JAMA | US Preventive Services Task Force | RECOMMENDATION STATEMENT

Screening and Interventions to Prevent Dental Caries in Children Younger Than 5 Years

US Preventive Services Task Force Recommendation Statement

US Preventive Services Task Force

IMPORTANCE Dental caries is the most common chronic disease in children in the US. According to the 2011-2016 National Health and Nutrition Examination Survey, approximately 23% of children aged 2 to 5 years had dental caries in their primary teeth. Prevalence is higher in Mexican American children (33%) and non-Hispanic Black children (28%) than in non-Hispanic White children (18%). Dental caries in early childhood is associated with pain, loss of teeth, impaired growth, decreased weight gain, negative effects on quality of life, poor school performance, and future dental caries.

OBJECTIVE To update its 2014 recommendation, the US Preventive Services Task Force (USPSTF) commissioned a systematic review on screening and interventions to prevent dental caries in children younger than 5 years.

POPULATION Asymptomatic children younger than 5 years.

EVIDENCE ASSESSMENT The USPSTF concludes with moderate certainty that there is a moderate net benefit of preventing future dental caries with oral fluoride supplementation at recommended doses in children 6 months or older whose water supply is deficient in fluoride. The USPSTF concludes with moderate certainty that there is a moderate net benefit of preventing future dental caries with fluoride varnish application in all children younger than 5 years. The USPSTF concludes that the evidence is insufficient on performing routine oral screening examinations for dental caries by primary care clinicians in children younger than 5 years and that the balance of benefits and harms of screening cannot be determined.

RECOMMENDATION The USPSTF recommends that primary care clinicians prescribe oral fluoride supplementation starting at age 6 months for children whose water supply is deficient in fluoride. (B recommendation) The USPSTF recommends that primary care clinicians apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption. (B recommendation) The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of routine screening examinations for dental caries performed by primary care clinicians in children younger than 5 years. (I statement)

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Summary of Recommendations

Children younger than 5 years	The USPSTF recommends that primary care clinicians prescribe oral fluoride supplementation starting at age 6 months for children whose water supply is deficient in fluoride.	B
Children younger than 5 years	The USPSTF recommends that primary care clinicians apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption.	B
Children younger than 5 years	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of routine screening examinations for dental caries performed by primary care clinicians in children younger than 5 years.	I

See the Figure for a more detailed summary of the recommendation for clinicians. USPSTF indicates US Preventive Services Task Force.

See the Summary of Recommendations figure.

Table. Summary of USPSTF Rationale

Rationale	Assessment
Detection	There is inadequate evidence about the accuracy of screening performed by a primary care clinician in identifying children younger than 5 years who have caries lesions or are at increased risk for future dental caries.
Benefits of early detection and preventive interventions	• There is inadequate evidence on the effectiveness of oral screening (including risk assessment) performed by a primary care clinician in preventing dental caries in children younger than 5 years. • There is adequate evidence that dietary fluoride supplementation in children who have low levels of fluoride in their water can provide moderate benefit in preventing dental caries. • There is adequate evidence that application of fluoride varnish to the primary teeth of all children can provide moderate benefit in preventing dental caries.
Harms of early detection and preventive interventions	• There is inadequate evidence to assess the harms of oral health screening performed by a primary care clinician in children younger than 5 years. • There is adequate evidence to bound the harms for dietary fluoride supplementation and topical fluoride application as no greater than small, based on limited evidence of harms.
USPSTF assessment	• The USPSTF concludes with moderate certainty that there is a moderate net benefit of preventing future dental caries with oral fluoride supplementation at recommended doses in children older than 6 months whose water supply is deficient in fluoride. • The USPSTF concludes with moderate certainty that there is a moderate net benefit of preventing future dental caries with fluoride varnish application in all children younger than 5 years. • The benefits and harms of oral screening for dental caries by primary care clinicians in children younger than 5 years are uncertain, and the balance of benefits and harms cannot be determined.

Abbreviation: USPSTF, US Preventive Services Task Force.

Importance

Dental caries is the most common chronic disease in children in the US.[1-3] According to the 2011-2016 National Health and Nutrition Examination Survey, approximately 23% of children aged 2 to 5 years had dental caries in their primary teeth.[4] Prevalence is higher in Mexican American children (33%) and non-Hispanic Black children (28%) than in non-Hispanic White children (18%).[5] Dental caries in early childhood is associated with pain, loss of teeth, impaired growth, decreased weight gain, negative effects on quality of life, poor school performance, and future dental caries.[1]

USPSTF Assessment of Magnitude of Net Benefit

The US Preventive Services Task Force (USPSTF) concludes with moderate certainty that there is a **moderate net benefit** of preventing future dental caries with oral fluoride supplementation at recommended doses in children 6 months or older whose water supply is deficient in fluoride.

The USPSTF concludes with moderate certainty that there is a **moderate net benefit** of preventing future dental caries with fluoride varnish application in all children younger than 5 years.

The USPSTF concludes that the **evidence is insufficient** on performing routine oral screening examinations for dental caries by primary care clinicians in children younger than 5 years and that the balance of benefits and harms of screening cannot be determined.

See the **Table** for more information on the USPSTF recommendation rationale and assessment and the eFigure in the Supplement for information on the recommendation grade. See the **Figure** for a summary of the recommendation for clinicians. For more details on the methods the USPSTF uses to determine the net benefit, see the USPSTF Procedure Manual.[6]

Practice Considerations

Patient Population Under Consideration

This recommendation applies to asymptomatic children younger than 5 years.

Assessment of Risk

All children are at potential risk for dental caries. There are no validated screening tools to determine which children are at higher risk for dental caries; however, a number of individual factors elevate risk. Higher prevalence and severity of dental caries are found among low-income and certain racial and ethnic (eg, Black and Mexican American) populations.[1] Risk factors for dental caries in children are multifactorial. Biological risk factors include cariogenic bacteria, developmental defects of tooth enamel, and low saliva flow rates. Social determinants of health (nonbiological factors) that are associated with increased caries risk include access to dental care, low socioeconomic status, personal and family oral health history, dietary habits (especially frequent intake of dietary sugars in foods and beverages), fluoride exposure, and oral hygiene practices.[1,7,8]

Interventions to Prevent Dental Caries

Oral fluoride supplementation prevents dental caries in patients with deficient water fluoridation (<0.6 parts fluoride per million parts water [ppm F]).[9-11] Topical fluoride is applied as a varnish with a small brush in young children (typically available as 5% sodium fluoride [2.26% fluoride]). The use of topical fluoride for prevention of caries is off-label.[12-15]

Figure. Clinician Summary: Screening and Interventions to Prevent Dental Caries in Children Younger Than 5 Years

What does the USPSTF recommend?	**Children younger than 5 years: Grade B** Prescribe **oral fluoride supplementation** starting at age 6 months for children whose water supply is deficient in fluoride.
	Children younger than 5 years: Grade B Apply **fluoride varnish** to the primary teeth of all infants and children starting at the age of primary tooth eruption.
	Children younger than 5 years: I statement The evidence is insufficient to assess the balance of benefits and harms **of routine screening** examinations for dental caries performed by primary care clinicians in children younger than 5 years.
To whom does this recommendation apply?	This recommendation applies to children younger than 5 years without signs or symptoms of dental caries.
What's new?	This recommendation is consistent with the 2014 USPSTF recommendation.
How to implement this recommendation?	• **Prescribe:** Prescribe oral fluoride supplementation beginning at age 6 months to children whose water supply is deficient in fluoride (<0.6 parts fluoride per million parts water [ppm F]). • **Apply:** Apply topical fluoride varnish to the primary teeth in all infants and children once primary teeth erupt. Typically, fluoride varnish is applied with a small brush and is available as 5% sodium fluoride (2.26% fluoride). Clinicians may consider using "My Water's Fluoride" (https://nccd.cdc.gov/doh_mwf/default/default.aspx), a CDC tool that may assist in determining local water system fluoridation status.
What additional information should clinicians know about this recommendation?	• **Assessment of risk:** Higher prevalence and severity of dental caries are found among specific racial and ethnic (eg, Black and Mexican American) populations. Social determinants of health associated with increased caries risk include lack of access to dental care, low socioeconomic status, personal and family oral health history, dietary habits (especially frequent intake of dietary sugars in foods and beverages), fluoride exposure, and oral hygiene practices. The USPSTF determined there was insufficient evidence to assess the balance of benefits and harms of performing **routine screening** examinations. In deciding whether to routinely perform screening examinations, clinicians may consider the following: • **Potential preventable burden:** Dental caries is the most common chronic disease in children in the US and can cause pain and diminished quality of life. Of children living below the poverty threshold, 17% had untreated caries in 2011 to 2014. As soon as teeth erupt, all children are susceptible to dental caries. • **Potential harms:** Primary care screening examinations for dental caries in children younger than 5 years are not invasive and unlikely to cause serious harms. • **Current practice:** About half of pediatricians report examining the teeth of more than half of their patients between birth and age 3 years. Fewer report regularly applying fluoride varnish.
Why is this recommendation and topic important?	Dental caries in early childhood is associated with pain, loss of teeth, impaired growth, decreased weight gain, negative effects on quality of life, poor school performance, and future dental caries. According to the 2011-2016 National Health and Nutrition Examination Survey, approximately 23% of children aged 2 to 5 years have dental caries in their primary teeth. Prevalence is higher in Mexican American children (33%) and non-Hispanic Black children (28%) than in non-Hispanic White children (18%).
What are other relevant USPSTF recommendations?	Information on other oral health recommendations in adults and children older than 5 years from the USPSTF is available at https://www.uspreventiveservicestaskforce.org/
What are additional Tools and Resources?	• The Community Preventive Services Task Force recommends ◦ Fluoridation of community water sources to reduce dental caries (https://www.thecommunityguide.org/findings/dental-caries-cavities-community-water-fluoridation) ◦ School-based dental sealant delivery programs to prevent caries (https://www.thecommunityguide.org/findings/dental-caries-cavities-school-based-dental-sealant-delivery-programs) • The Health Resources and Services Administration's website contains various oral health program resources, including the "Bright Futures: Oral Health-Pocket Guide, 3rd edition," an overview of oral health prevention and interventions (https://mchb.hrsa.gov/maternal-child-health-topics/child-health)
Where to read the full recommendation statement?	Visit the USPSTF website (https://www.uspreventiveservicestaskforce.org/) or the *JAMA* website (https://jamanetwork.com/collections/44068/united-states-preventive-services-task-force) to read the full recommendation statement. This includes more details on the rationale of the recommendation, including benefits and harms; supporting evidence; and recommendations of others.

The USPSTF recognizes that clinical decisions involve more considerations than evidence alone. Clinicians should understand the evidence but individualize decision-making to the specific patient or situation.

CDC indicates Centers for Disease Control and Prevention; USPSTF, US Preventive Services Task Force.

Timing and Dosage

No studies specifically addressed the dosage and timing of oral fluoride supplementation in children with inadequate water fluoridation.

No studies directly assessed the appropriate ages at which to start and stop the application of fluoride varnish. However, given the mechanism of action of this intervention, benefits are likely to accrue starting at the time of primary tooth eruption. In studies, fluoride varnish was most commonly administered as 5% sodium fluoride, every 6 months.[1]

Additional Tools and Resources

There are several related tools and resources that may help clinicians implement this recommendation:

- The Community Preventive Services Task Force recommends fluoridation of community water sources to reduce dental caries.[16]
- The Community Preventive Services Task Force recommends school-based dental sealant delivery programs to prevent caries.[17]
- The Centers for Disease Control and Prevention's Oral Health resources include "My Water's Fluoride," a tool to find information about a local water system's fluoridation status.[18]
- The Health Resources and Services Administration's website contains various oral health program resources, including the "Bright Futures: Oral Health–Pocket Guide, 3rd edition," an overview of oral health prevention and interventions (https://mchb.hrsa.gov/maternal-child-health-topics/child-health).[19]

Suggestions for Practice Regarding the I Statement

In deciding whether to routinely perform screening examinations for dental caries in children from birth to age 5 years, clinicians should consider the following.

Potential Preventable Burden

Dental caries is a common chronic disease that can cause pain and diminished quality of life.[4] According to the National Health and Nutrition Examination Survey, the prevalence of dental caries increased from 24% to 28% between 1988-1994 and 1999-2004; the prevalence was approximately 23% from 2011 to 2016.[5] Seventeen percent of children living below the poverty threshold had untreated caries in 2011 to 2014. Dental-related concerns lead to the loss of more than an estimated 50 million school hours each year.[3]

Potential Harms

Primary care screening examinations for dental caries in children from birth to age 5 years are noninvasive and not likely to cause serious harms.

Current Practice

A 2009 study demonstrated that only about half of pediatricians reported examining the teeth of more than half of their patients aged 0 to 3 years, and few (4%) reported regularly applying fluoride varnish.[20]

Update of Previous USPSTF Recommendation

This is an update of the 2014 USPSTF recommendation statement, in which the USPSTF similarly recommended that primary care clinicians prescribe oral fluoride supplementation starting at age 6 months for children whose water supply is deficient in fluoride (B recommendation) and that primary care clinicians apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption (B recommendation). The USPSTF found insufficient evidence to assess the balance of benefits and harms of routine screening examinations for dental caries performed by primary care clinicians in children younger than 5 years (I statement).[21]

Supporting Evidence

Scope of Review

The USPSTF commissioned a systematic review[1,22] to update its 2014 recommendation on screening and interventions to prevent dental caries in children younger than 5 years. The review focused on screening for caries, assessment of risk for future caries, and the effectiveness of various interventions (eg, caregiver/guardian oral health education, preventive medication, or referral to a dental health care professional) that have possible benefits in preventing caries. The USPSTF limited its consideration of caries screening and prevention by primary care clinicians to infants and preschool-aged children. The rationale for this decision was that primary care clinicians are more likely than dental health care professionals to have contact with children younger than 5 years in the US; this situation changes as children reach school age and beyond as opportunities to provide dental services in school settings become available. In addition, as children grow older, dental professionals use sealants rather than fluoride varnish. As such, the USPSTF limited its review of the evidence of preventive interventions for dental caries to this age group. This recommendation should not be construed to imply that preventive interventions for dental caries should cease after age 5 years.

Accuracy of Screening

One good-quality cohort study (n = 258) in children younger than 36 months found that a primary care pediatrician examination after 2 hours of training was associated with a sensitivity of 0.76 and specificity of 0.95 for identifying a child with 1 or more cavities, a sensitivity of 0.49 and specificity of 0.99 for identifying a tooth with a cavity, and a sensitivity of 0.63 and specificity of 0.98 for identifying children in need of a dental referral, compared with a pediatric dentist evaluation.[1,22] A fair-quality study in 110 children aged 18 to 36 months found that an oral examination by a pediatrician had a sensitivity of 1.0 and a specificity of 0.87 for identifying nursing caries.[1,22]

One fair-quality study (n = 1681) found that a novel caries risk assessment tool administered by health visitor nurses in children age 1 year was associated with sensitivity of 0.53 and specificity of 0.77 for predicting any dentin lesions at age 4 years and sensitivity of 0.65 and specificity of 0.69 for predicting presence of 3 or more dentin lesions.[1,22]

Effectiveness of Screening

No studies compared clinical outcomes between children younger than 5 years who were screened and not screened for dental caries by primary care clinicians.

Harms of Screening

No studies reported harms of screening in children younger than 5 years who were screened and not screened for dental caries by primary care clinicians.

Effectiveness of Preventive Interventions

The USPSTF considered 15 trials (2 good quality and the rest fair quality). The number of participants ranged from 123 to 2536 (total N = 9541). Trials were conducted in the US, Europe, Brazil, China, and Iran, and 2 trials were in Aboriginal communities in Australia and Canada. The mean age of enrolled children was 1 year to younger than 2 years in 6 trials and 2 years to younger than 5 years in 7 trials; 1 trial did not report mean age but enrolled children aged 6 months to 5 years.[1,22] Three trials were conducted in preschool or daycare settings and the others were conducted in clinics. Fourteen trials evaluated children classified as higher risk based on low socioeconomic status, high community prevalence of caries, high baseline caries burden (based on high proportion of children with caries at baseline), or low rates of oral health behaviors (eg, tooth brushing with fluoride toothpaste).[1,22]

The USPSTF found 1 randomized trial and 4 nonrandomized trials that compared dietary fluoride supplementation with no supplementation in settings with a water fluoride level less than 0.6 ppm F and found decreased caries incidence. The percentage reduction in incidence ranged from 48% to 72% for primary teeth and 51% to 81% for primary tooth surfaces.[1,22]

The USPSTF found 15 trials (n = 9541) that demonstrated that topical fluoride was associated with decreased caries increment (13 trials; n = 5733; mean difference, −0.94 [95% CI, −1.74 to −0.34]; I^2 = 86%) and decreased likelihood of incident caries (12 trials; n=8177; risk ratio, 0.80 [95% CI, 0.66 to 0.95]; I^2 = 79%; absolute risk difference, −7% [95% CI, −12% to −2%]) vs placebo or no varnish.[1,22] The majority of the trials were conducted in higher-risk populations or settings.[1,22] "High risk" was defined by low socioeconomic status, high caries burden, or suboptimal oral health practices (eg, inadequate tooth brushing). There was no difference in benefits of topical fluoride related to whether trials were conducted in settings with adequate fluoridation.[1,22] Evidence on other preventive interventions was limited (ie, xylitol and silver diamine fluoride).[1,22]

The USPSTF found no studies that directly evaluated the effect of referral by a primary care clinician to a dental health care professional on caries incidence. One fair-quality retrospective cohort study (n = 19 888) and 1 fair-quality observational study (n = 11 394) of children enrolled in Medicaid found no difference in rates of subsequent dental procedures between earlier and later first preventive dental visits among children with no caries at baseline.[1,22] Four fair-quality observational studies (n = 61 194) of children enrolled in Medicaid found that patients receiving a preventive dental visit were more likely to receive subsequent caries treatment than patients who saw a primary care clinician. However, the results were subject to confounding because children who saw a dental health care professional might have had a greater indication for dental services. The studies were also not designed to determine the referral source or effects of dental referral from primary care vs no referral.[1,22]

The USPSTF found limited evidence on educational or counseling interventions. One new fair-quality trial (n = 104) found that oral health education for mothers of caries-free children aged 12 to 36 months was associated with reduced risk of incident dental caries vs usual care at 6 months (13.5% vs 34.7%; risk ratio, 0.39 [95% CI, 0.18 to 0.85]).[1,22]

Harms of Preventive Interventions

Severe fluorosis (for example, as demonstrated by discoloration and pitted or rough enamel surface of the teeth) is uncommon, with a prevalence of less than 2%.[1,22] Nineteen observational studies showed an association between ingestion of systemic fluoride in early childhood and enamel fluorosis of permanent teeth.[1,22] Four trials (n = 4141) found no differences in risk of fluorosis or any other adverse event between fluoride varnish and placebo or no varnish.[1,22]

How Does Evidence Fit With Biological Understanding?

Systemic fluoride becomes incorporated into tooth structures during their formation. If fluoride is ingested repeatedly during tooth development, it is deposited throughout the tooth surface and provides protection against caries. Topical fluoride treatments, such as varnishes, help protect teeth that are already present. In this method, fluoride is incorporated into the surface layer of the teeth, making them more resistant to decay. Systemic fluoride also provides some measure of topical effects, as it is found in the saliva and bathes the teeth. Thus, providing both systemic and topical fluoride to children during tooth development fits with the biological understanding of the protective actions of fluoride against dental decay. All children with erupted teeth can potentially benefit from the periodic application of fluoride varnish, regardless of the levels of fluoride in their water. Although the evidence to support fluoride varnish is drawn from higher-risk populations, the provision of fluoride varnish to all children is reasonable because the prevalence of risk factors is high in the US population.[23-25]

Response to Public Comment

A draft version of this recommendation statement was posted for public comment on the USPSTF website from May 11, 2021, to June 7, 2021. Several respondents shared concerns about risk of fluoride toxicity and barriers to primary care clinician fluoride prescriptions, including knowledge of local water fluoridation status. In response, the USPSTF added timing and dosage information to the Practice Considerations section and updated the Harms of Preventive Interventions section. The USPSTF also expanded the Additional Tools and Resources section to include a tool from the Centers of Disease Control and Prevention that may aid clinicians in identifying the amount of fluoride in a local water system. Comments were also received requesting that the USPSTF recommend that primary care clinicians provide other interventions such as health education. The USPSTF describes the evidence it reviewed on health education in the Supporting Evidence section.

Research Needs and Gaps

More studies are needed that address the following:

- Research is needed to validate the accuracy and utility of caries risk assessment instruments for use in primary care settings and to determine how referral of young children for dental care by primary care clinicians affects caries outcomes.

- Further research would also be helpful to confirm the benefits of fluoride varnish among lower-risk children.
- Research is needed to understand the benefit or harm of routine screening by primary care clinicians on caries outcomes in children younger than 5 years.
- Future studies on risk assessment and preventive interventions should enroll sufficient numbers from certain racial and ethnic populations (eg, Black and Hispanic children) to understand the benefits and harms of interventions in these specific groups.
- Research is needed to identify effective preventive measures in economically disadvantaged children.
- Research is needed to identify effective oral health educational and counseling interventions for parents and caregivers/guardians of young children.
- Studies are also needed on the benefits and harms of silver diamine fluoride for the prevention of caries in young children.

Recommendations of Others

The American Academy of Pediatrics (AAP) recommends that pediatricians perform oral health risk assessments on all children at every routine well-child visit beginning at age 6 months. The AAP also recommends fluoride varnish application according to the AAP/Bright Futures Periodicity Schedule (applied at least once every 6 months for all children and every 3 months for children at high risk for caries) and dietary fluoride supplements for all children who do not have an adequate supply of fluoride in their primary drinking water. The AAP recommends a first dental visit by age 1 year.[25-27]

The American Dental Association recommends that children be seen by a dentist within 6 months of eruption of the first tooth and no later than age 12 months. It also recommends 2.26% fluoride varnish for children younger than 6 years who are at risk for developing dental caries.[28]

The Centers for Disease Control and Prevention recommends that fluoride supplements may be best prescribed to children at high risk for dental caries whose drinking water lacks adequate fluoridation.[24]

The American Academy of Pediatric Dentistry states that fluoride dietary supplements should be considered for children at risk for caries who drink fluoride-deficient (<0.6 ppm F) water. It also states that children at increased risk for caries should receive a professional fluoride treatment (eg, 5% sodium fluoride varnish or 1.23% acidulated phosphate fluoride) every 6 months.[29,30]

ARTICLE INFORMATION

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