JAMA | US Preventive Services Task Force | RECOMMENDATION STATEMENT

Screening for Asymptomatic Bacteriuria in Adults
US Preventive Services Task Force Recommendation Statement

US Preventive Services Task Force

IMPORTANCE Among the general adult population, women (across all ages) have the highest prevalence of asymptomatic bacteriuria, although rates increase with age among both men and women. Asymptomatic bacteriuria is present in an estimated 1% to 6% of premenopausal women and an estimated 2% to 10% of pregnant women and is associated with pyelonephritis, one of the most common nonobstetric reasons for hospitalization in pregnant women. Among pregnant persons, pyelonephritis is associated with perinatal complications including septicemia, respiratory distress, low birth weight, and spontaneous preterm birth.

OBJECTIVE To update its 2008 recommendation, the USPSTF commissioned a review of the evidence on potential benefits and harms of screening for and treatment of asymptomatic bacteriuria in adults, including pregnant persons.

POPULATION This recommendation applies to community-dwelling adults 18 years and older and pregnant persons of any age without signs and symptoms of a urinary tract infection.

EVIDENCE ASSESSMENT Based on a review of the evidence, the USPSTF concludes with moderate certainty that screening for and treatment of asymptomatic bacteriuria in pregnant persons has moderate net benefit in reducing perinatal complications. There is adequate evidence that pyelonephritis in pregnancy is associated with negative maternal outcomes and that treatment of screen-detected asymptomatic bacteriuria can reduce the incidence of pyelonephritis in pregnant persons. The USPSTF found adequate evidence of harms associated with treatment of asymptomatic bacteriuria (including adverse effects of antibiotic treatment and changes in the microbiome) to be at least small in magnitude. The USPSTF concludes with moderate certainty that screening for and treatment of asymptomatic bacteriuria in nonpregnant adults has no net benefit. The known harms associated with treatment include adverse effects of antibiotic use and changes to the microbiome. Based on these known harms, the USPSTF determined the overall harms to be at least small in this group.

RECOMMENDATIONS The USPSTF recommends screening pregnant persons for asymptomatic bacteriuria using urine culture. (B recommendation) The USPSTF recommends against screening for asymptomatic bacteriuria in nonpregnant adults. (D recommendation)

Viewpoint page 1143 and Editorial page 1152

Related article page 1195 and JAMA Patient Page page 1222

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Summary of Recommendations

The USPSTF recommends screening for asymptomatic bacteriuria using urine culture in pregnant persons.	B recommendation
The USPSTF recommends against screening for asymptomatic bacteriuria in nonpregnant adults.	D recommendation

See the Figure for a more detailed summary of the recommendation for clinicians.

Asymptomatic bacteriuria is defined as the presence of bacteria in the urine of a person without signs or symptoms of a urinary tract infection.[1] Among the general adult population, women (across all ages) have the highest prevalence of asymptomatic bacteriuria, although rates increase with age among both men and women.[2] The reported prevalence of asymptomatic bacteriuria ranges from 1% to 6% among premenopausal women to 22% among women older than 90 years.[3,4] Asymptomatic bacteriuria is present in an estimated 2% to 10% of pregnant women.[5] The condition is rare in men.[4,6]

During pregnancy, physiologic changes that affect the urinary tract increase the risk of asymptomatic bacteriuria and symptomatic urinary tract infections, including pyelonephritis (a urinary tract infection in which one or both kidneys become infected).[7] Pyelonephritis is one of the most common nonobstetric reasons for hospitalization in pregnant women.[8] Pyelonephritis is associated with perinatal complications including septicemia, respiratory distress, low birth weight, and spontaneous preterm birth.[9]

The presence of asymptomatic bacteriuria has not been shown to increase the risk of adverse health outcomes among nonpregnant persons.[6,10]

USPSTF Assessment of Magnitude of Net Benefit

Pregnant Persons

The USPSTF concluded with moderate certainty that screening for and treatment of asymptomatic bacteriuria in pregnant persons has **moderate net benefit** in reducing perinatal complications (**Figure** and **Table**; see the eFigure in the Supplement for explanation of USPSTF grades and levels of evidence). There is adequate evidence that pyelonephritis in pregnancy is associated with negative maternal outcomes and that treatment of screen-detected asymptomatic bacteriuria can reduce the incidence of pyelonephritis in pregnant persons. However, evidence shows that the incidence of pyelonephritis among pregnant women with untreated asymptomatic bacteriuria has been low in recent decades, which may reduce the potential benefit from screening asymptomatic bacteriuria. When direct evidence is limited, absent, or restricted to select populations or clinical scenarios, the USPSTF may place conceptual upper or lower bounds on the magnitude of benefit or harms. Therefore, the USPSTF bounds the benefits of screening for asymptomatic bacteriuria in pregnant persons as no greater than moderate.

The USPSTF found inadequate direct evidence on the harms of screening for asymptomatic bacteriuria in pregnant persons, although these harms are thought to be no greater than small in magnitude. The USPSTF found adequate evidence of harms associated with treatment of asymptomatic bacteriuria, including adverse effects of antibiotic treatment. It also considered the potential effects of changes in the microbiome resulting from antibiotic use. Therefore, the USPSTF bounds the overall magnitude of harms of screening for asymptomatic bacteriuria in pregnant persons to be at least small.

Nonpregnant Adults

The USPSTF concludes with moderate certainty that screening for and treatment of asymptomatic bacteriuria in nonpregnant adults

Figure. Clinician Summary for Screening for Asymptomatic Bacteriuria in Adults

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What does the USPSTF recommend?	**For pregnant persons: Grade B** Screen persons who are pregnant for asymptomatic bacteriuria with a urine culture.
	For nonpregnant adults: Grade D Do not screen adults who are not pregnant for asymptomatic bacteriuria.
To whom does this recommendation apply?	This applies to adults 18 years and older and pregnant persons of any age without signs and symptoms of a urinary tract infection. It does not apply to persons who have chronic medical or urinary tract conditions or are hospitalized or living in institutions such as nursing homes.
What's new?	This recommendation is consistent with the 2008 USPSTF recommendation. The USPSTF continues to recommend screening for pregnant persons and recommends against screening for nonpregnant adults.
How to implement this recommendation?	**Screen.** Screen pregnant persons for asymptomatic bacteriuria using a midstream, clean-catch urine culture at the first prenatal visit or at 12 to 16 weeks of gestation, whichever is earlier. A urine culture showing >100 000 CFU/mL of a single uropathogen or >10 000 CFU/mL if the pathogen is group B streptococcus indicates treatment.

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.

CFU indicates colony-forming units; USPSTF, US Preventive Services Task Force.

Table. Summary of USPSTF Rationale

	Pregnant Persons	Nonpregnant Adults
Detection	Urine culture is the established method for detecting asymptomatic bacteriuria.	
Benefits of screening and treatment	• There is inadequate direct evidence that screening for asymptomatic bacteriuria improves health outcomes. • There is adequate evidence that treatment of screen-detected asymptomatic bacteriuria reduces the incidence of pyelonephritis, a serious condition in pregnancy. However, given the lower prevalence of pyelonephritis found in more recent studies, the overall benefits can be bounded as no greater than moderate in magnitude.	• There is inadequate direct evidence that screening for asymptomatic bacteriuria improves health outcomes. • There is adequate evidence that treatment of screen-detected asymptomatic bacteriuria has no benefit.
Harms of screening and treatment	• There is inadequate direct evidence to determine the harms of screening though they can be bounded to be no greater than small in magnitude. • There is adequate evidence that the overall harms of treatment can be bounded as at least small in magnitude. This is based on the direct evidence of harms, such as side effects of antibiotic treatment, and the indirect evidence of harms associated with antibiotic use.	There is inadequate direct evidence to determine the harms of screening and treatment. However, based on the known harms associated with antibiotic use, the overall harms can be bounded as at least small in magnitude.
USPSTF assessment	The USPSTF concludes with moderate certainty that screening for and treatment of asymptomatic bacteriuria in pregnant persons has a **moderate net benefit**.	The USPSTF concludes with moderate certainty that screening for and treatment of asymptomatic bacteriuria in nonpregnant adults has **no benefit and may be harmful**.

See eFigure in the Supplement for explanation of US Preventive Services Task Force (USPSTF) grades and levels of evidence.

has **no net benefit** (Table). There is adequate evidence that treatment of screen-detected asymptomatic bacteriuria in nonpregnant adults has no benefit. Based on the harms associated with antibiotic use, the USPSTF found adequate evidence to bound the harms of treatment of screen-detected asymptomatic bacteriuria in nonpregnant adults as at least small.

Practice Considerations

Patient Population Under Consideration

This recommendation applies to adults 18 years and older and pregnant persons of any age without signs and symptoms of a urinary tract infection (Figure). It does not apply to persons who have chronic medical or urinary tract conditions, such as end-stage renal disease; have indwelling urinary catheters, urinary stents, or spinal cord injuries; are hospitalized; reside in an institution (eg, a nursing home); or who are transplant recipients.

Definition of Asymptomatic Bacteriuria

Asymptomatic bacteriuria occurs when the urinary tract is colonized with significant amounts of pathogenic bacteria, primarily from the gastrointestinal tract, in the absence of symptoms or signs of a urinary tract infection. The most common pathogen is *Escherichia coli*, although other bacteria such as *Klebsiella*, *Proteus mirabilis*, and group B streptococcus can be involved.[4,11]

Assessment of Risk

The risk of developing asymptomatic bacteriuria varies by age, sex, and pregnancy status.[6] Because of the location and length of the female urethra, women are predisposed to infections of the urinary tract, including asymptomatic bacteriuria.[5] Physiologic changes in both pregnant and older women increase the risk of asymptomatic bacteriuria and a urinary tract infection.[7,11,12] In general, men are at low risk of developing asymptomatic bacteriuria, although rates increase with older age.[12] Persons with diabetes are also at increased risk of developing asymptomatic bacteriuria.[4,6]

Screening Tests

Screening for asymptomatic bacteriuria during pregnancy is done with a urine culture at 12 to 16 weeks of gestation or at the first prenatal visit. Urine culture is currently recommended for screening in pregnancy and is the established method for diagnosis.[2] A culture obtained using a midstream, clean-catch urine sample with greater than 100 000 colony-forming units (CFU) per milliliter of a single uropathogen is considered a positive test result.[6] Greater than 10 000 CFU/mL of group B streptococcus is an indicator of vaginal colonization and is commonly used as the threshold for treatment of infection in pregnancy.[13]

Screening Intervals

In general, screening is performed once at the first prenatal visit per clinical guidelines. However, there is little evidence on the optimal timing and frequency of screening for asymptomatic bacteriuria in pregnancy.[2]

Treatment or Interventions

Pregnant persons with asymptomatic bacteriuria usually receive antibiotic therapy, based on urine culture results and follow-up monitoring. The choice of antibacterial regimen for treatment of asymptomatic bacteriuria during pregnancy is based on safety in pregnancy and patterns of antimicrobial resistance in the particular setting.[6,7]

Update of Previous USPSTF Recommendation

In this update, the USPSTF continues to recommend screening for asymptomatic bacteriuria in pregnant persons with urine culture and recommends against screening in nonpregnant adults. The USPSTF changed the grade for pregnant persons from an "A" to a "B" based on the reduced applicability of the previous evidence that included outdated antibiotic treatment regimens and newer evidence that shows a significantly lower risk of pyelonephritis than found in previous reviews. In addition, there are newer concerns about antibiotic use, such as antimicrobial resistance and adverse changes to the microbiome (not addressed in current studies), leading to an increase in the magnitude of potential harms. These factors led the USPSTF to reduce assessments of certainty and magnitude of benefit, resulting in the change of grade.

Since 1996, the USPSTF has maintained an "A" recommendation for 1-time screening for asymptomatic bacteriuria with urine culture in pregnant persons between 12 and 16 weeks of gestation. The

original 1996 recommendation was reaffirmed in 2004 and again in 2008.[14-16] In 1996, the USPSTF found that there was insufficient evidence to recommend for or against screening in older adult women or women with diabetes and, in a separate recommendation, that screening was not recommended in other asymptomatic adults or older adults who reside in an institution.[14] In 2004, these recommendations were combined into a single recommendation against screening, which was subsequently reaffirmed in 2008.[15,16]

Supporting Evidence

Scope of Review

The USPSTF commissioned a systematic evidence review to evaluate the evidence on the potential benefits and harms of screening for and treatment of asymptomatic bacteriuria in community-dwelling adults, including pregnant persons.[2,17] This review was used to update the 2008 USPSTF recommendation statement.[16]

Evidence on Benefits of Screening and Treatment

Pregnant Persons

Two observational cohort studies conducted in Spain and Turkey between 1987 and 1999[18,19] (n = 5289) examined outcomes in screened and unscreened pregnant women. Both studies included patients screened at the first prenatal visit with urine culture and treated on detection of asymptomatic bacteriuria. In both studies, few cases of pyelonephritis developed in women in either cohort. Only one of the studies reported additional outcomes, including infant birth weight, prematurity, intrauterine death, and intrauterine growth restriction, although the study was not adequately powered to detect differences in these outcomes.[2,18]

Twelve trials of pregnant women (n = 2377) screened for asymptomatic bacteriuria and randomized to either a treatment or control condition (placebo or no treatment) were included in the review.[20-31] Most studies were conducted in hospital-based obstetrics-gynecology clinics. Seven studies reported screening at the first prenatal visit, 2 studies reported the specific gestational age at which screening was performed, and 3 studies did not report the timing of screening.[2] All but 2 studies were published in the 1960s or 1970s, with the most recent studies published in 1987 and 2015.[25,31] In the older studies, there was sparse reporting on many patient characteristics such as age and race/ethnicity. In addition, treatment regimens for screen-detected asymptomatic bacteriuria varied according to the medication used, timing, duration, and dosage. Antibiotics were used in all studies except 1, although several antibiotics tested in the trials are no longer recommended for treatment of urinary tract infections in pregnancy.[2] Rates of pyelonephritis in the control groups were considerably higher in the 10 older studies than in the 2 more recent ones (7% to 36% vs 2.2% and 2.5%, respectively). Lower rates of pyelonephritis in newer studies suggests that the magnitude of benefit from screening may be reduced relative to screening in earlier cohorts.

Patients in the control groups had higher rates of pyelonephritis than those in the treatment groups in all but one of the studies.[25] Pooled analysis demonstrated a 76% reduction in pyelonephritis among the intervention groups (pooled relative risk [RR], 0.24 [95% CI, 0.14-0.40]; 12 studies; n = 2068).[2] A sensitivity analysis that removed studies deemed to have high risk of bias demonstrated a similar risk reduction (pooled RR, 0.19 [95% CI, 0.11-0.34]; 7 studies; n = 1184).[2]

Seven treatment studies reported on the incidence of low birth weight. The pooled analysis found statistically significant reductions in the incidence of infants with low birth weight (pooled RR, 0.64 [95% CI, 0.46-0.90]; 7 studies; n = 1522).[2] Preterm birth and perinatal mortality were reported in 3 and 6 studies, respectively. For both outcomes, results were mixed and pooled estimates did not demonstrate statistical significance.

Nonpregnant Adults

No studies were identified that directly evaluated the benefits of screening for asymptomatic bacteriuria in the general adult population. Five trials (n = 777)[32-36] addressed the benefits of treatment of screen-detected asymptomatic bacteriuria in general adult populations. All 5 studies included participants who had 2 consecutive positive screening urine cultures using a midstream, clean-catch urine sample and using a cutoff of greater than 100 000 CFU/mL. Across all studies, 84% to 100% of participants were women. One study included women aged 20 to 65 years without diabetes, 1 study included only women with diabetes (mean age, 55 years), and 3 studies included only older patients living in independent living facilities. In general, characteristics of participants were sparsely reported across studies, with none reporting on race/ethnicity. Treatment varied across trials, ranging from a single dose to 3 months of antibiotics. No study found a difference in the rates of symptomatic infections or mortality between treated and untreated groups.[2]

Evidence on Harms of Screening and Treatment

Pregnant Persons

One cohort study (n = 186) that compared screened and unscreened pregnant women reported on potential harms (congenital abnormalities) associated with the screening program, with no meaningful differences reported.[18]

Seven studies reported on harms associated with treatment of screen-detected asymptomatic bacteriuria.[20,22-24,28,29,31] Five studies (n = 961) reported on congenital malformations. All but 1 study reported fewer cases in the intervention group, although the number of cases was small and pooled estimates were not statistically significant.[2] Other infant or fetal harms, such as jaundice (2 studies), respiratory distress (1 study), and neonatal sepsis (1 study) were sparsely reported and event rates were low, which limited comparisons.[2] Adverse reactions to medications were reported in 2 studies; vaginitis and diarrhea were associated with ampicillin, and nausea and rashes were reported with use of nalidixic acid and nitrofurantoin.[2] Complications of pregnancy and delivery (such as third-trimester hemorrhage, premature rupture of the membranes, nonspontaneous onset of labor, or cesarean delivery before onset of labor) were inconsistently and sparsely reported, limiting any conclusions.[2]

Nonpregnant Adults

Two studies of treatment in nonpregnant women[34,36] and 2 studies in older adults[32,35] reported on rates of adverse events associated with treatment of asymptomatic bacteriuria. Overall, harms were not reported consistently, which limited the conclusions that could be drawn from the current evidence base.

No studies were identified that addressed the harms of screening for asymptomatic bacteriuria in nonpregnant adults.

How Does Evidence Fit With Biological Understanding?

The relationship between asymptomatic bacteriuria and adverse pregnancy outcomes is related to a combination of factors. Women are at increased risk of urinary tract infections, including asymptomatic bacteriuria, because of the anatomical placement of the urethra.[2] Conditions such as increased blood glucose levels and urinary stasis (in which the bladder is unable to completely empty) can increase risk for symptomatic urinary tract infections and pyelonephritis. Pregnancy further increases the risk because of changes in urine pH, bladder compression, and urethral dilation.[37] Pyelonephritis in pregnancy has been associated with worse pregnancy outcomes.[9,37,38] Screening for and treatment of asymptomatic bacteriuria in pregnant persons could prevent cases of pyelonephritis and associated negative pregnancy outcomes.

Antibiotics are the mainstay treatment for urinary tract infections, but there are consequences to their use. The use of antibiotics is known to lead to antimicrobial resistance. In addition, there is emerging evidence that bacterial colonization of the gastrointestinal and genitourinary tracts plays a protective role. Antibiotic use can disrupt these effects.

Response to Public Comment

A draft version of this recommendation statement was posted for public comment on the USPSTF website from April 23 through May 20, 2019. Commenters requested more information about how the USPSTF assessed older evidence. The USPSTF recognizes that older studies have certain limitations. However, in reviewing all available evidence on the benefits and harms of treating screen-detected asymptomatic bacteriuria in pregnant women, the USPSTF found the evidence to be adequate. Several comments sought clarification on the USPSTF's rationale for changing the grade of the recommendation from an "A" to a "B" for pregnant persons. A change in grade may occur when evidence has increased or decreased and results in a change in the certainty or magnitude of net benefit.[39] Newer evidence, such as the lower prevalence of pyelonephritis and a better understanding of the harms associated with antibiotic use, changed the USPSTF's assessment of both the certainty (from high to moderate certainty) and net benefit of screening (from substantial to moderate net benefit), leading to the grade change.

Research Needs and Gaps

The USPSTF identified several gaps in the evidence where more research is needed:

- There were few studies that examined asymptomatic bacteriuria and risk of serious outcomes (ie, pyelonephritis or urosepsis) in modern pregnant populations. Epidemiologic evidence suggests that the prevalence of asymptomatic bacteriuria has been low in recent decades, and many antibiotics used in older studies are no longer recommended for use in pregnancy. More observational studies examining this would help improve the applicability of the evidence base.
- Clinical trials, observational studies, and natural experiments in settings where asymptomatic bacteriuria screening and treatment are not the standard of care or where guidelines are changing would be useful in assessing benefits and harms.
- Newer understandings of the human microbiome suggest that bacterial colonization may play a protective role in both mothers and babies. For pregnant and nonpregnant populations, research is needed to better understand the microbiology of a healthy urinary tract and the natural history of asymptomatic bacteriuria.
- The role of current patterns of antibiotic use in the epidemiology of asymptomatic bacteriuria is unclear. Antibiotic use increases the risk of antimicrobial resistance and can change the microbiome. More research is needed to better understand potential harms of treatment and the effects of antibiotic use on newborn, child, and longer-term health.

Recommendations of Others

The Infectious Diseases Society of America recommends screening for asymptomatic bacteriuria in pregnant women and treatment for those who screen positive.[40] The American College of Obstetricians and Gynecologists endorses the Infectious Diseases Society of America's recommendations for screening for asymptomatic bacteriuria in pregnant women and treatment for those who screen positive. The Canadian Task Force on Preventive Health Care recommends screening in pregnant women with urine culture once during the first trimester, although this was issued as a "weak" recommendation and the quality of evidence was considered low.[41] The American Academy of Pediatrics (AAP) has no specific recommendation to screen for asymptomatic bacteriuria in pregnant persons. However, the AAP recommends that clinicians treat pregnant persons and perform a test of cure if asymptomatic bacteriuria is found to be present on a urine culture. In 2008, the American Academy of Family Physicians recommended screening in pregnant women at 12 to 16 weeks of gestation or at the first prenatal visit, whichever comes first.[42]

The AAP, the American Academy of Family Physicians, and the United Kingdom's National Institute for Health and Care Excellence all recommend against screening for and treatment of asymptomatic bacteriuria in nonpregnant adults.[42-44] The American College of Obstetricians and Gynecologists recommends against screening for and treatment of asymptomatic bacteriuria in nonpregnant, premenopausal women.[45]

ARTICLE INFORMATION

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Correction: This article was corrected on October 11, 2019, for incorrect information in an author affiliation.

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Additional Information: The US Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific preventive care services for patients without obvious 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.

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