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Human Papillomavirus (HPV) Infections in Women: A Narrative Review of Prevalence, Testing, and Prevention in Rural Areas of the United States, with a Focus on Arkansas

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ABSTRACT

Dear Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States and a well-established etiological agent in the development of cervical, vulvar, vaginal, anal, and oropharyngeal cancers, particularly among women. While national efforts in HPV vaccination and cervical cancer screening have led to measurable declines in HPV-related morbidity in urban and well-resourced regions, rural communities continue to experience persistent disparities. These disparities are especially evident in states like Arkansas, where women in rural areas face disproportionately high rates of HPV infection, cervical cancer incidence, and mortality. Contributing factors include structural deficiencies in healthcare access, economic challenges, limited availability of gynecologic and preventive care, cultural stigma surrounding HPV vaccination, and gaps in public health outreach. This narrative review synthesizes contemporary research and public health data to evaluate HPV prevalence, testing practices, and prevention efforts among rural women in the U.S., with a particular focus on Arkansas. It examines barriers that hinder early detection and immunization, and it explores scalable, evidence-based interventions such as self-sampling HPV tests, mobile screening units, and community-based education campaigns that could bridge these gaps. Expanding access to HPV testing and vaccination through targeted, locally informed strategies holds promise in mitigating cervical cancer disparities and advancing equitable reproductive health outcomes for rural populations.

KEYWORDS: *HPV, Papillomavirus Infections, Cervical Cancer, HPV Vaccine, Medically Underserved*

INTRODUCTION

HPV is a double-stranded DNA virus comprising more than 200 genotypes, of which at least 14 are classified as high-risk due to their strong association with oncogenic outcomes, particularly cervical cancer. Among these, HPV types 16 and 18 are responsible for approximately 70% of cervical cancer cases globally, as well as a significant proportion of vulvar, vaginal, anal, and oropharyngeal cancers (Centers for Disease Control and Prevention [CDC], 2021). While most HPV infections are transient and asymptomatic, persistent infection with high-risk strains can lead to

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precancerous lesions and, ultimately, invasive malignancies.

Despite the availability of effective prophylactic vaccines and standardized cervical cancer screening methods, including Pap smears and HPV DNA testing, HPV-related diseases remain a significant public health concern, particularly among medically underserved populations. In the United States, rural women experience a higher burden of HPV-related morbidity and mortality compared to their urban counterparts. This disparity is even more pronounced in southern states such as Arkansas, where socioeconomic vulnerability, geographic isolation, and limited healthcare infrastructure converge to create systemic barriers to prevention and care.

Rural women often face reduced access to gynecologic services, a shortage of trained providers, and a lack of culturally sensitive health education. Additionally, many individuals encounter transportation challenges, affordability issues, and lower rates of health insurance coverage. Stigma surrounding sexual health, limited public awareness about the HPV-cancer link, and distrust in medical systems further exacerbate the underutilization of screening and vaccination services.

Understanding the multifactorial nature of these disparities is critical for designing effective interventions tailored to rural populations. This narrative review explores current evidence on HPV prevalence, testing practices, and prevention strategies in rural areas of the United States, with a particular focus on Arkansas. By highlighting the structural, cultural, and policy-related challenges that contribute to elevated HPV-related disease burden in these communities, the review aims to inform evidence-based approaches that can reduce inequities and improve women's health outcomes in high-risk rural regions.

METHODS

This narrative review was conducted to synthesize current evidence on the prevalence of HPV, testing practices, and prevention strategies among rural women in the United States, with a specific focus on Arkansas. A structured search was conducted across three electronic databases, PubMed, Scopus, and Google Scholar, to identify relevant literature published between January 2010 and May 2025. Search terms included combinations of keywords such as "HPV," "human papillomavirus," "cervical cancer," "rural women," "United States," "Arkansas," "HPV testing," "Pap smear," "self-collection," and "vaccination barriers." Boolean operators were used to optimize search sensitivity and specificity, and filters were applied to include only English-language articles that focused on human populations.

The inclusion criteria encompassed peer-reviewed journal articles, government publications, policy briefs, and publicly available data from national and state-level public health institutions. Eligible sources were those that addressed one or more of the following themes: HPV prevalence and disease burden in rural populations, cervical cancer screening practices, HPV vaccination rates, barriers to preventive care, and community-based interventions targeting underserved areas. Particular emphasis was given to studies and reports featuring data from Arkansas or the southeastern United States, given the region's high incidence of HPV-associated cancers and its significant rural population.

Following an initial screening of titles and abstracts, a full-text review was performed on 42 selected sources. These documents were analyzed thematically to identify consistent patterns, health system challenges, and emerging strategies that could inform efforts to reduce HPV-related health disparities in rural communities.

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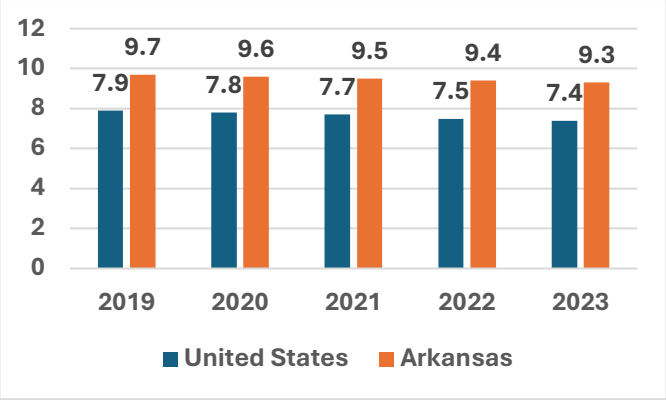
RESULTS

HPV remains the most common sexually transmitted infection in the United States, with an estimated 80 million individuals currently infected and approximately 14 million new cases reported each year (CDC, 2021). Despite national efforts to reduce HPV-related disease through widespread vaccination and screening programs, the burden of cervical cancer remains disproportionately high in rural areas.

In Arkansas, a predominantly rural state, this disparity is particularly acute. Between 2001 and 2018, the age-adjusted incidence rate of cervical cancer in Arkansas was approximately 9.5 per 100,000 women, significantly higher than the national average of 7.5 (Arkansas Department of Health [ADH], 2021; St. Jude Children's Research Hospital, 2024). In 2017 alone, Arkansas reported 116 new cases of cervical cancer attributable to HPV, with an incidence rate of 7.4 per 100,000 (ADH, 2020; Figure 1). Notably, the state ranked sixth in the nation for the overall incidence of HPV-associated cancers, which include cervical, anal, vulvar, and oropharyngeal malignancies (St. Jude, 2024).

Figure 1: HPV-Associated Cervical Cancer Incidence per 100,000 Women (2019–2023)



This elevated disease burden is more pronounced in rural counties, where healthcare access is limited, and cancers are frequently diagnosed at more advanced stages. During the 18 years from 2001 to 2018, a total of 7,818 HPV-related cancers were reported in Arkansas, of which over 3,150 were cervical carcinoma cases, underscoring the significant and persistent threat HPV poses to women's health in this region (ADH, 2021).

Barriers to Prevention

Multiple interrelated barriers hinder HPV prevention efforts in rural areas, both within Arkansas and nationally. Limited access to primary and gynecologic care is among the most significant challenges, often driven by healthcare provider shortages, facility closures, and geographic isolation. Many rural clinics lack the infrastructure or trained personnel to offer routine HPV vaccination and cervical cancer screening services.

Cultural and social factors also play a substantial role. Vaccine hesitancy, driven by misinformation, stigma associated with sexually transmitted infections, and religious or moral beliefs, continues to reduce uptake of the HPV vaccine. Economic instability and transportation challenges further restrict rural women's ability to attend preventive health visits. Additionally, a general lack of public awareness about the link between HPV and cancer contributes to under-screening and late detection of disease (Monnat & Mueller, 2015). Lack of awareness regarding new self-testing options is also contributing to the problem among the public and in rural healthcare settings. These cumulative barriers exacerbate health inequities and leave rural women particularly vulnerable to preventable HPV-related cancers.

HPV Testing Practices

High-risk HPV testing is an essential component of cervical cancer screening. It is recommended for women aged 30 to 65 years, either as a stand-alone test every five years or in combination with a Pap smear (co-testing) every five years (U.S. Preventive Services Task Force, 2018). However, utilization of these services remains suboptimal in rural regions.

Financial constraints, insurance coverage limitations, and limited provider availability often mean that women in underserved areas do not undergo timely or regular screening. Moreover, some rural healthcare facilities may still rely on outdated screening protocols or lack the capacity to process HPV DNA tests efficiently. These system-level deficiencies contribute to missed opportunities for early detection and treatment of precancerous lesions, ultimately increasing the risk of cancer progression.

Emerging Strategies: Self-Testing and Mobile Screening

Innovative approaches are being explored to overcome screening barriers, and among the most promising is HPV self-sampling. Studies, including a widely cited meta-analysis by Arbyn *et al*. (2018), have shown that self-collected vaginal swabs are comparable in sensitivity to clinician-collected samples for detecting high-risk HPV strains. This method offers a private, accessible, and less stigmatizing alternative, especially valuable in communities where cultural norms may discourage pelvic exams.

In rural Arkansas, where many women face long travel distances to health centers, self-testing kits mailed to patients or distributed through local pharmacies and community programs could significantly expand screening coverage. Early pilot programs in other regions of the southern U.S. have demonstrated that such initiatives can boost participation rates and improve early detection. Limitations of mail-in kits include the challenge of follow-up and guiding a patient with a positive result, as well as the availability of a knowledgeable healthcare provider in their community.

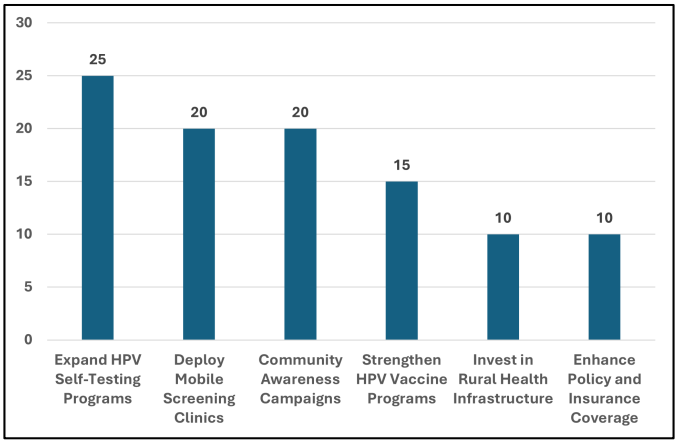
Mobile health units represent another scalable solution. These clinics, equipped for Pap smears, HPV testing, and basic gynecologic services, can travel to high-incidence areas, particularly in southeast and northeast Arkansas, where the disease burden is highest. Coupled with telehealth follow-up for results and treatment referrals, mobile and self-testing strategies offer a feasible path forward in closing the rural cervical cancer screening gap.

DISCUSSION

Despite decades of advancements in HPV vaccination, cervical cancer screening technologies, and public health campaigns, rural women in the United States, especially in states like Arkansas, continue to experience disproportionate burdens of HPV-related diseases. These disparities are rooted in structural inequities that have persisted across generations, including limited access to healthcare infrastructure, persistent provider shortages, socioeconomic hardship, and inadequate health education.

In Arkansas, where nearly half the population resides in rural counties, the cumulative impact of these barriers is evident in elevated cervical cancer incidence and mortality rates. Women living in these communities often face logistical challenges such as long travel distances to clinics, lack of reliable transportation, and inconsistent availability of gynecologic services. Additionally, rural health systems frequently suffer from chronic underfunding, a shortage of trained specialists, and limited adoption of modern diagnostic technologies (Figure 2).

Figure 2: Relative Emphasis on Different Intervention Strategies Recommended to Address HPV Disparities in Rural Areas



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Delayed diagnosis remains a particularly pressing issue. Many rural women present with cervical cancer at more advanced stages due to missed screening opportunities and a lack of early intervention. This delay results not only in poorer clinical outcomes but also in higher treatment costs and emotional distress for patients and families.

Amid these challenges, HPV testing via self-collection has emerged as a promising and patient-centered solution. Numerous studies have validated the accuracy and acceptability of self-sampling for high-risk HPV detection, and its use can bypass many traditional barriers, including cultural discomfort with pelvic exams and logistical difficulties in accessing healthcare facilities. When distributed through mail, pharmacies, or community centers, self-testing kits offer a private, accessible, and dignified option for women who might otherwise forgo screening entirely.

However, successful implementation of self-collection programs requires more than clinical feasibility; it demands a multi-level, coordinated effort across policy, community engagement, and healthcare delivery systems. Policies must be adapted to recognize self-sampling as a reimbursable and validated screening tool. Community organizations and local health leaders must be engaged to promote awareness and build trust. Equally important is the establishment of streamlined pathways for follow-up care when test results are positive.

Complementing self-collection efforts, mobile health units offer another viable strategy to close the rural screening gap. These units can be equipped with Pap testing, HPV DNA testing, and vaccination services, and can be deployed to high-burden counties where permanent facilities are lacking. Integrated with telehealth platforms, mobile clinics can also facilitate timely communication of results and referrals for diagnostic or treatment services.

Ultimately, reducing HPV-related disparities in rural areas will require a commitment to equity-focused innovation. Programs that are locally tailored, community-informed, and sustainably resourced stand the best chance of reaching women who have long been underserved. As public health systems continue to evolve, rural women must be viewed not as peripheral to national efforts but as central stakeholders in achieving HPV elimination.

CONCLUSION

HPV remains one of the most prevalent and preventable causes of cervical and other anogenital cancers in women, with profound implications for public health. Despite advancements in vaccination, early screening, and education campaigns, significant disparities persist, particularly in rural regions such as Arkansas, where structural, social, and economic barriers compound the burden of disease. The data clearly show that women in these communities are not only more likely to be infected with high-risk strains of HPV but also more likely to be diagnosed with cancer at advanced stages and to experience poorer outcomes.

These disparities are not rooted in biology but in unequal access to healthcare. Rural women often face logistical challenges such as transportation issues, geographic isolation, lack of nearby gynecologic services, and financial constraints that hinder routine screenings and follow-up care. In many cases, cultural stigmas and health misinformation further exacerbate the gap, making rural women less likely to seek preventive services or to adhere to recommended vaccination and testing schedules. This intersection of vulnerability, medical, economic, and cultural demands a bold, targeted response.

Innovations such as self-sampling for HPV testing represent a transformative opportunity. By enabling women to test themselves in the privacy and convenience of their homes, self-collection helps overcome some of the most persistent barriers to care, including discomfort with clinical exams, lack of time, and travel burdens. Similarly, mobile screening clinics equipped to perform Pap smears

and deliver HPV vaccines can serve as critical lifelines in remote counties, ensuring that care reaches the populations who need it most. These units, staffed by knowledgeable healthcare professionals, can also be used for self-testing to provide adequate guidance to the patients.

Yet, the promise of these tools will only be realized if a strong policy framework and sustained funding support them. Medicaid expansion, universal coverage of preventive services, investments in rural health infrastructure, and the integration of telehealth platforms are all essential for scaling and maintaining these interventions. Additionally, community engagement strategies that leverage trusted local leaders, churches, schools, and social networks can help destigmatize HPV testing and promote vaccine acceptance among skeptical populations.

Eliminating HPV-related cancers is not just a scientific or medical challenge; it is a matter of justice. Suppose we are to succeed in the national and global mission to eliminate cervical cancer as a public health threat. In that case, we must prioritize those most at-risk women in rural and underserved areas. The road to elimination does not run through major cities alone; it winds through rural highways, underserved clinics, and communities that mainstream healthcare efforts have long overlooked.

In conclusion, the time for action is now. Expanding access to HPV testing, increasing vaccination rates, and deploying mobile health strategies can dramatically alter the trajectory of HPV-related cancers in rural America. Policymakers, healthcare providers, and community leaders must collaborate to create a healthcare system that leaves no woman behind. By focusing on equity, innovation, and compassion, we can build a future where every woman, regardless of her geographical location, has the tools, knowledge, and support to protect herself from a preventable and devastating disease.

REFERENCES:

1. Arbyn, M., Smith, S. B., Temin, S., Sultana, F., & Castle, P. (2018). Detecting cervical precancer and reaching under-screened women by using HPV testing on self-samples: Updated meta-analyses. BMJ, 363, k4823. https://doi.org/10.1136/bmj.k4823
2. Arkansas Department of Health. (2020). Cervical Cancer in Arkansas. Retrieved July 15, 2025, from https://healthy.arkansas.gov/wp-content/uploads/CervicalCancerPresentation.pdf
3. Arkansas Department of Health. (2021). HPV and Cancer in Arkansas. Retrieved July 15, 2025, from https://healthy.arkansas.gov/wp-content/uploads/HPV_and_Cancer.pdf
4. Brewer, N. T., Fazekas, K. I., & Hall, M. E. (2017). Rethinking HPV vaccination barriers: Provider and parent perspectives. Health Education & Behavior, 44(2), 233–241. https://doi.org/10.1177/1090198116658385
5. Centers for Disease Control and Prevention. (2021). United States Cancer Statistics: Data Visualizations Tool. https://www.cdc.gov/cancer/dataviz
6. Henley, S. J., King, J., German, R. R., Richardson, L. C., & Plescia, M. (2017). Surveillance of screening-detected cancers (colon and rectum, breast, and cervix)—United States, 2004–2006. Morbidity and Mortality Weekly Report: Surveillance Summaries, 66(35), 1–21. https://doi.org/10.15585/mmwr.ss6608a1
7. Monnat, S. M., & Mueller, J. T. (2015). Health disparities in rural America: Current challenges and future solutions. American Journal of Public Health, 105(10), 1967–1969. https://doi.org/10.2105/AJPH.2015.302777
8. St. Jude Children's Research Hospital. (2024). Arkansas State HPV-Associated Cancer Data Profile. Southeast HPV Cancer Prevention Initiative. Retrieved July 15, 2025, from https://sjr-redesign.stjude.org/content/dam/research-redesign/centers-initiatives/hpv-cancer-prevention-program/se-roundtable/state-profiles/arkansas-state-data-2024.pdf
9. U.S. Preventive Services Task Force. (2018). Screening for cervical cancer: U.S. Preventive

Services Task Force recommendation statement. JAMA, 320(7), 674–686. https://doi.org/10.1001/jama.2018.10897

10. Walker, T. Y., Elam-Evans, L. D., Yankey, D., Markowitz, L. E., Williams, C. L., Fredua, B., … & Stokley, S. (2020). National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years—United States, 2019. Morbidity and Mortality Weekly Report, 69(33), 1109–1116. https://doi.org/10.15585/mmwr.mm6933a1