47	
Partnered	44	40		53	
Mean age of initiation (yrs)	17	17	0.98	16	0.14
Mean no. of cigarettes per day	19	19	0.39	18	0.28
First cigarette within 5 min of waking (% yes)	45	47	0.19	38	<0.01
Other smoker in household (% yes)	40	37	0.09	44	0.04

Abbreviation: GED = General Educational Development certificate.

1.31 times (95% confidence interval = 1.12–1.54) the odds of reporting smoking abstinence for the past 30 days at 7 months post-enrollment compared with telephone-only users, and 1.54 times (95% confidence interval = 1.31–1.82) the odds compared with Web-only users.

Discussion

Dual-service users had demographic and smoking characteristics similar to telephone-only and Web-only users. However, single-service users had significantly lower odds of cessation success compared with dual-service users. This suggests that availability and combined use of telephone-only and Web-based services might enhance quit success, but it might also reflect a greater commitment to quit among persons who use both services.

Although the effectiveness of telephone-only services is well-established, information regarding effectiveness of Web-based services is less conclusive (*3,7*). A randomized controlled trial of Web-based cessation services showed no increase in cessation success over a placebo (*8*). However, use of multiple Web-based programs in a separate randomized control trial showed increased odds of tobacco cessation (*9*), and a 2013 study of Web-based cessation for health professionals showed increased tobacco cessation with service use (*10*). This study adds to the body of evidence to support the possibility of an additional cessation benefit from using both types of cessation services.

Users of telephone, Web-based, or dual-service cessation interventions differed in terms of age, race/ethnicity, education level, and marital status, and public health practitioners can take this information into account when establishing or reviewing tobacco cessation programs for their target population. Public health practitioners can also use this information to promote the use of additional services to those who have already engaged in one service to increase the likelihood of cessation. These findings can also be used by physicians, who often serve as an initial counselor for patients seeking to quit

What is already known on this topic?

Smoking has caused an average of 480,000 deaths a year in the United States, and studies of whether use of combined telephone and Web-based cessation services improve long-term cessation over telephone-only services report mixed results.

What is added by this report?

Participants in telephone and Web-based smoking cessation programs in four states were invited to complete questionnaires at enrollment and 7 months afterwards. After adjusting for multiple variables, persons who used both telephone and Web-based services were more likely to report abstinence from smoking for at least the past 30 days at the 7-month follow up (odds ratio = 1.3, 95% confidence interval = 1.1–1.5) compared with telephone-only users and with Web-only users (odds ratio = 1.5, 95% confidence interval = 1.3–1.8).

What are the implications for public health practice?

Although telephone and Web-based interventions are effective in tobacco cessation, providing access to multiple types of cessation services might improve the odds of users in achieving long-term cessation.

TABLE 2. Odds of smoking cessation among users of telephone, Web, and dual (telephone and Web) smoking cessation services, by selected characteristics — four states, 2011–2012

Characteristic	Unadjusted 30-Day PPA OR (95% CI)	Adjusted 30-Day PPA OR (95% CI)*	p-value
Age (5-yr difference)	1.03 (1.01–1.05)	0.98 (0.95–1.01)	0.11
Sex			0.21
Male	Referent	Referent	
Female	0.90 (0.81–1.00)	0.92 (0.82–1.05)	
Race/Ethnicity			0.84
White, non-Hispanic	Referent	Referent	
Black, non-Hispanic	1.02 (0.86–1.20)	1.04 (0.84–1.29)	
Hispanic	1.26 (1.05–1.53)	1.11 (0.88–1.39)	
Other, non-Hispanic	1.05 (0.82–1.35)	1.02 (0.78–1.35)	
Education			0.23
Less than a high school diploma/GED	Referent	Referent	
High school diploma/GED	0.94 (0.79–1.12)	0.92 (0.75–1.13)	
Some college	0.88 (0.75–1.05)	0.85 (0.70–1.05)	
College degree or higher	0.94 (0.79–1.13)	0.81 (0.65–1.01)	
Employment status†			0.1
Employed	Referent	Referent	
Unemployed	0.79 (0.66–0.94)	0.82 (0.67–1.00)	
Disability	1.07 (0.93–1.23)	0.92 (0.77–1.11)	
Retired	1.30 (1.08–1.58)	1.14 (0.88–1.48)	
Other	1.01 (0.87–1.18)	1.06 (0.89–1.28)	
Marital status†§	1.22 (1.10–1.35)		<0.01
Partnered		0.31 (0.26–0.37)	
Single		0.60 (0.50–0.72)	
Other smoker in household§	0.45 (0.40–0.50)		<0.01
No		1.76 (1.52–2.05)	
Yes		0.90 (0.73–1.11)	
Type of platform used			<0.01
Dual versus telephone	1.18 (1.04–1.34)	1.31 (1.12–1.54)	<0.01
Dual versus Web	1.51 (1.32–1.73)	1.54 (1.31–1.82)	<0.01

Abbreviations: 30-day PPA = point prevalence of reporting 30 days of abstinence 7 months after enrollment; OR = odds ratio; CI = confidence interval; GED = General Educational Development certificate.

* Multivariable models adjusted for age, sex, race/ethnicity, education, employment status, marital status, living with a smoker at baseline, baseline number of cigarettes smoked per day, cessation service used, and state.

† Measured at follow-up interview.

§ Marital status x other smoker interaction included in the model (p<0.001). P-value represents the simultaneous test that the main effect and interaction coefficients are all equal to zero.

tobacco use, based on their particular patient population. Ultimately, public health practitioners, including those at state and local public health programs, and health care providers can use this information to determine the best tobacco cessation programs to offer based on the demographics and needs of the regions they serve.

The findings in this report are subject to at least seven limitations. First, participants were from four states, which limits the generalizability of the results. Second, because the study was not initially designed to determine differences between dual-service and single-service use, participants initially chose only one intervention mode, which might have contributed to a selection bias against tobacco cessation service users who initially planned to use both types of cessation services, and therefore reduced the number of participants in this category in the study. Third, although total interactions with the primary cessation service were controlled for in the multivariable analysis, data were unavailable for total interactions with the other state-provided cessation service by dual-service users. Fourth, all data are self-reported and subject to limitations associated with recall and social desirability. Fifth, the study focused on cigarette smoking and did not include those who used other forms of tobacco, such as smokeless tobacco, hookah, or e-cigarettes. Sixth, the use of additional interventions (other than telephone-based and Web-based services) might affect measured cessation success if use differed by intervention group. However, analyses of additional cessation practices did not yield significant differences between dual-service users and single-service users, which suggests this limitation might have little effect on the results presented in this report. Finally, information bias might have affected the results because of the way participants and states were selected to participate and because of the low response rate of 48% and the final participation rate of 33%.

Tobacco use is a leading preventable cause of mortality from lung cancer, cardiovascular disease, and other diseases. These findings suggest that access to and use of both cessation services might improve tobacco cessation success. Use of Web-based and telephone cessation services in combination provides a new tool for public health programs, such as CDC's National Comprehensive Cancer Control Program, to prevent lung cancer. As such, tobacco and cancer control programs might choose to focus on implementation and improvement of both types of cessation services in their populations.

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References

1. US Department of Health and Human Services. The health consequences of smoking—50 years of progress: a report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, CDC; 2014:659. Available at http://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf.
2. Jacobs EJ, Newton CC, Carter BD, et al. What proportion of cancer deaths in the contemporary United States is attributable to cigarette smoking? Ann Epidemiol 2014; November 13 [Epub ahead of print].
3. Zbikowski SM, Hapgood J, Barnwell SS, McAfee T. Phone and web-based tobacco cessation treatment: real-world utilization patterns and outcomes for 11,000 tobacco users. J Med Internet Res 2008;10:e41.
4. Anderson CM, Zhu SH. Tobacco quitlines: looking back and looking ahead. Tob Control 2007;16(Suppl 1):i81–6.
5. Zbikowski SM, Jack LM, McClure JB, et al. Utilization of services in a randomized trial testing phone- and web-based interventions for smoking cessation. Nicotine Tob Res 2011;13:319–27.
6. Harrell FE, Lee KL, Mark DB. Multivariable prognostic models: issues in developing models, evaluating assumptions and adequacy, and measuring and reducing errors. Stat Med 1996;15:361–87.
7. Civljak M, Stead LF, Hartmann-Boyce J, Sheikh A, Car J. Internet-based interventions for smoking cessation. Cochrane Database Syst Rev 2013;7:CD007078.
8. Mckay HG, Danaher BG, Seeley JR, Lichtenstein E, Gau JM. Comparing two web-based smoking cessation programs: randomized controlled trial. J Med Internet Res 2008;10:e40.
9. Gordon JS, Mahabee-Gittens EM, Andrews JA, Christiansen SM, Byron DJ. A randomized clinical trial of a web-based tobacco cessation education program. Pediatrics 2013;131:e455–62.
10. Danaher BG, Lichtenstein E, Mckay HG, Seeley JR. Use of non-assigned smoking cessation programs among participants of a web-based randomized controlled trial. J Med Internet Res 2009;11:e26.

Tetrodotoxin Poisoning Outbreak from Imported Dried Puffer Fish — Minneapolis, Minnesota, 2014

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On June 13, 2014, two patients went to the Hennepin County Medical Center Emergency Department in Minneapolis, Minnesota, with symptoms suggestive of tetrodotoxin poisoning (i.e., oral paresthesias, weakness, and dyspnea) after consuming dried puffer fish (also known as globefish) purchased during a recent visit to New York City. The patients said two friends who consumed the same fish had similar, although less pronounced, symptoms and had not sought care. The Minnesota Department of Health conducted an investigation to determine the source of the product and samples were sent to the Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition for chemical and genetic analysis. Genetic analysis identified the product as puffer fish (*Lagocephalus lunaris*) and chemical analysis determined it was contaminated with high levels of tetrodotoxin. A traceback investigation was unable to determine the original source of the product. Tetrodotoxin is a deadly, potent poison; the minimum lethal dose in an adult human is estimated to be 2–3 mg (*1*). Tetrodotoxin is a heat-stable and acid-stable, nonprotein, alkaloid toxin found in many species of the fish family Tetraodontidae (puffer fish) as well as in certain gobies, amphibians, invertebrates, and the blue-ringed octopus (*2*). Tetrodotoxin exerts its effects by blocking voltage-activated sodium channels, terminating nerve conduction and muscle action potentials, leading to progressive paralysis and, in extreme cases, to death from respiratory failure. Because these fish were reportedly purchased in the United States, they pose a substantial U.S. public health hazard given the potency of the toxin and the high levels of toxin found in the fish.

Case Reports

Patient 1. A man aged 30 years went to the emergency department (ED) with his sister (patient 2), concerned that they both might have puffer fish poisoning. The patient stated that he had purchased dried fish described as globefish from a street vendor in New York City and transported the fish to Minnesota himself. Six hours before he came to the ED, he rehydrated some fish and consumed it with his sister and two friends. Thirty minutes after consumption, he experienced perioral and tongue numbness, numbness and weakness in his extremities, extreme fatigue, and dyspnea. He also complained that "my teeth can't feel themselves." Despite self-induced vomiting, his symptoms did not resolve, after which he went to the ED. He noted that his two friends, who also consumed the fish but did not go to the ED, had similar symptoms that resolved over several hours.

At the ED, his temperature was 98.1°F (36.7°C), pulse 75 beats/min, respiratory rate 24 breaths/min, blood pressure 160/87 mmHg, and blood oxygen saturation 100% on room air. Physical examination was unremarkable; respiratory effort, mental status, and strength testing were normal. The patient was observed in the ED for 6 hours, during which time his hypertension and tachypnea resolved and his symptoms improved. Laboratory results were as follows: hemoglobin, 15.8 g/dL (normal range = 13.1–17.5), white blood cell count, 9,020/μL (normal = 4,000–10,000), platelets 221,000 (normal = 150,000–400,000), sodium 138 mEq/L (normal = 135–148), potassium 3.4 mEq/L (normal = 3.5–5.3), chloride 100 mEq/L (normal = 100–108), carbon dioxide 27 mEq/L (normal = 22–30), creatinine 0.66 mg/dL (normal = 0.7–1.25), ionized calcium, 4.68 mg/dL (normal = 4.4–5.2). Overnight observation was recommended; however, the patient elected to leave against medical advice.

Patient 2: A woman aged 33 years, who went to the ED with her brother (patient 1), also consumed the fish 6 hours before arrival at the ED and also complained of perioral and tongue numbness, numbness and weakness in her extremities, extreme fatigue, dyspnea, and the feeling that "my teeth can't feel themselves," all beginning 30 minutes after consuming the rehydrated fish. Her temperature was 98.1°F (36.7°C), pulse 71 beats/min, respiratory rate 16 breaths/min, blood pressure 110/74 mmHg, and blood oxygen saturation 100% on room air. Her physical examamination was unremarkable; respiratory effort, mental status, and strength testing were normal.

Laboratory results were as follows: hemoglobin, 14.4 g/dL (normal range = 13.1–17.5), white blood cell count, 6,080/μL (normal = 4,000–10,000), platelets 179,000/μL (normal = 150,000–400,000), sodium 141 mEq/L (normal = 135–148), potassium 3.6 mEq/L (normal = 3.5–5.3), chloride 105 mEq/L (normal = 100–108), carbon dioxide 29 mEq/L (normal = 22–30), creatinine 0.57 mg/dL (normal = 0.7–1.25), and ionized calcium, 4.9 mg/dL (normal = 4.4–5.2). After 6 hours of observation in the ED, the patient's symptoms began to improve. Overnight observation was recommended but she also left against medical advice.

Laboratory Analysis

Seven of the dried, dressed fish (Figure 1) purchased by patient 1 were provided to the ED staff by the patients on arrival. Samples were transferred to the FDA Center for Food Safety and Applied Nutrition for analysis. Samples of dried muscle (10 mg) were taken from each fish for genetic analysis. A portion of the cytochrome *c* oxidase I (COI) mitochondrial gene was amplified and compared with COI sequences from FDA-authenticated reference standards for various species of puffer fish (*3*). The genetic analysis determined that all samples were *Lagocephalus lunaris* (Figure 2). For the toxin analysis, samples of dried muscle (2 g) were taken from each fish and rehydrated overnight at 39.2°F (4.0°C) using 10 mL of 1% acetic acid in water. After rehydration, tissues were homogenized, centrifuged, decanted, and samples were extracted a second time with an additional 9 mL of 1% acetic acid in water. Combined extracts were brought up to a total volume of 20 mL. Aliquots of each extract (2 mL) were de-fatted with 8 mL of chloroform, filtered (0.22 μm) and diluted 1:200 using 50/50 acetonitrile/1% acetic acid in water.

Samples were analyzed for tetrodotoxin by liquid chromatography-electrospray ionization-multiple reaction monitoring mass spectrometry (*4*). All seven samples were found to contain significant concentrations of tetrodotoxin with a mean of 19.8 ppm and a range of 5.7–72.3 ppm (Table). FDA has not established a guidance level for tetrodotoxin, but for comparison, the guidance level for the paralytic shellfish toxin saxitoxin, another alkaloid toxin with similar pharmacology and potency, is 0.8 ppm (*5*).

Actions Taken

Several attempts were made to contact patient 1 and patient 2 by telephone; however, none were successful. Visits to the two patients' home were made by both public health officials and law enforcement; however, current residents of the home stated that they had no knowledge of the patients' whereabouts. There was no labeling on the fish packaging, and all attempts to determine the source of the fish were unsuccessful. The Minnesota Department of Health and Department of Agriculture notified the New York City Department of Health and Department of Agriculture of the outbreak. However, with no specific information available about the source of the fish, no further investigation was feasible.

Discussion

The puffer fish (sometimes called globefish, fugu, or blowfish) is highly prized in many Asian cultures and is consumed safely in some countries (e.g., Japan). Consumption is safe, however, only with specialized training regarding which species to prepare and how to prepare them because the concentration and tissue distribution of toxin varies greatly among the >180 known species. Regulatory authorities in the United States do not provide this training, nor is tetrodotoxin testing routinely conducted; therefore, only the frozen meat, skin, and male gonad from one species of puffer fish (*Takifugu rubripes*) from Japan, processed according to Japanese safety guidelines, is permitted to be imported into the United States a limited number of times per year, pursuant to an FDA/Japanese government agreement established in 1988 (*6*). All other imported puffer fish products are prohibited (*7*). For domestic sources of puffer fish, only nontoxic species are recommended by FDA for consumption.* FDA regulates domestically sourced puffer fish through the Seafood Hazard Analysis and Critical Control Points regulation (*5*). Selected states have established additional requirements for controls for puffer fish from certain areas because of potential toxicity (*8*).

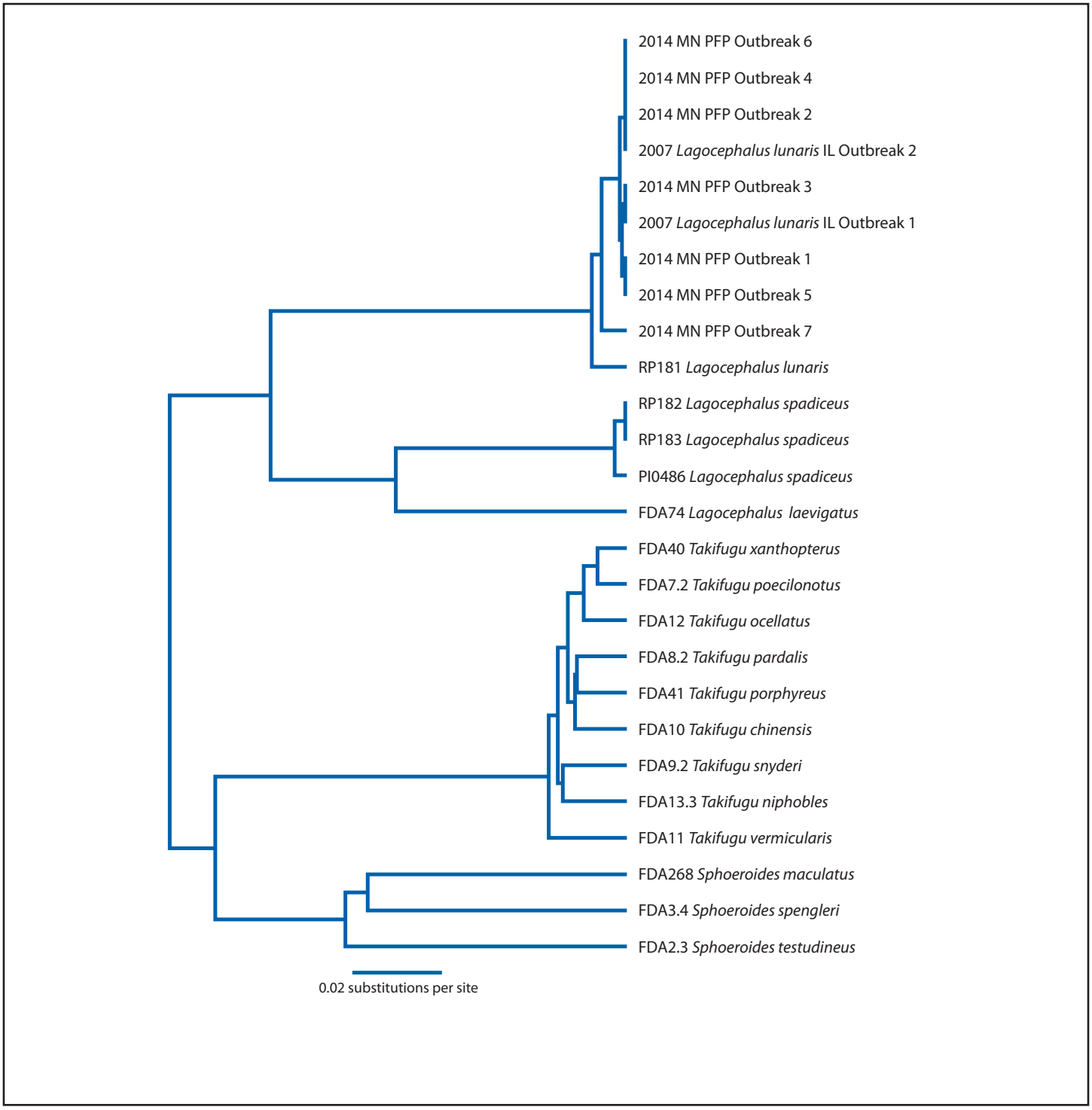
Lagocephalus lunaris is an Indo-Pacific species of puffer fish and is one of the only species known to contain high concentrations of tetrodotoxin naturally in the meat, making safe preparation of this product impossible (*9*). In its native region, it has been confused with similar looking, nontoxic species, resulting in numerous illnesses (*10*). This is the same species that was illegally imported and responsible for illnesses in California, Illinois, and New Jersey in 2007 (*4*).

The presence of this puffer fish species in a U.S. market represents a substantial public health threat given the potentially lethal toxin and the high concentration of the toxin in the flesh of these fish. However, because the two patients provided limited information, the source of the fish and how it was imported, in violation of current FDA import restrictions, could not be determined. Medical professionals who work in EDs or with persons from countries with a tradition of puffer

FIGURE 1. Dried, dressed fillets of puffer fish (*Lagocephalus lunaris*) obtained from patients in a tetrodotoxin poisoning outbreak — Minneapolis, Minnesota, 2014

* Additional information available at http://www.fda.gov/food/resourcesforyou/consumers/ucm085529.htm.

FIGURE 2. Genetic analysis* of dried puffer fish samples involved in a tetrodotoxin poisoning outbreak — Minneapolis, Minnesota, 2014



Abbreviations: MN = Minnesota; PFP = puffer fish poisoning; IL = Illinois; FDA = Food and Drug Administration.

* Unweighted pair-group method with arithmetic mean (UPGMA) tree of 655 base pair cytochrome *c* oxidase 1 (COI) mitochondrial fragment for seven samples from the 2014 Minnesota outbreak compared with COI reference standard sequences for various members of the Tetraodontidae (puffer) family, including *Lagocephalus* spp., *Takifugu* spp., and *Sphoeroides* spp. Also included are sequences for two 2007 outbreak samples from illegally imported frozen products, previously identified as *Lagocephalus lunaris*. Sequences for FDA reference standards are available at http://www.fda.gov/Food/FoodScienceResearch/DNASeafoodIdentification/ucm238880.htm. Sequences for outbreak samples are available in GenBank at http://www.ncbi.nlm.nih.gov/genbank (accession no. KM236207-KM236215).

TABLE. Analytic results of puffer fish toxin and species identification analyses in a tetrodotoxin poisoning outbreak — Minneapolis, Minnesota, 2014

Sample	Amount of toxin	Species identification
Dried fish 1	7.7 ppm	*Lagocephalus lunaris*
Dried fish 2	17.4 ppm	*Lagocephalus lunaris*
Dried fish 3	16.1 ppm	*Lagocephalus lunaris*
Dried fish 4	72.3 ppm	*Lagocephalus lunaris*
Dried fish 5	12.4 ppm	*Lagocephalus lunaris*
Dried fish 6	5.7 ppm	*Lagocephalus lunaris*
Dried fish 7	6.7 ppm	*Lagocephalus lunaris*

fish consumption should be aware of this potential public health threat and collaborate with local poison centers and health departments to investigate any outbreaks of tetrodotoxin poisoning to determine the source of the product and block additional sales to prevent additional illnesses. FDA recently released materials, including instructions for the collection and submission of meal remnants, for several fish-related illnesses, including puffer fish poisoning. These materials are available on CDC's Epidemic Information Exchange.[†]

[†] Available at http://www.cdc.gov/epix.

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What is already known on this topic?

The puffer fish (family Tetraodontidae; also known as globefish, fugu, or blowfish) is considered a delicacy in many parts of the world. Certain species of puffer fish naturally contain levels of the alkaloid toxin tetrodotoxin that are harmful to humans, requiring specialized training on safe methods of preparation and knowledge of which species can be safely consumed. Because of the risks, the importation of puffer fish products into the United States is highly restricted by the Food and Drug Administration.

What is added by this report?

Four cases of puffer fish poisoning in Minneapolis, Minnesota, resulted from consumption of dried globefish. Toxin analysis showed the product to be highly contaminated with tetrodotoxin, and a DNA analysis identified the fish as *Lagocephalus lunaris,* which is not allowed for import because naturally occurring toxin in its meat make safe preparation of this species impossible. Lack of product labeling and limited information provided by two persons who went to the emergency department prevented determination of the exact source of the product and how it was illegally imported into the country.

What are the implications for public health practice?

The presence of *Lagocephalus lunaris* in a U.S. market represents a public health threat given the potential lethal nature of the toxin and the high concentration of the toxin in the meat of these fish. Health care providers who work in emergency departments or with persons from countries with a tradition of puffer fish consumption should be aware of this potential public health threat and coordinate with local poison centers and health departments to investigate any suspected cases of puffer fish poisoning to determine the source of the fish, whether it was legally imported, and whether additional contaminated product needs to be removed from commerce.

References

1. Noguchi T, Ebesu JSM. Puffer poisoning: epidemiology and treatment. J Toxicol Toxin Rev 2001;20:1–10.
2. Cavazzoni E, Lister B, Sargent P, Schibler A. Blue-ringed octopus (*Hapalochlaena* sp.) envenomation of a 4-year-old boy: a case report. Clin Toxicol (Phila) 2008;46:760–1.
3. Handy SM, Deeds JR, Ivanova NV, et al. A single laboratory validated method for the generation of DNA barcodes for the identification of fish for regulatory compliance. J AOAC Int 2011;94:201–10.
4. Cohen NJ, Deeds JR, Wong ES, et al. Public health response to puffer fish (tetrodotoxin) poisoning from mislabeled product. J Food Prot 2009;72:810–7.
5. Food and Drug Administration. Fish and fisheries products hazards and controls guidance. 4th ed. US Department of Health and Human Services, Food and Drug Administration; 2014. Available at http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm2018426.htm.
6. Food and Drug Administration. Exchange of letters between Japan and the US Food and Drug Administration regarding puffer fish. US Department of Health and Human Services, Food and Drug Administration. Available at http://www.fda.gov/InternationalPrograms/Agreements/MemorandaofUnderstanding/ucm107601.htm.
7. Food and Drug Administration. Import alert no. 16-20: detention without physical examination of puffer fish and foods that contain puffer fish. US Department of Health and Human Services, Food and Drug Administration; 2014. Available at http://www.accessdata.fda.gov/cms_ia/importalert_37.html.
8. Deeds JR, White KD, Etheridge SM, Landsberg JH. Concentrations of saxitoxin and tetrodotoxin in three species of puffers from the Indian River Lagoon, Florida, the site of multiple cases of saxitoxin puffer fish poisoning from 2002–2004. Trans Am Fish Soc 2008;137:1317–26.
9. Yang CC, Liao SC, Deng JF. Tetrodotoxin poisoning in Taiwan: an analysis of poison center data. Vet Hum Toxicol 1996;38:282–6.
10. Hwang DF, Hsieh YW, Shiu YC, Chen SK, Cheng CA. Identification of tetrodotoxin and fish species in a dried dressed fish fillet implicated in food poisoning. J Food Prot 2002;65:389–92.

Perceptions of the Risk for Ebola and Health Facility Use Among Health Workers and Pregnant and Lactating Women — Kenema District, Sierra Leone, September 2014

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With an estimated maternal mortality ratio of 1,100 per 100,000 live births and a neonatal mortality rate of 49 per 1,000 live births, Sierra Leone has the highest maternal mortality ratio and the fourth highest neonatal mortality rate in the world, accounting for 2,400 maternal and 11,200 newborn deaths annually (*1,2*). By straining the fragile health care infrastructure, the Ebola virus disease (Ebola) epidemic might put pregnant women and their newborns at even greater risk for adverse outcomes.

During May–July 2014, one third of confirmed Ebola cases in Sierra Leone originated in Kenema District (population 653,000), located in the Eastern Province (*3*). During this period, routine maternal and newborn health service use was reported by the Sierra Leone Ministry of Health and Sanitation (MOHS) to have declined across the district (Sierra Leone MOHS, unpublished data, 2014). For example, the number of first antenatal care visits in the district decreased by 29%, from 2,086 in May to 1,488 in July, and the number of postnatal care visits within 48 hours after delivery decreased by 21%, from 1,923 in May to 1,512 in July (Sierra Leone MOHS, unpublished data, 2014). To understand factors that might have contributed to these declines and to explore approaches to increase use of maternal and newborn health services during the Ebola epidemic, MOHS collaborated with the International Rescue Committee, the Kenema District Health Management Team, and CDC to assess attitudes and perceptions regarding the risk for Ebola and health facility use among health workers and pregnant and lactating women.

In Kenema District, community-level maternal, newborn, and child health services are available at community health centers, health posts, and maternal and child health posts. During September 2014, five focus group discussions with a total of 34 participants who were health workers and support staff were held at six primary health care facilities, and four focus group discussions with a total of 27 participants were held with pregnant and lactating women in Kenema District. Facilities at varying distances from referral hospitals were chosen to improve representativeness of the information. Health worker participants included 10 traditional birth attendants, eight maternal and child health aides, five vaccinators, three nurses, three community health officers and assistants, and five support staff.

A structured interview guide was used to ask open-ended questions covering the following areas: 1) health facility use for routine health services; 2) reasons for decreased use; 3) ideas for encouraging women and children to return to the facility for care; and 4) perceptions of safety. Content analysis was used on interview notes to group responses into common themes. Responses were repeatedly and systematically reviewed until no new themes emerged.

Perceptions of Health Facility Use. Health workers, support staff, and pregnant and lactating women reported a sharp decline in facility use for routine health services immediately after the Ebola outbreak began. Deliveries in health facilities were perceived to be less affected by the Ebola outbreak compared with antenatal, postnatal, and immunization care. After Ebola awareness and educational activities had been implemented, health workers reported that the numbers of antenatal, family planning, and immunization care visits appeared to increase gradually, although most have not yet returned to pre-epidemic levels. Vaccination coverage remained stable in some communities because health workers went directly to villages to vaccinate. Health workers and pregnant and lactating women believed that the recent infection prevention training of health workers, and additional equipment such as containers for hand washing with chlorinated water, has increased use of maternal and infant health services by providing reassurance to the community. Some noted that community members now come to health facilities just for the purpose of washing their hands.

Perceptions of Reasons for Decreased Use. There was consensus among facility staff and pregnant and lactating women that the primary reason for decreased use of health facilities was fear of contracting Ebola at a facility, including outpatient facilities. Several common misconceptions were reported by pregnant and lactating women. For example, it was erroneously believed that staff was paid for each patient referred and therefore every person who went to a health facility would be presumed to have Ebola and taken to the Kenema Ebola Treatment Unit. Another common misconception was that health facility staff injected patients with Ebola or took their blood for financial gain or magical power. All vehicles or foreigners or both that

came into the community were thought to be bringing Ebola to the area. These misconceptions were particularly strong early in the outbreak, but have become much less common according to pregnant and lactating women. However, all participants reported knowing at least some persons in their communities who continue to refuse to seek care at health facilities because of ongoing fear related to misconceptions.

Ideas for Encouraging Women and Children to Return to Health Facilities. Women and health workers suggested the following messaging to encourage facility use: "The health workers took good care of you before Ebola, and they will do so now! Come and see how many other women and children are coming for care." A popular idea among participants was to share messages about the recent infection prevention and control trainings so that facilities were perceived to be safe. Health workers and community members also suggested offering incentives such as food or clothing to encourage antenatal care registration and use of the facility for care. Another recommendation was having women who have had care recently in the facility return to their villages to share their positive experiences. Traditional birth attendants described the process of going into villages and singing and dancing as a way to call women together for education. The traditional birth attendants showed a deep interest in helping to spread messages about Ebola and the importance of coming to the facilities for health care, but felt they would first need training to be effective. The facility staff strongly encouraged this option because traditional birth attendants are highly trusted by women in the villages. Pregnant and lactating women and health workers expressed their eagerness to engage in these activities to encourage facility use.

Feelings of Safety Among the Staff. The health staff reported a reduction in fear of Ebola since their recent infection prevention and control training, although they noted gaps in the provision of infection prevention equipment. It was commonly reported that "if these other people at the higher health system level [hospitals] can get Ebola and die, then of course we can, too!" Fear among and for traditional birth attendants by nurses and midwives was particularly strong, because they did not receive the trainings and did not have access to personal protective equipment such as gloves, aprons, and masks.

Information from these focus groups contributed towards the modification of the national infection prevention and control strategy to incorporate community awareness of the infection prevention and control trainings. To restore communities' confidence in their health facilities, the Ebola Response Consortium (a group of 10 international non-governmental organizations that supports the MOHS in the Ebola response) will work with the local health development committees, local facility management teams, health workers, and traditional birth attendants to educate communities about improvements in infection prevention and control and waste management, and to dispel myths that might have prevented attendance at health facilities. Engaging the community after infection prevention and control trainings has become a key strategy to encourage women and families to return to health facilities.

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References

1. World Health Organization, UNICEF, World Bank, United Nations Population Division. Trends in maternal mortality: 1990 to 2013. Geneva, Switzerland: World Health Organization; 2014. Available at http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2013/en.
2. Save the Children. Surviving the first day: state of the world's mothers 2013. Available at http://www.refworld.org/docid/51a5ad654.html.
3. Sierra Leone Ministry of Health and Sanitation. Ebola virus disease—situation report (Sit-Rep) 07 December 2014. Available at http://health.gov.sl/wp-content/uploads/2014/12/Ebola-Situation-Report_Vol-193.pdf.

Notes from the Field

Aseptic Meningitis Outbreak Associated with Echovirus 30 Among High School Football Players — Los Angeles County, California, 2014

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On August 4, 2014, the Acute Communicable Disease Control Program of the Los Angeles County Department of Public Health received a report of three aseptic meningitis cases among football players at a county high school. An investigation was conducted to determine the extent of the outbreak, identify potential exposures, and recommend control measures. An outbreak-associated aseptic meningitis case was defined as an illness of any team or family member with onset during July 28–August 11 with 1) cerebrospinal fluid pleocytosis and negative bacterial culture or 2) an emergency department visit with headache, fever, and stiff neck. Ten cases were identified; nine in males, and one in a female; patient ages ranged from 13 to 17 years. All the patients sought care at an emergency department, and five were hospitalized, resulting in 12 total hospital days. All 10 patients have recovered. Eight patients were football players, and two were siblings of football players. The most affected subgroup was the junior varsity football team, with seven cases out of 57 players (attack rate = 12.3%); the relative risk for aseptic meningitis was higher among players who were linemen than among those who were not linemen (relative risk = 5.4 [p = 0.03]). Of the 10 patients, eight tested positive by polymerase chain reaction for enterovirus, and two were not tested. Echovirus testing was performed at the California Viral and Rickettsial Disease Laboratory. Of the eight specimens testing positive for enterovirus, seven tested positive for echovirus 30, and one specimen could not be typed because of insufficient quantity.

Echovirus 30 accounted for 4.5% of nonpolio enterovirus serotypes reported in the United States during 2006-2008 (*1*). Echovirus types 5, 9, 16, and 24 have been associated with aseptic meningitis outbreaks in football teams (*2,3*). However, this appears to be the first documented echovirus 30 aseptic meningitis outbreak in the United States among members of a sports team.

Investigators from the Acute Communicable Disease Control Program determined the most likely factors resulting in transmission included water bottles shared among football players, inadequate washing of water bottles, and poor hand hygiene. School staff members notified parents of the outbreak and likely mitigated infection sources. Summer football league games between the affected high school and nearby schools posed a risk for spread of infection; however, investigators pursued active case-finding in area hospitals and schools and identified no additional cases. School staff members were asked to encourage proper hand hygiene and discourage shared water bottles to avoid future outbreaks.

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References

1. CDC. Nonpolio enterovirus and human parechovirus surveillance—United States, 2006–2008. MMWR Morb Mortal Wkly Rep 2010; 59:1577–80.
2. Turbeville SD, Cowan LD, Greenfield RA. Infectious disease outbreaks in competitive sports. A review of the literature. Am J Sports Med 2006;34:1860–5.
3. Baron RC, Hatch MH, Kleeman K, MacCormack JN. Aseptic meningitis among members of a high school football team: an outbreak associated with echovirus 16 infection. JAMA 1982;248:1724–7.

Erratum

Vol. 63, No. 50

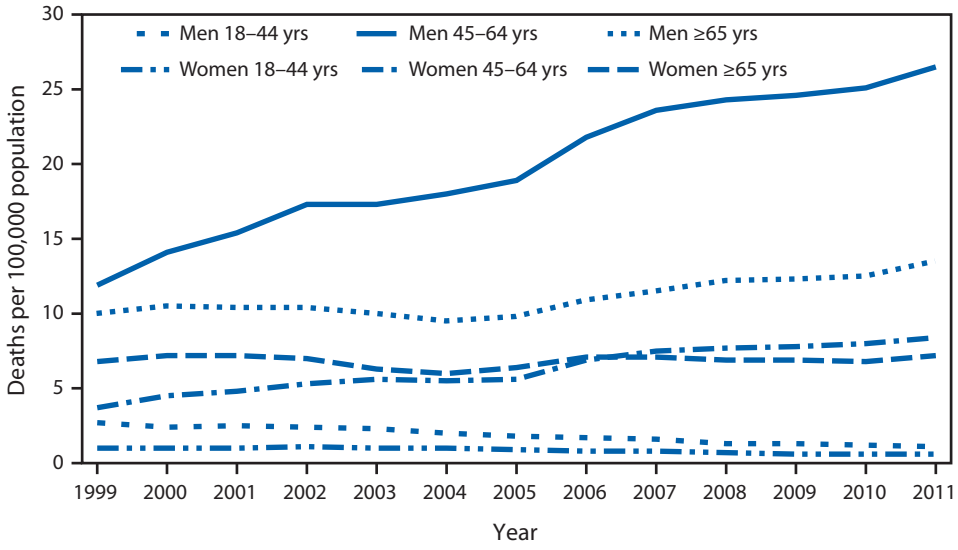
In the report, "Update: Ebola Virus Disease Epidemic — West Africa, December 2014," an error occurred in the references. Reference 5 should read as follows:

5. Incident Management System Ebola Epidemiology Team, CDC; Guinea Interministerial Committee for Response Against the Ebola Virus and the World Health Organization; CDC Guinea Response Team; et al. Update: Ebola virus disease epidemic—West Africa, November 2014. Morb Mortal Wkly Rep 2014;63:1064–6.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Death Rates from Viral Hepatitis Among Adults Aged ≥18 Years,* by Age Group and Sex — National Vital Statistics System, United States, 1999–2011



* Deaths from viral hepatitis include underlying and contributing causes coded as B15–B19 in the *International Classification of Diseases, 10th Revision*.

From 1999 to 2011, the death rate for viral hepatitis as the underlying or contributing cause of death among those aged 45–64 years increased 2.2 times among men (from 11.9 to 26.5 per 100,000 population) and 2.3 times among women (from 3.7 to 8.4 per 100,000 population). The death rate decreased 60% among men aged 18–44 years; among women aged 18–44 years the death rate did not change from 1999 to 2002 and then decreased 46% from 2003 to 2011. For men aged ≥65 years the death rate did not change from 1999 to 2003 and then increased 40% from 2004 to 2011. For women aged ≥65 years the rate did not change from 1999 to 2011.

Sources: CDC. National Vital Statistics System. Available at http://www.cdc.gov/nchs/nvss.htm.

CDC. Health Data Interactive. Available at http://www.cdc.gov/nchs/hdi.htm.

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