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Health-Related Behaviors and Academic Achievement Among High School Students — United States, 2015

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Studies have shown links between educational outcomes such as letter grades, test scores, or other measures of academic achievement, and health-related behaviors (*1–4*). However, as reported in a 2013 systematic review, many of these studies have used samples that are not nationally representative, and quite a few studies are now at least 2 decades old (*1*). To update the relevant data, CDC analyzed results from the 2015 national Youth Risk Behavior Survey (YRBS), a biennial, cross-sectional, school-based survey measuring health-related behaviors among U.S. students in grades 9–12. Analyses assessed relationships between academic achievement (i.e., self-reported letter grades in school) and 30 health-related behaviors (categorized as dietary behaviors, physical activity, sedentary behaviors, substance use, sexual risk behaviors, violence-related behaviors, and suicide-related behaviors) that contribute to leading causes of morbidity and mortality among adolescents in the United States (*5*). Logistic regression models controlling for sex, race/ethnicity, and grade in school found that students who earned mostly A's, mostly B's, or mostly C's had statistically significantly higher prevalence estimates for most protective health-related behaviors and significantly lower prevalence estimates for most health-related risk behaviors than did students with mostly D's/F's. These findings highlight the link between health-related behaviors and education outcomes, suggesting that education and public health professionals can find their respective education and health improvement goals to be mutually beneficial. Education and public health professionals might benefit from collaborating to achieve both improved education and health outcomes for youths.

The national YRBS is a biennial, school-based survey of U.S. high school students conducted by CDC. For the 2015 survey, a three-stage cluster sample design was used to produce a nationally representative sample of students in grades 9–12 who attended public and private schools (*6*). The school response rate was 69%, the student response rate was 86%, and the overall response rate (the school response rate multiplied by the student response rate) was 60%. Data were weighted based on sex, race/ethnicity, and school grade to adjust for nonresponse and oversampling of black and Hispanic students. The final data set included data from 15,624 students in grades 9–12.

School-level parental permission procedures were followed before survey administration, and participation was voluntary. Survey procedures were designed to protect students' privacy by allowing for anonymous participation. Students completed the self-administered questionnaire during a single class period and recorded their responses on a computer-scannable booklet or answer sheet.

Academic achievement was measured with a question on self-reported letter grades in school: "During the past 12 months,

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how would you describe your grades in school?" Students could select one of the following response options: mostly A's, mostly B's, mostly C's, mostly D's, mostly F's, none of these grades, and not sure. Data from additional questions were used to measure five dietary behaviors, three physical activity behaviors, two sedentary behaviors, seven substance use behaviors, five sexual risk behaviors, five violence-related behaviors, and three suicide-related behaviors. The dietary behaviors included (for the 7 days before the survey): ate breakfast on all 7 days; ate fruit or drank 100% fruit juices one or more times per day; ate vegetables one or more times per day; drank one or more glasses of milk per day; and did not drink a can, bottle, or glass of soda or pop. The physical activity behaviors included being physically active at least 60 minutes per day on 5 or more days during the 7 days before the survey, played on at least one sports team during the 12 months before the survey, and attended physical education classes on 1 or more days in an average week when they were in school. The sedentary behaviors included having watched television 3 or more hours per day on an average school day, and played video or computer games or used a computer for something that was not school work 3 or more hours per day on an average school day.

The substance use behaviors included current alcohol use (on at least 1 day during the 30 days before the survey); current marijuana use (one or more times during the 30 days before the survey); ever use of cocaine, ever use of heroin, ever use of methamphetamines, ever injection of any illegal drug, and ever took prescription drugs without a doctor's prescription. The sexual risk behaviors included ever had sexual intercourse, had sexual intercourse with four or more persons, currently sexually active (had sexual intercourse during the 3 months before the survey), did not use a condom during last sexual intercourse, and did not use any method to prevent pregnancy during last sexual intercourse. The violence-related behaviors included having experienced, during the 12 months before the survey, physical violence by someone they were dating or going out with, sexual violence by someone they were dating or going out with, being bullied on school property, and being electronically bullied, and, during the 30 days before the survey, not going to school because of safety concerns. Finally, the suicide-related behaviors included having, during the 12 months before the survey, seriously considered attempting suicide, made a plan about how they would attempt suicide, and attempted suicide. Four additional questions on sex, race, ethnicity, and grade in school were used to create control variables for the statistical analyses.

Unadjusted prevalence estimates were calculated. Logistic regression models were used to determine whether the categorical variable of self-reported grades in school was associated with each health-related behavior while controlling for sex, race/ethnicity, and grade (9th, 10th, 11th, or 12th). Wald F p-values from the logistic regressions were used to determine statistically significant associations between overall self-reported letter grades in school and each behavior with an alpha level of 0.05. Comparisons of students with specific self-reported grades (mostly A's, mostly B's, or mostly C's) against a combined referent group of students with mostly D's/F's were also assessed.

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Unadjusted percentages showed a general gradient of association between self-reported letter grades and health behaviors (Table 1). After adjusting for sex, race/ethnicity, and grade level, overall self-reported grades in school were significantly associated with each behavior ($p<0.05$), except for physical education attendance ($p = 0.6416$) (Table 2). Students with mostly A's, mostly B's, or mostly C's had significantly higher prevalence estimates for most protective health-related behaviors and significantly lower prevalence estimates for most health-related risk behaviors, including all substance use, sexual risk, violence-related, and suicide-related behaviors (Table 2). Prevalence estimates for students with mostly C's were not significantly different from those for students with mostly D's/F's for two behaviors: ate vegetables one or more times per day during the past 7 days and watched television 3 or more hours per day on an average school day.

Discussion

Among U.S. high school students, healthy eating and physical activity were associated with higher self-reported letter grades, whereas sedentary, substance-use, sexual risk, violence-related, and suicide-related behaviors were associated with lower self-reported grades. This relationship, which appears similar for both lifetime and more recent behaviors (i.e., behaviors that occurred one or more times during a student's life and behaviors that occurred during the previous 7 days, 30 days, 3 months, or 12 months), is consistent with findings of other reports (*1–4*,*7*). A 2013 systematic review examining

TABLE 1. Unadjusted weighted prevalence of health-related behaviors, by letter grades earned among high school students — National Youth Risk Behavior Survey, United States, 2015

Health-related behavior	% (95% CI) Mostly A's	Mostly B's	Mostly C's	Mostly D's/F's
Dietary behavior				
Ate breakfast on all 7 days*	45.4 (40.8–50.1)	35.2 (33.2–37.4)	28.7 (26.2–31.2)	18.8 (15.3–22.8)
Ate fruit or drank 100% fruit juices one or more times per day*	68.2 (65.0–71.2)	62.8 (60.8–64.7)	60.5 (57.1–63.7)	52.5 (47.9–57.2)
Ate vegetables one or more times per day†	68.0 (64.6–71.2)	60.0 (57.6–62.4)	55.1 (52.0–58.2)	54.2 (49.9–58.5)
Drank one or more glasses per day of milk*	42.8 (38.3–47.5)	35.7 (33.5–37.9)	33.8 (31.0–36.8)	28.2 (23.8–33.2)
Did not drink a can, bottle, or glass of soda or pop§	34.2 (30.1–38.6)	24.8 (22.3–27.4)	17.7 (15.3–20.4)	13.1 (10.2–16.7)
Physical activity behavior				
Physically active at least 60 minutes per day on 5 or more days¶	51.5 (47.2–55.8)	50.7 (47.8–53.6)	43.9 (40.9–47.0)	38.3 (33.8–43.1)
Played on at least one sports team**	66.9 (59.9–73.3)	58.9 (56.2–61.5)	48.6 (45.7–51.5)	36.7 (30.9–43.0)
Attended physical education classes on one or more days††	49.9 (43.1–56.7)	50.5 (43.8–57.1)	53.9 (48.8–58.8)	59.4 (52.2–66.1)
Sedentary behavior				
Watched television 3 or more hours per day§§	18.3 (15.2–21.9)	25.2 (23.3–27.3)	30.6 (28.2–33.2)	35.3 (30.2–40.7)
Played video or computer games or used a computer 3 or more hours per day¶¶	36.0 (32.2–40.0)	41.6 (39.2–44.1)	47.3 (44.0–50.5)	53.4 (49.1–57.7)
Substance use				
Currently drank alcohol***	24.3 (20.8–28.1)	34.6 (32.6–36.7)	40.4 (36.7–44.3)	51.6 (46.1–57.0)
Currently used marijuana†††	11.5 (9.4–14.0)	21.7 (19.2–24.5)	30.7 (27.8–33.7)	46.9 (41.4–52.5)
Ever used cocaine§§§	2.5 (1.8–3.6)	4.4 (3.5–5.5)	6.4 (5.2–7.8)	19.2 (14.8–24.6)
Ever used heroin¶¶¶	0.9 (0.5–1.6)	1.2 (0.8–1.8)	2.1 (1.2–3.6)	10.0 (6.8–14.4)
Ever used methamphetamines****	1.3 (0.8–2.0)	2.3 (1.7–3.1)	3.5 (2.6–4.7)	11.9 (8.9–15.7)
Ever injected any illegal drug††††	0.8 (0.5–1.3)	1.2 (0.7–2.1)	1.9 (1.2–3.0)	8.9 (6.3–12.6)
Ever took prescription drugs without a doctor's prescription§§§§	10.7 (9.2–12.4)	16.7 (15.0–18.6)	21.7 (19.6–23.9)	34.1 (29.0–39.7)
Sexual risk behavior				
Ever had sexual intercourse	30.5 (26.1–35.3)	40.7 (37.2–44.2)	54.2 (50.9–57.4)	62.1 (55.7–68.1)
Had sexual intercourse with four or more persons¶¶¶¶	6.3 (4.4–8.9)	11.3 (9.8–13.1)	16.6 (14.6–18.9)	26.2 (19.8–33.7)
Currently sexually active*****	23.0 (19.8–26.6)	30.0 (27.3–32.9)	38.0 (35.4–40.6)	45.8 (40.2–51.5)
Did not use a condom during last sexual intercourse†††††	38.6 (33.5–44.0)	42.0 (38.5–45.6)	46.3 (41.2–51.6)	58.7 (48.7–68.0)
Did not use any method to prevent pregnancy during last sexual intercourse†††††	8.9 (6.8–11.5)	11.7 (9.1–15.0)	16.4 (12.8–20.9)	31.3 (23.3–40.7)
Violence-related behavior				
Experienced physical dating violence§§§§§	7.4 (5.9–9.3)	9.2 (8.0–10.5)	10.3 (8.9–12.0)	18.6 (14.5–23.7)
Experienced sexual dating violence¶¶¶¶¶	9.5 (7.8–11.6)	10.6 (9.3–12.0)	9.6 (8.0–11.5)	16.7 (12.1–22.5)
Were bullied on school property******	19.6 (17.5–21.9)	19.7 (18.0–21.6)	19.6 (17.2–22.3)	31.1 (27.5–34.9)
Were electronically bullied††††††	14.7 (13.3–16.1)	14.9 (13.2–16.8)	16.8 (14.8–18.9)	25.6 (21.8–30.0)
Did not go to school because of safety concerns§§§§§§	2.8 (1.9–4.1)	5.2 (4.3–6.2)	7.3 (5.9–9.1)	15.3 (12.1–19.2)

See table footnotes on next page.

TABLE 1. (*Continued*) Unadjusted weighted prevalence of health-related behaviors, by letter grades earned among high school students — National Youth Risk Behavior Survey, United States, 2015

Health-related behavior	% (95% CI)			
	Mostly A's	Mostly B's	Mostly C's	Mostly D's/F's
Suicide-related behavior				
Seriously considered attempting suicide******	14.1 (12.5–15.9)	15.7 (14.3–17.2)	21.7 (19.4–24.2)	36.0 (30.7–41.5)
Made a plan about how they would attempt suicide******	11.3 (9.4–13.5)	13.8 (12.5–15.3)	17.6 (15.3–20.1)	27.6 (23.4–32.2)
Attempted suicide¶¶¶¶¶¶	5.6 (4.4–7.1)	7.4 (6.5–8.4)	11.7 (9.9–13.9)	21.3 (17.4–25.8)

Abbreviation: CI = confidence interval.

* During the 7 days before the survey.
† Includes green salad, potatoes (excluding French fries, fried potatoes, or potato chips), carrots, or other vegetables, during the 7 days before the survey.
§ Not including diet soda or diet pop, during the 7 days before the survey.
¶ Doing any kind of physical activity that increased their heart rate and made them breathe hard some of the time during the 7 days before the survey.
** Run by their school or community groups during the 12 months before the survey.
†† In an average week when they were in school.
§§ On an average school day.
¶¶ For something that was not school work on an average school day.
*** At least one drink of alcohol on at least 1 day during the 30 days before the survey.
††† One or more times during the 30 days before the survey.
§§§ Any form of cocaine, such as powder, crack, or freebase, one or more times during their life.
¶¶¶ Also called "smack," "junk," or "China white," one or more times during their life.
**** Also called "speed," "crystal," "crank," or "ice," one or more times during their life.
†††† Used a needle to inject any illegal drug into their body one or more times during their life.
§§§§ Such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax, one or more times during their life.
¶¶¶¶ During their life.
***** Had sexual intercourse with at least one person during the 3 months before the survey.
††††† During last sexual intercourse among the 30.1% of students nationwide who were currently sexually active.
§§§§§ One or more times during the 12 months before the survey, being physically hurt on purpose (including being hit, slammed into something, or injured with an object or weapon on purpose) by someone they were dating or going out with among the 68.6% of students nationwide who dated or went out with someone during the 12 months before the survey. (Note: the prevalence of dating or going out with someone during the 12 months before the survey varies slightly for physical and sexual dating violence because of the differences in the number of usable responses to each violence question.)
¶¶¶¶¶ One or more times during the 12 months before the survey, being forced to do sexual things (including kissing, touching, or being physically forced to have sexual intercourse) they did not want to do by someone they were dating or going out with among the 69.1% of students nationwide who dated or went out with someone during the 12 months before the survey.
****** During the 12 months before the survey.
†††††† Including being bullied through e-mail, chat rooms, instant messaging, Websites, or texting during the 12 months before the survey.
§§§§§§ Did not go to school because they felt unsafe at school or on their way to or from school on at least 1 day during the 30 days before the survey.
¶¶¶¶¶¶ One or more times during the 12 months before the survey.

25 years of evidence related to academic achievement and health-related behaviors across a wide range of ages and grade levels found that 96.8% of reviewed cross-sectional studies and 93.1% of longitudinal studies identified statistically significant associations between some form of academic achievement and behaviors related to physical activity, nutrition, substance use, sexual risk, or violence (*1*). With no assessment of self-reported academic performance on YRBS since 2009, this report of 2015 data from a nationwide sample of high school students supports earlier findings and offers updated, nationally representative findings as evidence of a continuing association between health-related behaviors and academic achievement.

Although causation cannot be inferred from the current analysis, causal relationships are believed to exist in both directions between education and health (*1*,*8*). Longitudinal studies in the 2013 literature review concluded that less engagement in health risk behaviors among persons aged 10–18 years leads to higher achievement later in life, and that earlier academic achievement during the same period leads to less health risk behaviors later in life (*1*). Education is commonly viewed as an important social determinant of health, leading some health professionals to measure and target education-related outcomes in health-focused programming (*2*,*7*). Conversely, some educational researchers have advocated addressing health risk behaviors and related disparities as a key approach to closing academic achievement gaps among youths (*9*).

Highlighting the association between education and health might facilitate the establishment of partnerships between health agencies and education agencies, many of which are well positioned to support health programs, in part because of existing infrastructure to support educational interventions, health services, and family and community involvement. U.S. high schools enroll approximately 16.5 million youths,* and schools provide the physical and social environment in which youths spend much of their day at a key phase of life when many youths engage in risk behaviors. Schools face tremendous pressure to reach educational goals. These findings, combined

* https://www.census.gov/data/tables/2015/demo/school-enrollment/2015-cps.html.

TABLE 2. Adjusted prevalence ratios* for health-related behaviors, by letter grades earned among high school students (using mostly D's/F's as the referent) — National Youth Risk Behavior Survey, United States, 2015

Health-related behavior	aPR (95% CI)			Wald F p-value
	Mostly A's	Mostly B's	Mostly C's	
Dietary behavior				
Ate breakfast on all 7 days†	2.13 (1.89–2.41)	1.66 (1.46–1.89)	1.39 (1.23–1.56)	<0.0001
Ate fruit or drank 100% fruit juices one or more times per day†	1.28 (1.20–1.37)	1.17 (1.09–1.25)	1.12 (1.04–1.21)	<0.0001
Ate vegetables one or more times per day§	1.22 (1.13–1.32)	1.08 (1.01–1.16)	1.01 (0.94–1.09)	<0.0001
Drank one or more glasses per day of milk†	1.58 (1.35–1.84)	1.28 (1.12–1.47)	1.20 (1.04–1.39)	<0.0001
Did not drink a can, bottle, or glass of soda or pop¶	2.18 (1.79–2.65)	1.63 (1.35–1.96)	1.25 (1.01–1.54)	<0.0001
Physical activity behavior				
Physically active at least 60 minutes per day on 5 or more days**	1.37 (1.23–1.52)	1.33 (1.22–1.45)	1.14 (1.04–1.26)	<0.0001
Played on at least one sports team††	1.62 (1.45–1.82)	1.44 (1.32–1.57)	1.22 (1.11–1.34)	<0.0001
Attended physical education classes on one or more days§§	0.94 (0.85–1.04)	0.93 (0.82–1.06)	0.97 (0.88–1.07)	0.6416
Sedentary behavior				
Watched television 3 or more hours per day¶¶	0.54 (0.43–0.67)	0.72 (0.60–0.86)	0.84 (0.69–1.02)	<0.0001
Played video or computer games or used a computer 3 or more hours per day***	0.66 (0.57–0.76)	0.77 (0.68–0.87)	0.88 (0.77–0.99)	<0.0001
Substance use				
Currently drank alcohol†††	0.43 (0.37–0.50)	0.64 (0.57–0.71)	0.77 (0.67–0.89)	<0.0001
Currently used marijuana§§§	0.24 (0.19–0.29)	0.44 (0.38–0.52)	0.62 (0.54–0.72)	<0.0001
Ever used cocaine¶¶¶	0.14 (0.09–0.23)	0.22 (0.17–0.30)	0.33 (0.25–0.44)	<0.0001
Ever used heroin****	0.10 (0.05–0.21)	0.12 (0.08–0.20)	0.22 (0.11–0.43)	<0.0001
Ever used methamphetamines††††	0.12 (0.07–0.21)	0.20 (0.14–0.28)	0.31 (0.20–0.48)	<0.0001
Ever injected any illegal drug§§§§	0.11 (0.06–0.21)	0.15 (0.09–0.24)	0.24 (0.14–0.41)	<0.0001
Ever took prescription drugs without a doctor's prescription¶¶¶¶	0.30 (0.23–0.38)	0.46 (0.38–0.56)	0.62 (0.52–0.73)	<0.0001
Sexual risk behavior				
Ever had sexual intercourse	0.47 (0.41–0.54)	0.61 (0.56–0.67)	0.82 (0.76–0.89)	<0.0001
Had sexual intercourse with four or more persons*****	0.24 (0.17–0.35)	0.40 (0.31–0.52)	0.56 (0.45–0.70)	<0.0001
Currently sexually active†††††	0.46 (0.40–0.53)	0.60 (0.53–0.67)	0.77 (0.70–0.86)	<0.0001
Did not use a condom during last sexual intercourse§§§§§	0.61 (0.50–0.74)	0.70 (0.58–0.84)	0.81 (0.68–0.97)	0.0001
Did not use any method to prevent pregnancy during last sexual intercourse§§§§§	0.29 (0.19–0.42)	0.38 (0.27–0.54)	0.54 (0.40–0.74)	<0.0001
Violence-related behavior				
Experienced physical dating violence¶¶¶¶¶	0.36 (0.25–0.51)	0.47 (0.36–0.62)	0.55 (0.41–0.75)	<0.0001
Experienced sexual dating violence******	0.49 (0.34–0.73)	0.62 (0.47–0.82)	0.59 (0.43–0.81)	0.0069
Were bullied on school property††††††	0.55 (0.45–0.67)	0.62 (0.52–0.72)	0.66 (0.54–0.80)	<0.0001
Were electronically bullied§§§§§§	0.45 (0.37–0.56)	0.56 (0.45–0.68)	0.69 (0.55–0.85)	<0.0001
Did not go to school because of safety concerns¶¶¶¶¶¶	0.20 (0.12–0.31)	0.35 (0.26–0.48)	0.51 (0.38–0.69)	<0.0001

See table footnotes on next page.

with existing evidence that improved academic achievement outcomes can be seen from health programs based on the coordinated school health or Whole School, Whole Community, Whole Child models, suggest that efforts to improve health among students might contribute to achievement of those educational goals (*7*).

The findings in this report are subject to at least four limitations. First, because data analyzed in this report are cross-sectional, findings show only associations and cannot demonstrate causality in either direction. Second, this study does not address potential confounding (e.g., the extent to which both health behaviors and educational outcomes might result from other factors such as family context and neighborhood setting). However, several studies included in the 2013 review found that the association between health-related behaviors and education outcomes can be seen even when accounting for family and community contextual variables (*1*). Third, these data represent only youths who attend school and are not representative of all youths in this age group. Data from 2012 indicated that approximately 2.9% of youths aged 16 and 17 years in the United States had dropped out of high school†; such youths are not represented in this report. Finally, CDC cannot determine the extent to which respondents might overreport or underreport behaviors or grades in school; however, YRBS questions have demonstrated good test-retest reliability (*6*).

School health interventions can promote positive health behaviors by 1) offering students opportunities to practice healthy behaviors; 2) increasing student knowledge and skills

† https://nces.ed.gov/pubs2015/2015015.pdf.

TABLE 2. (*Continued*) Adjusted prevalence ratios* for health-related behaviors, by letter grades earned among high school students (using mostly D's/F's as the referent) — National Youth Risk Behavior Survey, United States, 2015

Health-related behavior	aPR (95% CI)			Wald F p-value
	Mostly A's	Mostly B's	Mostly C's	
Suicide-related behavior				
Seriously considered attempting suicide†††††††	0.35 (0.29–0.42)	0.43 (0.36–0.51)	0.64 (0.53–0.77)	<0.0001
Made a plan about how they would attempt suicide††††††	0.36 (0.28–0.46)	0.49 (0.41–0.58)	0.66 (0.53–0.83)	<0.0001
Attempted suicide*******	0.25 (0.19–0.33)	0.35 (0.27–0.47)	0.59 (0.45–0.78)	<0.0001

Abbreviations: aPR = adjusted prevalence ratio; CI = confidence interval.
* Logistic regression adjusted for sex, race/ethnicity, and grade (i.e., 9th, 10th, 11th, or 12th) in school.
† During the 7 days before the survey.
§ Includes green salad, potatoes (excluding French fries, fried potatoes, or potato chips), carrots, or other vegetables, during the 7 days before the survey.
¶ Not including diet soda or diet pop, during the 7 days before the survey.
** Doing any kind of physical activity that increased their heart rate and made them breathe hard some of the time during the 7 days before the survey.
†† Run by their school or community groups during the 12 months before the survey.
§§ In an average week when they were in school.
¶¶ On an average school day.
*** For something that was not school work on an average school day.
††† At least one drink of alcohol on at least 1 day during the 30 days before the survey.
§§§ One or more times during the 30 days before the survey.
¶¶¶ Any form of cocaine, such as powder, crack, or freebase, one or more times during their life.
**** Also called "smack," "junk," or "China white," one or more times during their life.
†††† Also called "speed," "crystal," "crank," or "ice," one or more times during their life.
§§§§ Used a needle to inject any illegal drug into their body one or more times during their life.
¶¶¶¶ Such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax, one or more times during their life.
***** During their life.
††††† Had sexual intercourse with at least one person during the 3 months before the survey.
§§§§§ During last sexual intercourse among the 30.1% of students nationwide who were currently sexually active.
¶¶¶¶¶ One or more times during the 12 months before the survey, being physically hurt on purpose (including being hit, slammed into something, or injured with an object or weapon on purpose) by someone they were dating or going out with among the 68.6% of students nationwide who dated or went out with someone during the 12 months before the survey. (Note: the prevalence of dating or going out with someone during the 12 months before the survey varies slightly for physical and sexual dating violence because of the differences in the number of usable responses to each violence question.)
****** One or more times during the 12 months before the survey, being forced to do sexual things (including kissing, touching, or being physically forced to have sexual intercourse) when they did not want to do by someone they were dating or going out with among the 69.1% of students nationwide who dated or went out with someone during the 12 months before the survey.
†††††† During the 12 months before the survey.
§§§§§§ Including being bullied through email, chat rooms, instant messaging, Websites, or texting during the 12 months before the survey.
¶¶¶¶¶¶ Did not go to school because they felt unsafe at school or on their way to or from school on at least 1 day during the 30 days before the survey.
******* One or more times during the 12 months before the survey.

through school nutrition programs and services, physical education, and comprehensive health education (including sexual health education); 3) enhancing protective factors such as school connectedness or parent engagement; and 4) shaping school health services and environments more broadly (*9*,*10*). School health programs based on the Whole School, Whole Community, Whole Child or coordinated school health models (https://www.cdc.gov/healthyyouth/wscc/) that include safe, supportive environments and engagement from communities and families as key components, have been linked to improved academic achievement outcomes among students (*2*,*7*). Such evidence suggests that education and public health professionals have a shared interest in promoting student health and that collaborative efforts have the potential to make important strides in improving the health and academic achievement of youths.

Conflict of Interest

No conflicts of interest were reported.

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Summary

What is already known about this topic?

Studies have shown links between health-related behaviors and educational outcomes such as grades, test scores, and other measures of academic achievement; however, many of these studies have used samples that are not nationally representative or are out of date.

What is added by this report?

Analyses of nationwide 2015 Youth Risk Behavior Survey data (controlling for sex, race/ethnicity, and grade in school) reveal that high school students who received mostly A's, mostly B's, or mostly C's had significantly higher prevalence estimates for most protective health-related behaviors and significantly lower prevalence estimates for most health-related risk behaviors compared with students with mostly D's/F's.

What are the implications for public health practice?

School health interventions can promote positive health behaviors and improve both health and academic outcomes for students. Evidence suggests that educational and public health institutions have a shared interest in promoting student health and that collaborative efforts have the potential to make important strides in improving the health and academic achievement of youths.

Update: Increase in Human Infections with Novel Asian Lineage Avian Influenza A(H7N9) Viruses During the Fifth Epidemic — China, October 1, 2016–August 7, 2017

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Among all influenza viruses assessed using CDC's Influenza Risk Assessment Tool (IRAT), the Asian lineage avian influenza A(H7N9) virus (Asian H7N9), first reported in China in March 2013,* is ranked as the influenza virus with the highest potential pandemic risk (*1*). During October 1, 2016–August 7, 2017, the National Health and Family Planning Commission of China; CDC, Taiwan; the Hong Kong Centre for Health Protection; and the Macao CDC reported 759 human infections with Asian H7N9 viruses, including 281 deaths, to the World Health Organization (WHO), making this the largest of the five epidemics of Asian H7N9 infections that have occurred since 2013 (Figure 1). This report summarizes new viral and epidemiologic features identified during the fifth epidemic of Asian H7N9 in China and summarizes ongoing measures to enhance pandemic preparedness. Infections in humans and poultry were reported from most areas of China, including provinces bordering other countries, indicating extensive, ongoing geographic spread. The risk to the general public is very low and most human infections were, and continue to be, associated with poultry exposure, especially at live bird markets in mainland China. Throughout the first four epidemics of Asian H7N9 infections, only low pathogenic avian influenza (LPAI) viruses were detected among human, poultry, and environmental specimens and samples. During the fifth epidemic, mutations were detected among some Asian H7N9 viruses, identifying the emergence of high pathogenic avian influenza (HPAI) viruses as well as viruses with reduced susceptibility to influenza antiviral medications recommended for treatment. Furthermore, the fifth-epidemic viruses diverged genetically into two separate lineages (Pearl River Delta lineage and Yangtze River Delta lineage), with Yangtze River Delta lineage viruses emerging as antigenically different compared with those from earlier epidemics. Because of its pandemic potential, candidate vaccine viruses (CVV) were produced in 2013 that have been used to make vaccines against Asian H7N9 viruses circulating at that time. CDC is working with partners to enhance surveillance for Asian H7N9 viruses in humans and poultry, to improve laboratory capability to detect and characterize H7N9 viruses, and to develop, test and distribute new CVV that could be used for vaccine production if a vaccine is needed.

Epidemiologic data were collected from the WHO Disease Outbreak News† and Influenza Risk Assessment summaries,§ and from recent publications. Genetic and virus characterization data were collected from the publically accessible Global Initiative on Sharing All Influenza Data and GenBank databases.¶ Nucleotide sequence alignments of hemagglutinin (HA) and neuraminidase (NA) genes were created and used to generate phylogenetic trees for lineage determination. Amino acid changes in fifth-epidemic viruses were identified through comparisons with CVVs produced using 2013 Asian H7N9 virus sequences, and identification of viruses as either LPAI or HPAI was accomplished by analysis of the HA cleavage site. CDC assessed the antigenic properties of virus isolates using the hemagglutination inhibition (HI) assay employing a panel of reference ferret antisera that includes antisera raised to LPAI Yangtze River Delta and Pearl River Delta fifth-epidemic viruses, HPAI H7N9 viruses, and the 2013 CVVs. The extent of cross-reactivity with 2013 CVVs and viruses from previous epidemics was assessed.

Epidemiology

During March 31, 2013–August 7, 2017, a total of 1,557 human infections with Asian H7N9 viruses were reported; at least 605 (39%) of these infections resulted in death. All infections were either detected in mainland China, Hong Kong, and Macao, or associated with travel from mainland China (29 cases were exported to Malaysia, Canada, Hong Kong, Macao, and Taiwan). Infections were reported from more provinces, regions, and municipalities in China during the fifth epidemic (30) than during the first four epidemics combined (21) (Figure 2). Similar to epidemics 1–4, 70% of infections during the fifth epidemic occurred in men, and the median age was 57 years (range = 4–93 years); most occurred among persons with recent poultry exposure (90%) and resulted in

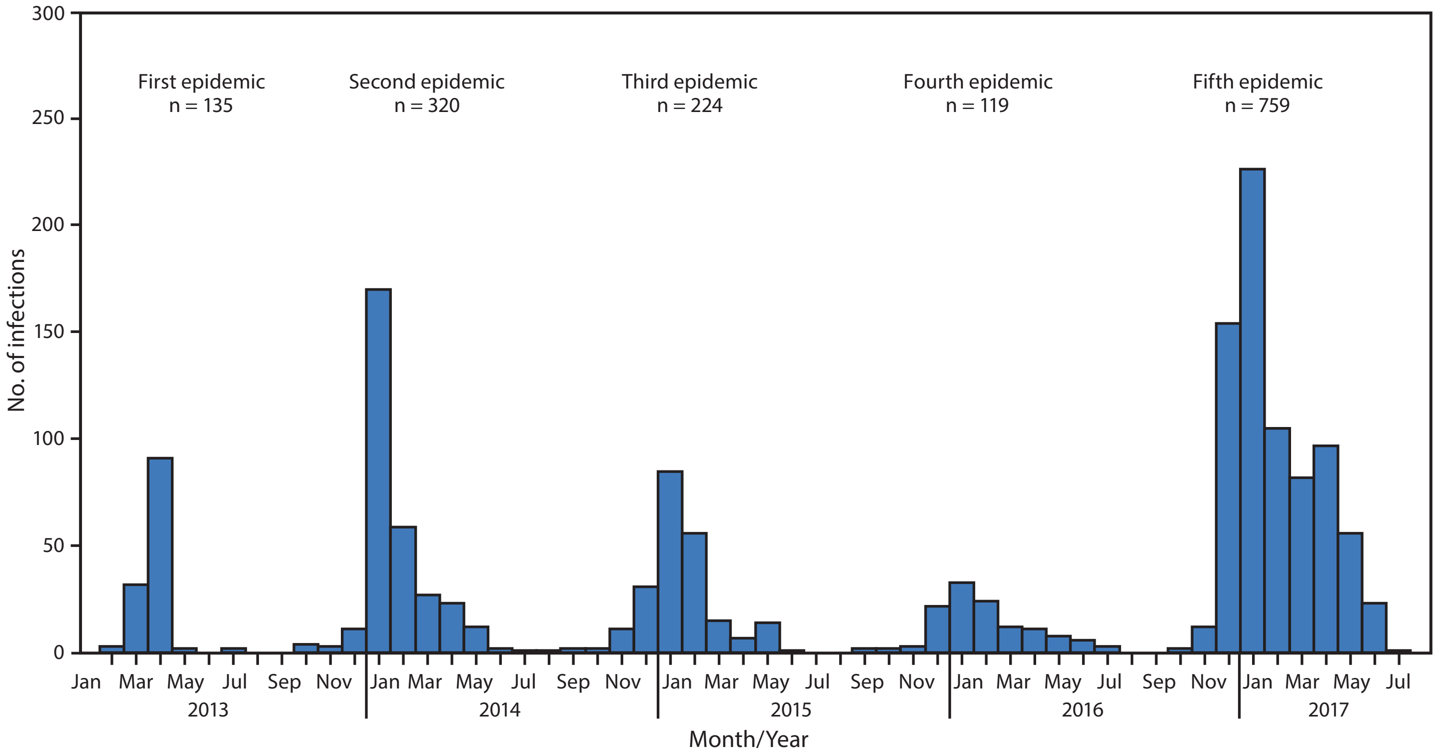
* Total number of fatal cases in mainland China are published on a monthly basis by China National Health and Family Planning Commission. http://www.nhfpc.gov.cn/jkj/s3578/201706/99b1482bfd7e499db90b3ee133e56e13.shtml.

† http://www.who.int/csr/don/en/.

§ http://www.who.int/influenza/human_animal_interface/Influenza_Summary_IRA_HA_interface_06_15_2017.pdf?ua=1.

¶ Global Initiative on Sharing All Influenza Data (https://www.gisaid.org/). GenBank databases (https://www.ncbi.nlm.nih.gov/genbank/).

FIGURE 1. Confirmed Asian lineage avian influenza A(H7N9) virus infections of humans reported to the World Health Organization (N = 1,557),* by month of illness onset — China,† February 19, 2013–August 7, 2017



Source: Publically released infections in Disease Outbreak News (http://www.who.int/csr/don/en/) or Human-Animal Interface Monthly Report (http://www.who.int/influenza/human_animal_interface/en/).
* Date of onset missing for six infections.
† One case was exported to Malaysia (January 2014) and two to Canada (January 2015).

severe respiratory illness (90%)** (*2*). Among the 759 reported infections during the fifth epidemic, 14 clusters of two or three persons with Asian H7N9 virus infections were reported to WHO, compared with an average of nine clusters in each of the previous epidemics (range = 4–11 clusters).

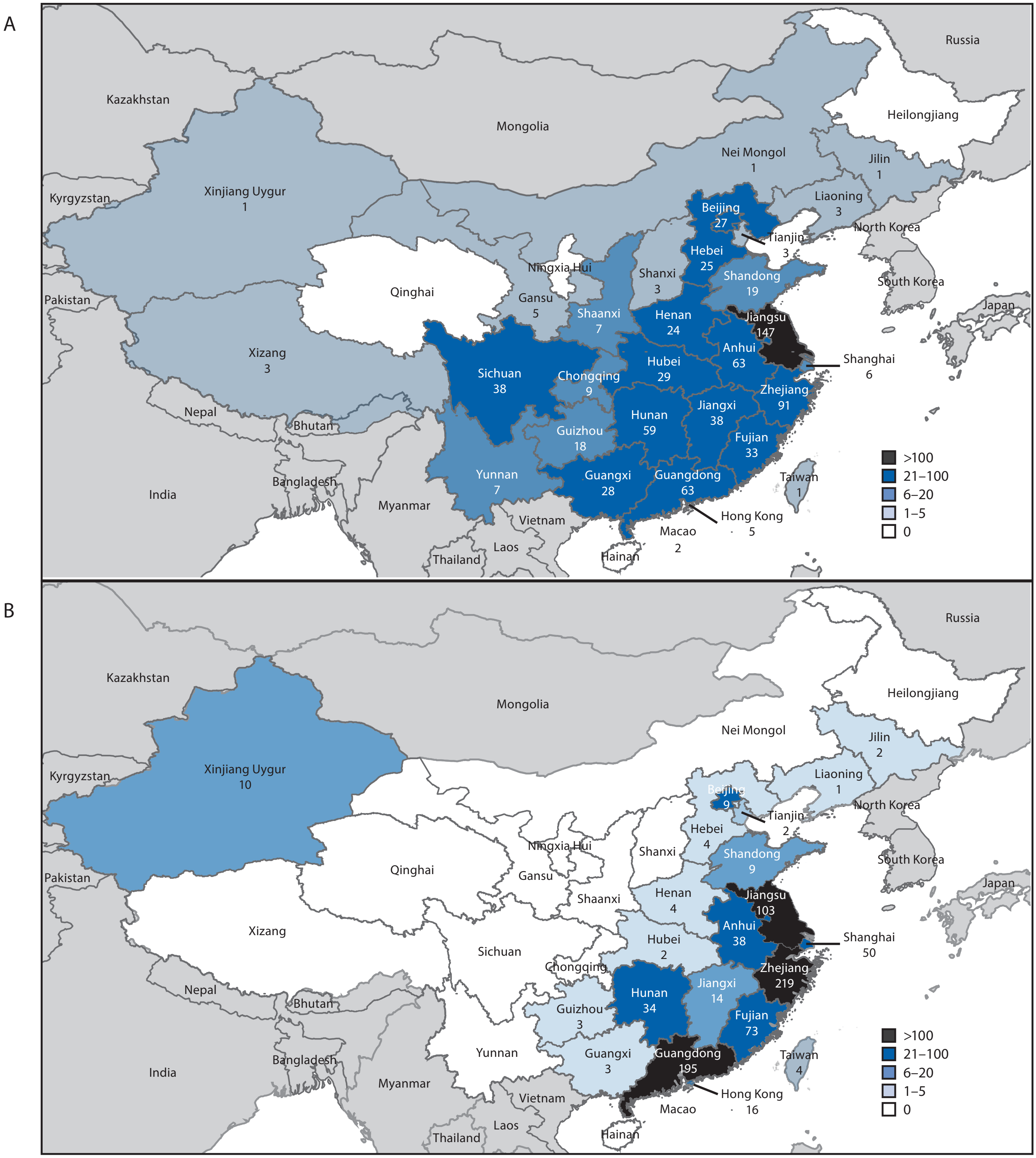
During the fifth epidemic, LPAI Asian H7N9 viruses acquired an HPAI mutation that causes increased morbidity and mortality in poultry. Ten of 33 provinces, regions, and municipalities in China reported HPAI Asian H7N9 viruses in poultry and environmental samples: Fujian, Guangdong, Guangxi, Hebei, Heilongjiang, Henan, Hunan, Inner Mongolia, Shaanxi, and Tianjin.†† Among the 759 human infections identified in the fifth epidemic, 27 were HPAI Asian H7N9 viruses (11 from Guangxi, eight from Guangdong, five from Hunan, one from Hebei and one from Shaanxi Provinces, and one from Taiwan)§§ (*3*). Human infections with HPAI Asian H7N9 viruses were significantly more likely to occur in rural areas, among persons with early hospital admission, and after exposure to sick or dead poultry, but were otherwise similar in their demographic and clinical characteristics to infections with LPAI Asian H7N9 viruses (*3*,*4*).

Analysis of Virus Gene Sequences

Analysis of HA gene sequences demonstrated two distinct Asian H7N9 virus lineages isolated from humans during the fifth epidemic: the Pearl River Delta lineage and Yangtze River Delta lineage (*5*). Among 166 fifth-epidemic Asian H7N9 virus HA gene sequences entered into Global Initiative on Sharing All Influenza Data and GenBank, 160 were from infected humans in mainland China, five were from Hong Kong, and one was from Taiwan. A total of 159 of the virus HA sequences were from the Yangtze River Delta lineage and seven were from the Pearl River Delta lineage, indicating the predominance of the Yangtze River Delta lineage. In addition, 35 (21%) of the 166 fifth-epidemic Asian H7N9 virus specimens and samples (27, 77% from human specimens and 8, 23% from environmental samples) with publicly available sequences had a four amino acid insertion in the cleavage site of the HA protein indicating a mutation found in HPAI viruses (*6*).

** http://www.who.int/influenza/human_animal_interface/HAI_Risk_Assessment/en/.
†† http://www.oie.int/wahis_2/public/wahid.php/Diseaseinformation/WI.
§§ http://ivdc.chinacdc.cn/cnic/en/Surveillance/WeeklyReport/201708/t20170828_151326.htm.

FIGURE 2. Geographic distribution of Asian lineage avian influenza A(H7N9) virus infections of humans reported to the World Health Organization — China,* A) epidemic 5 (October 1, 2016–August 7, 2017) and B) epidemics 1–4 (March 2013–September 30, 2016)



Source: Publically released infections in Disease Outbreak News (http://www.who.int/csr/don/en/) or Human-Animal Interface Monthly Report (http://www.who.int/influenza/human_animal_interface/en/).

* Avian influenza A(H7N9) virus infections of humans reported in mainland China, Hong Kong, Macao, and Taiwan.

NA gene sequence data were available for all 166 viruses collected during the fifth epidemic; 18 (10.8%) viruses (all from patients who were possibly treated with NA inhibitors) had genetic markers of reduced susceptibility to one or more NA inhibitors. All 166 viruses had the S31N mutation in the M2 protein, indicating resistance to amantadine and rimantadine, as was observed in previous Asian H7N9 epidemics (*7*).

Analysis of Virus Surface Proteins

HI testing of fifth-epidemic Yangtze River Delta lineage viruses, which accounted for the majority of available viruses, demonstrated significant antigenic differences compared with 2013 CVVs produced from 2013 Asian H7N9 viruses.¶¶ Ferret antisera raised against the 2013 CVVs poorly inhibited hemagglutination of fifth-epidemic Yangtze River Delta lineage viruses compared with inhibition of viruses tested from previous epidemics. HI testing of HPAI Asian H7N9 viruses also indicated significant antigenic differences compared with 2013 CVVs. As part of a National Institutes of Health trial, sera from adults who received vaccine produced using a 2013 Asian H7N9 CVV showed reduced cross-reactive HI and neutralizing antibody titers to fifth-epidemic Yangtze River Delta lineage and HPAI viruses, compared with titers to 2013 H7N9 viruses (*8*).

Discussion

The fifth annual epidemic of Asian H7N9 in China is marked by extensive geographic spread in poultry and in humans. The number of human infections reported in the fifth epidemic is almost as many as were reported during the previous four epidemics combined. The consistent epidemiology combined with a similar number of clusters suggests that the increased number of human infections appears to be associated with wider geographic spread and higher prevalence of Asian H7N9 viruses among poultry rather than any increased incidence of poultry-to-human or human-to-human spread. Furthermore, surveillance and testing have remained relatively unchanged from the fourth to fifth epidemic.

Although human infections with Asian H7N9 viruses from poultry are rare and no efficient or sustained human-to-human transmission has been detected, when human infections do occur, they are associated with severe illness and high mortality. Continued vigilance is important to identify changes in the virus that might have epidemiologic implications, such as increased transmission from poultry to humans or transmission between humans.

CDC assesses the pandemic potential of novel influenza A viruses using the IRAT evaluation tool. The IRAT analysis process considers the properties of the specific virus, attributes of the population, and associated ecology and epidemiology to assess the potential pandemic risk posed to human health by each virus. In light of the increased number of human infections and virologic changes observed during the fifth epidemic, CDC carried out an IRAT assessment of the newly emerged Yangtze River Delta lineage LPAI Asian H7N9 virus. This virus lineage scored as having the highest potential pandemic risk (moderate to high) among viruses similarly evaluated using the IRAT (*1*).

In March 2017, WHO recommended the development of new CVVs to match the antigenically distinguishable Yangtze River Delta viruses. The WHO Collaborating Center for the Surveillance, Epidemiology and Control of Influenza at CDC generated a new Asian H7N9 CVV derived from a Yangtze River Delta lineage LPAI Asian H7N9 virus, A/Hong Kong/125/2017 (an A/Hunan/02650/2016-like virus) (*9*). The WHO Collaborating Center for Reference and Research on Influenza in China developed a CVV from an HPAI Asian H7N9 virus, A/Guangdong/17SF003/2016. These CVVs, as well as others being developed by other WHO Collaborating Centers for Influenza, can be used for vaccine production, clinical trials, stockpiling and other pandemic preparedness purposes based on ongoing public health risk assessment.

The Government of China remains committed to controlling the transmission of Asian H7N9 viruses from birds to humans, and to mitigating human infections. Specific control measures implemented by the Government of China in response to the pandemic threat include strategies to minimize spread through promoting large-scale farming and centralized slaughtering, improving poultry product cold chain transportation and storage at markets, routine live poultry market closures with cleaning and disinfection, and a national poultry vaccination program (*10*). To monitor and control human infections, the Government of China has issued prevention and control protocols that include guidance on enhanced surveillance for influenza-like illness, severe acute respiratory infection, and pneumonia of unknown etiology; case investigation and contact tracing; and diagnosis and treatment guidance. Additional strategies to monitor and control human infections include conducting field investigations to identify and monitor close contacts of confirmed human infections, and testing environmental samples from possible exposure locations such as live bird markets (*10*).

The findings in this report are subject to at least three limitations. First, underreporting of human infections and deaths with Asian H7N9 viruses is likely, given that most are identified through a passive surveillance system. Second, delays between what has been officially reported to, and publically released by, WHO might occur; thus numbers in this report might vary from those reported by other sources. Finally, as more genetic and antigenic data become available, further evaluation and characterization of these viruses might reveal additional differences.

¶¶ http://apps.who.int/iris/bitstream/10665/254827/1/WER9212.pdf?ua=1.

The evolving Asian H7N9 viruses highlight the importance of rapid analysis and public sharing of sequence data to inform pandemic preparedness efforts. These data allow for the rapid identification of genetic changes known to be associated with antigenic variation, antiviral drug susceptibility, mammalian adaptation, virulence and transmissibility. Assessments based on sequence data have the potential to inform surveillance, guide allocation of outbreak response resources, and inform pandemic preparedness policy decisions, such as selecting viruses for CVV development, and purchasing of prepandemic vaccines and antivirals. CDC continues to partner with China CDC, together with other China government organizations, United Nations organizations, and the governments of surrounding countries to support surveillance for Asian H7N9 viruses in humans, poultry, and environmental samples from live bird markets, and to enhance laboratory capacity. CDC's International Influenza Program also supports efforts by >50 countries to detect and respond to novel influenza A virus threats.*** Guidance for travelers to China is provided at the U.S. CDC Travelers' Health website, (https://wwwnc.cdc.gov/travel/notices/watch/avian-flu-h7n9).

*** https://www.cdc.gov/flu/pdf/international/program/2014-15/2014-15-report_background.pdf.

Acknowledgments

National Influenza Center, World Health Organization Collaborating Center for Reference and Research on Influenza, China CDC, Beijing, China.

Conflict of Interest

Jacqueline M. Katz, reports U.S. Patent 6,196,175 (issued January 2, 2001) for "Preparation and use of recombinant influenza A virus M2 construct vaccine" and U.S. Patent 8,163,545 (issued April 26, 2012) for "An effective vaccine against pandemic strains of influenza viruses." No other conflicts of interest were reported.

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Summary

What is already known about this topic?

The current Asian lineage avian influenza A(H7N9) virus (Asian H7N9) epidemic in China is the fifth and largest epidemic on record.

What is added by this report?

Human infections with Asian H7N9 virus were reported from more provinces, regions, and municipalities in China during the fifth epidemic than in the previous four epidemics combined. Because of antigenic variation between the Yangtze River Delta lineage viruses, the newly emerged high pathogenic Asian H7N9 viruses, and 2013 candidate vaccine viruses, new candidate vaccine viruses have been produced.

What are the implications for public health practice?

These candidate vaccine viruses, as well as others being developed by other World Health Organization Collaborating Centers for Influenza, could be used for vaccine production, clinical trials, stockpiling, and other pandemic preparedness purposes, based on ongoing public health risk assessment. CDC has partnered with China CDC, and other China government organizations, United Nations organizations, and surrounding countries to enhance surveillance and laboratory capacity to detect and respond to Asian H7N9 in animals and humans.

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Vital Signs: Recent Trends in Stroke Death Rates — United States, 2000–2015

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On September 6, 2017, this report was posted as an MMWR Early Release on the MMWR website (https://www.cdc.gov/mmwr).

Abstract

Introduction: The prominent decline in U.S. stroke death rates observed for more than 4 decades has slowed in recent years. CDC examined trends and patterns in recent stroke death rates among U.S. adults aged ≥35 years by age, sex, race/ethnicity, state, and census region.

Methods: Trends in the rates of stroke as the underlying cause of death during 2000–2015 were analyzed using data from the National Vital Statistics System. Joinpoint software was used to identify trends in stroke death rates, and the excess number of stroke deaths resulting from unfavorable changes in trends was estimated.

Results: Among adults aged ≥35 years, age-standardized stroke death rates declined 38%, from 118.4 per 100,000 persons in 2000 to 73.3 per 100,000 persons in 2015. The annual percent change (APC) in stroke death rates changed from 2000 to 2015, from a 3.4% decrease per year during 2000–2003, to a 6.6% decrease per year during 2003–2006, a 3.1% decrease per year during 2006–2013, and a 2.5% (nonsignificant) increase per year during 2013–2015. The last trend segment indicated a reversal from a decrease to a statistically significant increase among Hispanics (APC = 5.8%) and among persons in the South Census Region (APC = 4.2%). Declines in stroke death rates failed to continue in 38 states, and during 2013–2015, an estimated 32,593 excess stroke deaths might not have occurred if the previous rate of decline could have been sustained.

Conclusions and Implications for Public Health Practice: Prior declines in stroke death rates have not continued in recent years, and substantial variations exist in timing and magnitude of change by demographic and geographic characteristics. These findings suggest the importance of strategically identifying opportunities for prevention and intervening in vulnerable populations, especially because effective and underused interventions to prevent stroke incidence and death are known to exist.

Introduction

Stroke death rates in the United States have declined since at least the 1960s; stroke fell from the third to the fourth leading cause of death in 2008 and to the fifth in 2013. Age-standardized rates among adults aged ≥35 years declined from 315.7 deaths per 100,000 in 1968 to 73.3 per 100,000 in 2015.* The substantial decline in stroke death rates has been attributed to improvements in modifiable stroke risk factors and in stroke treatment and care over time (*1*,*2*). Despite this decline, nearly 800,000 persons in the United States have a new or recurrent stroke each year, and approximately 140,000 stroke victims die; thus, stroke accounts for one in every 20 deaths (*3*). Stroke is also a leading cause of serious long-term disability, with an estimated annual cost of $33.9 billion (*3*).†

* American Heart Association annual Heart Disease and Stroke Statistics updates. https://www.heart.org/HEARTORG/General/Heart-and-Stroke-Association-Statistics_UCM_319064_SubHomePage.jsp; CDC WONDER Underlying Cause-Of-Death. https://wonder.cdc.gov/mortSQL.html.

† Direct and indirect costs.

However, a recent study suggested that the rate of decline in stroke death rates has slowed in recent years, and the rate has even increased slightly since 2013 (*4*). Mortality data from the U.S. National Vital Statistics System from the National Center for Health Statistics were used to examine recent trends in stroke death rates by age, sex, and race/ethnicity at the national level and by census region and state during 2000–2015. The findings of this study will help identify populations that could benefit from interventions to prevent and control modifiable stroke risk factors, further improve the quality of care, and reduce stroke prevalence and mortality.

Methods

Data Source. Stroke death rates were examined among adults aged ≥35 years, who bear the largest burden of stroke (approximately 99% in 2015) and typically share common stroke risk factors. To examine trends in stroke death rates for

Key Points

- After more than 4 decades of decline, stroke death rates in the United States have declined more slowly, stalled, or reversed among some subpopulations in recent years.
- Trends in stroke death rates reversed in 2013 among Hispanics and in the South Census Region, where significant declines from year to year changed to significant increases during 2013–2015.
- Thirty-eight states had an unfavorable change in the rate of decline in stroke death rates during 2000–2015.
- An estimated 30,000 excess stroke deaths might have occurred because of the unfavorable changes in the rate of decline in stroke mortality during 2013–2015.
- The findings emphasize the importance of continuing surveillance of stroke and strategically identifying disparities in specific risk factors, incidence, and geography that might be driving the unfavorable changes in the rate of decline so that targeted interventions can be implemented to prevent strokes in vulnerable populations.
- Additional information is available at https://www.cdc.gov/vitalsigns/.

adults aged ≥35 years, by age, sex, race/ethnicity, U.S. Census region, and state, death data from the U.S. National Vital Statistics System during 2000–2015 with stroke (including all subtypes) reported as the underlying cause of death according to the *International Classification of Diseases, Tenth Revision* (ICD-10; codes I60–I69) were analyzed. Population estimates from the U.S. Census Bureau and CDC's National Center for Health Statistics for 2000–2015 were used to calculate age-standardized stroke death rates.[§] Race/ethnicity was categorized into five mutually exclusive groups: non-Hispanic whites (whites), non-Hispanic blacks (blacks), non-Hispanic Asian/Pacific Islanders (A/PI), non-Hispanic American Indian/Alaska Natives, and Hispanics (who could be of any race). State-level analyses were conducted based on the place of residence at death in the United States.

Statistical analysis. Age-specific stroke death rates per 100,000 persons by age group (35–54, 55–64, 65–74, 75–84, and ≥85 years) and age-standardized rates by sex, race/ethnicity, census region,[¶] and state were calculated. Rates were standardized to the 2000 U.S. standard population.

Trend analyses based on the age-standardized or age-specific stroke death rates were conducted to identify different trends in stroke death rates, using Joinpoint software. Joinpoint regression fits a series of joined straight lines on a logarithmic scale to the trend data. These lines, or trend segments, start and end at years where the software detects a statistically significant change in trend. Consequently, trend segments might start and end at different years for each examined variable (e.g., age, race/ethnicity, state, etc.). For each trend segment in the selected model, the annual percent change (APC) was calculated, and the average APC for all years (2000–2015) was obtained as the weighted APC. Because only 16 data points were available for trend analysis, modeling was limited to a maximum of three joinpoints, and the permutation test was used for model selection. Unfavorable changes in the trends were categorized as 1) slowed (a significantly decreasing APC followed by a less negative [significant or nonsignificant] decreasing APC; 2) stalled (a significantly decreasing APC followed by a nonsignificantly increasing APC); or 3) reversed (a significantly decreasing APC followed by a significantly increasing APC (*4*). The number of "excess" stroke deaths associated with the unfavorable changes in trends was estimated in three steps. First, age-, sex-, and race/ethnicity-specific stroke death rates were analyzed using Joinpoint, extrapolating that the stroke death rates would continue to decline through 2015 at the same annual rate as the immediately preceding APC. Second, the age-, sex-, and race/ethnicity-specific populations were multiplied by the extrapolated stroke death rates, to calculate the "expected" number of stroke deaths. Finally, the difference between the observed and extrapolated stroke deaths were calculated by age, sex, and race/ethnicity over time to obtain the number of estimated excess stroke deaths. Because a small number of deaths occurred in the age group 35–54 years, this group was combined with the age group 55–64 years to obtain a stable estimate of excess stroke deaths. Estimated excess stroke deaths during 2013–2015 are reported for better comparability across the groups, noting that the unfavorable changes in trends began in different years for different groups.

Results

Among U.S. adults aged ≥35 years, age-standardized stroke death rates declined 38% from 2000 (118.4 per 100,000 persons) to 2015 (73.3 per 100,000 persons) (Figure 1) with an average APC of -3.1% (Table 1) (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/47567). The mean annual percent decline in stroke death rates changed during 2000–2015: a 3.4% decline per year during 2000–2003, a 6.6% decline per year during 2003–2006, a 3.1% decline per year during 2006–2013, and a nonsignificant 2.5% increase per year during 2013–2015 (Table 1). Although stroke death rates among

[§] Bridged-race postcensal estimates were used for population estimates. https://www.cdc.gov/nchs/data/series/sr_02/sr02_135.pdf.

[¶] https://www.census.gov/geo/reference/gtc/gtc_census_divreg.html.

adults aged 35–54 years declined from 2006 to 2015, for all other age groups and both sexes, and the overall national trend was characterized by stalling declines in the two most recent trend segments. Blacks experienced the highest stroke death rate compared with other racial/ethnic groups, and the stalling of the rate of decline among this group began in 2012. Among Hispanics, the stroke death rate trend reversed in 2013, changing from a 3.6% decline per year during 2000–2013, to a significant 5.8% increase per year during 2013–2015. Stroke death rates continued to decline among American Indian/Alaska Natives during 2000–2015. In the South Census Region, stroke death rate APCs also reversed in 2013, from a 3.3% decline per year during 2006–2013, to a significant 4.2% increase per year during 2013–2015. In the West, Northeast, and Midwest Census Regions, the decline in stroke death rates slowed or stalled in the last trend segment (APC = 0.6% [West], 0.7% [Northeast], and -1.5% [Midwest]). The temporal patterns in national stroke death rates primarily were driven by the rates among adults aged ≥65 years across sex and racial/ethnic groups (Table 1).

An estimated 32,593 excess stroke deaths might have occurred because of unfavorable changes in the rate of decline in stroke mortality during 2013–2015. Among the estimated excess stroke deaths, nearly one third (10,269; 32%) occurred among adults aged 35–64 years (Table 2) (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/47568).

Nationally, 38 (75%) states, including eight of nine states in the Northeast Census Region, seven of 12 in the Midwest, 14 of 17 in the South, and nine of 13 in the West, experienced a slowing, stalling, or reversing in the decline in stroke death rates during 2000–2015 (Supplementary Figure, https://stacks.cdc.gov/view/cdc/47566). In Florida, the decline in the stroke death rate reversed during 2013–2015, with a significant increase (10.8% per year) in the stroke death rate (Figure 2) (Supplementary Table 3, https://stacks.cdc.gov/view/cdc/47569).

Conclusions and Implications for Public Health Practice

The unfavorable changes in declines in stroke death rates identified in this analysis at the national level and among various demographic groups and geographic areas are consistent with other recent U.S. studies (*4*,*5*). Reasons for the slowing, stalling, and reversing in declines in stroke death rates are not clear. These changes could be related to adverse changes in the prevalence or management of stroke risk factors that might increase stroke incidence and other time-limited factors, such as complications of a severe influenza season, as occurred with drifted H3N2 influenza in 2014–15 (*6*,*7*). It is possible that changes in some stroke risk factors, including increased prevalence of obesity (*8*,*9*), diabetes (*10*), unhealthy diets, and physical inactivity (*11*,*12*), over the past few decades are contributing to the slowing of the decline. Obesity is recognized as a major cause of hypertension, which is the single most important modifiable risk factor for stroke (*13*). Despite recent improvements, nearly half of the 75 million U.S. adults with hypertension do not have their blood pressure under control (*14*,*15*). Recent studies have reported that younger adults have experienced a significant increase in both stroke hospitalizations and in associated stroke risk factors (e.g., hypertension, obesity, diabetes, lipid disorder, and tobacco use) documented at the time of the acute stroke hospitalization during the past

FIGURE 1. Stroke deaths and age-standardized stroke death rate among adults aged ≥35 years — United States, 2000–2015

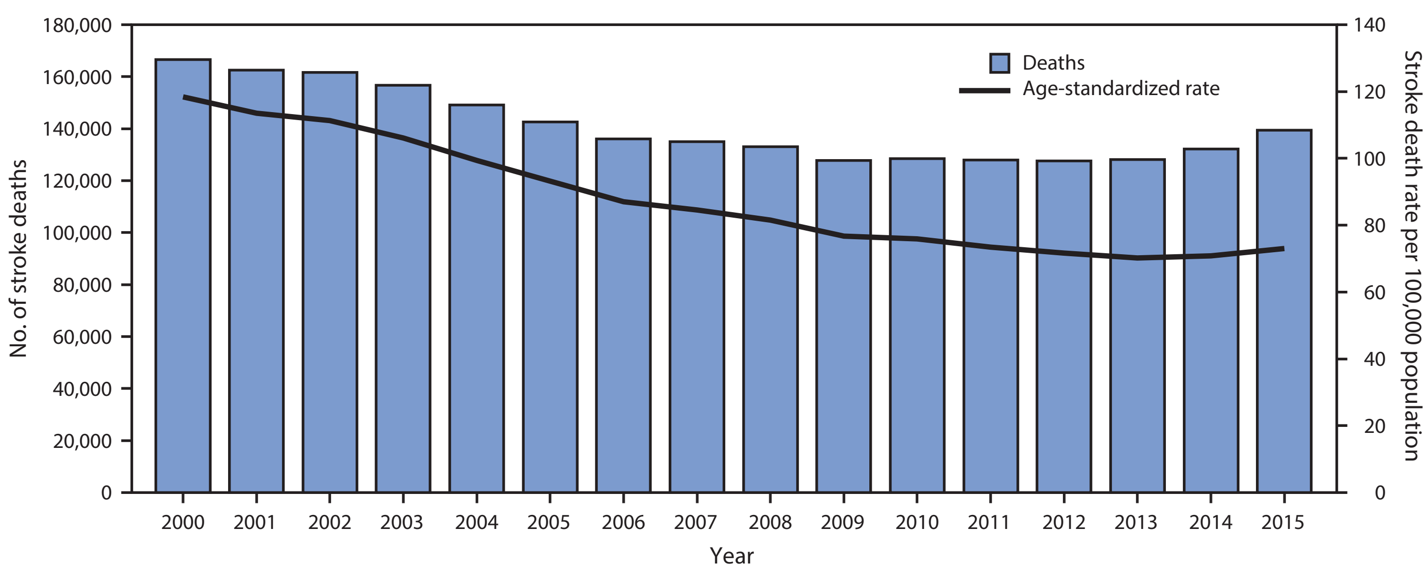

TABLE 1. Age-standardized stroke death rates and annual percentage change by selected characteristics, adults aged ≥35 years — United States, 2000–2015

Characteristic	No. stroke deaths (age-standardized rate)* 2000	No. stroke deaths (age-standardized rate)* 2015	Average APC (95% CI) 2000–2015	Trend segment 1 Year	Trend segment 1 APC (95% CI)	Trend segment 2 Year	Trend segment 2 APC (95% CI)	Trend segment 3 Year	Trend segment 3 APC (95% CI)	Trend segment 4 Year	Trend segment 4 APC (95% CI)
Total	**166,611 (118.4)**	**139,367 (73.3)**	**-3.1 (-3.9 to -2.3)**	**2000–2003**	**-3.4 (-5.1 to -1.5)†**	**2003–2006**	**-6.6 (-10.2 to -2.8)†**	**2006–2013**	**-3.1 (-3.8 to -2.4)†**	**2013–2015**	**2.5 (-1.6 to 6.9)**
Sex											
Men	64,228 (121.3)	57,750 (73.6)	-3.3 (-4.0 to -2.6)	2000–2003	-3.7 (-5.4 to -2.1)†	2003–2006	-6.7 (-10.0 to -3.3)†	2006–2012	-3.4 (-4.2 to -2.6)†	2012–2015	0.8 (-1.0 to 2.6)
Women	102,383 (114.9)	81,617 (71.8)	-3.1 (-4.0 to -2.2)	2000–2003	-3.2 (-5.1 to -1.2)†	2003–2006	-6.5 (-10.4 to -2.4)†	2006–2013	-3.2 (-4.0 to -2.5)†	2013–2015	2.7 (-1.9 to 7.5)
Age group (yrs)											
35–54	8,610 (10.4)	7,095 (8.5)	-1.4 (-1.8 to -1.0)	2000–2006	-0.5 (-1.4 to 0.3)	2006–2015	-2.0 (-2.5 to -1.5)†	—§	—	—	—
55–64	9,956 (41.0)	12,116 (29.6)	-2.1 (-2.7 to -1.6)	2000–2004	-4.3 (-5.7 to -2.9)†	2004–2010	-2.5 (-3.5 to -1.6)†	2010–2015	0.1 (-0.8 to 1.1)	—	—
65–74	23,649 (128.6)	20,793 (75.5)	-3.5 (-4.1 to -3.0)	2000–2009	-4.8 (-5.1 to -4.6)†	2009–2013	-2.8 (-4.5 to -1.1)†	2013–2015	0.9 (-2.4 to 4.3)	—	—
75–84	57,020 (461.3)	38,012 (273.0)	-3.5 (-4.3 to -2.7)	2000–2003	-3.7 (-5.4 to -1.9)†	2003–2006	-7.0 (-10.5 to -3.3)†	2006–2013	-3.2 (-3.9 to -2.5)†	2013–2015	1.3 (-3.0 to 5.9)
≥85	67,376 (1,589.2)	61,351 (975.8)	-3.2 (-4.5 to -2.0)	2000–2003	-2.9 (-5.7 to 0.0)	2003–2006	-8.0 (-13.5 to -2.0)†	2006–2013	-3.3 (-4.4 to -2.3)†	2013–2015	4.4 (-2.0 to 11.1)
Race/Ethnicity¶											
White	137,981 (115.2)	106,770 (71.3)	-3.2 (-3.9 to -2.4)	2000–2003	-3.5 (-5.2 to -1.8)†	2003–2006	-6.8 (-10.3 to -3.2)†	2006–2013	-3.0 (-3.6 to -2.3)†	2013–2015	2.5 (-1.7 to 6.7)
Black	18,850 (161.1)	17,593 (102.0)	-3.0 (-3.7 to -2.3)	2000–2002	-2.1 (-6.4 to 2.5)	2002–2012	-4.5 (-5.0 to -4.1)†	2012–2015	1.6 (-0.9 to 4.1)	—	—
Hispanic	6,018 (89.7)	9,599 (62.5)	-2.4 (-2.9 to -2.0)	2000–2013	-3.6 (-3.9 to -3.4)†	2013–2015	5.8 (2.1 to 9.6)†	—	—	—	—
AI/AN	549 (97.2)	634 (62.1)	-3.3 (-3.9 to -2.8)	2000–2015	-3.3 (-3.9 to -2.8)†	—	—	—	—	—	—
A/PI	3,213 (103.3)	4,771 (58.5)	-4.1 (-4.7 to -3.6)	2000–2009	-5.3 (-6.0 to -4.6)†	2009–2015	-2.3 (-3.5 to -1.2)†	—	—	—	—
Census regions											
Northeast	29,155 (96.6)	22,195 (60.0)	-3.1 (-4.0 to -2.3)	2000–2003	-3.8 (-5.6 to -2.0)†	2003–2006	-6.3 (-10.0 to -2.4)†	2006–2013	-2.5 (-3.3 to -1.8)†	2013–2015	0.7 (-3.6 to 5.3)
Midwest	40,959 (120.5)	31,240 (73.8)	-3.4 (-3.9 to -3.0)	2000–2009	-4.7 (-5.2 to -4.2)†	2009–2015	-1.5 (-2.6 to -0.5)†	—	—	—	—
South	62,529 (127.8)	57,142 (82.6)	-2.9 (-3.7 to -2.1)	2000–2003	-3.3 (-5.1 to -1.5)†	2003–2006	-6.0 (-9.6 to -2.2)†	2006–2013	-3.3 (-3.9 to -2.6)†	2013–2015	4.2 (0.1 to 8.5)†
West	33,968 (122.7)	28,790 (68.9)	-3.9 (-4.8 to -2.9)	2000–2003	-3.1 (-5.4 to -0.8)†	2003–2006	-8.4 (-12.9 to -3.7)†	2006–2012	-4.1 (-5.3 to -3.0)†	2012–2015	0.6 (-2.0 to 3.3)

Abbreviations: A/PI = Asian/Pacific Islander; AI/AN = American Indian/Alaska Native; APC = annual percentage change; CI = confidence interval.
* Per 100,000 persons, standardized to U.S. 2000 population with age groups 35–54, 55–64, 65–74, 75–84 and ≥85 years.
† Significant at p = 0.05.
§ Dashes indicate that the best-fit joinpoint model did not include that trend segment.
¶ Whites, blacks, American Indians/Alaska Natives, and Asian/Pacific Islanders are non-Hispanic. Hispanic persons might be of any race.

15 years (*16–18*). These changes in modifiable stroke risk factors might present new challenges for stroke prevention and for maintaining a sustained decline in stroke mortality in the United States (*19–21*).

The observed unfavorable changes in stroke mortality declines could be related to differences in stroke treatment and care among certain population subgroups, leading to disparate increases in stroke case fatality rates (*1*); however, recent studies suggest that the racial and regional disparities in stroke mortality are driven by differences in stroke incidence (*22,23*). Since 1950, other periods of stagnation in age-standardized stroke death rates followed by subsequent decline have occurred (*24*). Thus, the recent changes could reflect patterns similar to those that have previously occurred, which were then followed by substantial declines.

Approximately 7 million Americans aged ≥20 years report having had a stroke, yet approximately 80% of strokes are preventable (*1*). Numerous randomized controlled trials, observational studies, and interventions have demonstrated the effectiveness of lifestyle changes, improving the quality of acute stroke care, and secondary prevention in reducing stroke incidence or mortality, disability, and health care costs.**

Recognizing the signs and symptoms of a stroke and knowing the importance of calling 9-1-1 is critical to ensuring that stroke patients receive the best care as quickly as possible. Stroke symptoms tend to occur suddenly and include sudden onset of weakness or numbness on one side of the body, sudden confusion, trouble speaking or understanding, sudden trouble

** https://www.cdc.gov/stroke/healthy_living.htm.

TABLE 2. Observed, expected, and estimated number of excess stroke deaths by age, sex, and race/ethnicity — United States, 2013–2015

	Stroke deaths		
Characteristic	**Observed**	**Expected***	**Excess† (% of total)**
Total	**378,787**	**364,194**	**32,593 (100)**
Age group (yrs)			
35–64	44,843	34,575	10,269 (32)
65–74	54,693	51,314	3,379 (10)
75–84	106,316	100,081	6,235 (19)
≥85	172,935	160,226	12,709 (39)
Sex			
Men	160,795	141,267	19,528 (60)
Women	217,992	204,927	13,065 (40)
Race/Ethnicity§			
White	308,396	285,170	23,226 (71)
Black	43,870	38,030	5,840 (18)
Hispanic	21,823	2,858	2,858 (9)
AI/AN	—¶	—	—
A/PI	4,698	4,029	669 (2)

Abbreviations: A/PI = Asian/Pacific Islander; AI/AN = American Indian/Alaska Native.

* The expected number of stroke deaths were obtained by 1) assuming that the age-, sex-, and racial/ethnic-specific stroke mortality rates would continue to decline through 2015 at the annual rate of the immediately preceding APC as identified by the Joinpoint analysis, and 2) multiplying the age-, sex-, and racial/ethnic-specific population with the assumed age-, sex-, and racial/ethnic-specific stroke death rates for each year.

† Excess stroke deaths were calculated by 1) estimating the age-, sex-, and race/ethnicity-specific stroke death rates using Joinpoint, assuming the stroke death rates would continue to decline through 2015 at the annual rate of the immediately preceding APC, 2) calculating the "expected" number of stroke death by multiplying the age-, sex-, and race/ethnicity-specific population by the assumed stroke death rates, and 3) calculating the excess stroke deaths based on the difference between the observed and expected stroke deaths by age-, sex-, and race/ethnicity over time. The excess stroke deaths during 2013–2015 were reported for better comparability across the groups because the starting year of the unfavorable changes in trend might be different for different groups.

§ Whites, blacks, American Indians/Alaska Natives and Asian/Pacific Islanders are non-Hispanic; Hispanic persons might be of any race.

¶ Excess deaths were not calculated for this group because the trend did not change during the study period.

seeing in one or both eyes, sudden trouble walking, dizziness or loss of balance, or a sudden severe headache. CDC's Paul Coverdell National Acute Stroke Program (https://www.cdc.gov/dhdsp/programs/stroke_registry.htm) is working closely with partners in health care to enhance the quality of stroke care through data-driven quality improvement in approximately 570 hospitals, which have treated >620,000 acute stroke patients in the United States since 2005. With better recognition of stroke by the general public and emergency medical services, better care provided by emergency medical services and in the hospital, and the initiation of secondary stroke prevention, the Coverdell program is developing coordinated systems of care to reduce stroke-related death and disability. In addition, the goal of the Million Hearts initiative,†† co-led by CDC and the Centers for Medicare & Medicaid Services and supported by many public and private partners, is to prevent 1 million heart attacks and strokes by 2022. This goal can be achieved by reducing sodium intake, tobacco use, and physical inactivity, and improving implementation of the ABCS (aspirin when appropriate, blood pressure control, cholesterol management, and smoking cessation), cardiac rehabilitation, and patient engagement, with a heightened focus on priority populations at high risk for heart disease and stroke.

The findings in this report are subject to at least six limitations. First, the underlying cause of death on death certificates might be subject to misclassification, as well as changes or improvements in cause of death identification (*1*). Second, age-standardized stroke death rates do not represent actual stroke death rates; they were appropriate for comparisons across populations and over time, but will vary more from the unadjusted rate as the population distribution changes over time. To address this concern, age-specific rates were also provided. Third, Joinpoint with permutation tests were used for the trend analyses; selecting different models that use different statistical tests might result in different trend patterns. Fourth, the lower number of stroke deaths in some states might affect the detection of trends. Fifth, excess stroke deaths were estimated by assuming stroke death rates would continue to decline through 2015 at the annual rate of the most recent APC, and represents the hypothetical achievable reduction in stroke deaths. Finally, in light of evidence supporting a role for influenza infection in the development of cardiovascular events (*25*,*26*), it is unclear what effect the severe influenza seasons in 2012–13 and 2014–15 (https://gis.cdc.gov/grasp/fluview/mortality.html) might have had on stroke mortality in recent years.

The substantial decline in stroke death rates during the past four decades has slowed, stalled or, in some cases, reversed in recent years, and substantial variations exist in the timing and magnitude of this unfavorable change among subpopulations and states. These findings emphasize the importance of strategically identifying disparities in specific risk factors, incidence, and geography that might be driving the unfavorable changes in decline, so that targeted interventions can be implemented to prevent strokes in vulnerable populations.

Conflict of Interest

No conflicts of interest were reported.

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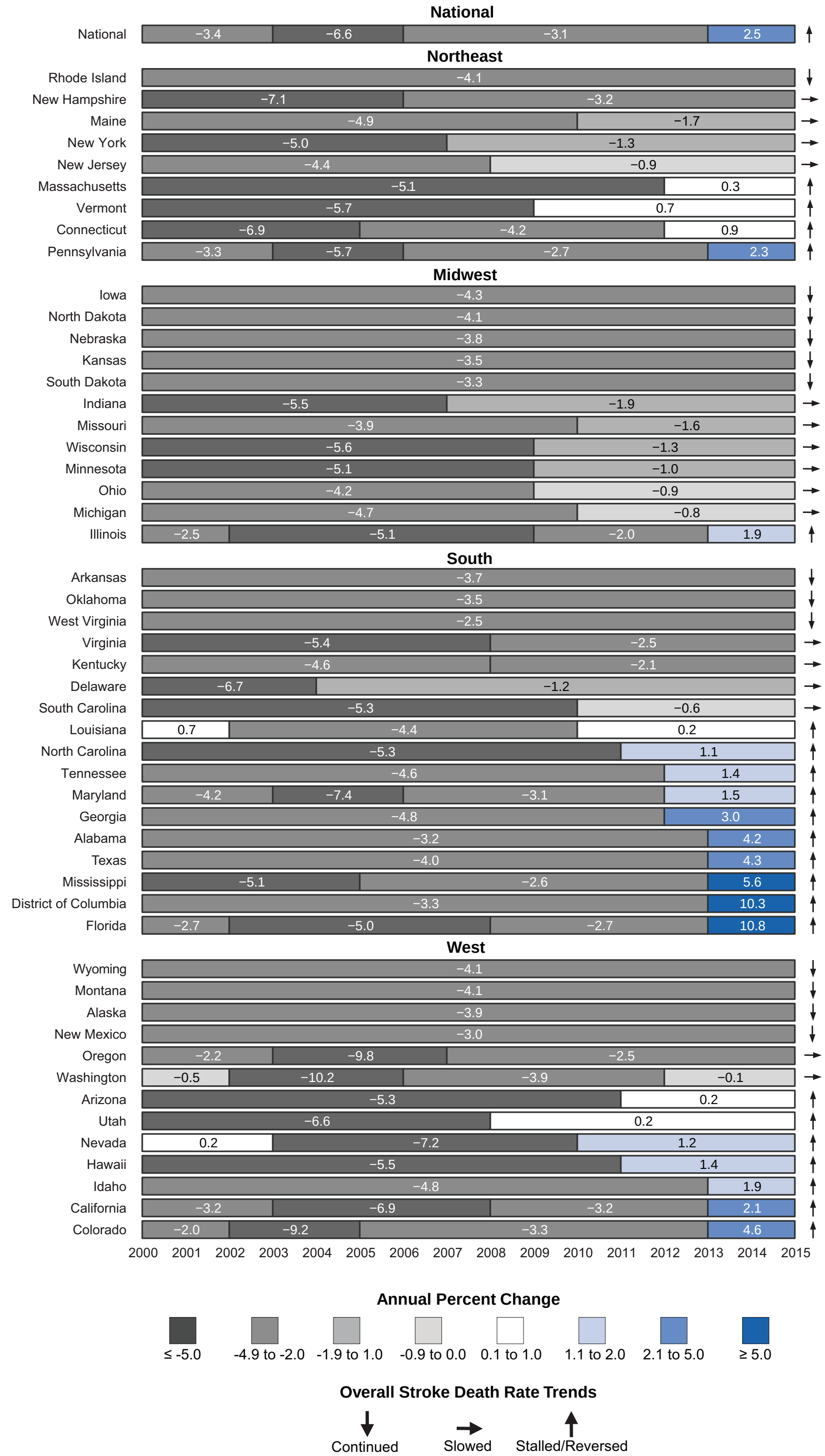
†† https://millionhearts.hhs.gov.

FIGURE 2. Trends in age-standardized stroke death rates among adults aged ≥35 years, by state and census region — United States, 2000–2015*,†,§



* Continued: significant decrease in stroke death rate continued over the period.
† Slowed: significant decrease in stroke death rate followed by a less negative decreasing (significant or nonsignificant) trend segment.
§ Stalled/reversed: significant decrease in stroke death rate followed by a nonsignificant (stalled) or significant (reversed) increasing trend segment (final Joinpoint trend segment Annual Percent Change >0).

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Notes from the Field

Clostridium perfringens Outbreak at a Catered Lunch — Connecticut, September 2016

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In September 2016, the Connecticut Department of Public Health was notified of a cluster of gastrointestinal illnesses among persons who shared a catered lunch. The Connecticut Department of Public Health worked with the local health department to investigate the outbreak and recommend control measures. Information about symptoms and foods eaten was gathered using an online survey. A case was defined as the onset of abdominal pain or diarrhea in a lunch attendee <24 hours after the lunch. Risk ratios (RRs), 95% confidence intervals (CIs), and Fisher's exact p-values were calculated for all food and beverages consumed. Associations of food exposures with illness were considered statistically significant at $p<0.05$.

Among approximately 50 attendees, 30 (60%) completed the survey; 19 (63%) respondents met the case definition. The majority of commonly reported symptoms included diarrhea (17 of 18), abdominal pain (15 of 16), and headache (7 of 15). The median interval from lunch to illness onset was 5.3 hours (range = 0.4–15.5 hours) for any symptom and 7 hours (range = 2.5–13 hours) for diarrhea. Analysis of food exposures reported by 16 ill and 10 well respondents (four respondents did not provide food exposure information) found illness to be associated with the beef dish (RR = undefined; CI = 1.06–∞; p = 0.046) (Table). All 16 ill respondents reported eating the beef. Coffee was also associated with illness; however, all 13 coffee drinkers who became ill also ate the beef. Eating cake approached significance (p = 0.051); all 10 cake eaters who became ill also ate the beef.

The caterer had begun preparing all dishes the day before the lunch. Meats were partially cooked and then marinated in the refrigerator overnight. In the morning, they were sautéed 2 hours before lunch. Inspection of the facility found the limited refrigerator space to be full of stacked containers that were completely filled with cooked food, disposable gloves that appeared to have been washed for reuse, and a porous wooden chopping block.

The caterer's four food workers reported no recent illness. Stool specimens from the food workers and from four ill attendees all tested negative for norovirus, *Campylobacter*, *Escherichia coli* O157, *Salmonella*, and *Shigella* at the Connecticut State Public Health Laboratory. All eight specimens were sent to the Minnesota Department of Health Public Health Laboratory, where additional testing was available. Two specimens from food workers were positive for enterotoxigenic *Escherichia coli* by polymerase chain reaction, but no enterotoxigenic *E. coli* colonies were isolated. Seven specimens (four from food workers and three from attendees) were culture-positive for *Clostridium perfringens*, and specimens from all attendees contained *C. perfringens* enterotoxin. Pulsed-field gel electrophoresis of 29 *C. perfringens* isolates from the culture-positive specimens found no matches among attendee isolates, but demonstrated a single matching pattern between two food worker specimens. No leftover food items were available for testing.

C. perfringens, a gram-positive, rod-shaped bacterium, forms spores allowing survival at normal cooking temperatures and germination during slow cooling or storage at ambient temperature (*1*). Diarrhea and other gastrointestinal symptoms are caused by *C. perfringens* enterotoxin production in the intestines. Vomiting is rare and illness is usually self-limited, although type C strains can cause necrotizing enteritis (*1*).

Symptoms reported were consistent with *C. perfringens* infection, with a predominance of diarrhea, and median diarrhea onset time was at the lower end of the typical *C. perfringens* incubation period (6–24 hours) (*1*). *C. perfringens* enterotoxin detection in the stool of two or more ill persons confirms *C. perfringens* as the outbreak etiology (*2*). Both *C. perfringens* and enterotoxigenic *E. coli* can colonize asymptomatic persons (*3,4*), which might explain the presence of these pathogens in the stools of asymptomatic food workers. Pulsed-field gel electrophoresis did not identify the *C. perfringens* strain responsible for the outbreak, but findings add to the evidence for a wide variety of *C. perfringens* strains, not all producing *C. perfringens* enterotoxin (*5*).

C. perfringens outbreaks are typically associated with improper cooling or inadequate reheating of contaminated meats (*1*), which might have occurred with the beef dish. The restaurant was advised about the need for adequate refrigeration and best practices for cooling foods, including using stainless steel rather than plastic containers, avoiding filling containers to depths exceeding two inches, avoiding stacking containers, and ventilating hot food. Upon follow-up inspection, staff members discarded disposable gloves after one use, used only food-grade cutting boards, and maintained proper food temperatures for hot holding, cold holding, cooling, and reheating, as outlined in the Food and Drug Administration Food Code.

An estimated 1 million illnesses in the United States each year are attributable to *C. perfringens*, but fewer than 1,200 illnesses are reported annually with *C. perfringens* outbreaks (*6*).

TABLE. Associations between illness and food exposures reported by attendees at a catered lunch — Connecticut, September 2016

	Ill persons (n = 16)		Well persons (n = 10)			
Food/Drink exposure	**No. who ate item**	**No. who did not eat item**	**No. who ate item**	**No. who did not eat item**	**Risk ratio (95% CI)**	**P-value**
Tripe	12	4	5	5	1.59 (0.72–3.51)	0.234
Fish	9	7	3	7	1.50 (0.81–2.78)	0.248
Pork	10	6	5	5	1.22 (0.64–2.34)	0.689
Chicken	9	7	6	4	0.94 (0.51–1.73)	1.000
Beef	16	0	7	3	—* (1.06–∞)	0.046†
Noodles	11	5	7	3	0.98 (0.51–1.88)	1.000
Mixed vegetables	8	8	4	6	1.17 (0.64–2.14)	0.702
Spring rolls	14	2	7	3	1.67 (0.55–5.08)	0.340
Cake	10	6	2	8	1.94 (1.01–3.75)	0.051
Pudding	7	9	3	7	1.24 (0.69–2.25)	0.683
Yam dessert	10	6	4	6	1.43 (0.74–2.75)	0.422
Rice	15	1	9	1	1.25 (0.30–5.17)	1.000
Grapes	9	7	5	5	1.10 (0.59–2.04)	1.000
Mango salad	6	10	4	6	0.96 (0.51–1.81)	1.000
Muffin	5	11	1	9	1.52 (0.89–2.58)	0.352
Bagel	8	8	2	8	1.60 (0.90–2.86)	0.218
Coffee	11	5	2	8	2.20 (1.06–4.55)	0.041†
Juice	5	11	2	8	1.23 (0.67–2.26)	0.668
Water	15	1	10	0	0.60 (0.44–0.83)	1.000
Soda	4	12	2	8	1.11 (0.57–2.17)	1.000

Abbreviations: CI = confidence interval; RR = risk ratio.
* The risk ratio is undefined because the calculation involves dividing by zero.
† Statistically significant finding.

C. perfringens testing is not routine for foodborne outbreaks; even if testing is unavailable, *C. perfringens* should be considered when improper cooling, inadequate reheating, and improper temperature maintenance of meat are identified.

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Conflict of Interest

No conflicts of interest were reported.

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Announcements

National Food Safety Education Month — September 2017

September is National Food Safety Education Month. One of CDC's food safety objectives is to raise awareness about healthy practices to prevent food poisoning. Every year in the United States, an estimated one in six persons (48 million persons) become ill, and 3,000 die from eating contaminated food (*1*). Some persons are at higher risk for foodborne illnesses (food poisoning) or might experience more severe symptoms: children aged <5 years (*2*), adults aged ≥65 years (*3*), pregnant women, and those with immune systems compromised by medical conditions, such as cancer, diabetes, and human immunodeficiency virus infection, or by treatments such as chemotherapy.

This year, CDC is focusing on raising awareness about these groups at high risk for foodborne illnesses. Persons in these groups should not eat undercooked animal products (e.g., meat, poultry, eggs, or seafood) (*4*), raw or lightly cooked sprouts, or unpasteurized milk and juices. They should also avoid eating soft cheese (e.g., queso fresco) unless the product's label indicates that it was made with pasteurized milk.

Information about CDC's activities related to Food Safety Education Month can be found at https://www.cdc.gov/foodsafety/education-month.html. Information on preventing food poisoning can be found at https://www.cdc.gov/foodsafety/groups/consumers.html.

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Community Preventive Services Task Force Recommendation for Intensive Lifestyle Interventions for Patients with Type 2 Diabetes

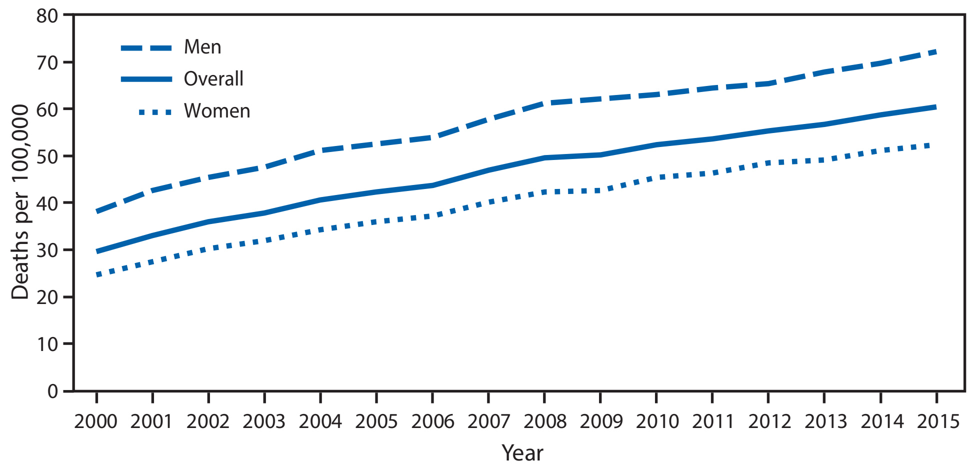
The Community Preventive Services Task Force (CPSTF) recently posted new information on its website: "Diabetes Management: Intensive Lifestyle Interventions for Patients with Type 2 Diabetes." The information is available at https://www.thecommunityguide.org/findings/diabetes-intensive-lifestyle-interventions-patients-type-2-diabetes.

Established in 1996 by the U.S. Department of Health and Human Services, the CPSTF is an independent, nonfederal panel of public health and prevention experts who are appointed by the director of CDC. The CPSTF provides information for a wide range of persons who make decisions about programs, services, and other interventions to improve population health. Although CDC provides administrative, scientific, and technical support for the CPSTF, the recommendations developed are those of the CPSTF and do not undergo review or approval by CDC.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates* from Unintentional Falls Among Adults Aged ≥65 Years,† by Sex — National Vital Statistics System, United States, 2000–2015



* Deaths per 100,000 standard population, year 2000.

† As the underlying cause of death, unintentional falls were coded as W00–W19 in the *International Classification of Diseases, Tenth Revision*.

From 2000 to 2015, the age-adjusted unintentional fall death rate for adults aged ≥65 years increased an average of 4.9% per year. The death rate for women increased from 24.6 to 52.4 per 100,000 population. The death rate for men increased from 38.2 to 72.2. Throughout the period, men had higher death rates than women.

Source: National Vital Statistics System. Underlying cause of death data, 2000–2015. https://wonder.cdc.gov/ucd-icd10.html.

Reported by: Jiaquan Xu, MD, jiaquanxu@cdc.gov, 301-458-4086.

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