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## Application of the Carolina Framework for Cervical Cancer Prevention

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### Abstract

**Objective**—The Carolina Framework for Cervical Cancer Prevention describes 4 main causes of cervical cancer incidence: human papillomavirus (HPV) infection, lack of screening, screening errors, and not receiving follow-up care. We present 2 applications of the Carolina Framework in which we identify high-need counties in North Carolina and generate recommendations for improving prevention efforts.

**Methods**—We created a cervical cancer prevention need index (CCPNI) that ranked counties on cervical cancer mortality, HPV vaccine initiation and completion, Pap smear screening, and provision of Pap tests to rarely- or never-screened women. In addition, we conducted in-depth interviews with 19 key informants from programs and agencies involved in cervical cancer prevention in North Carolina.

**Results**—North Carolina's 100 counties varied widely on individual CCPNI components, including annual cervical cancer mortality (median 2.7/100,000 women; range 0.0–8.0), adolescent girls' HPV vaccine initiation (median 42%; range 15%–62%), and Pap testing in the previous 3 years among Medicaid-insured adult women (median 59%; range 40%–83%). Counties with the greatest prevention needs formed 2 distinct clusters in the northeast and south-central regions of the state. Interviews generated 9 recommendations to improve cervical cancer prevention in North Carolina, identifying applications to specific programs and policies in the state.

**Conclusions**—This study found striking geographic disparities in cervical cancer prevention need in North Carolina. Future prevention efforts in the state should prioritize high-need regions as well as recommended strategies and applications in existing programs. Other states can use the Carolina Framework to increase the impact of their cervical cancer prevention efforts.

### Keywords

cervical cancer; cancer prevention; Pap test; human papillomavirus (HPV) vaccine; health disparities

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## Introduction

Cervical cancer mortality in the U.S. has dropped precipitously in the last 60 years, with annual rates falling from 7.9 per 100,000 women in 1950<sup>1</sup> to 2.4 per 100,000 in 2008,<sup>2</sup> largely due to widespread use of Pap screening.<sup>3</sup> Despite this remarkable achievement, reductions in mortality have slowed in recent years,<sup>2</sup> likely due to a plateauing of screening. Over 4,000 women still die of this preventable cancer each year.<sup>4</sup> Disparities in cervical cancer mortality include higher rates among African American, Hispanic, low-income women, and rural-dwelling women, especially in Appalachia and on the U.S.-Mexico border.<sup>2,4-11</sup> In addition, states within the U.S. demonstrate wide variation in cervical cancer mortality, ranging from 1.2 per 100,000 women in Utah to 3.8 per 100,000 women in Mississippi.<sup>2</sup>

Given stalled progress and persistent disparities in mortality, the time is right for reevaluating and refining approaches to addressing cervical cancer. Toward this end, Cervical Cancer-Free North Carolina, a statewide initiative to reduce the burden of cervical cancer, developed the Carolina Framework for Cervical Cancer Prevention (see Box 1). The Carolina Framework guides prevention efforts by identifying and addressing 4 causes of cervical cancer incidence: human papillomavirus (HPV) infection; lack of cervical cancer screening; screening errors; and not receiving follow-up care. In this paper, we discuss 2 applications of the Framework for prioritizing cervical cancer prevention efforts in North Carolina.

### Box 1

#### Carolina Framework for Cervical Cancer Prevention

*Public health programs can better prevent cervical cancer by understanding four factors in the Carolina Framework.<sup>59,60</sup> The impact of these factors likely varies by geographic region, but they affect women globally.*

**1. Human papillomavirus (HPV) infection** is responsible for nearly all cases of cervical cancer.<sup>59</sup> In the U.S., prevalence of HPV infection among women peaks at more than 40% among 20- to 25-year-olds, with decreasing prevalence with older age.<sup>61</sup> Among high-risk populations, including women attending STI clinics or who are HIV-positive, prevalence can be greater than 60%.<sup>61</sup> Two strains of HPV, types 16 and 18, cause 70% of cervical cancer cases.<sup>59</sup> Estimates of the prevalence of these oncogenic types in U.S. women vary by region, and they range from 1.5% to 17.7% (HPV 16) and from 0.2% to 5.3% (HPV 18).<sup>61</sup> The Centers for Disease Control and Prevention (CDC) recommend that all adolescents ages 11–12 receive HPV vaccine to protect against these strains of HPV.<sup>62</sup> In addition, females up to age 26 and males up to age 21 are eligible for catch-up vaccination if they have not already received the vaccine.<sup>63,64</sup> Unfortunately, rates of vaccination are far below the Healthy People 2020 goal of 80% vaccine completion among adolescent girls ages 13–17<sup>65</sup>: only 33% of girls and 7% of boys in the U.S. had completed the three-dose vaccine series by 2012.<sup>66</sup> Among adolescent girls in the U.S.

who initiated HPV vaccine, 67% had completed the series (i.e., received all three doses).<sup>66</sup>

**2. Lack of screening** for cervical cancer is responsible for a little over half of new cervical cancers. According to national recommendations, most adult women younger than age 65 should receive a Pap test every three years.<sup>67–69</sup> Targeting women without recent Pap tests is a crucial goal in cervical cancer prevention, as detection of precancerous lesions or cervical cancer using a Pap test is most common among women whose previous test was greater than three years earlier or who had never been screened.<sup>19,60,70–73</sup> Less than three-fourths of all U.S. women have received a timely Pap test,<sup>74</sup> and certain subgroups have even lower rates of adherence to this recommendation.<sup>16,74</sup> In North Carolina, 88% of women report receiving a Pap test in the last three years,<sup>75</sup> though rates are likely to be much lower given errors in self-report.<sup>74</sup> Particularly at risk for cervical cancer are women who have never received a Pap test.<sup>70,76</sup>

**3. Pap screening errors** (false-negative tests) are responsible for around a third of new cervical cancers.<sup>72</sup> Although a Pap test is a powerful screening tool, 23% to 70% of Pap tests in low-risk women fail to detect cervical abnormalities when present.<sup>77</sup> To reduce the number of false negatives, the USPSTF (and other regulatory agencies) recommends co-testing with Pap and HPV DNA tests every 5 years for women ages 30–65.<sup>41</sup> Unfortunately, HPV DNA tests have higher rates of false-positives and could lead to overdiagnosis,<sup>78</sup> so it is important that clinicians follow guidelines that balance the risks of false-positives and false-negatives, such as the USPSTF co-testing recommendation.

**4. Inadequate follow-up care** is responsible for around a tenth of new cervical cancer cases.<sup>72</sup> Most often, this involves women who have received abnormal results on Pap or HPV DNA tests, but who do not receive confirmatory tests or treatment. The causes of loss to follow-up are likely complex but reflect the deeply fractured health care system in the US.<sup>19</sup>

We first used the Carolina Framework to characterize counties in terms of prevention need. We next used the Carolina Framework to identify recommendations for improving cervical cancer prevention in North Carolina. In this way, we aim to demonstrate practical applications of the Carolina Framework for guiding prevention efforts that will ultimately reduce the burden of cervical cancer.

## Methods

### Application 1. Prioritizing Counties by Cervical Cancer Prevention Need

To understand the range of cervical cancer prevention need among the 100 counties in North Carolina, we selected 5 indicators based on the Carolina Framework and availability of data.

#### Data sources

**Cervical cancer mortality**—The North Carolina State Center for Health Statistics provided age-adjusted annual cervical cancer mortality rates per 100,000 women for each of

the state's 100 counties for the period from 1998–2007.<sup>4</sup> We chose to focus on cervical cancer mortality instead of incidence because incidence is subject to several well-known biases.<sup>12,13</sup>

**HPV vaccination (initiation and completion)**—The North Carolina Immunization Registry (NCIR) (<http://www.immunize.nc.gov/providers/ncir.htm>) is an electronic database that over 90% of the state's primary care providers use to document vaccination. The North Carolina Immunization Branch provided county-level NCIR data on HPV vaccination among girls, ages 13–17, with active records in the registry. Measures were HPV vaccine initiation (i.e., percentage who received 1 dose) and completion (i.e., percentage who received 3 doses, among those who initiated). We chose this completion measure, instead of absolute levels of completion, because it does not confound completion with initiation.

**Pap test screening among Medicaid-insured women**—Community Care of North Carolina (CCNC) provided county-level data on the percentage of Medicaid-insured women, ages 21–64, who received at least 1 Pap test between 2009 and 2011. Previous research has found that Medicaid-insured women are somewhat more likely to receive Pap tests than women with other insurance types.<sup>14</sup> Thus, these data likely overestimate the prevalence of Pap screening among other women in the state, comprising a conservative measure of cervical cancer prevention need. Reliable county-level data on screening among privately-insured women were unavailable.

**Pap test screening among women without recent tests**—The National Breast and Cervical Cancer Early Detection Program (NBCCEDP) provides cervical cancer screening services to low-income and under- and uninsured adult women who do not have Medicaid, a population with low rates of regular Pap testing.<sup>15–17</sup> The program targets these higher-risk women by requiring that at least 20% of women newly-enrolled in state programs qualify as rarely- or never-screened (i.e., having had no Pap in the previous 5 years). For this study, the North Carolina Breast and Cervical Cancer Control Program (NC BCCCP) provided county-level data from 2010–2012 on the percentage of newly-enrolled women who qualified as rarely- or never-screened.

**Analysis**—We created a cervical cancer prevention need index (CCPNI) that reflected each county's performance on all 5 indicators, with higher scores signifying greater need. For cervical cancer mortality, we assigned scores to counties ranging from 0 to 8, or double the weight of each of the other indicators, as it is the most direct measure of cervical cancer prevention need. For the other 4 indicators, we assigned scores ranging from 0 to 4 (for the percentage of Medicaid-insured women who had a recent Pap test) or 1 to 4 (for the other indicators). Counties received a score of 0 for each indicator if they met relevant national guidelines (e.g., Healthy People 2020 goals). We created the cut-off points for each indicator (available from the last author and online at <http://ccfnc.com/etc/Cervical%20Cancer%20Prevention%20in%20NC-Strengthening%20Health%20Programs%20and%20Systems.pdf>) by inspecting the distribution of the raw data for each indicator and identifying natural groupings that roughly mapped on to quartiles. For example, we scored counties' cervical cancer mortality rates with the following rules: counties received a 0 if

they had mortality rates < 2.5 per 100,000 women (which meets the Healthy People benchmark relevant to the time these mortality data were collected), 2 for rates between 2.5 and 2.9, 4 for rates between 3.0 and 3.9, 6 for rates between 4.0 and 4.9, and 8 for rates greater than 5.0. We summed each county's scores on the indicators to obtain an overall score on cervical cancer prevention, with a possible range of 3–24. Sensitivity analyses to test the effect of different weighting schemes on the conclusions of the analysis found similar results.

## **Application 2. Compiling Recommendations for Improving Cervical Cancer Prevention**

To identify strategies for cervical cancer prevention with the most promise for North Carolina, we developed recommendations with applications to specific state programs and policies for 2 key pillars of the Carolina Framework (HPV vaccination and Pap screening).

**Data sources**—We conducted key informant interviews with 19 leaders of healthcare organizations, non-profits, governmental agencies, and quality improvement organizations from around the state. We generated an original list of informants based on contacts established during CCNFC's 3.5 years of work in cervical cancer prevention. Using a snowball sampling strategy, we contacted additional interviewees based on original informants' suggestions of other influential stakeholders. We used a semi-structured interview guide informed by the Carolina Framework to elicit informants' perspectives on existing programs and policies in North Carolina related to HPV vaccination and cervical cancer screening, as well as suggestions for improving existing efforts.

Informants included representatives from several statewide and local organizations. At the level of state government, the Division of Public Health includes the Immunization Branch, which administers NCIR as well as the state's Vaccines for Children (VFC) program that provides free vaccines, including HPV vaccine, to eligible children; and the Cancer Prevention and Control Branch that administers NC BCCCP. Local health departments support these efforts through health promotion activities and providing healthcare services, including those funded by VFC and NC BCCCP. In addition, the North Carolina Office of Minority Health and Health Disparities promotes health equity and the reduction of health-related disparities, such as those described above in cervical cancer mortality.

Non-profit organizations include Community Care of North Carolina (CCNC), which is a public-private partnership that aims to improve the efficiency of healthcare services. The North Carolina School Community Health Alliance (NCSCHA) supports alternative healthcare sites, including school-located clinics that may deliver HPV vaccine. Other key stakeholders include professional organizations (e.g., the North Carolina Pediatric Society and the North Carolina Academy of Family Physicians) that offer training to healthcare providers responsible for delivering cervical cancer prevention services.

**Analysis**—Two coders independently reviewed case notes from each interview for suggestions for improving cervical cancer prevention. We used an iterative process of data collection and analysis to generate a list of suggested activities for key state programs and policies. We grouped these state-specific activities under broader recommendations that rely

in part on the national recommendations from the Community Guide to Preventive Services<sup>18</sup> and Smith and colleagues' recommendations.<sup>19</sup>

The University of North Carolina Institutional Review Board exempted this study from review because it uses publicly-available data and interviews with participants operating in their capacity as public officials.

## Results

### Application 1. Counties' Cervical Cancer Prevention Need

North Carolina counties' median cervical cancer mortality rate was 2.7 per 100,000 women annually in 1998–2007, with counties in the top decile of prevention need ranging from 4.5–8.0 (Table 1). The median rate of adolescent girls receiving at least 1 dose of HPV vaccine was 42%, with counties in the top decile of prevention need ranging from 15%–30%. Among adolescent girls initiating HPV vaccine, the median rate of receiving all 3 doses was 57%; the top decile of need was 40%–45%. The median rate of Medicaid-insured women who received a Pap test in the previous 3 years was 59%, with the top decile of need ranging from 40%–51%. The median rate of women, newly-enrolled in NC BCCCP, who qualified as rarely- or never-screened was 15%; the top decile of need ranged from 0%–5%.

The median CCPNI score based on these 5 measures was 12 (observed range: 8–23; possible range 3–24). Figure 1 highlights the 31 counties with the highest scores (i.e., 15) on the CCPNI. Counties with high cervical cancer prevention need were primarily in the northeastern and south-central parts of the state, with several counties also in the western part of the state.

### Application 2. Recommendations for Improving Cervical Cancer Prevention in North Carolina

Key informants' suggestions for improving cervical cancer prevention fell into 9 broad recommendations (Table 2).

**Recommendation 1. Reduce missed opportunities for HPV vaccination among eligible adolescents**—Healthcare providers should take every opportunity to address adolescents' vaccination needs during healthcare visits, including those for acute care and sports physicals,<sup>20,21</sup> as adolescents are less likely to attend preventive healthcare visits than younger children. Of the many action steps identified that support this recommendation, immunization quality improvement efforts are particularly important. The state Immunization Branch can train providers using CDC's Assessment, Feedback, Incentives, and eXchange (AFIX) curriculum, a program that teaches providers techniques they can use to reduce missed opportunities for vaccination. Originally designed to improve early childhood vaccination, AFIX programs for adolescent vaccination are becoming more common. Targeting AFIX visits specifically to HPV vaccination could address the dramatic underuse of this vaccine.<sup>22</sup>

**Recommendation 2. Encourage pediatricians, family practitioners, nurses, and other healthcare professionals to recommend HPV vaccine**—Physician or



other healthcare provider recommendation is perhaps the most important determinant of HPV vaccine uptake.<sup>21,23,24</sup> However, providers often fail to deliver effective recommendations for HPV vaccine.<sup>25,26</sup> To support provider recommendation of HPV vaccine, healthcare professional organizations can play a leading role in educating physicians and other healthcare providers about vaccine timetables, contraindications, concomitant vaccination, and strategies for communicating with vaccine hesitant parents. Continuing medical education or maintenance of certification courses could efficiently deliver such education.

**Recommendation 3. Increase provision of adolescent vaccines in alternative settings, including pharmacies and schools**—Adolescent vaccination in alternative settings is an important complement to vaccination in traditional healthcare settings, especially for adolescents who lack healthcare access. Pharmacies have great potential for HPV vaccine provision, although North Carolina laws currently allow pharmacists to provide vaccines only for adults. In addition, the Community Guide<sup>18</sup> recommends school-located programs for adolescent vaccination, which has been tremendously impactful in other countries.<sup>27–30</sup> Because school programs to increase HPV vaccination rates in isolation of other CDC-recommended vaccines are less effective,<sup>31,32</sup> school-located clinics should offer students the tetanus, diphtheria, and pertussis booster and the meningococcal vaccine in addition to HPV vaccine.

To expand HPV vaccine provision in alternative settings, local health departments can partner with school systems and the North Carolina Institute for Public Health to develop mass vaccination programs. For instance, practitioners in Brunswick County have offered school-located mass vaccination since 2003. In 2010, this program provided HPV vaccine to 137 of 234 (59%) participating adolescents.<sup>33</sup>

**Recommendation 4. Increase funding to establish universal coverage of all CDC-recommended vaccines, including HPV vaccine, to children up to age 18**—The cost of HPV vaccine represents a significant barrier to uptake.<sup>34–37</sup> One potential solution to this challenge is public funding to support administration to adolescents who may forgo vaccination because of cost. Indeed, studies have demonstrated that HPV vaccination is relatively high in contexts with more generous programs supporting public funding of vaccines.<sup>27,38,39</sup> To support this recommendation, healthcare providers, professional organizations, and other individuals could lobby in support of state-level legislation to provide universal coverage of public funding for all CDC-recommended vaccines for children up to age 18. Currently, North Carolina has public funding for HPV vaccine only for children who are Medicaid-eligible, are under- or uninsured, or are American Indian or Alaska Native.<sup>40</sup>

**Recommendation 5. Improve recruitment of women rarely- or never-screened for cervical cancer**—As described in Box 1, healthcare providers detect most cases of cervical abnormalities in women who have not received a Pap test in the previous 3 years. Screening programs and healthcare providers should target recruitment efforts at women who have rarely or never received cervical cancer screening, who are Hispanic or African-American, live in rural areas, or who are HIV-positive. As these women may be hard to

reach, health departments that are successful in recruiting and screening these women should disseminate effective strategies. To support this recommendation, state and local health departments could identify and adapt existing materials (e.g., from the national Cervical Cancer Resource Directory, <http://clearinghouse.cervicalcancerfreecoalition.org/>, or from Cancer Control P.L.A.N.E.T., <http://cancercontrolplanet.cancer.gov/>).

**Recommendation 6. Reduce missed opportunities for cervical cancer**

**screening**—Systematizing women’s health screenings and modifying intake procedures could simplify preventive health services, thereby reducing missed opportunities. To support this recommendation, CCNC could use its electronic medical records systems (based on Medicaid/Medicare claims data) to alert providers when their patients are overdue for screenings and treatment services.

**Recommendation 7. Encourage adherence to USPSTF guidelines for cervical cancer screening**

—The United States Preventive Services Task Force (USPSTF) adopted new cervical cancer screening guidelines in 2012,<sup>41</sup> but many healthcare providers remain unaware of the new guidelines or do not follow them. For instance, USPSTF recommends that most adult women receive Pap tests every 3 years, or co-testing with Pap and HPV DNA tests every 5 years, but many providers screen more often.<sup>42–44</sup> To support this recommendation, healthcare professional organizations can educate members about the new USPSTF guidelines through professional conferences and newsletters.

**Recommendation 8. Expand NC BCCCP funding**—Funding to maintain and improve NC BCCCP’s screening efforts is crucial for continued reductions of the burden of cervical cancer in this state. About 85 of the 360 cervical cancers diagnosed in North Carolina each year happen through this program.<sup>6</sup> Thus, NC BCCCP identifies about a quarter of all cases of cervical cancer in the state, though serving less than 1% of adult women. In addition, expanding NC BCCCP (and other BCCCP programs) could allow clinicians to provide follow-up treatment to undocumented immigrant women, who are currently ineligible for treatment funded by BCCCP beyond screening, potentially leading to even more impressive outcomes. Legislators have repeatedly attempted to pass legislation that would allow taxpayers to contribute part of state tax refunds to NC BCCCP. CCFNC coalition partners that do not receive their funding from the state could participate in advocacy activities to demonstrate support for such legislation.

**Recommendation 9. Increase understanding of the importance of cervical cancer prevention, especially among populations at higher-risk for cervical cancer**

—Many parents report that they want more information about HPV vaccine,<sup>45–47</sup> have concerns about safety and side effects,<sup>25,45</sup> do not understand the recommended ages for routine administration (ages 11–12), or do not know that boys should get the vaccine.<sup>48</sup> Similarly, adult women may not understand<sup>49,50</sup> or may have misinformation<sup>51,52</sup> about cervical cancer screenings, and therefore they may not seek them out. The NC Office of Minority Health and Health Disparities can support this recommendation by expanding the focus of its Community-Focused Eliminating Health Disparities Initiative grants to explicitly include cervical cancer prevention, allowing community organizations to seek



their support for campaigns to expand the public's understanding of cervical cancer screening and HPV vaccination.

## Discussion

We applied the Carolina Framework for Cervical Cancer Prevention to identify counties with higher cervical cancer prevention need and to solicit experts' recommendations for addressing those needs. Cervical cancer prevention need showed striking geographic disparities, with 2 high-need clusters of counties emerging in the northeastern and south-central regions of the state. While the causes of higher need are likely complex, identified counties are notable for being in regions that have lower population density, higher poverty, and higher percentages of African American residents. This pattern suggests that access to care, as well as broader social determinants of health, play a role in cervical cancer prevention need in North Carolina. Whatever the case, state and local program planners must redouble their efforts in these areas in order to counteract the regional challenges that currently undercut the effectiveness of screening and vaccination programs. At the same time, counties with high population density contribute meaningfully to disease burden and should also be a focus of prevention efforts.

Key informants identified a wide array of cervical cancer prevention activities that would work within existing systems, often using current funding. One of the most important overarching recommendations is to reduce missed opportunities for HPV vaccination and cervical cancer screening. Encouraging providers to adopt current national guidelines with regard to screening and vaccination is critical to this goal. The complexity of these problems, together with the large number of identified stakeholders, suggests that recommendations cannot be enacted by any 1 agency alone, but rather require a concerted effort by a coalition of motivated partners. To that end, in September 2013, Cervical Cancer-Free North Carolina convened a statewide conference on optimizing preventive care and reducing cervical cancer mortality for state, county, and community stakeholders. The aim was to foster collaboration for incorporating these recommendations into existing programs and systems. The conference was well attended, with more than 90 participants from over 50 governmental, non-profit, and healthcare organizations across the state. During the conference, participants gave feedback to help refine the recommendations presented here. They prioritized 4 of the 9 recommendations for immediate action (Recommendations 2, 5, 6, and 9, described above).

Strengths of this paper include our pragmatic approach that combined an evidence-based framework with available data and expert opinion to yield actionable, state-specific priorities for cervical cancer prevention. This approach is well-suited for public health practitioners, policymakers, and others who must guide cervical cancer prevention efforts in a timely and resource-efficient manner based on the available evidence. In terms of limitations, we chose to focus our study only on North Carolina, but understanding the national context is also important for improving prevention. County-level estimates of CCPNI indicators are less reliable than state-level estimates,<sup>53</sup> so a given county's performance may be higher or lower than indicated here; however, estimates of health behaviors at smaller geographic areas are becoming increasingly common because of their

inherent utility to local decision-makers.<sup>54–56</sup> In addition, our use of the Carolina Framework emphasized 2 of the 4 pillars (i.e., HPV infection and lack of screening), but gave less attention to screening errors and follow-up care. While this omission is due largely to the lack of available data through established statewide systems, future work should also address these latter 2 pillars through promising strategies such as co-testing with Pap tests and HPV DNA tests to reduce Pap screening errors<sup>57</sup> and patient navigation services to improve follow-up care.<sup>58</sup>

Future studies should expand on the present application of the Carolina Framework to examine the impact of programs, policies, and approaches we identified in our applications of the Framework. Program planners in North Carolina or other states can use a similar approach to identify high-need areas and generate recommended activities to improve cervical cancer prevention. Evaluation of these applications of the Framework will be important in determining its utility in supporting cervical cancer prevention efforts.

In conclusion, the 4 pillars of the Carolina Framework (HPV infection, lack of screening, screening errors, and lack of follow-up care) identify the main causes of cervical cancer. Addressing these 4 pillars can reduce the incidence of this preventable disease, thereby saving thousands of lives each year. We have demonstrated 2 applications of the Carolina Framework for prioritizing geographic regions and recommended strategies to reduce cervical cancer in North Carolina. In this state, public health practitioners, healthcare providers, non-profit organizations, and other stakeholders can target these areas and activities in order to have the greatest impact on cervical cancer incidence and mortality. Stakeholders in other states can similarly use this approach so as to channel limited funds for cervical cancer prevention to effective programs for the communities that need them most.

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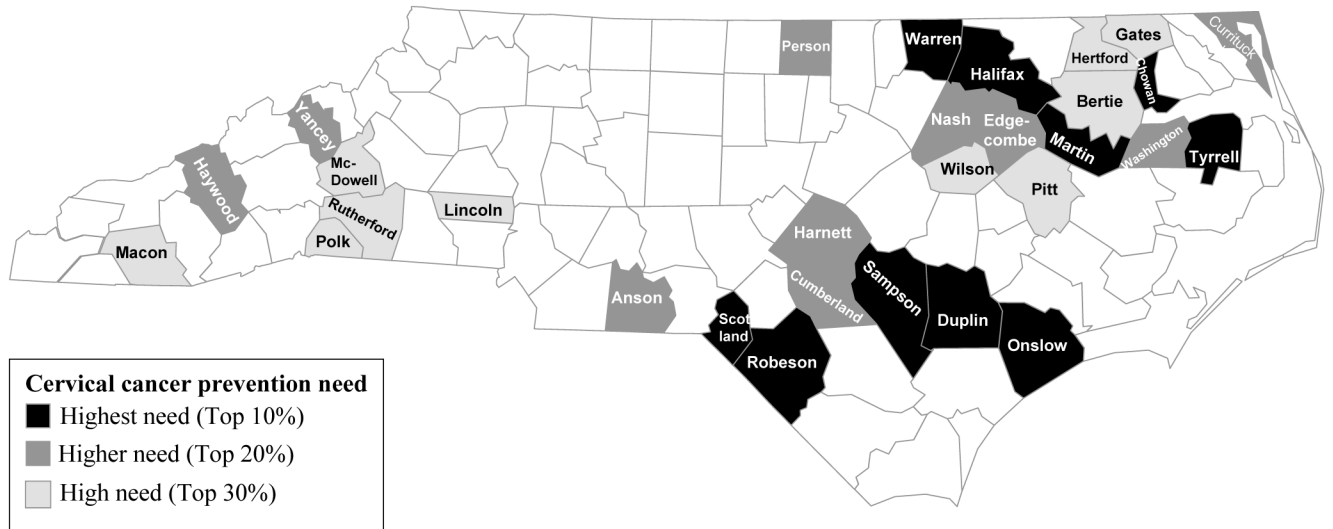
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### Highlights

- We present 2 applications of Carolina Framework for Cervical Cancer Prevention, which outlines 4 causes of cervical cancer incidence.
- North Carolina counties varied on cervical health indicators, but 2 high-need regions emerged.
- Key informants recommended improvements to existing programs and policies.



**Figure 1.**  
North Carolina counties with high cervical cancer prevention need scores.

**Table 1**

North Carolina counties' cervical cancer prevention need.

	0%ile	50%ile	70%ile	80%ile	90%ile	100%ile
Cervical cancer mortality, per 100,000 women	0.0	2.7	3.2	3.7	4.5	8.0
1+ doses of HPV vaccine among girls ages 13–17	62%	42%	38%	35%	31%	15%
3 doses of HPV vaccine among girls ages 13–17 who initiated	84%	57%	54%	51%	46%	40%
Percent of Medicaid-insured women with Pap tests, last 3 years	83%	59%	55%	53%	51%	40%
Percent of BCCCP's newly-enrolled women without recent Pap tests	46%	15%	10%	7%	5%	0%
CCPNI score	8	12	15	16	18	23

*Note.* Percentiles reflect lowest (0%ile) to highest (100%ile) need.

**Table 2**

Recommendations for improving cervical cancer prevention in North Carolina.

<p><b>HPV Vaccination</b></p> <p><b>Recommendation 1. Reduce missed opportunities for HPV vaccination among eligible adolescents.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>State health department:</i> Train providers how to reduce missed opportunities by offering more adolescent Assessment, Feedback, Incentives, and eXchange trainings (CDC’s quality improvement program for childhood vaccination) and expanding the training to focus more on HPV vaccine.</li> <li>• <i>State and local health departments:</i> Collect recruitment materials and best practice strategies for reducing missed opportunities to vaccinate, and disseminate via the NC Center for Public Health Quality iMAP database.</li> <li>• <i>Local health departments:</i> Offer HPV vaccination to adolescents who receive care in other health department programs, including sexual health and family planning clinics, WIC, and dental clinics. Increase use of the NCIR’s reminder/recall function for routine and catch-up adolescent vaccines.</li> <li>• <i>Healthcare providers:</i> Modify patient intake procedures to identify adolescents who are eligible for preventive health services, including HPV vaccination, and monitor performance on the reduction of missed opportunities. Use NCIR’s reminder/recall function to contact adolescents who are eligible to receive initial or subsequent doses of HPV vaccine.</li> <li>• <i>CCNC:</i> Use patient care alerts for adolescent vaccination, especially during summer months when young patients can more easily access healthcare services.</li> <li>• <i>State Immunization Branch:</i> Update NCIR to permit reminder/recall for the first dose of HPV vaccine.</li> </ul>
<p><b>Recommendation 2. Encourage pediatricians, family practitioners, nurses, and other healthcare professionals to recommend HPV vaccine.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>Healthcare professional organizations:</i> Disseminate tools that train healthcare providers to make efficient and effective recommendations of HPV and other adolescent vaccines, including education about vaccine timetables, contraindications, and concomitant vaccination.</li> <li>• <i>Healthcare providers:</i> Commit to a policy of making clear and strong recommendations for all adolescents ages 11 to 18 to receive HPV vaccine and other adolescent vaccines.</li> </ul>
<p><b>Recommendation 3. Increase provision of adolescent vaccines in alternative settings, including pharmacies and schools.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>Pharmacies and CCFNC:</i> Continue to research the protocol and feasibility of HPV vaccine administration in pharmacy settings.</li> <li>• <i>Local health departments:</i> Develop and implement school-located mass vaccine programs (e.g., as demonstrated in Brunswick County) through collaboration with the NC Institute for Public Health.</li> <li>• <i>School health centers:</i> Stock adolescent vaccines (i.e., tetanus, diphtheria, and pertussis booster, meningococcal vaccine, and HPV vaccine) and encourage adolescents to seek these services in school health centers.</li> <li>• <i>NCSCHA:</i> Encourage school health centers to stock HPV vaccine, in addition to other adolescent vaccines. Share successful strategies to improve the return of parent consent forms.</li> </ul>
<p><b>Recommendation 4. Increase funding to establish universal coverage of all CDC-recommended vaccines, including HPV vaccine, to children up to age 18.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>CCFNC Coalition partners:</i> Support legislation to provide universal coverage with public funding for all CDC-recommended vaccines for children, including HPV vaccine.</li> </ul>
<p><b>Cervical Cancer Screening</b></p> <p><b>Recommendation 5. Improve recruitment of women rarely- or never-screened for cervical cancer.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>State and local health departments:</i> Collect recruitment materials and disseminate via the NC Center for Public Health Quality iMAP database.</li> <li>• <i>Local health departments:</i> Recruit into screening programs women who receive care in other health department programs, including sexual health and family planning clinics, WIC, dental clinics, and immunization clinics.</li> <li>• <i>Healthcare providers:</i> Use recruitment materials from iMAP and best practice strategies to identify and provide Pap tests to women without recent screenings.</li> </ul>

<ul style="list-style-type: none"> <li>• <i>CCFNC</i>: Update and disseminate the Cervical Cancer Resource Directory to local health departments, primary care providers, and community based organizations.</li> </ul>
<p><b>Recommendation 6. Reduce missed opportunities for cervical cancer screening.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>State health department</i>: Work with other administrators from other programs that target women’s health services (e.g., WISEWOMAN and WIC) to develop age-specific packages of preventive services such as screening for breast and cervical cancer, blood pressure, and body mass index.</li> <li>• <i>State BCCCP office and State Health Information System office</i>: Develop computer applications that facilitate in-reach recruitment efforts and provision of comprehensive packages of health screening services.</li> <li>• <i>Healthcare providers</i>: Modify intake procedures to identify women who should receive screening.</li> <li>• <i>Healthcare professional associations</i>: Develop a maintenance of certification Part IV quality improvement project for implementing comprehensive screening packages.</li> <li>• <i>CCNC</i>: Use care alerts to promote screening.</li> </ul>
<p><b>Recommendation 7. Encourage adherence to USPSTF guidelines for cervical cancer screening.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>State health department</i>: Collaborate with State Lab officials to expedite adoption of HPV DNA co-testing.</li> <li>• <i>State health department</i>: Finalize, publish, and disseminate new BCCCP program manual for local program providers.</li> <li>• <i>Healthcare professional associations</i>: Educate providers on USPSTF guidelines for cervical cancer screening and discourage over-screening through professional conferences, association newsletter updates, and other information sharing opportunities.</li> <li>• <i>Healthcare providers</i>: Provide Pap tests to women in accordance with USPSTF guidelines (i.e., not more often than every three years).</li> <li>• <i>Central Cancer Registry</i>: Prepare periodic evaluation reports of women’s cancers and screenings to inform the State Five Year Cancer Plan as well as the CDC federal reporting requirements. These reports will highlight the extent to which healthcare providers meet cervical cancer screening guidelines.</li> </ul>
<p><b>Recommendation 8. Expand NC BCCCP funding.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>State health department</i>: Prepare evaluation data and report to justify program expansion from \$3M to \$9M allocation from the CDC.</li> <li>• <i>CCFNC Coalition partners</i>: Advocate for legislation to allow individuals due a state income tax refund to contribute all or part of their tax refund to the NC Breast and Cervical Cancer Control Program.</li> </ul>
<p><i>General</i></p>
<p><b>Recommendation 9. Increase understanding of the importance of cervical cancer prevention, especially among populations at higher-risk for cervical cancer.</b> Supporting activities:</p> <ul style="list-style-type: none"> <li>• <i>State health department</i>: Seek funding and technical support for health communication campaigns.</li> <li>• <i>Local health departments</i>: Share health communication materials with appropriate local populations.</li> <li>• <i>NC Office of Minority Health and Health Disparities</i>: Expand the scope of the Community Focused Eliminating Health Disparities grants to include: 1) cervical cancer as a priority area; and 2) public awareness activities. Screening messages should target African American and Hispanic women, particularly those who have been in the US less than 5 years, and HIV-positive women. Vaccination messages should address beliefs around HPV vaccine safety and effectiveness, venues where patients can access the vaccine, and recommendations for routine use among 11–12 year old boys and girls.</li> </ul>

*Note.* BCCCP = Breast and Cervical Cancer Control Program; CCFNC = Cervical Cancer-Free North Carolina; CCNC = Community Care of North Carolina; CDC = Centers for Disease Control and Prevention; HPV = human papillomavirus; NCIR = North Carolina Immunization Registry; NCSCHA = North Carolina School Community Health Alliance; Pap = Papanicolaou; USPSTF = United States Preventive Services Task Force; WIC = Women, Infants, and Children.