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Contact Lens Health Week — August 22–26, 2016

August 22–26, 2016, marks the third annual Contact Lens Health Week. In collaboration with partners from clinical, public health, industry, and regulatory sectors, CDC is promoting healthy contact lens wear and care practices to reduce the risk for eye infections among the approximately 41 million persons in the United States who wear contact lenses. Research after outbreaks of rare but serious eye infections in the United States have indicated that these infections occur most often in contact lens wearers who do not take proper care of their contact lenses, indicating a need to promote safer wear and care (*1*,*2*).

A report in this issue of *MMWR* analyzed 1,075 contact lens–related eye infections reported to the Food and Drug Administration's Medical Device Report database. Nearly 20% of the reports described a patient who had eye damage, and approximately 25% of the reports described potentially modifiable factors that might have put patients at risk for a contact lens–related corneal infection, such as sleeping in lenses or wearing lenses for longer periods than prescribed.

Although most contact lens wearers receive the benefits of vision correction, contact lenses can pose an infection risk, especially if they are not worn and cared for properly. Practicing proper contact lens hygiene and regularly visiting an eye care provider are important actions for keeping contact lens wearers' eyes healthy. Additional information on Contact Lens Health Week and the proper wear and care of contact lenses is available at http://www.cdc.gov/contactlenses.

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Contact Lens–Related Corneal Infections — United States, 2005–2015

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Keratitis (inflammation of the cornea) can result from contact lens wear or other causes. Keratitis from all causes, including contact lens wear, results in approximately 1 million clinic and emergency department visits annually, with an estimated cost of $175 million in direct health care expenditures in 2010 (*1*). Approximately 41 million U.S. residents wear contact lenses, and in 2014, >99% of contact lens wearers surveyed reported at least one behavior that puts them at risk for a contact lens–related eye infection (*2*). The Center for Devices and Radiological Health at the Food and Drug Administration (FDA) regulates contact lenses as medical devices, and certain adverse events related to contact lenses are reported to FDA's Medical Device Report (MDR) database. To describe contact lens–related corneal infections reported to the FDA, 1,075 contact lens–related MDRs containing the terms "ulcer" or "keratitis" reported to FDA during 2005–2015 were analyzed. Among these 1,075 reports, 925 (86.0%) were reported by a contact lens manufacturer and 150 (14.0%) by an eye care

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provider or patient. Overall, 213 (19.8%) reports described a patient who had a central corneal scar, had a decrease in visual acuity, or required a corneal transplant following the event. Among the reports, 270 (25.1%) described modifiable factors known to be associated with an increased risk for contact lens–related corneal infections, including sleeping in contact lenses or poor contact lens hygiene; the remainder did not provide details that permitted determination of associated factors. Continued efforts to educate contact lens wearers about prevention of contact lens–related eye infections are needed.

FDA's MDR database contains reports submitted by mandatory reporters (manufacturers, importers, and device user facilities*) and voluntary reporters (health care professionals, patients, and consumers). FDA uses MDRs to monitor device performance, detect potential device-related safety issues, and develop benefit/risk assessments of these devices. An MDR contains standardized device and patient problem codes, as well as a narrative description of the adverse event. A contact lens MDR was included in this analysis if it was submitted by a U.S. reporter during 2005–2015 and contained the terms "ulcer" or "keratitis" anywhere in the MDR; these terms were selected after reviewing a subset of MDRs indicating that these terms reliably identified reports of apparent microbial keratitis. Each MDR narrative was reviewed by at least two reviewers, and data pertaining to modifiable risk factors, outcomes, and etiologic agents were abstracted. Discrepancies related to data interpretation were discussed by the study team and resolved by consensus. Frequencies of modifiable risk factors, outcomes, and etiologic agents were calculated for both standard variables and variables created from abstracted narrative data.

The final data set included 1,075 MDRs, representing 62% of all contact lens MDRs from U.S. reporters during 2005–2015. Overall, 925 (86.0%) MDRs were reported to FDA by contact lens manufacturers, and 150 (14.0%) were reported by an eye care provider or patient. A total of 615 (57.2%) reports were associated with soft daily wear lenses,† 381 (35.4%) with soft extended-wear lenses,§ 36 (3.3%) with daily disposable lenses,¶ and 43 (4.0%) with rigid gas-permeable lenses.** Thirty-three (3.1%) reports were associated with decorative or cosmetic lenses.†† Sixteen (1.5%) reports indicated purchase of lenses without a prescription, from an unapproved source such as a flea market or costume shop. One hundred thirty

* A device user facility is a hospital, ambulatory surgical facility, nursing home, or outpatient facility (including urgent care clinics and emergency departments).

† Soft daily wear lenses are contact lenses made of soft, flexible, plastics that allow oxygen to pass through to the cornea. They are worn daily and removed, cleaned, and stored prior to sleeping.

§ Soft extended wear lenses are contact lenses made of soft, flexible plastics that allow oxygen to pass through to the cornea. They can be worn overnight or continuously for up to 30 days.

¶ Daily disposable lenses are contact lenses that are worn once and discarded daily.

** Rigid gas-permeable lenses are contact lenses made of durable materials resistant to deposit buildup.

†† Decorative or cosmetic lenses are contact lenses that change the look of the eye but might not correct vision. These lenses can be daily disposable, soft daily, soft extended wear, or rigid gas permeable lenses.

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(12.1%) reports described patients who went to an emergency department or urgent care clinic for their condition, and 25 (2.3%) reported patients who were hospitalized. Eye damage, defined as having a central corneal scar or a decrease in visual acuity, or needing a corneal transplant, was indicated in 213 (19.8%) reports (Table 1).

Two hundred seventy (25.1%) reports described potentially modifiable factors that might have put the patient at risk for a contact lens–related corneal infection. Extended wear of lenses (defined as routine wearing of lenses continuously or overnight, whether prescribed for extended wear or not) was noted in 121 (11.3%) reports, and often prompted the provider to discontinue their use. Other behaviors reported included occasional overnight wear or napping in lenses (7.0%), overwear of lenses (wearing lenses for longer than the prescribed period) (7.9%), using expired lenses or products (0.7%), storing lenses in tap water (0.8%), and wearing lenses while swimming (0.9%) (Table 2). The pathogen causing the infection was reported in 137 (12.7%) MDRs. The most commonly mentioned pathogens were, in order of frequency, *Pseudomonas* (48, 4.5%), *Acanthamoeba* (34, 3.2%), *Fusarium* (24, 2.2%), and *Staphylococcus* species (15, 1.4%). Analysis of narrative sections of reports of patients who ultimately recovered revealed frequent visits to their eye care provider (sometimes daily), frequent administration of prescribed treatment (including hourly administration of eye drops), and missed work or school during the acute phase of their infection.

TABLE 1. Number and percentage of patients with contact lens–related eye infections (N = 1,075), by selected characteristics and outcomes — Food and Drug Administration's Medical Device Report Database, 2005–2015

Characteristic	No. (%)
Female sex (n = 960*)	637 (66.4)
Type or source of lens	
Daily disposables	36 (3.4)
Soft daily wear	615 (57.2)
Soft extended wear	381 (35.4)
Rigid gas permeable	43 (4.0)
Decorative or cosmetic lens†	33 (3.1)
Purchased from unlicensed source (i.e., flea market or costume shop)	16 (1.5)
Outcome	
Emergency department or urgent care clinic visit	130 (12.1)
Hospitalized	25 (2.3)
Eye damage§	213 (19.8)
Corneal transplant	47 (4.4)

* Sex was unknown for 115 patients.
† Decorative or cosmetic lenses can include any type of lens (i.e., daily disposables, soft daily wear, soft extended wear, or rigid gas permeable).
§ Having a central corneal scar or a decrease in visual acuity, or requiring a corneal transplant.

TABLE 2. Modifiable factors known to increase the risk for contact lens–related eye infections mentioned in reports of patients with infectious keratitis (N = 1,075) — Food and Drug Administration's Medical Device Report Database, 2005–2015.

Risk factor*	No. (%)
Any modifiable risk factor	270 (25.1)
Extended wear†	121 (11.3)
Occasional sleeping in contact lenses	75 (7.0)
Overwear (i.e., longer than the prescribed period)	85 (7.9)
Using expired lenses or products	8 (0.7)
Storing lenses in tap water	9 (0.8)
Wearing lenses while swimming	10 (0.9)
Unspecified hygiene problem	12 (1.1)

* These categories are not mutually exclusive.
† Defined as routine wearing of lenses continuously or overnight, whether the use is prescribed or not.

Discussion

During the reporting period included in this analysis, 25.1% of MDRs that included the terms "ulcer" or "keratitis" mentioned a modifiable risk factor, including occasionally sleeping in contact lenses or extended wear of lenses, whereas few reports were associated with problems with the contact lens itself, such as the lens being ripped or torn. Other studies have shown that sleeping in contact lenses, whether occasionally or as part of a prescribed wearing schedule (i.e., extended wear lenses), increases the risk for contact lens–related eye infections by sixfold to eightfold (*3*,*4*). In addition, 19.8% of analyzed MDRs described eye damage after the contact lens–related infection. However, the actual proportion of contact lens–related infections that result in eye damage cannot be determined from the MDR database because of the passive nature of this surveillance system.

The MDR narratives reviewed for this analysis, which described frequent visits to eye care providers, frequent administration of prescribed treatments, and missed work or school give a more patient-focused view of the impact of microbial keratitis, qualitatively corroborating previous findings using large databases (*1*) and demonstrating substantial morbidity, even among patients who ultimately recover. MDR regulations mandate reporting of adverse events and product problems by manufacturers, importers, and device user facilities such as hospital emergency departments and urgent care facilities (*5*).

A high percentage of reports noted extended wear or sleeping in contact lenses. Habitual or occasional sleeping in contact lenses has been shown to increase risk for microbial keratitis (*3*,*6*). Conversely, wearers of daily disposable lenses have been shown to have a lower risk for eye infections (*3*), and in this analysis, daily disposable lenses were infrequently listed in reports for microbial keratitis.

The findings in this report are subject to at least four limitations. Although MDRs are a valuable source of information, they represent a passive surveillance system that includes the potential submission of incomplete, inaccurate, untimely, unverified, or biased information. Second, neither the

Summary

What is already known about this topic?

Approximately 41 million persons in the United States wear contact lenses, a safe and effective form of vision correction if worn and cared for as directed. Contact lenses are medical devices that are regulated by the Food and Drug Administration (FDA). Adverse events related to contact lenses are reported to FDA's Medical Device Report (MDR) database.

What is added by this report?

During 2005–2015, a total of 1,075 MDRs describing contact lens–related corneal infections were reported to the FDA MDR database. Approximately 20% of these MDRs described a patient who suffered eye damage. Approximately 25% of the 1,075 MDRs described potentially modifiable factors that might have put the patient at risk for a contact lens–related corneal infection, such as sleeping in lenses or wearing lenses longer than for the prescribed period.

What are the implications for public health practice?

Prompt reporting of adverse events can help the FDA identify and understand the health risks related to the use of contact lenses. Contact lens wearers can reduce their risk for contact lens–related infections by improving their hygiene behaviors, such as not sleeping in contact lenses unless prescribed and replacing their contact lenses as prescribed. If patients or eye care providers suspect or experience a problem with contact lenses or their care products, they are encouraged to file an MDR report through the FDA Safety Information and Adverse Event Reporting program

incidence nor prevalence of contact lens–related infections can be determined from this reporting system alone because of potential underreporting of events and lack of information regarding frequency of device use. Third, because cases involving patients with more severe outcomes are more likely to be reported, outcomes of infections reported to the MDR database are potentially more severe than typical contact lens–related eye infections. Finally, a small number of reports submitted to the system provided information about more than one patient or more than one problem per patient, and in other cases, multiple reports were submitted for one patient (one report for each eye or contact lens lot number involved). Therefore, the 1,075 reports cannot be interpreted as representing 1,075 cases of contact lens–related corneal infection.

Although contact lenses are a safe and effective form of vision correction if worn and cared for as directed, they pose an infection risk to wearers if not worn and cared for properly. Health promotion activities should focus on informing contact lens wearers of common behaviors that might put them at risk for eye infections, such as sleeping in contact lenses and exposing lenses to tap water, distilled water, or recreational water (*7*). Additionally, prompt reporting of adverse events can help FDA identify and understand the risks associated with the use of contact lenses. Patients or eye care providers who suspect or experience a problem with contact lenses or their care products, should file an MDR report through the FDA Safety Information and Adverse Event Reporting program at http://www.fda.gov/medwatch.

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Tobacco Advertising and Promotional Expenditures in Sports and Sporting Events — United States, 1992–2013

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Smokeless tobacco has been actively promoted by tobacco companies using endorsements by major sport figures, and research indicates that tobacco advertising can lead to youth initiation of tobacco use (*1*,*2*). Television and radio advertisements for cigarettes and smokeless tobacco have been prohibited since 1969,* and the 1998 Master Settlement Agreement† further prohibited tobacco companies from targeting youths with tobacco product advertisements in specified areas. In 2010, the Food and Drug Administration (FDA), under authority of the 2009 Family Smoking Prevention and Tobacco Control Act (FSPTCA), prohibited tobacco-brand sponsorship (i.e., sponsorship of sports and entertainment events or other social or cultural events using the tobacco brand name or anything identifiable with any brand of cigarettes or smokeless tobacco).§ However, corporate-name tobacco sponsorship (i.e., sponsorship using the name of the corporation that manufactures regulated tobacco products) is still permitted under certain conditions.¶ To monitor tobacco advertising and promotional activities in sports in the United States, CDC analyzed trends in sports-related marketing expenditures for cigarettes and smokeless tobacco during 1992–2013 using data from the Federal Trade Commission (FTC). During 1992–2013, sports-related marketing expenditures, adjusted by the consumer price index to constant 2013 dollars, decreased significantly for both cigarettes (from $136 million in 1992 to $0 in 2013) and smokeless tobacco (from $34.8 million in 1992 to $2.1 million in 2013). During 2010–2013, after the prohibition of tobacco-brand sponsorship in sports under the FSPTCA, cigarette manufacturers reported no spending (i.e., $0) on sports-related advertising and promotional activities; in contrast, smokeless tobacco manufacturers reported expenditures of $16.3 million on advertising and promoting smokeless tobacco in sports during 2010–2013. These findings indicate that despite prohibitions on brand sponsorship, smokeless tobacco products continue to be marketed in sports in the United States, potentially through other indirect channels such as corporate-name sponsorship. Enhanced measures are warranted to restrict youth-oriented tobacco marketing and promotional activities that could lead to tobacco initiation and use among children and adolescents (*2*). Reducing tobacco industry promotion through sponsorship of public and private events is an evidence-based strategy for preventing youth initiation of tobacco use (*3*). In addition, other proven interventions (e.g., tobacco price increases, anti-tobacco mass media campaigns, tobacco-free policies inclusive of smokeless tobacco, and barrier-free access to cessation services), could help reduce smokeless tobacco use in the United States (*1*).

Marketing expenditures reported by tobacco companies during 1992–2013 were obtained from the FTC for cigarette and smokeless tobacco (*4*,*5*). FTC classifies cigarette and smokeless tobacco** advertising and promotional expenditures into the following mutually exclusive categories: newspapers; magazines; outdoor; audio, visual; transit; point-of-sale; price discounts; promotional allowances (retailers, wholesalers, and other); sampling; specialty item distribution (branded and nonbranded); public entertainment (adult-only and general-audience); sponsorships; endorsements and testimonials; direct mail; coupons and retail-value-added; Internet (including company website, social media, and other); telephone; and all other. Sports and sporting events expenditures are reported by tobacco companies as a component of one or more of these mutually exclusive categories.††

Tobacco advertising in sports and sporting events was defined by FTC as expenditures used for 1) the sponsoring, advertising, or promotion of sports or sporting events; support of an individual, group, or sports team; and purchase of or support for equipment, uniforms, sports facilities, or training facilities; 2) advertising in the name of the tobacco company or any of its brands in a sports facility, on a scoreboard, or in conjunction with the reporting of sports results; and 3) functional

* http://www.cdc.gov/tobacco/data_statistics/by_topic/policy/legislation/.

† In 1998, the Attorneys General of 46 states, the District of Columbia, and five U.S. territories signed the 1998 Master Settlement Agreement with the five largest U.S. tobacco companies, restricting youth-oriented tobacco advertising, marketing and promotion (https://oag.ca.gov/tobacco/resources/msasumm).

§ http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/ucm360573.htm.

¶ https://www.federalregister.gov/articles/2010/03/19/2010-6087/regulations-restricting-the-sale-and-distribution-of-cigarettes-and-smokeless-tobacco-to-protect.

** Data collected from manufacturers of the following smokeless tobacco types: chewing tobacco, plug tobacco, scotch tobacco, moist snuff, snus, and dissolvable tobacco products.

†† The FTC requires tobacco manufacturers to report the total amount of money spent advertising at and promoting sports and sporting events. This question is separate from, and duplicative of, the reporting of the various distinct advertising and promotion categories. Thus, advertising expenditures for sports and sporting events could span across several of the distinct categories of tobacco advertising and promotion expenditures (e.g., general audience public entertainment, sponsorship, etc.)

promotional items (e.g., clothing, hats, etc.) connected with a sporting event.

Data were analyzed separately for cigarettes and smokeless tobacco to assess total dollar expenditures, as well as the percentage of all marketing expenditures that were sports-related. Expenditures were adjusted for inflation using the consumer price index from the Bureau of Labor Statistics; the annual average consumer price index for 2013 was used as reference. Trends were assessed using Joinpoint regression[§§] ($p<0.05$); for sports-related cigarette marketing expenditures after 2005, joinpoints could not be assessed because these figures were not provided by FTC in 2006 and 2009 to avoid potential disclosure of individual company data.[¶¶] In addition, annual percentage change (APC) and average annual percentage changes (AAPC) were computed to summarize the temporal trends during the study period.

Adjusted aggregate expenditures for smokeless tobacco marketing across all advertising and promotional categories was $191.5 million in 1992 and $503.2 million in 2013 (Table 1). Sports-related smokeless tobacco marketing expenditures decreased from $34.8 million in 1992 (18.2%) to $2.1 million in 2013 (0.4%) ($p<0.05$). During 1992–2009, expenditures declined (APC = -5.4; 95% confidence interval [CI] = -7.6 to -3.1) ($p<0.05$); steeper declines occurred during 2009–2013 (APC = -45.1; 95% CI = -55.8 to -31.8) ($p<0.05$). The overall rate of change (AAPC) during 1992–2013 was -14.7 (95% CI = -18.3 to -11.0). The percentage of all marketing expenditures that were sports-related was higher for smokeless tobacco than cigarettes in each study year (Figure).

Adjusted aggregate expenditures for cigarette marketing across all advertising and promotional categories was $8.7 billion in 1992 and $8.9 billion in 2013 (Table 2). Sports-related cigarette marketing expenditures decreased from $136 million in 1992 (1.6%) to $0 in 2013. Adjusted expenditures were stable during 1992–2001 (APC = 4.1; 95% CI = -0.9 to 9.4) and declined significantly during 2001–2005 (APC = -34.9; 95% CI = -45.1 to -22.8) ($p<0.05$). The overall rate of change (AAPC) during 1992–2005 was -9.9 (95% CI = -14.6 to -4.9).

Discussion

During 1992–2013, adjusted sports-related marketing expenditures decreased significantly for both cigarettes (from $136 million in 1992 to $0 during 2010–2013) and smokeless tobacco (from $34.8 million in 1992 to $2.1 million in 2013).

Summary

What is known about this topic?

Smokeless tobacco has been actively promoted in sports by tobacco companies using endorsements by major sport figures. In March 2010, the Food and Drug Administration, under authority of the 2009 Family Smoking Prevention and Tobacco Control Act, prohibited tobacco brand sponsorship of regulated tobacco products in sports and entertainment events or other social or cultural events.

What is added by this report?

During 1992–2013, sports-related marketing expenditures decreased significantly for both cigarettes (from $136 million in 1992 to $0 in 2013) and smokeless tobacco (from $34.8 million in 1992 to $2.1 million in 2013). After prohibition of tobacco brand sponsorship in sports in March 2010, cigarette manufacturers reported $0 on sports-related advertising and promotion during 2010–2013. In contrast, during 2010–2013, smokeless tobacco manufacturers reported a total of $16.3 million advertising and promoting smokeless tobacco in sports.

What are the implications for public health practice?

Restricting tobacco advertising and promotion in sports, coupled with other proven population-based measures (e.g., tobacco price increases, anti-tobacco mass media campaigns, tobacco-free policies inclusive of smokeless tobacco, and barrier-free cessation services), can help reduce tobacco use in the United States.

After prohibition of tobacco-brand sponsorship in sports in March 2010 under FSPTCA, sports-related marketing expenditures declined for smokeless tobacco during 2010–2013, although 2013 expenditures ($2.1 million) represented an increase from 2012 expenditures ($1.9 million). Notably, during 2010–2013, smokeless tobacco companies spent a total of $16.3 million advertising and promoting smokeless tobacco in sports and sporting events. Moreover, although absolute sports-related marketing expenditures were higher for cigarettes than smokeless tobacco before 2009, the percentage of all marketing expenditures that were sports-related was higher for smokeless tobacco than cigarettes in each study year. Taken together, these findings suggest targeted marketing of smokeless tobacco products in sports and sporting events. Policies to reduce exposure of youths to sports-related advertising and promotion of smokeless tobacco might help reduce use of these products among youths (*3*). The dramatic decline in total cigarette and smokeless tobacco sports-related expenditures after the 1998 Master Settlement Agreement and subsequent prohibition of tobacco-brand sponsorship under FSPTCA correlates with the decrease in adult and teen smoking in the United States during the past two decades (*1*).

The World Health Organization recommends restrictions on direct and indirect forms of tobacco advertising, promotion,

[§§] https://surveillance.cancer.gov/joinpoint/.

[¶¶] Estimates for sports-related cigarette marketing expenditures were reported by FTC as "N/A" in 2006 and 2009 because only one company reported spending money on a particular type of advertising or promotion. The expenditures for those years were included in the "All Others" category, to avoid potential disclosure of individual company data.

TABLE 1. Total and sports-related smokeless tobacco* advertising and promotional expenditures, by year — United States, 1992–2013

Year	Total expenditure on smokeless tobacco advertising/promotion, all categories† (million $)		Total expenditure on smokeless tobacco advertising/promotion, sports and sporting events§ (million $)		Proportion of total advertising/promotion expenditures spent on sports and sporting events (%)
	Unadjusted	Adjusted¶	Unadjusted	Adjusted¶	
1992	115.3	191.5	21.0	34.8	18.2
1993	119.2	192.2	22.7	36.7	19.1
1994	126.0	198.0	24.5	38.5	19.5
1995	127.3	194.6	25.9	39.5	20.3
1996	123.9	183.9	19.8	29.4	16.0
1997	150.4	218.3	25.8	37.4	17.1
1998	145.5	207.9	26.6	38.0	18.3
1999	170.2	238.0	23.4	32.7	13.8
2000	224.6	303.8	11.0	14.9	4.9
2001	236.7	311.3	17.9	23.5	7.6
2002	234.6	303.8	21.1	27.3	9.0
2003	242.5	307.0	16.9	21.4	7.0
2004	231.1	285.0	20.6	25.5	8.9
2005	250.8	299.1	15.7	18.8	6.3
2006	354.1	409.2	16.9	19.5	4.8
2007	411.2	462.0	17.9	20.1	4.4
2008	547.9	592.8	14.6	15.8	2.7
2009	492.1	534.4	15.2	16.5	3.1
2010	444.2	474.6	9.0	9.6	2.0
2011	451.7	467.8	3.4	3.6	0.8
2012	435.7	442.1	1.8	1.9	0.4
2013	503.2	503.2	2.1	2.1	0.4

* Data collected from manufacturers of the following smokeless tobacco types on the U.S. market: chewing tobacco, plug tobacco, scotch tobacco, moist snuff, snus, and dissolvable tobacco products.

† Includes aggregate expenditures across the different cigarette advertising and promotional categories: newspapers; magazines; outdoor; transit; point-of-sale; price discounts; promotional allowances (retailers, wholesalers, and other); sampling distribution; specialty item distribution (branded and nonbranded); public entertainment (adult-only and general-audience); sponsorships; endorsements and testimonials; direct mail; coupons; retail-value-added–nontobacco bonus; company website; internet-other; telephone; social media marketing; and other.

§ Tobacco advertising in sports and sporting events was defined by the Federal Trade Commission (FTC) as 1) expenditures used for the sponsoring, advertising, or promotion of sports or sporting events; support of an individual, group, or sports team; and purchase of or support for equipment, uniforms, sports facilities, and/or training facilities; 2) all expenditures for advertising in the name of the cigarette company or any of its brands in a sports facility, on a scoreboard, or in conjunction with the reporting of sports results; and 3) all expenditures for functional promotional items (clothing, hats, etc.) connected with a sporting event. Expenditures for sports and sporting events were not part of original line items collected by FTC for advertising and promotional expenditure categories, but were assessed by FTC from one or more of the above mutually exclusive categories (e.g., magazines, endorsements, sampling distribution, sponsorships, or outdoor).

¶ Dollar values were adjusted by the consumer price index (all items) to constant 2013 $US.

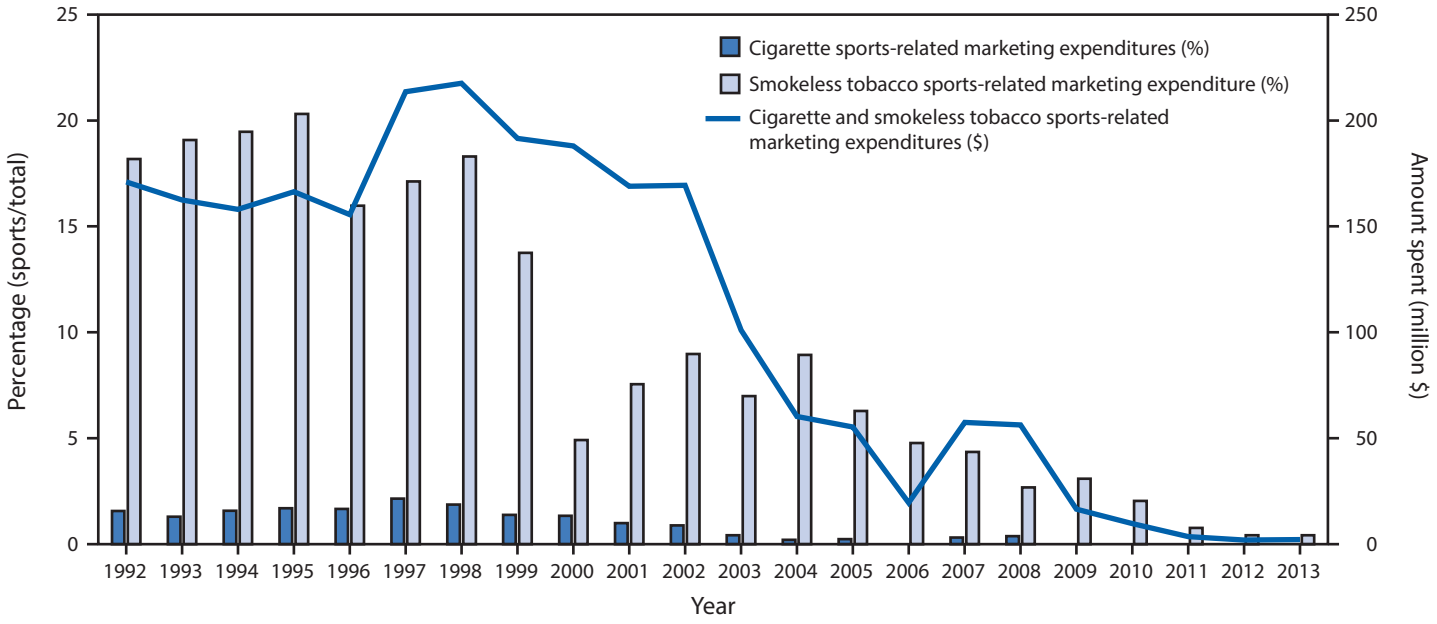
and sponsorships.*** Tobacco-brand sponsorship prohibited under the FSPTCA distinguishes tobacco brand name from the corporate name. The rule prohibits the use of brand name (alone or in conjunction with any other word), logo, symbol, motto, selling message, recognizable color or pattern of colors, or other identifying features used for any brand of cigarettes or smokeless tobacco for sponsorship activities in sports and entertainment events or other social or cultural events. However, manufacturers, distributors, and retailers are permitted to conduct such sponsorships in their corporate name, if both the corporate name and the corporation were registered and in use in the United States before January 1, 1995, and the corporate name does not include any brand name or any of the other aforementioned brand characteristics (*6*). Corporate-name tobacco sponsorship has the potential to maintain tobacco industry presence in sports, promote tobacco industry corporate image, and allow tobacco industry corporate names to be mentioned in media, even though cigarette and smokeless tobacco commercials are prohibited in broadcast media.

High prevalence of smokeless tobacco use has been reported among athletes at different levels, including among minor league baseball players (24.8%), major league baseball players (36.0%), and National Collegiate Athletic Association Division I male baseball players (49.6%), and among male high school athletes (17.4%) (*7*–*9*). To date, several U.S. cities, including Chicago, Illinois; San Francisco and Los Angeles, California; Boston, Massachusetts; and New York, New York, have passed legislation to prohibit smokeless tobacco use in public sports venues by players, coaches, referees, and fans.†††

*** World Health Organization report on the global tobacco epidemic, 2013. Enforcing bans on tobacco advertising, promotion, and sponsorship (http://apps.who.int/iris/bitstream/10665/85380/1/9789241505871_eng.pdf?ua=1).

††† http://tobaccofreebaseball.org/content/.

FIGURE. Sports-related cigarette and smokeless tobacco marketing expenditures and percentage of total expenditures* — United States, 1992–2013



* Percentage of total cigarette and smokeless tobacco marketing expenditures that were spent in sports and sporting events.

Smokeless tobacco use among professional athletes has the potential to serve as an unpaid advertisement for these products, even in an environment where tobacco-brand sponsorship is prohibited. Professional athletes serve as role models for youths who might perceive such behavior as safe, socially acceptable, or a means to enhance athletic performance (*8*). However, smokeless tobacco use is not safe and can lead to nicotine addiction; oral, pancreatic, and esophageal cancer; and other oral conditions, including periodontal disease.[§§§]

The findings in this report are subject to at least two limitations. First, sports-related marketing expenditures were not disaggregated by the different advertising and promotional categories (e.g., Internet, specialty item distribution, magazines, etc.); therefore, determining what proportion of sports-related marketing expenditures was spent on specific advertising and promotional categories, especially those that appeal to youths, was not possible. Second, the amount of tobacco industry expenditures on advertising and promotion in sports might not necessarily correlate with actual levels of individual exposure to pro-tobacco marketing activities in sports.

Tobacco advertising and promotion might increase tobacco use by encouraging youths to experiment with and initiate regular tobacco use (*10*), deterring current tobacco users from quitting, prompting former tobacco users to relapse, and increasing intensity of tobacco use among current users by serving as external behavioral cues (*2*). Restricting tobacco advertising and promotion in sports, coupled with other proven population-based measures (e.g., tobacco price increases, anti-tobacco mass media campaigns, tobacco-free policies inclusive of smokeless tobacco, and barrier-free cessation services), can help reduce tobacco use in the United States (*3*).

[§§§] http://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco/smokeless-fact-sheet.

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TABLE 2. Total and sports-related cigarette advertising and promotional expenditures, by year — United States, 1992–2013

Year	Total expenditure on cigarette advertising and promotion, all categories* (billion $)		Total expenditure on cigarette advertising and promotion, sports and sporting events† (million $)		Proportion of total advertising and promotion expenditures spent on sports and sporting events (%)
	Unadjusted	Adjusted§	Unadjusted	Adjusted§	
1992	5.2	8.7	82.0	136.0	1.6
1993	6.0	9.7	78.0	126.0	1.3
1994	4.8	7.6	76.0	119.0	1.6
1995	4.9	7.5	83.0	127.0	1.7
1996	5.1	7.6	85.0	126.0	1.7
1997	5.7	8.2	121.0	176.0	2.1
1998	6.7	9.6	126.0	180.0	1.9
1999	8.2	11.5	114.0	159.0	1.4
2000	9.6	13.0	128.0	173.0	1.3
2001	11.2	14.8	111.0	145.0	1.0
2002	12.5	16.1	110.0	142.0	0.9
2003	15.1	19.2	63.0	80.0	0.4
2004	14.2	17.5	28.0	35.0	0.2
2005	13.1	15.6	31.0	37.0	0.2
2006	12.5	14.4	N/A¶	N/A¶	N/A¶
2007	10.9	12.2	33.0	37.0	0.3
2008	9.9	10.8	37.0	40.0	0.3
2009	8.5	9.3	N/A¶	N/A¶	N/A¶
2010	8.0	8.6	0.0	0.0	0.0
2011	8.4	8.7	0.0	0.0	0.0
2012	9.2	9.3	0.0	0.0	0.0
2013	8.9	8.9	0.0	0.0	0.0

* Includes aggregate expenditures across the different cigarette advertising and promotional categories: newspapers; magazines; outdoor; transit; point-of-sale; price discounts; promotional allowances (retailers, wholesalers, and other); sampling distribution; specialty item distribution (branded and nonbranded); public entertainment (adult-only and general-audience); sponsorships; endorsements and testimonials; direct mail; coupons; retail-value-added–nontobacco bonus; company website; internet-other; telephone; social media marketing; and other.

† Tobacco advertising in sports and sporting events was defined by the Federal Trade Commission (FTC) as 1) expenditures used for the sponsoring, advertising, or promotion of sports or sporting events; support of an individual, group, or sports team; and purchase of or support for equipment, uniforms, sports facilities, and/or training facilities; 2) all expenditures for advertising in the name of the cigarette company or any of its brands in a sports facility, on a scoreboard, or in conjunction with the reporting of sports results; and 3) all expenditures for functional promotional items (clothing, hats, etc.) connected with a sporting event. Expenditures for sports and sporting events were not part of original line items collected by FTC for advertising and promotional expenditure categories, but were assessed by FTC from one or more of the above mutually exclusive categories (e.g., magazines, endorsements, sampling distribution, sponsorships, or outdoor).

§ Dollar values were adjusted by the consumer price index (all items) to constant 2013 $US.

¶ Estimates for sports-related cigarette marketing expenditures were reported by FTC as "N/A" in 2006 and 2009 because only one company reported spending money on a particular type of advertising or promotion. The expenditures for those years were included in the "All Others" category, to avoid potential disclosure of individual company data.

5. Federal Trade Commission. Federal Trade Commission smokeless Tobacco report for 2013. Washington, DC: Federal Trade Commission; 2016. https://www.ftc.gov/system/files/documents/reports/federal-trade-commission-smokeless-tobacco-report-2013/2013tobaccorpt.pdf
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CDC Grand Rounds: Public Health Strategies to Prevent Preterm Birth

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Preterm birth (delivery before 37 weeks and 0/7 days of gestation) is a leading cause of infant morbidity and mortality in the United States. In 2013, 11.4% of the nearly 4 million U.S. live births were preterm; however, 36% of the 8,470 infant deaths were attributed to preterm birth (*1*). Infants born at earlier gestational ages, especially <32 0/7 weeks, have the highest mortality (Figure) and morbidity rates. Morbidity associated with preterm birth includes respiratory distress syndrome, necrotizing enterocolitis, and intraventricular hemorrhage; longer-term consequences include developmental delay and decreased school performance. Risk factors for preterm delivery include social, behavioral, clinical, and biologic characteristics (Box). Despite advances in medical care, racial and ethnic disparities associated with preterm birth persist. Reducing preterm birth, a national public health priority (*2*), can be accomplished by implementing and monitoring strategies that target modifiable risk factors and populations at highest risk, and by providing improved quality and access to preconception, prenatal, and interconception care through implementation of strategies with potentially high impact.

Most preterm births are spontaneous and can occur with intact membranes (40%–45% of preterm births) or after preterm premature rupture of membranes (25%–30% of preterm births) (*3*). The etiology of preterm labor is poorly understood; prevailing theories include infectious and inflammatory processes. Intrauterine infection and inflammation might account for up to 40% of preterm births, but in many instances, the cause might be subclinical and difficult to detect (*3*,*4*). Maternal or fetal complications can often result in preterm birth because of medically indicated induction of labor or cesarean delivery (30%–35% of preterm births) (*3*). Growing awareness of the complications of prematurity has prompted careful evaluation of the indications for and timing of delivery (*5*).

This is another in a series of occasional MMWR *reports titled CDC Grand Rounds. These reports are based on grand rounds presentations at CDC on high-profile issues in public health science, practice, and policy. Information about CDC Grand Rounds is available at http://www.cdc.gov/cdcgrandrounds.*

For more accurate estimates of the preterm birth rate, CDC's National Center for Health Statistics transitioned from using the date of last normal menstrual period to the obstetric estimate of gestation at delivery, starting with 2014 births and revising data back to 2007 (*6*).* Based on the historical last normal menstrual period measure, the U.S. preterm birth rate increased 21%, from 10.6% in 1990 to 12.8% in 2006 (*7*). Since 2007, the first year that data using the obstetric estimate of gestation at delivery were available, the overall rate declined, from 10.4% in 2007 to 9.6% in 2014. However, declines have been disproportionate across racial and ethnic groups (*6*). In 2014, non-Hispanic black (black) women had the highest preterm birth rate (13.2%), followed by American Indians or Alaska Natives (AI/AN) (10.2%), Hispanics (9.4%), non-Hispanic whites (whites) (8.9%), and Asian/Pacific Islanders (API) (8.5%). Compared with the preterm birth rate among whites, the rates of preterm birth among blacks and AI/AN were 1.5 and 1.1, respectively (*6*).

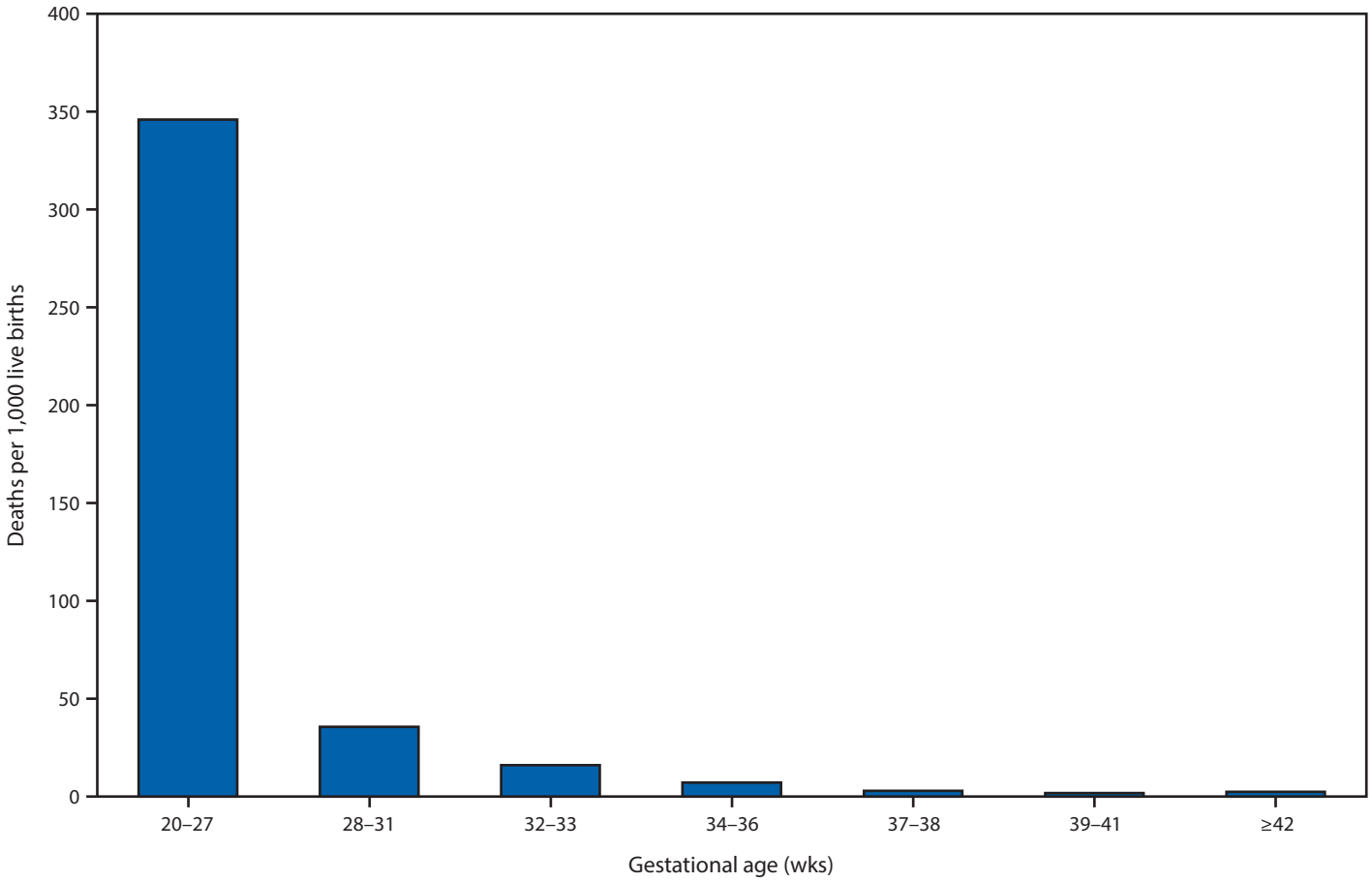
Declines in infant mortality (53%) since the 1980s have been largely attributed to increasing preterm survival, owing to improvements in neonatal intensive care and treatments for lung immaturity. Infant mortality rates (deaths in children aged <12 months per 1,000 live births) declined from 12.6 in 1980 (*8*) to 5.96 in 2013 (*1*).† Despite these declines, racial and ethnic disparities persist. In 2013, the infant mortality rate among black infants (11.2) was 2.2 times higher than that among white infants (5.1). Rates of preterm-related infant mortality§ (per 1,000 live births) provide further evidence of racial and ethnic disparities and highlight the importance of reducing preterm births. Black women have the highest rates of preterm-related infant mortality (4.9), followed by AI/AN women (2.0), Hispanic women (1.8), white women (1.6), and API women (1.5) (*1*).

* Obstetric estimate is defined as the best obstetric estimate of the infant's gestation in completed weeks based on the birth attendant's final estimate of gestation. Preferably, the obstetric estimate is based on an early pregnancy ultrasound.

† Linked birth and infant death data are a preferred data source for reporting U.S. infant mortality rates by race and ethnicity; 2013 is the most recent data available.

§ Preterm-related deaths are those where the infant was born preterm (before 37 completed weeks of gestation) with the underlying cause of death assigned to one of the following *International Classification of Diseases, 10th edition* categories: K550, P000, P010, P011, P015, P020, P021, P027, P070–P073, P102, P220–229, P250–279, P280, P281, P360–369, P520–523, or P77.

FIGURE. Infant mortality rates,* by gestational age — United States, 2013



* Deaths in children aged <12 months per 1,000 live births.

Strategies to Reduce Preterm Birth and Complications

Five groups of strategies can reduce the occurrence of preterm births. First, women of childbearing age need access to preconception care services including screening, health promotion, and interventions that will enable them to achieve high levels of wellness, minimize risks, and enter a pregnancy in optimal health. As the prevalence of chronic diseases in women of reproductive age increases, improving health before and between pregnancies is an important strategy to reduce maternal risk factors for preterm birth (*9*). Chronic conditions, such as diabetes and hypertension, should be well managed and controlled. Modifiable risk factors, including obesity, tobacco use and substance abuse, also should be addressed. Approximately 5.3%–7.7% of U.S. preterm deliveries, and 5.0%–7.3% of U.S. preterm-related deaths are attributable to smoking during pregnancy (*10*). Increases in tobacco prices, comprehensive smoke-free laws, mass media campaigns, and barrier-free access to quitting assistance are proven population-based interventions that could reduce cigarette smoking among reproductive-aged women (www.surgeongeneral.gov). Since 2010, state Medicaid programs are required to cover tobacco-cessation counseling and drug therapy for pregnant women without cost sharing. In 2012, most obstetricians were unaware of this coverage; however, one third indicated they would offer services if they received Medicaid reimbursement (*11*,*12*).

Second, women at risk for preterm delivery need to be identified and offered access to effective treatments to prevent preterm birth. For example, for women who have had a spontaneous preterm delivery, the risk for preterm delivery in subsequent pregnancies is 1.5–2.0 times higher. Among women with a singleton pregnancy and history of spontaneous preterm delivery, 17 alpha-hydroxyprogesterone caproate (17P) can reduce the risk of preterm birth by approximately 30% (*13*). Because infants with preterm births from 24 to 34 weeks gestation are at higher risk for respiratory distress syndrome, intraventricular hemorrhage, necrotizing enterocolitis, and perinatal mortality, the American College of Obstetricians and Gynecologists (ACOG) recommends that mothers at risk for preterm delivery should be offered antenatal corticosteroids

(ANCS) to improve fetal lung maturity (*14*). A Cochrane review (*15*) determined that maternal treatment with a single course of ANCS reduced respiratory distress syndrome by 66%, intraventricular hemorrhage by 54%, necrotizing enterocolitis by 46%, and death by 69%, compared with non-ANCS treatment. Further research is needed to determine optimal dosing, timing, and frequency of administration (*14*).

A third strategy to prevent preterm birth is to discourage nonmedically indicated deliveries, especially before 39 0/7 weeks. Even infants born late preterm (34–36 6/7 weeks) and early term (37–38 6/7 weeks) (*5*) have higher risks of birth complications (*16*), infant mortality (Figure) (*16*), and neurodevelopmental delays (*17*) than do infants born after 39 completed weeks. Based on these findings, ACOG issued an opinion discouraging nonmedically indicated deliveries (*18*). Efforts to reduce nonindicated deliveries before 39 weeks have largely succeeded: during 2010–2014, the national average declined from 17% to 3.4%.¶ Approaches to reducing nonmedically indicated deliveries before 39 weeks include clinical leadership, public advocacy (e.g., March of Dimes' [MOD] Healthy Babies are Worth the Wait campaign); quality improvement initiatives (e.g., state Perinatal Quality Collaboratives [PQCs], Collaboration on Innovation and Improvement Network, Centers for Medicare & Medicaid Services' Strong Start for Mothers and Newborns Initiative); public reporting (e.g., the Joint Commission); and payment reform.

A fourth strategy for reducing preterm birth is preventing unintended pregnancies and achieving optimal birth spacing. Nearly three quarters of teen births are unintended. These pregnancies are at 17% higher risk for preterm delivery, and teen mothers are more likely to have a second baby within 2 years of the first birth, making preterm delivery more likely for the second birth as well (*19*,*20*). Although the U.S. teen birth rate has declined, efforts to reduce teen pregnancy need to continue (*6*,*20*), especially in minority communities where teen and preterm birth rates are highest.** Women who become pregnant after age 35 years are also at increased risk for preterm delivery, and they are also more likely to have a chronic medical condition. Regardless of a woman's age, having access to the full range of contraceptive methods is important to prevent unintended pregnancies. Barriers in provider and patient knowledge, availability, and costs should be addressed to ensure the most efficacious contraception method is accessible, including long-acting reversible contraception.†† Providers should be informed about the safety of available contraceptives and reimbursement for contraceptive services (*21*,*22*).

¶ http://www.leapfroggroup.org/ratings-reports/reports-hospital-performance.
** http://www.cdc.gov/teenpregnancy/.
†† http://www.cdc.gov/cdcgrandrounds/archives/2013/march2013.htm.

BOX. Risk factors for preterm delivery

Maternal demographic characteristics
- Young or advanced maternal age
- Black race
- Low socioeconomic status

Unhealthy lifestyle
- Tobacco use
- Substance abuse
- Low or high prepregnancy body mass index

Pregnancy history
- Short interpregnancy interval
- Previous preterm delivery
- Multiple gestations

Pregnancy complications
- Placental abruption or previa
- Polyhydramnios
- Oligohydramnios

Maternal medical disorders
- Thyroid disease
- Obesity
- Asthma
- Diabetes
- Hypertension

Mental health
- Psychological or social stress
- Depression

Fertility treatments
- Assisted reproductive technology (ART)
- Non-ART fertility treatments

Intrauterine infection

Finally, multiple gestations have a higher preterm birth risk. In 2013, it was estimated that assisted reproductive technology contributed to 18.7% of multiple births, 4.6% of preterm births, and 5.0% of very preterm births (*23*). Electing to transfer a single embryo for pregnancies achieved by assisted reproductive technology can reduce multiple births and the risk for preterm birth (*23*).

To effectively implement and evaluate these prevention strategies, high-quality surveillance systems are needed to monitor preterm births, associated risk factors, and outcomes. Timely availability of and access to data sources, such as vital records, administrative data, and surveys, are important for monitoring risk factors and outcomes and informing program evaluation at local, state, and national levels. For example, the Pregnancy Risk Assessment Monitoring System (http://www.cdc.gov/prams/)

collects state-level data on maternal experiences before, during, and shortly after pregnancy, and can measure progress on risk factors, such as prepregnancy and prenatal smoking, and postpartum contraceptive use.

Societal and community factors play an important role in the risk for preterm birth (*2*). Adverse neighborhood conditions (e.g., residential segregation; concentrated poverty; high crime rates; and lack of goods, services, recreational activities, and access to quality health care), and diminished opportunities (e.g., inferior education and employment; housing market discrimination; and low wages) contribute to the stress of communities and the pregnant women who live in them (*2*). Although the mechanism is not clear, exposure to acute and chronic stress might affect the maternal neuroendocrine and immune pathways, resulting in increased susceptibility to infection or inflammation and an increased risk for preterm birth (*2*). Research using multilevel modeling, which links social and population data to clinical and biologic data, could aid in understanding social determinants of health as they relate to preterm birth. Exploring broader social policies to improve the health of mothers, particularly in African American and other communities at high risk, could reduce preterm birth and associated disparities (*2*).

Ongoing Initiatives to Prevent Preterm Delivery

Several initiatives are underway to reduce preterm delivery and complications. One is CDC's Maternal and Child Health Epidemiology program.[§§] This program develops leadership and builds state, local, and tribal level capacity for surveillance, monitoring, and evaluation activities by assigning senior epidemiologists to work with communities. In addition, CDC collaborates with national, state, tribal, and territorial organizations and partners to increase visibility of preterm birth and its consequences, and to help translate science into relevant clinical and public health practice. Ongoing collaborative activities involve ACOG, the American Academy of Pediatrics, MOD, Collaboration on Innovation and Improvement Network, the Association of State and Territorial Health Officials' Healthy Babies Initiative,[¶¶] and state-based PQCs.[***]

Expanding the success of state-based PQCs is another ongoing initiative. The Ohio PQC has advanced evidence-based clinical practices and processes to improve pregnancy outcomes for women and newborns through continuous quality improvement. Interventions underway include the Ohio PQC's Progesterone Project[†††] and ANCS Project.[§§§] The Progesterone Project aims to reduce preterm birth rates by 10% through increased screening, identification, and treatment of pregnant women at risk for preterm birth who could benefit from progesterone treatment. Through quality improvement activities and the use of a toolkit, the ANCS Project aims to increase to 90% the percentage of women between 24–33 weeks gestation and at risk for preterm delivery who receive any ANCS before delivery.

Finally, MOD is leading a promising initiative to reduce preterm birth. The "Roadmap to 2020 and 2030 Goals" program aims to reduce modifiable risk factors by bundling various interventions through the Healthy Babies are Worth the Wait Community Program.[¶¶¶] Beginning in 2017, the program will reach 16 states with preterm birth rates >11.5% with substantial racial/ethnic disparities and approximately 100,000 births per year. In addition, MOD is funding five centers to further research and understand the complex etiology of preterm birth.[****]

During the past decade, considerable advances have been made in medical care for preterm infants, along with corresponding reductions in infant mortality. Continued efforts to reduce preterm birth and its associated racial and ethnic disparities are critical for further reduction of the U.S. infant mortality rate. Through collaborative efforts, public health programs play essential roles in further reducing preterm birth by combining surveillance and evaluation with population-focused interventions to improve health behaviors, address social determinants, and improve the quality of care for women and infants.

§§ http://www.cdc.gov/reproductivehealth/mchepi/.
¶¶ http://www.astho.org/healthybabies/.
*** http://www.cdc.gov/reproductivehealth/maternalinfanthealth/pqc.htm.
††† https://www.opqc.net/projects/progesterone.
§§§ https://www.opqc.net/projects/OB-ANCS.
¶¶¶ http://www.marchofdimes.org/professionals/healthy-babies-are-worth-the-wait.aspx.
**** http://www.prematurityresearch.org/.

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Announcement

Clinical Practice Guidelines Published for Treatment of Drug-Susceptible Tuberculosis

The American Thoracic Society, CDC, and the Infectious Diseases Society of America (IDSA) have jointly sponsored the development of guidelines for the treatment of drug-susceptible tuberculosis, which were published by IDSA in *Clinical Infectious Diseases* on August 11, 2016 (*1*) and are available through IDSA (http://www.idsociety.org/Index.aspx) and CDC (http://www.cdc.gov/tb/publications/guidelines/treatment.htm).

Representatives from the American Academy of Pediatrics, Canadian Thoracic Society, International Union Against Tuberculosis and Lung Disease, and World Health Organization also participated in the development of these guidelines, which update American Thoracic Society/CDC/IDSA guidelines published in 2003 (*2*). The guidelines have been endorsed by the European Respiratory Society and the U.S. National Tuberculosis Controllers Association.

The guidelines provide recommendations for the clinical and public health management of active tuberculosis in settings in which mycobacterial cultures, drug susceptibility testing, and radiographic studies are routinely available. For all recommendations, literature reviews were performed, followed by assessment of the quality of evidence, using the Grading of Recommendations, Assessment, Development and Evaluation methodology (*3*).

Given the public health implications of prompt diagnosis and effective management of tuberculosis, empiric multidrug treatment should be initiated in almost all situations in which active tuberculosis is suspected. Clinicians and public health practitioners who care for persons with active tuberculosis should see the full-text online version of the document, which provides detailed discussion of the management of drug-susceptible tuberculosis and recommendations for practice.

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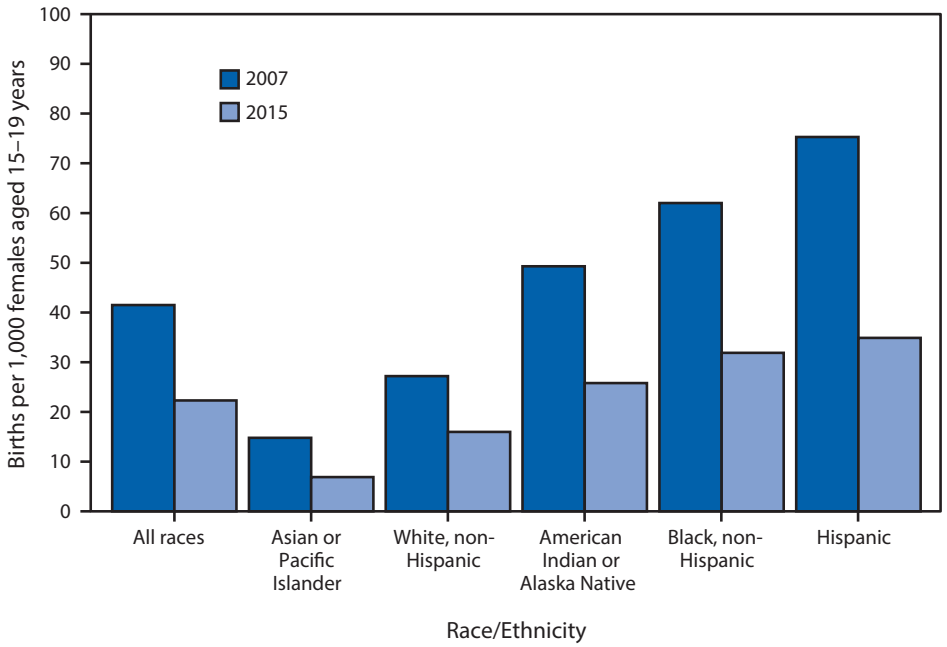
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Birth Rates Among Teens Aged 15–19 Years, by Race/Hispanic Ethnicity* — National Vital Statistics System, United States,† 2007 and 2015§



* For American Indian or Alaska Natives and Asian or Pacific Islanders, includes persons of Hispanic and non-Hispanic ethnicity.
† Data are for U.S. residents only.
§ Data for 2015 are preliminary.

From 2007 to 2015, the birth rate for female teens aged 15–19 years declined 46%, from 41.5 to 22.3 births per 1,000, the lowest rate ever recorded for this population in the United States. In 2015, rates declined to record lows for all racial/ethnic populations, with declines ranging from 41% for non-Hispanic white teens to 54% for Hispanic teens. Despite the declines, teen birth rates by race/Hispanic ethnicity continued to reflect wide disparities, with rates ranging from 6.9 per 1,000 for Asian or Pacific Islander teens to 34.9 for Hispanic teens in 2015.

Source: Hamilton BE, Martin JA, Osterman MJK. Births: preliminary data for 2015. National Vital Statistics Reports, Vol. 65, No. 3. Hyattsville, MD: National Center for Health Statistics; 2016. http://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_03.pdf.

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