

# Behavioral and Pharmacotherapy Interventions for Tobacco Smoking Cessation in Adults, Including Pregnant Women: U.S. Preventive Services Task Force Recommendation Statement

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**Description:** Update of the 2009 U.S. Preventive Services Task Force (USPSTF) recommendation on counseling and interventions to prevent tobacco use and tobacco-related disease in adults, including pregnant women.

**Methods:** The USPSTF reviewed the evidence on interventions for tobacco smoking cessation that are relevant to primary care (behavioral interventions, pharmacotherapy, and complementary or alternative therapy) in adults, including pregnant women.

**Population:** This recommendation applies to adults aged 18 years or older, including pregnant women.

**Recommendations:** The USPSTF recommends that clinicians ask all adults about tobacco use, advise them to stop using tobacco, and provide behavioral interventions and U.S. Food and Drug Administration–approved pharmacotherapy for cessation to adults who use tobacco. (A recommendation)

The USPSTF recommends that clinicians ask all pregnant women about tobacco use, advise them to stop using tobacco,

and provide behavioral interventions for cessation to pregnant women who use tobacco. (A recommendation)

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of pharmacotherapy interventions for tobacco cessation in pregnant women. (I statement)

The USPSTF concludes that the current evidence is insufficient to recommend electronic nicotine delivery systems for tobacco cessation in adults, including pregnant women. The USPSTF recommends that clinicians direct patients who smoke tobacco to other cessation interventions with established effectiveness and safety (previously stated). (I statement)

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**T**he U.S. Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific preventive care services for patients without related signs or symptoms.

It bases its recommendations on the evidence of both the benefits and harms of the service and an assessment of the balance. The USPSTF does not consider the costs of providing a service in this assessment.

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. Similarly, the USPSTF notes that policy and coverage decisions involve considerations in addition to the evidence of clinical benefits and harms.

## SUMMARY OF RECOMMENDATIONS AND EVIDENCE

The USPSTF recommends that clinicians ask all adults about tobacco use, advise them to stop using tobacco, and provide behavioral interventions and pharmacotherapy U.S. Food and Drug Administration (FDA)-approved pharmacotherapy for cessation to adults who use tobacco. (A recommendation)

The USPSTF recommends that clinicians ask all pregnant women about tobacco use, advise them to stop using tobacco, and provide behavioral interventions for cessation to pregnant women who use tobacco. (A recommendation)

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of pharmacotherapy interventions for tobacco cessation in pregnant women. (I statement)

The USPSTF concludes that the current evidence is insufficient to recommend electronic nicotine delivery systems (ENDS) for tobacco cessation in adults, including pregnant women. The USPSTF recommends that clinicians direct patients who smoke tobacco to other cessation interventions with established effectiveness and safety (previously stated). (I statement)

See the Clinical Considerations section for suggestions for practice regarding the I statements.

See the **Figure** for a summary of the recommendations and suggestions for clinical practice.

### See also:

- Related article . . . . . 1
- Summary for Patients . . . . . 2

**Figure.** Behavioral and pharmacotherapy interventions for tobacco cessation in adults, including pregnant women: clinical summary.

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Behavioral and Pharmacotherapy Interventions for Tobacco Smoking Cessation in Adults, Including Pregnant Women: Clinical Summary

Population	Nonpregnant adults aged ≥18 y	Pregnant adults aged ≥18 y	Pregnant adults aged ≥18 y	All adults aged ≥18 y
Recommendation	Provide pharmacotherapy and behavioral interventions for cessation. Grade: A	Provide behavioral interventions for cessation. Grade: A	Pharmacotherapy interventions: No recommendation. Grade: I statement	ENDS: No recommendation. Grade: I statement

Assessment	The 5 A's framework is a useful strategy for engaging patients in smoking cessation discussions. The 5 A's include asking every patient about tobacco use, advising all tobacco users to quit, assessing the willingness of all tobacco users to make an attempt to quit assisting tobacco users with their attempt to quit, and arranging follow-up.			
Behavioral Counseling Interventions	Behavioral interventions alone (in-person behavioral support and counseling, telephone counseling, and self-help materials) or combined with pharmacotherapy substantially improve achievement of tobacco cessation.	Behavioral interventions substantially improve achievement of tobacco smoking abstinence, improve infant birthweight, and reduce risk for preterm birth.		
Pharmacotherapy Interventions	Pharmacotherapy interventions, including NRT, bupropion SR, and varenicline—with or without behavioral counseling interventions—substantially improve achievement of tobacco cessation.		There is inadequate or no evidence on the benefits of NRT, bupropion SR, or varenicline to achieve tobacco cessation or improve perinatal outcomes in infants.	There is inadequate evidence on the benefit of ENDS to achieve tobacco cessation or improve perinatal outcomes in infants.
Balance of Benefits and Harms	The USPSTF concludes with high certainty that the net benefit of behavioral interventions and FDA-approved pharmacotherapy for tobacco cessation, alone or in combination, is substantial.	The USPSTF concludes with high certainty that the net benefit of behavioral interventions for tobacco cessation on perinatal outcomes and smoking abstinence is substantial.	The USPSTF concludes that the evidence on pharmacotherapy interventions for tobacco cessation is insufficient because of a lack of studies, and the balance of benefits and harms cannot be determined.	The USPSTF concludes that the evidence on the use of ENDS for tobacco cessation is insufficient, and the balance of benefits and harms cannot be determined.
Other Relevant USPSTF Recommendations	The USPSTF recommends that primary care clinicians provide interventions, including education or brief counseling, to prevent the initiation of tobacco use in school-aged children and adolescents. This recommendation is available on the USPSTF Web site ( <a href="http://www.uspreventiveservicestaskforce.org">www.uspreventiveservicestaskforce.org</a> ).			

For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, please go to [www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org).

ENDS = electronic nicotine delivery system; FDA = U.S. Food and Drug Administration; The 5 A's = Five Major Steps to Intervention; NRT = nicotine replacement therapy; USPSTF = U.S. Preventive Services Task Force.

Appendix Table 1 describes the USPSTF grades, and Appendix Table 2 describes the USPSTF classification of levels of certainty about net benefit (both tables are available at [www.annals.org](http://www.annals.org)).

**RATIONALE**  
**Importance**

Tobacco use is the leading preventable cause of disease, disability, and death in the United States. Cigarette smoking results in more than 480 000 premature deaths each year and accounts for approximately 1 in every 5 deaths (1). In pregnant women, smoking increases the risk for congenital anomalies; perinatal complications, such as preterm birth, fetal growth re-

striction, and placental abruption; miscarriage and still-birth; and neonatal or pediatric complications, such as sudden infant death syndrome and impaired lung function in childhood (1-4). An estimated 42.1 million U.S. adults (nearly 18% of the population) currently smoke (5).

**Recognition of Behavior**

The benefits of assessing patients' smoking behavior are well-established. Common approaches for clinicians include recording a patient's smoking status as a vital sign or using The 5 A's: 1) Ask about smoking; 2) Advise to quit through clear, personalized messages; 3) Assess willingness to quit; 4) Assist in quitting; and 5) Arrange follow-up and support). Another approach is

“Ask, Advise, Refer,” which encourages clinicians to ask patients about tobacco use, advise them to quit, and refer them to telephone quit lines and/or other evidence-based cessation interventions.

## Benefits of Interventions

### *Nonpregnant Adults*

The USPSTF found convincing evidence that behavioral interventions (including in-person behavioral support and counseling, telephone counseling, and self-help materials) alone or combined with pharmacotherapy substantially improve achievement of tobacco cessation in nonpregnant adults who smoke. The USPSTF found convincing evidence that pharmacotherapy interventions, including nicotine replacement therapy (NRT), bupropion hydrochloride sustained-release (bupropion SR), and varenicline—with or without behavioral counseling interventions—substantially improve achievement of tobacco cessation in nonpregnant adults who smoke. The USPSTF also found convincing evidence that using 2 types of NRT moderately improves achievement of tobacco smoking cessation over using 1 type and that addition of NRT to treatment with bupropion SR provides additional benefit over use of bupropion SR alone. The USPSTF found inadequate evidence to determine the effect of ENDS on achievement of tobacco smoking cessation.

### *Pregnant Women*

The USPSTF found convincing evidence that behavioral interventions substantially improve achievement of tobacco smoking abstinence in pregnant women, increase infant birthweight, and reduce risk for preterm birth. The USPSTF found inadequate evidence on the benefits of NRT and no evidence on the benefits of bupropion SR, varenicline, or ENDS to achieve tobacco cessation in pregnant women who smoke or to improve perinatal outcomes in infants.

## Harms of Interventions

### *Nonpregnant Adults*

The USPSTF determined that there is adequate evidence to bound the magnitude of harms of behavioral interventions for tobacco cessation in nonpregnant adults who smoke as small to none. The USPSTF found adequate evidence that the harms of NRT, bupropion SR, or varenicline for tobacco cessation in adults who smoke are small. The USPSTF found inadequate evidence to determine the harms of ENDS.

### *Pregnant Women*

The USPSTF determined that there is adequate evidence to bound the magnitude of harms of behavioral interventions for tobacco cessation in pregnant women who smoke as small to none. The USPSTF found inadequate evidence on the harms of NRT and no evidence on the harms of bupropion SR, varenicline, or ENDS for tobacco cessation in pregnant women who smoke.

## USPSTF Assessment

The USPSTF concludes with high certainty that the net benefit of behavioral interventions and FDA-approved pharmacotherapy for tobacco cessation, alone or combined, in nonpregnant adults who smoke is substantial.

The USPSTF concludes with high certainty that the net benefit of behavioral interventions for tobacco cessation on perinatal outcomes and smoking abstinence in pregnant women who smoke is substantial.

The USPSTF concludes that the evidence on pharmacotherapy interventions for tobacco cessation in pregnant women is insufficient because of a lack of studies, and the balance of benefits and harms cannot be determined.

The USPSTF concludes that the evidence on the use of ENDS for tobacco smoking cessation in adults, including pregnant women, is insufficient, and the balance of benefits and harms cannot be determined. The USPSTF has identified the lack of well-designed, randomized, controlled trials (RCTs) on ENDS that report smoking abstinence or adverse events as a critical gap in the evidence.

## CLINICAL CONSIDERATIONS

### Patient Population Under Consideration

This recommendation applies to adults aged 18 years or older, including pregnant women. The USPSTF previously issued a separate recommendation statement on primary care interventions for tobacco use in children and adolescents (available at [www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org)). Although the USPSTF acknowledges that tobacco may be used in other forms and that other substances aside from tobacco may be smoked, they are not the focus of this recommendation.

### Assessment of Risk

According to the 2012–2013 National Adult Tobacco Survey, smoking prevalence is higher in the following groups: men; adults aged 25 to 44 years; persons with a race or ethnicity category of “other, non-Hispanic”; persons with a GED (vs. graduate-level education); persons with an annual household income of less than \$20 000; and persons who are lesbian, gay, bisexual, or transgender (6). Higher rates of smoking have been found in persons with mental health conditions (7).

### Implementation Considerations of Behavioral and Pharmacotherapy Interventions

The information that follows on the implementation of interventions for smoking cessation draws from the USPSTF systematic evidence review (8) and the 2008 Public Health Service guidelines (9).

### Assessment of Smoking Status

The 5 A's framework (available at [www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/5steps.html](http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/5steps.html)) is a useful strategy

**Table.** Components of Effective Behavioral Interventions for Tobacco Cessation**Intensity**

- Both minimal (<20 min in 1 visit) and intensive ( $\geq 20$  min plus >1 follow-up visit) physician-advice interventions effectively increase the proportion of adults who successfully quit smoking and remain abstinent for  $\geq 6$  mo.
- There is a dose-response relationship between the intensity of counseling and cessation rates (i.e., more or longer sessions improve cessation rates).

**Duration**

- Brief, in-person behavioral counseling sessions (<10 min) effectively increase the proportion of adults who successfully quit smoking and remain abstinent for 1 y.
- Although less effective than longer interventions, even minimal interventions (<3 min) have been found to increase cessation rates in some studies.

**Frequency**

- Multiple sessions should be provided; according to the Public Health Service guidelines, patients should receive  $\geq 4$  in-person counseling sessions.
- Cessation rates may plateau after 90 min of total counseling contact time.

**Format**

- In-person behavioral counseling sessions (individual or group counseling)
- Telephone counseling
- Tailored, print-based self-help materials

**Provider**

- In-person behavioral counseling sessions: various types of primary care providers, including physicians, nurses, psychologists, social workers, and cessation counselors
- Telephone counseling: professional counselors or health care providers who are trained to offer advice over the telephone

**Content**

- Assessment of smoking status
  - Ask every patient about tobacco use
  - Advise all tobacco users to quit
  - Assess willingness of all tobacco users to make an attempt to quit
  - Assist all tobacco users with their attempt to quit
  - Arrange follow-up
- Effective counseling interventions provide social support and training in practical problem-solving skills
  - Training in problem-solving skills includes helping persons who smoke to recognize situations that increase their risk for smoking, develop coping skills to overcome common barriers to quitting, and develop a plan to quit
  - Basic information about smoking and successful quitting should also be provided
  - Complementary practices that improve cessation rates include motivational interviewing, assessing readiness to change, and offering more intensive counseling or referrals

for engaging patients in discussions about smoking cessation. This program includes the following: 1) Asking every patient about tobacco use, 2) Advising all tobacco users to quit, 3) Assessing their willingness to attempt to quit, 4) Assisting with attempts to quit, and 5) Arranging follow-up (10). "Ask, Advise, Refer" is another approach and involves asking patients about tobacco use, advising those who smoke to quit, and referring them to evidence-based interventions. Treating smoking status as a vital sign and recording smoking status at every health visit are also frequently used to assess smoking status. Because many pregnant women who smoke do not report it, using multiple-choice questions to assess smoking status in this group may improve disclosure (9).

**Nonpregnant Adults**

Both intervention types (pharmacotherapy and behavioral interventions) are effective and recommended; combinations of interventions are most effective, and all should be offered. The best and most effective combinations are those that are acceptable to and feasible for an individual patient; clinicians should consider the patient's specific medical history and preferences and offer and provide the combination that works best for the patient.

*Behavioral Interventions.* Many behavioral interventions are available to encourage smoking cessation

in adults. These interventions can be delivered in the primary care setting or can be referred to community settings with feedback to the primary care provider. Effective behavioral interventions include in-person behavioral support and counseling, telephone counseling, and self-help materials (Table). Behavioral interventions may increase rates of smoking abstinence from a baseline range of approximately 5% to 11% in control groups to 7% to 13% in intervention groups (8).

Both minimal (<20 minutes in 1 visit) and intensive ( $\geq 20$  minutes plus >1 follow-up visit) physician-advice interventions effectively increase the proportion of adults who successfully quit smoking and remain abstinent for at least 6 months (8).

Brief, in-person behavioral counseling sessions (<10 minutes) effectively increase the proportion of adults who successfully quit smoking and remain abstinent for 1 year. Although less effective than longer interventions, even minimal interventions (<3 minutes) have increased cessation rates in some studies (9).

There is a dose-response relationship between the intensity of counseling and cessation rates (that is, more or longer sessions improve cessation rates) (9).

Several sessions should be provided; according to the Public Health Service guidelines, patients should receive at least 4 in-person counseling sessions (9).

Cessation rates may plateau after 90 minutes of total counseling contact time (9).

Effective interventions can be delivered by various types of primary care providers, including physicians, nurses, psychologists, social workers, and cessation counselors (8, 9).

Both individual and group counseling are effective (9).

Effective counseling interventions provide social support and training in practical problem-solving skills (9).

Training in problem-solving skills includes helping persons who smoke to recognize situations that increase their risk for smoking, develop coping skills to overcome common barriers to quitting, and develop a plan to quit.

Basic information about smoking and successful quitting should be provided.

Complementary practices that improve cessation rates include motivational interviewing, assessing readiness to change, and offering more intensive counseling or referrals (9).

Telephone counseling interventions are effective (8, 9).

Effective interventions provide at least 3 telephone calls (8).

Telephone counseling can be provided by professional counselors or health care providers who are trained to offer advice over the telephone.

Providing self-help materials (primarily print-based) that are tailored to the individual patient (that is, beyond a brochure that simply describes the health effects of smoking) is also effective in improving smoking abstinence (8). Evidence on nontailored, print-based, self-help materials; computer-based programs; and mobile phone-based interventions (such as a mHEALTH) is mixed, although several trials show promise (8).

**Pharmacotherapy.** The only pharmacotherapy interventions approved by the FDA for the treatment of tobacco dependence in adults are bupropion SR, varenicline, and NRT (including nicotine transdermal patches, lozenges, gum, inhalers, or nasal spray).

Evidence suggests that rates of smoking abstinence may increase from approximately 10% in control groups (placebo or no pharmacotherapy) to 17% in persons using any form of NRT, from roughly 11% in control groups (placebo or no bupropion SR) to 19% in those using bupropion SR, and from approximately 12% in control groups (placebo) to 28% in those using varenicline (8).

Information on dosing regimens is available in the package inserts of individual medications or at <http://betobaccofree.hhs.gov>. Information for consumers on FDA-approved pharmacotherapy for smoking cessation is available at [www.fda.gov/ForConsumers/ConsumerUpdates/ucm198176.htm](http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm198176.htm).

**Combinations of Pharmacotherapy.** Using 2 types of NRT has been found to be more effective than using a single type. In particular, there was evidence that combining a nicotine patch with a rapid-delivery form of NRT is more effective than using a single type.

Some studies suggest that NRT in combination with bupropion SR may be more efficacious than bupropion SR alone but not necessarily NRT alone (8).

**Combinations of Behavioral and Pharmacotherapy Interventions.** Combining behavioral and pharmacotherapy interventions may increase cessation rates from approximately 8% to 14% (11) compared with usual care or minimal behavioral interventions (such as self-help materials or brief advice on quitting).

These combination interventions often have behavioral components delivered by specialized cessation counselors or trained staff and often use NRT.

Combination interventions often involve several sessions ( $\geq 4$ ) and tend to be more successful with more sessions.

The largest effect was found in interventions that provided 8 or more sessions, although the difference in effect among the number of sessions was not significant.

Contact time ranged from 0 to greater than 300 minutes; interventions lasting 91 to 300 minutes were most common.

The addition of behavioral support to pharmacotherapy also significantly increased cessation rates from approximately 18% in persons using pharmacotherapy alone to 21% in those using a combination of pharmacotherapy and behavioral support.

Intensity of behavioral support ranged from 0 to greater than 300 minutes of contact; interventions most often involved greater than 91 minutes of contact (roughly 40% were 91 to 300 minutes, and 60% were  $>300$  minutes).

### **Pregnant Women**

**Behavioral Interventions.** Effective behavioral interventions in pregnant women who smoke include counseling, feedback, health education, incentives, and social support. Compared with usual care or controls, behavioral interventions can increase rates of smoking abstinence from approximately 11% to 15% in pregnant women.

Effective behavioral interventions provided more intensive counseling than minimal advice and other standard components of usual care (9).

Counseling sessions augmented with messages and self-help materials tailored for pregnant women who smoke increased abstinence rates during pregnancy compared with brief, generic counseling interventions alone (9).

Counseling specific to pregnant women should include messages about the effects of smoking on both maternal and fetal health and clear, strong advice to quit as soon as possible. Although smoking cessation at any point during pregnancy yields substantial health benefits for the expectant mother and baby, quitting early in pregnancy provides the greatest benefit to the fetus (9).

### **Other Interventions**

Health care system-based strategies that have been shown to improve rates of clinical interventions for smoking cessation in primary care settings include

implementing an identification system for tobacco users; providing education, resources, and feedback to promote clinician intervention; and dedicating staff to provide treatment for tobacco dependence and assessing the delivery of this treatment in staff performance evaluations (9).

### Useful Resources

Primary care clinicians may find the following resources useful in talking with adults and pregnant women about smoking cessation: Centers for Disease Control and Prevention fact sheets on quitting smoking ([www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/cessation/quitting/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/quitting/index.htm)), the U.S. Department of Health and Human Services' BeTobaccoFree (<http://betobaccofree.hhs.gov/quit-now/index.html#professionals>), the U.S. Department of Health and Human Services' SmokeFreeWomen (<http://women.smokefree.gov/pregnancy-motherhood.aspx>), and the Public Health Service's 2008 clinical practice guidelines (9).

In addition, the following resources may be useful to primary care clinicians and practices trying to implement interventions for smoking cessation: the Substance Abuse and Mental Health Services Administration-Health Resources and Services Administration Center for Integrated Health Solutions' resources for smoking cessation ([www.integration.samhsa.gov/health-wellness/wellness-strategies/tobacco-cessation-2](http://www.integration.samhsa.gov/health-wellness/wellness-strategies/tobacco-cessation-2)), Centers for Disease Control and Prevention state and community resources for tobacco-control programs ([www.cdc.gov/tobacco/stateandcommunity/index.htm](http://www.cdc.gov/tobacco/stateandcommunity/index.htm)), and the World Health Organization's toolkit for delivering brief smoking interventions in primary care ([www.who.int/tobacco/publications/smoking\\_cessation/9789241506953/en](http://www.who.int/tobacco/publications/smoking_cessation/9789241506953/en)).

### Suggestions for Practice Regarding the I Statements

#### Pharmacotherapy for Pregnant Women

Although smoking prevalence is lower in pregnant women than nonpregnant women of the same age, approximately 1 in 6 pregnant women aged 15 to 44 years smoke (7). Smoking during pregnancy slows fetal growth, doubles the risk for delivering a baby with low birthweight, and increases the risk for fetal death by 25% to 50%. For women in whom behavioral counseling does not work, other options to promote smoking cessation may be beneficial.

A few studies have evaluated the benefit of NRT on perinatal and child health outcomes. Although results generally suggest a potential benefit, the overall evidence is too limited to draw clear conclusions. Nicotine replacement therapy is a pregnancy category D medication, which means that there is positive evidence of fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans. However, it has been suggested that NRT may be safer than smoking during pregnancy (4, 12). Potential adverse events reported include increased rates of cesarean delivery, slightly increased diastolic blood pressure, and skin reactions to the patch. Potential adverse events reported in nonpregnant adults include higher

rates of low-risk cardiovascular events, such as tachycardia. There is no evidence of perinatal harms from NRT, although few trials reported consistently on these adverse events.

The USPSTF identified no studies on bupropion SR or varenicline pharmacotherapy during pregnancy. These drugs are both pregnancy category C, which means that animal reproduction studies have shown an adverse effect on the fetus but there are no adequate well-controlled studies in humans.

In the absence of clear evidence on the balance of benefits and harms of pharmacotherapy in pregnant women, clinicians are encouraged to consider the severity of smoking behavior in each patient and engage in shared decision making to determine the best individual treatment course.

### ENDS

Approximately 69% of adults who smoke daily report interest in quitting, and roughly 43% attempted to quit in the previous year (1). To date, no ENDS manufacturer has applied for or received FDA approval to market their product for smoking cessation purposes. According to a small 2013 study, approximately two thirds of physicians reported that they believed that electronic cigarettes (e-cigarettes) were a helpful aid for smoking cessation, and 35% recommended them to patients (13). A recent small survey of e-cigarette users found that 56% reported using them to quit or reduce cigarette use, and 26% reported using them to smoke in places where conventional cigarettes were banned (14). Because of the perception by the public and clinicians that ENDS may be used for quitting conventional smoking, the USPSTF reviewed the evidence in this area. No studies evaluated the use of ENDS for smoking cessation in pregnant women or adolescents. The USPSTF identified only 2 RCTs that evaluated the effect of e-cigarettes on smoking abstinence in adults and found mixed results. Neither study reported any serious adverse events related to ENDS use; however, potential concerns raised in other literature include the unknown safety and toxicity of their components and aerosols (11, 15), and poisoning in children who mishandle nicotine cartridges (16). How the ingredients in ENDS may affect a fetus is also unknown. Overall, the USPSTF found the evidence on the use of ENDS as a smoking cessation tool in adults, including pregnant women, and adolescents to be insufficient.

### Additional Approaches to Prevention

Given the public health significance of the consequences of tobacco use, numerous public health interventions aim to prevent tobacco use and promote smoking cessation. The Community Preventive Services Task Force offers several recommendations on interventions that can be used in community settings (available at [www.thecommunityguide.org/tobacco/index.html](http://www.thecommunityguide.org/tobacco/index.html)). The Surgeon General's report, "The Health Consequences of Smoking—50 Years of Progress," discusses initiatives to end the tobacco use epidemic in the United States (1). In addition, the USPSTF recom-

mends that primary care clinicians provide interventions, including education or brief counseling, to prevent the initiation of tobacco use among school-aged children and adolescents (available at [www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org)).

## OTHER CONSIDERATIONS

### Research Needs and Gaps

A large body of evidence on interventions for smoking cessation already exists, and the overall benefit of pharmacotherapy and behavioral counseling to promote smoking cessation is well-established. However, further research is still needed to elucidate specific effective features of complex behavioral counseling interventions, benefits of pharmacotherapy in specific subpopulations, and the efficacy of newer technology-based interventions. Although numerous behavioral interventions for smoking cessation are available to primary care clinicians, further research is needed to better clarify the effects of varying levels of intensity (such as how the number of sessions and number of minutes per session affect continuous abstinence rates), which settings of behavioral counseling interventions are most conducive to quitting (individual vs. group, health vs. community, and primary care vs. specialty), and ways to tailor self-help materials. Further research is needed on the benefits and harms of pharmacotherapy in specific subpopulations, such as pregnant women and adults with mental health conditions. Research that directly compares types of pharmacotherapy in different populations may help inform providers on which interventions to use with which patients. Additional research is also needed on interventions for light or nondaily smokers and to better understand the effectiveness of newer technology platforms for interventions for smoking cessation, such as Internet-based programs, mobile or smartphone applications, and text-messaging programs. Although no ENDS manufacturer has applied to the FDA to have their product approved as a therapeutic device, because of the perception by both the public and clinicians that ENDS may be used as an option for quitting conventional smoking, further research is needed on the safety, benefits, and harms of ENDS.

## DISCUSSION

### Burden of Disease

Tobacco use is the leading preventable cause of disease, disability, and death in the United States. Smoking increases the risk for all-cause mortality and has been found to increase risk for various types of cancer (such as lung, liver, and colorectal), respiratory diseases (such as chronic obstructive pulmonary disease and tuberculosis), cardiovascular disease (such as stroke from secondhand smoke), diabetes, impaired immune function and autoimmune disease (such as rheumatoid arthritis), eye disease (such as age-related macular degeneration), and erectile dysfunction in men. Smoking early in pregnancy has been found to

cause ectopic pregnancy and orofacial clefts in infants (1).

According to National Health Interview Survey data from 2013, a total of 42.1 million adults in the United States (17.8%) smokes cigarettes (5). Rates are higher among men; adults aged 24 to 44 years; lesbian, gay, bisexual, or transgender adults; multiracial groups and American Indians or Alaska Natives; persons whose highest education level attained is a GED; and persons living below the poverty level (5). Adults with mental health conditions have higher smoking rates and tend to smoke a higher average number of cigarettes than adults without mental health conditions. Approximately 27% of persons with a mental health or substance use disorder smoke (17).

Based on data from the Pregnancy Risk Assessment and Monitoring System, 23.2% of women smoked during the 3 months before conception (18). Data from 2011 showed that 55% of women quit smoking during pregnancy, roughly 10% of pregnant women smoked during the last 3 months of pregnancy, and 40% of women relapsed within 6 months of delivery (19). Smoking during pregnancy is associated with fetal growth restriction, preterm delivery, and sudden infant death syndrome. Prenatal smoking contributed to an estimated 5.3% to 7.7% of preterm deliveries, 13.1% to 19.0% of low-birthweight term deliveries, 23.2% to 33.6% of cases of sudden infant death syndrome, and 5.0% to 7.3% of preterm-related deaths in 2002 (1).

Quitting smoking is one of the most important and yet challenging preventive health measures a person can take to improve his or her health. Most smokers make several serious attempts to quit before achieving permanent abstinence.

### Scope of Review

The current review focused on appraising evidence on interventions for smoking cessation that are relevant to primary care (behavioral interventions, pharmacotherapy, and complementary or alternative therapy) in adults, including pregnant women. Only pharmacotherapy interventions that were approved by the FDA as first-line agents for smoking cessation were included (NRT, bupropion SR, and varenicline). Health outcomes included all-cause mortality, tobacco-related mortality and morbidity, and perinatal mortality and morbidity. Smoking-cessation outcomes had to be reported at 6 months or later to be included; findings on smoking reduction (based on frequency or quantity only), intention to quit, and cessation at less than 6 months were excluded. The USPSTF also evaluated adverse events reported at any time point.

### Effectiveness of Interventions

#### Nonpregnant Adults

*Behavioral Interventions.* The USPSTF reviewed 11 good- or fair-quality systematic reviews on behavioral interventions, including complementary or alternative therapies, and smoking-cessation outcomes (8). Evidence on increasing smoking abstinence was strongest for physician and nurse advice, tailored self-help materials, and telephone counseling. Based on a 2013 sys-

tematic review of 28 studies ( $n = 22\,239$ ) (20), rates of smoking abstinence at 6 months or more were 8.0% in groups that received physician advice compared with 4.8% in groups that received no advice or usual care (risk ratio [RR], 1.76 [95% CI, 1.56 to 1.96]). Based on pooled analyses of 35 studies from a 2013 systematic review that evaluated advice delivered by nurses, 13.3% of participants who received interventions from nurses achieved smoking abstinence at 6 months or more compared with 11.3% of those who received usual care or minimal intervention (RR, 1.29 [CI, 1.20 to 1.39]) (21). When stratified by intensity level, both minimal advice (defined as a single session lasting <20 minutes with  $\leq 1$  follow-up session) and intensive advice (defined as a single session lasting  $\geq 20$  minutes or >1 follow-up session) from a physician significantly increased cessation rates compared with no advice. In a subset of 15 trials that directly compared intensive versus minimal advice from physicians, intensive advice significantly increased smoking abstinence compared with minimal advice (RR, 1.37 [CI, 1.20 to 1.56]) (20). Based on pooled analyses of 32 studies from a 2014 review of print-based self-help materials ( $n = 40\,890$ ), participants who received tailored self-help materials showed a significantly higher rate of smoking abstinence at 6 months or more than control participants (7.1% vs. 5.8%; RR, 1.28 [CI, 1.18 to 1.37]). However, no significant improvement was seen when nontailored materials were compared with no self-help materials (RR, 1.06 [CI, 0.98 to 1.16]), based on pooled analyses of 33 studies ( $n = 29\,495$ ) (22). A 2013 review on telephone counseling interventions found that recruiter-initiated telephone support improved rates of smoking cessation at 6 months or more (23). Based on pooled analyses of 12 studies ( $n = 30\,182$ ), abstinence rates were significantly higher in participants who received several counseling sessions via a telephone quit line than in those who received only a single session or self-help materials (10.7% vs. 7.6%; RR, 1.41 [CI, 1.20 to 1.66]). Pooled analyses of 51 studies ( $n = 30\,246$ ) found that recruiter-initiated telephone counseling that did not result from patients' calls to help lines also showed a benefit on smoking abstinence rates at 6 months or more compared with controls (13.1% vs. 9.7%; RR, 1.27 [CI, 1.20 to 1.36]).

The USPSTF also reviewed the 2008 Public Health Service guidelines on treating tobacco use and dependence for additional details on intensity and content of behavioral interventions, as well as type of staff providing counseling for smoking cessation (15). The USPSTF also considered evidence from additional reviews on mobile phone and Internet-based interventions (8). Although findings suggested a benefit, there were too few studies and the studies were too heterogeneous to draw definitive conclusions. The USPSTF also considered evidence from reviews on biomedical risk assessment interventions, exercise, and hypnotherapy for smoking cessation; the studies were too limited to draw conclusions (8). A 2014 review on the use of acupuncture for smoking cessation (9 studies;  $n = 1892$ ) did not find increased rates of smoking cessation at 6 to 12 months (24).

*Pharmacotherapy.* The USPSTF reviewed 3 good-quality systematic reviews on pharmacotherapy for smoking cessation in nonpregnant adults (11).

A 2012 systematic review on NRT (117 studies;  $n = 51\,265$ ) (25) found that 17.3% of participants taking any form of NRT achieved abstinence at 6 months or more compared with 10.3% of participants receiving placebo or taking no NRT (RR, 1.60 [CI, 1.53 to 1.68]). Those who used 2 forms of NRT achieved higher abstinence rates than those who used just 1 (20.6% vs. 15.6%; RR, 1.34 [CI, 1.18 to 1.51]). All studies of dual NRT used the patch plus another type of NRT (such as gum, nasal spray, or inhaler), although which form served as the control varied. All single forms of NRT significantly improved cessation rates at 6 months or more (gum: RR, 1.49 [CI, 1.40 to 1.60]; patch: RR, 1.64 [CI, 1.52 to 1.78]; tablets or lozenges: RR, 1.95 [CI, 1.61 to 2.36]).

A 2014 systematic review on the use of antidepressants for smoking cessation (44 studies;  $n = 13\,728$ ) found that bupropion SR was associated with a significantly higher rate of smoking abstinence at 6 months or more than placebo or no bupropion SR (19.7% vs. 11.5%; RR, 1.62 [CI, 1.49 to 1.76]) (26).

Based on a smaller number of studies (14 studies;  $n = 6166$ ), a 2012 systematic review (27) found that varenicline was associated with a higher cessation rate than placebo (28.0% vs. 12.0%; RR, 2.27 [CI, 2.02 to 2.55]).

Pooled analyses found that NRT plus bupropion was more effective than bupropion alone (RR, 1.24 [CI, 1.06 to 1.45]; 4 studies;  $n = 1991$ ); however, it was not more effective than NRT alone (RR, 1.19 [CI, 0.94 to 1.51]; 12 studies) (8).

Smaller subsets of studies from these reviews directly compared types of pharmacotherapy for smoking cessation. Abstinence rates among participants using NRT versus bupropion SR at 6 months or more did not significantly differ (8 studies;  $n = 4086$ ) (26). Two studies ( $n = 778$ ) compared NRT and varenicline and found no significant difference between groups (27). Four studies evaluated bupropion SR versus varenicline; although not all of the studies found a significant difference, a pooled estimate ( $n = 1810$ ) found a lower cessation rate with bupropion SR than varenicline (RR, 0.68 [CI, 0.56 to 0.83]).

*Combinations of Behavioral Interventions and Pharmacotherapy.* Combinations of behavioral counseling and pharmacotherapy for smoking cessation were also effective (8). A 2012 good-quality systematic review (40 studies;  $n = 15\,021$ ) (28) found that participants who received combination pharmacotherapy and intensive behavioral counseling had a higher abstinence rate at 6 months or more compared with control participants who received usual care, self-help materials, or brief advice on quitting (which was less intensive than the counseling or support given to the intervention groups) (14.5% vs. 8.3%; RR, 1.82 [CI, 1.66 to 2.00]). Most studies (27 of 40) used NRT as the pharmacotherapy and offered at least 4 behavioral counseling sessions (33 of 41). Another good-quality systematic review (29) found that abstinence rates at 6 months or more were higher in participants who received behav-

ioral support as an adjunct to pharmacotherapy than in those who received pharmacotherapy alone (21.4% vs. 18.3%; RR, 1.16 [CI, 1.09 to 1.24]). Most studies (27 of 38) offered NRT alone as the pharmacotherapy. Participants in the control group may have also received some counseling or support, but it was less intensive than in the intervention group. Most studies (28 of 38) offered at least 91 minutes of total contact time, and many (16 of 38) offered greater than 300 minutes.

**ENDS.** The USPSTF identified only 2 fair-quality RCTs that reported on the effects of e-cigarettes for stopping conventional cigarette smoking (8). One study (30) of persons not attempting or wishing to quit found a higher abstinence rate at 12 months in participants using e-cigarettes than in control participants (11.0% vs. 4%;  $P = 0.04$ ), whereas a larger study found no significant difference in abstinence rates at 6 months (31). Neither trial was conducted in the United States.

### Pregnant Women

**Behavioral Interventions.** Based on a good-quality systematic review of 86 studies done in 2013 (8, 32), the USPSTF found that behavioral interventions in pregnant women (including behavioral counseling, feedback, health education, incentives, and social support) are effective at improving rates of smoking cessation as well as perinatal health outcomes. Compared with control participants (most often defined as usual care or less intensive interventions), pregnant women who received any type of behavioral intervention before the third trimester had higher cessation rates late in pregnancy (15.2% vs. 11.2%; RR, 1.45 [CI, 1.27 to 1.64]). Their children also had improved mean birthweight (mean difference, 40.78 g [CI, 18.45 to 63.10 g]), rates of low birthweight (RR, 0.82 [CI, 0.71 to 0.94]), and rates of preterm birth (RR, 0.82 [CI, 0.70 to 0.96]). When analyzed separately, behavioral counseling (the behavioral intervention in most studies) was effective in increasing abstinence rates in late pregnancy and mean birthweight in infants.

**Pharmacotherapy.** The USPSTF found a much smaller body of evidence on pharmacotherapy for smoking cessation in pregnant women. Only 5 RCTs ( $n = 11\ 922$ ) evaluating NRT use were found; there were no published trials on the use of bupropion SR or varenicline as an intervention for smoking cessation in pregnant women (8). The NRT studies reported very low (as low as <25%) adherence rates, which limited the interpretability of findings. Meta-analysis of these 5 trials showed no significant improvement in rates of smoking abstinence late in pregnancy (10.8% vs. 8.5%; RR, 1.24 [CI, 0.95 to 1.64]). Given the small number of studies that reported on perinatal health outcomes, meta-analysis was not done. Although results on preterm birth were mostly in the direction of benefit, only 1 study (33) showed a significant benefit. Reported results on mean birthweight and stillbirth were mixed. The largest trial ( $n = 1050$ ) reported a higher rate of survival with no impairment at 2 years in children whose mothers received NRT during pregnancy (34).

## Potential Harms of Interventions

### Nonpregnant Adults

**Behavioral Interventions.** Evidence on harms of behavioral interventions for smoking cessation is limited. Based on the evidence reviewed by the USPSTF, only minor adverse events related to ear acupuncture, ear acupressure, and other auriculotherapy were identified. Adverse events related to other forms of behavioral interventions were not reported.

**Pharmacotherapy.** A 2014 fair-quality systematic review (35) of 21 studies ( $n = 11\ 647$ ) found that NRT use was associated with a higher rate of all cardiovascular adverse events (RR, 1.81 [CI, 1.35 to 2.43]) compared with placebo. This result seems to be driven by minor events, such as tachycardia and arrhythmia. No significant increase in major cardiovascular adverse events was found (RR, 1.38 [CI, 0.58 to 3.26]). An older fair-quality review from 2010 (36) also found higher rates of heart palpitation and chest pain, nausea and vomiting, gastrointestinal symptoms, and insomnia in NRT users than control participants. The patch was associated with an increase in skin irritation, and oral NRT was associated with throat soreness, mouth ulcers, and hiccups. Based on a subset of 8 studies, this older review also found no difference in mortality rates in participants using NRT versus control participants (odds ratio, 0.74 [CI, 0.33 to 1.67]).

The same systematic review also evaluated the potential harms of bupropion SR for smoking cessation (27 studies;  $n = 10\ 402$ ) (35). No significant difference was found between groups using bupropion SR versus placebo in all cardiovascular adverse events (RR, 1.03 [CI, 0.71 to 1.50]). A trend toward reduction in major cardiovascular adverse events was found in the bupropion SR group (RR, 0.57 [CI, 0.31 to 1.04]). A good-quality review (33 studies;  $n = 9631$ ) found an increased rate of serious adverse events in bupropion SR users versus those using placebo or controls that was of borderline significance (RR, 1.30 [CI, 1.00 to 1.69]). On the basis of 19 studies, the current USPSTF review found no significant increase in serious psychiatric events with bupropion SR (RR, 0.60 [CI, 0.28 to 1.28]). It found 10 reported cases of seizures among 13 000 study participants. Bupropion SR labels include a boxed warning about serious neuropsychiatric events in persons who take bupropion SR for smoking cessation.

Concerns have been raised about varenicline and potential cardiovascular and neuropsychiatric harms. In 2012, the FDA issued a safety communication indicating a nonsignificant increase in major adverse cardiovascular events (37). Based on a fair-quality systematic review done in 2014 (35), a meta-analysis of 18 studies ( $n = 9072$ ) showed no significant increase in all cardiovascular adverse events (RR, 1.24 [CI, 0.85 to 1.81]) or major cardiovascular adverse events (RR, 1.44 [CI, 0.73 to 2.83]). Varenicline labels contain a boxed warning about serious neuropsychiatric events; however, none of the evidence reviewed by the USPSTF reported on this outcome. A good-quality systematic review done in 2012 (27) found an increased risk for 1 or more serious adverse events in participants using varenicline compared with those receiving placebo (RR, 1.36 [CI, 1.03

to 1.81]), but the type of serious adverse event was not specified. Most recently, the FDA issued a warning and approved updated labeling to describe a potential but rare occurrence of seizures with varenicline use and a potential interaction between varenicline and alcohol (38).

*Combinations of Behavioral Interventions and Pharmacotherapy.* The USPSTF did not identify any reports of adverse events related to combinations of behavioral interventions and pharmacotherapy.

*ENDS.* Neither of the 2 trials on e-cigarette use for conventional smoking cessation reported any serious adverse events related to product use or any difference in the frequency of adverse events (11). One study (30) reported a higher number of serious adverse events in the nicotine e-cigarette group (27 [19.7%]) than in the nicotine patch group (14 [11.8%]). However, the authors stated that they did not find any evidence on an association with the study product, and there was no difference in overall incidence of adverse events (serious and nonserious) between groups (incidence rate ratio, 1.05 [CI, 0.82 to 1.34]). Although it was not reported in the 2 trials, concerns have been raised about potentially harmful ingredients in e-cigarettes (11, 15). Because of the large number and variation of available devices and cartridge fluids and the lack of regulation, the toxicity and safety of e-cigarettes and ENDS are extremely difficult to determine uniformly (8). Inadvertent poisoning in children who mishandle nicotine cartridges is also a concern, and the number of calls to poison centers involving nicotine-containing e-cigarette liquids has increased from 1 per month in 2010 to 215 per month in 2014 (16). Based on estimates from a recent small survey, dual use of e-cigarettes and conventional cigarettes may be high: 9.4% of persons who smoke conventional cigarettes reported concurrently using e-cigarettes, and 76.8% of persons who use e-cigarettes reported concurrently smoking conventional cigarettes (39). Further research is needed to better understand how dual use of e-cigarettes and conventional cigarettes may affect attempts at cessation and initiation of smoking.

### **Pregnant Women**

*Behavioral Interventions.* The USPSTF did not find any serious adverse events related to behavioral interventions for smoking cessation in pregnant women. According to 1 systematic review (32), an increase in smoking was reported in 4 out of 86 studies.

*Pharmacotherapy.* Evidence on harms from pharmacotherapy interventions for smoking cessation in pregnant women is limited. The USPSTF found no evidence of perinatal harms, although the number of studies was low and they were underpowered for rare outcomes (8). Similarly, there were too few studies to make any definitive determination on maternal harms of NRT. Maternal harms of NRT that have been reported in some studies include increased rates of cesarean delivery, slightly increased blood pressure (1 study reported an increase of 0.02 mm Hg per day in diastolic blood pressure over time [40]), and skin reaction to the NRT patch (8).

## **Estimate of Magnitude of Net Benefit**

### **Nonpregnant Adults**

*Behavioral Interventions.* The USPSTF found convincing evidence that behavioral interventions (such as physician and nurse advice, tailored self-help materials, and telephone counseling) provided or referred to by primary care providers substantially improve achievement of smoking cessation in nonpregnant adults. The USPSTF found adequate evidence that there are no harms of behavioral interventions. The USPSTF concludes with high certainty that the net benefit of providing behavioral interventions for smoking cessation in nonpregnant adults is substantial.

*Pharmacotherapy.* The USPSTF found convincing evidence that pharmacotherapy with NRT, bupropion SR, or varenicline substantially improves achievement of smoking cessation in nonpregnant adults. Evidence is also convincing that using 2 types of NRT moderately improves achievement of smoking cessation over single forms and that the addition of NRT to treatment with bupropion SR provides additional benefit over use of bupropion alone. The USPSTF found adequate evidence that the harms of pharmacotherapy, including serious cardiovascular adverse events and neuropsychiatric events, are small. It concludes with high certainty that the net benefit of providing pharmacotherapy for smoking cessation in nonpregnant adults is substantial.

*Combinations of Behavioral and Pharmacotherapy Interventions.* The USPSTF found convincing evidence that combinations of behavioral plus pharmacotherapy interventions substantially increase achievement of smoking cessation in nonpregnant adults. The USPSTF found adequate evidence that the harms of combined interventions are small. The USPSTF concludes with high certainty that the net benefit of providing combined interventions for smoking cessation in nonpregnant adults is substantial.

*ENDS.* The USPSTF concludes that the current evidence on the use of ENDS for conventional smoking cessation is insufficient. Evidence is lacking and conflicting, and the balance of benefits and harms cannot be determined. Given the established safety and effectiveness of behavioral and pharmacotherapy interventions, the USPSTF recommends that primary care providers direct patients who smoke to these other interventions.

### **Pregnant Women**

*Behavioral Interventions.* The USPSTF found convincing evidence that behavioral interventions (such as behavioral counseling, feedback, health education, incentives, and social support) substantially improve achievement of smoking cessation in pregnant women, increase birthweight, and decrease preterm birth in their children. The USPSTF found convincing evidence that there are no harms of behavioral interventions and concludes with high certainty that the net benefit of providing behavioral interventions for smoking cessation in pregnant women is substantial.

*Pharmacotherapy.* The USPSTF concludes that the current evidence on pharmacotherapy for smoking ces-

sation in pregnant women is insufficient. Evidence on NRT is limited and conflicting, evidence on other forms of pharmacotherapy is lacking, and the balance of benefits and harms cannot be determined.

### Response to Public Comments

A draft version of this recommendation statement was posted for public comment on the USPSTF Web site from 5 May to 1 June 2015. Several comments requested clarification about which types of interventions are being recommended—pharmacotherapy, behavioral interventions, or combinations of both. Several comments also expressed concern that the draft language for the recommendation may cause clinicians to offer only 1 type of intervention. The USPSTF clarified that both intervention types (pharmacotherapy and behavioral interventions) are effective and recommended; combinations of interventions are most effective, and all should be offered. The best and most effective combinations are those that are acceptable to and feasible for an individual patient. Clinicians should consider the patient's specific medical history and preferences and offer and provide the combination that works best for that patient. Comments also sought clarification about which populations are included in the I statement for ENDS; the USPSTF clarified that the I statement for ENDS includes pregnant women. A few comments requested additional implementation resources. The USPSTF revised the recommendation to include a table that highlights effective components of behavioral interventions and provided links to additional resources on pharmacotherapy options and resources for pregnant women. The USPSTF revised its language on ENDS to reflect current terminology.

### How Does Evidence Fit With Biological Understanding?

Because of the well-established health benefits of smoking cessation (1, 9), most of the research on interventions for smoking cessation focuses on cessation (rather than health outcomes) as a primary outcome. The current review identified 1 study of middle-aged men at high risk for cardiorespiratory disease that found a significantly smaller number of deaths from respiratory illness at 33 years of follow-up in participants who received advice from medical practitioners. The study also found favorable effects on all-cause mortality, coronary disease mortality, and lung cancer incidence and mortality at 20 years of follow-up, although these effects were not significant (41).

### UPDATE OF PREVIOUS USPSTF RECOMMENDATION

In 2009, the USPSTF recommended that clinicians ask all adults about tobacco use and provide interventions for smoking cessation for those who use tobacco products (A recommendation) (42). It also recommended that clinicians ask all pregnant women about tobacco use and provide augmented, pregnancy-tailored counseling for those who smoke (A recommendation). The current recommendation updates and is

consistent with the 2009 recommendation. In addition, the USPSTF reviewed evidence on ENDS, an emerging tobacco product, but found insufficient evidence to recommend for or against its use for smoking cessation. The USPSTF also reviewed updated evidence on pharmacotherapy interventions for smoking cessation in pregnant women and found that the evidence is still insufficient to make a recommendation.

### RECOMMENDATIONS OF OTHERS

Numerous professional societies and health organizations, including the American College of Physicians (43), American College of Preventive Medicine (44), American Heart Association (45), and American Congress of Obstetricians and Gynecologists (46), recommend that clinicians screen for tobacco use and provide interventions to patients who smoke. More recently, with the emergence and increased use of e-cigarettes, some organizations have incorporated statements about e-cigarettes into their guidelines. Both the American Congress of Obstetricians and Gynecologists (46) and the American Heart Association (43) recommend that e-cigarettes be included in smoking screening questions. The American Heart Association also concludes that evidence is insufficient to counsel patients on the use of e-cigarettes as a primary cessation aid. The American Academy of Family Physicians has updated its recommendations, which are consistent with those of the USPSTF (47).

From the U.S. Preventive Services Task Force, Rockville, Maryland.

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## APPENDIX: MEMBERS OF THE USPSTF

Members of the USPSTF at the time this recommendation was finalized† are Albert L. Siu, MD, MSPH, *Chair* (Mount Sinai School of Medicine, New York, and James J. Peters Veterans Affairs Medical Center, Bronx, New York); Kirsten Bibbins-Domingo, PhD, MD, MAS, *Co-Vice Chair* (University of California, San Francisco, San Francisco, California); David Grossman, MD, MPH, *Co-Vice Chair* (Group Health, Seattle, Washington); Linda Ciofu Baumann, PhD, RN, APRN (University of Wisconsin, Madison, Wisconsin); Karina W. Davidson, PhD, MASc (Columbia University, New York, New York); Mark Ebell, MD, MS (University of Georgia, Athens, Georgia); Francisco A.R. García, MD, MPH (Pima County Department of Health, Tucson, Arizona); Matthew Gillman, MD, SM (Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts); Jessica Herzstein, MD, MPH (Independent

Consultant, Washington, DC); Alex R. Kemper, MD, MPH, MS (Duke University, Durham, North Carolina); Alexander H. Krist, MD, MPH (Fairfax Family Practice, Fairfax, and Virginia Commonwealth University, Richmond, Virginia); Ann E. Kurth, PhD, RN, MSN, MPH (New York University, New York, New York); Douglas K. Owens, MD, MS (Veterans Affairs Palo Alto Health Care System, Palo Alto, and Stanford University, Stanford, California); William R. Phillips, MD, MPH (University of Washington, Seattle, Washington); Maureen G. Phipps, MD, MPH (Brown University, Providence, Rhode Island); and Michael P. Pignone, MD, MPH (University of North Carolina, Chapel Hill, North Carolina). Former USPSTF member Susan Curry, PhD, also contributed to the development of this recommendation.

† For a list of current USPSTF members, visit [www.uspreventiveservicestaskforce.org/Page/Name/our-members](http://www.uspreventiveservicestaskforce.org/Page/Name/our-members).

**Appendix Table 1.** What the USPSTF Grades Mean and Suggestions for Practice

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer/provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer/provide this service.
C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer/provide this service for selected patients depending on individual circumstances.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.	Read the Clinical Considerations section of the USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

**Appendix Table 2.** USPSTF Levels of Certainty Regarding Net Benefit

Level of Certainty*	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by such factors as: the number, size, or quality of individual studies; inconsistency of findings across individual studies; limited generalizability of findings to routine primary care practice; and lack of coherence in the chain of evidence. As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: the limited number or size of studies; important flaws in study design or methods; inconsistency of findings across individual studies; gaps in the chain of evidence; findings that are not generalizable to routine primary care practice; and a lack of information on important health outcomes. More information may allow an estimation of effects on health outcomes.

\* The USPSTF defines *certainty* as “likelihood that the USPSTF assessment of the net benefit of a preventive service is correct.” The net benefit is defined as benefit minus harm of the preventive service as implemented in a general primary care population. The USPSTF assigns a certainty level on the basis of the nature of the overall evidence available to assess the net benefit of a preventive service.