

Administrative Supplements for NCI-
Designated Cancer Centers to
Investigate HPV Vaccine Uptake
A Summary Report

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BACKGROUND

Human papillomaviruses (HPV) cause nearly 35,000 cases of cancer in the United States and about 630,000 cases of cancer worldwide each year.^{1,2} These include cancers of the oropharynx (head and neck), cervix, anus, vulva, penis, and vagina. Three vaccines—Cervarix, Gardasil 4, and Gardasil 9—have been approved by the U.S. Food and Drug Administration for prevention of HPV infection.³ As of 2017, only Gardasil 9 is available for use in the United States. Cervarix and Gardasil 4 still are used in other countries. The U.S. Advisory Committee on Immunization Practices recommends routine HPV vaccination of girls and boys at 11 or 12 years of age. Two doses 6 to 12 months apart are needed for children who start the vaccine series before age 15. Those who receive their first dose at age 15 or later need three doses. HPV vaccination is recommended for everyone through age 26 years who has not yet been vaccinated and for some adults up to age 45.⁴

Initial uptake of the HPV vaccine in the United States was slow. In 2012, six years after the first HPV vaccine was recommended for girls and one year after it was recommended for boys, only about one-third of girls and less than 7 percent of boys aged 13 to 17 had completed the HPV vaccine series.⁵ The February 2014 report of the President’s Cancer Panel called underuse of HPV vaccines “a serious but correctable threat to progress against cancer” and urged the cancer community to take several steps to accelerate uptake of the vaccines.⁶ Two years later, the Cancer Moonshot Blue Ribbon Panel report highlighted HPV vaccination as an effective cancer prevention modality that required better large-scale implementation to achieve target adoption rates.⁷

The National Cancer Institute (NCI) Division of Cancer Control and Population Sciences (DCCPS) recognized that promotion of the HPV vaccine presented new challenges for the cancer control community. Adolescents are an unusual target population for cancer control experts who did not have established relationships with the immunization community or pediatricians and other healthcare professionals who deliver care to adolescents. In July 2014, NCI DCCPS offered a supplemental funding opportunity to NCI-designated cancer centers to promote collaborations between cancer centers and state/local cancer coalitions and HPV immunization programs.* The one-year supplement was awarded to 18 cancer centers (Table 1) to support an environmental scan and development/enhancement of linkages with existing coalitions and programs, with a focus on HPV vaccine uptake in pediatric settings. A summary report was released in June 2016.⁸

In 2017, NCI DCCPS provided administrative supplements related to HPV vaccination to an additional 12 cancer centers (Table 2). Similar to the first round, the short-term goals for the second round of awards were to identify low-uptake areas within cancer center catchment areas and conduct environmental scans to identify local barriers, facilitators, and implementation strategies related to HPV vaccination. The long-term goal is to use this information to develop or expand applied research to increase HPV vaccine uptake. This report provides an overview of the activities and key findings of Round 2 supplement recipients, as well as efforts by both Round 1 and Round 2 grantees to disseminate and leverage the work supported by the supplements to promote HPV vaccine uptake and continued research in this area.

* More information on the NCI Cancer Centers program can be found at <https://cancercenters.cancer.gov>.

Table 1. Recipients of the 2014 Administrative Supplements for HPV Vaccination

Institution Name	Center Name	State	Catchment Area
Albert Einstein College of Medicine	Albert Einstein Cancer Center	NY	Bronx County and communities in Southern Westchester, New York
Baylor College of Medicine	Dan L. Duncan Comprehensive Cancer Center	TX	Harris County, Texas
Case Western Reserve University	Case Comprehensive Cancer Center	OH	Cuyahoga County and Cleveland, Ohio
Medical University of South Carolina	Hollings Cancer Center	SC	State of South Carolina
Moffitt Cancer Center	Moffitt Cancer Center	FL	7-county area of southern Florida
Roswell Park Cancer Institute	Roswell Park Cancer Institute	NY	Western New York—8 counties and other areas of upstate New York
The Ohio State University	The Ohio State University Comprehensive Cancer Center – James Cancer Hospital & Solove Research Institute	OH	State of Ohio
The University of Texas	MD Anderson Cancer Center	TX	State of Texas
University of Alabama at Birmingham	UAB Comprehensive Cancer Center	AL	State of Alabama
University of Hawaii at Manoa	University of Hawaii Cancer Center	HI	State of Hawaii
University of Kentucky	Markey Cancer Center	KY	Eastern Kentucky, including Appalachia
University of North Carolina, Chapel Hill	UNC Lineberger Comprehensive Cancer Center	NC	State of North Carolina
University of Southern California	USC Norris Comprehensive Cancer Center	CA	Greater Los Angeles, California
University of Utah	Huntsman Cancer Institute	UT	Utah, Idaho, Nevada, Wyoming, Montana
University of Virginia	UVA Cancer Center	VA	Central, southern, western Virginia, and portions of rural West Virginia
University of Wisconsin	University of Wisconsin Carbone Cancer Center	WI	State of Wisconsin
Vanderbilt University	Vanderbilt-Ingram Cancer Center	TN	State of Tennessee, central state, extending into Kentucky and Alabama
Yale University School of Medicine	Yale Cancer Center	CT	State of Connecticut, especially New Haven

Table 2. Recipients of the 2017 Administrative Supplements for HPV Vaccination

Institution	Center Name	State	Catchment Area
Dartmouth-Hitchcock Medical Center	Norris Cotton Cancer Center	NH	States of New Hampshire and Vermont
Emory University	Winship Cancer Institute	GA	State of Georgia
Indiana University-Purdue University at Indianapolis	Melvin & Bren Simon Cancer Center	IN	State of Indiana
Oregon Health & Science University	Knight Cancer Institute	OR	State of Oregon
The University of Texas Southwestern Medical Center	Harold C. Simmons Comprehensive Cancer Center	TX	13 counties in Dallas-Fort Worth metropolitan area: Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise
Thomas Jefferson University	Sidney Kimmel Cancer Center	PA	“River Wards” of Philadelphia, southwest Philadelphia, and Camden, NJ
University of California, Davis	UC Davis Comprehensive Cancer Center	CA	13 counties of inland CA: Alpine, Amador, Calaveras, El Dorado, Nevada, Placer, San Joaquin, Sacramento, Sierra, Solano, Sutter, Yolo, and Yuba
University of California, San Diego	Moore's Comprehensive Cancer Center	CA	San Diego County
University of Iowa	Holden Comprehensive Cancer Center	IA	Rural counties in Iowa
University of Minnesota	Masonic Cancer Center	MN	State of Minnesota
University of Pittsburgh	UPMC Hillman Cancer Center	PA	29 counties in western Pennsylvania, including Pittsburgh (Allegheny County)
Wayne State University School of Medicine	Barbara Ann Karmanos Cancer Institute	MI	Genesee, Oakland, Macomb, Wayne, and Monroe Counties

METHODS

Round 2 grantees were asked to submit final reports summarizing their environmental scan activities and findings, as well as information on other activities, linkages, lessons learned, dissemination efforts, and new research launched as a result of the supplement. Interim progress reports and abstracts for the June 2018 NCI Cancer Center HPV Vaccination Meeting at Huntsman Cancer Center also were reviewed when available. Some grantees provided supplemental information upon request. There was variation among grantees in the activities and focus of the environmental scans, as well as in the level of detail provided in final reports. In addition, some grantees had not completed analyses of their scans at the time this report was prepared. Comparisons between Round 1 and Round 2 grantees in the section

entitled *Round 2 Grantees: Summary of Activities and Outcomes* are based on information collected from Round 1 grantees immediately following their funding period and previously reported in the June 2016 summary report.⁸ Round 1 grantees were asked to complete a brief survey in June–August 2019 to provide updated information on new initiatives/activities, work with coalitions, dissemination efforts, and lessons learned. This information is reported in the sections entitled *Round 1 and 2 Grantees: Moving Beyond Supplemental Funding* and *Lessons Learned*. In some cases, external sources were used to supplement information provided by grantees (e.g., policy). These sources are cited throughout the report.

CANCER CENTER COLLABORATIONS

Since the first HPV vaccination administrative supplements were issued in 2014, the NCI-designated cancer centers have repeatedly joined forces to advance research and promote HPV vaccination. In January 2015, Moffitt Cancer Center hosted a meeting to facilitate interactions among the first round of supplement recipients and other interested cancer centers. Since then, four more cancer centers have hosted meetings, and a sixth meeting is planned for November 2019 (see Table 3). These meetings—which have been widely attended by representatives from both centers that received the HPV vaccination supplement and those that did not—provide a forum for sharing methods and lessons learned, as well as developing strategies to promote vaccine uptake.

One outcome of the November 2015 meeting was a consensus statement jointly issued by all NCI-designated cancer centers in January 2016 that identifies low rates of HPV vaccination as a serious public health threat and calls for specific actions by parents/guardians, young adults, and health providers to increase vaccine uptake.⁹ This was the first time the cancer centers used their collective voice to weigh in on any topic. In 2017, the cancer centers collectively endorsed the updated HPV vaccination recommendations issued by the Centers for Disease Control and Prevention.¹⁰ In 2018, the cancer centers again issued a joint statement endorsing the goal of eliminating cancers caused by HPV through gender-neutral vaccination and evidence-based screening.¹¹

The cancer centers that received the second round of administrative supplements built on the work done by other centers. Of the 12 Round 2 grantees, 11 reported that their work was informed by the work of Round 1 grantees. Many were in direct contact with and/or used or modified resources developed by 2014 supplement recipients. Round 2 grantees also worked with each other. For example, The University of Texas Southwestern team consulted with researchers at Winship Cancer Institute when developing their parent survey. Knight Cancer Institute and Holden Comprehensive Cancer Center are working together on a concept mapping project to investigate factors influencing HPV vaccination in rural areas.

Table 3. Cancer Center HPV Vaccination Meetings

Date	Host Cancer Center
January 2015	Moffitt Cancer Center
November 2015	MD Anderson Cancer Center
June 2016	The Ohio State University James Cancer Hospital & Solove Research Institute
May 2017	Medical University of South Carolina Hollings Cancer Center
June 2018	University of Utah Huntsman Cancer Institute
November 2019	The University of Texas Southwestern Harold C. Simmons Comprehensive Cancer Center

ROUND 2 GRANTEES: SUMMARY OF ACTIVITIES AND OUTCOMES

Substantial variation in HPV vaccination rates has been observed between and within states, counties, and communities across the United States.¹² NCI recognized that its cancer centers—located throughout the country—are well positioned to facilitate these partnerships and promote HPV vaccination within their communities. Round 2 grantees were charged with conducting environmental scans to increase their understanding of HPV vaccination in their catchment areas and building relationships with local and regional stakeholders.

Linkages with Local and Regional Organizations

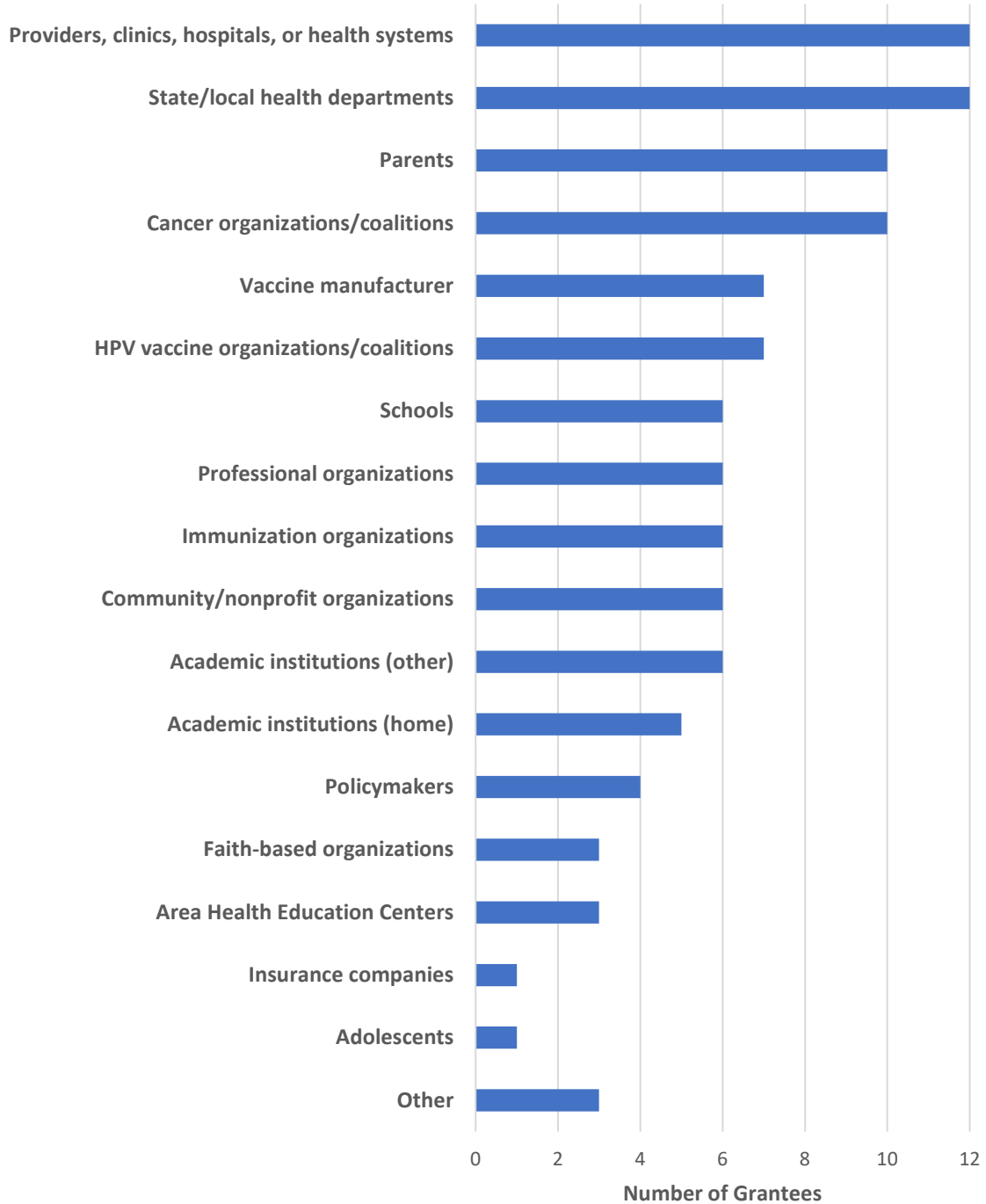
The 12 Round 2 cancer centers formed linkages with many types of stakeholders in their catchment areas (Figure 1). All grantees interacted with healthcare providers, clinics, hospitals, and/or healthcare systems. Healthcare providers included physicians (e.g., pediatricians, family physicians), physician assistants, nurses, nurse practitioners, dentists, and pharmacists. These providers practiced in a variety of settings, including private practices, hospital-/institution-based clinics, health department clinics, federally qualified health centers, and schools. All grantees engaged providers in some way in their environmental scans (e.g., interviews, surveys, focus groups). Four grantees held educational workshops for or provided educational resources to providers. Six grantees formed linkages with local and regional chapters of professional organizations such as the American Academy of Pediatrics (AAP), the American Academy of Family Physicians, state medical associations, and state primary care associations. In some cases, professional organizations helped grantees carry out their environmental scans (e.g., dissemination of surveys). Professional organizations also participated with coalitions or work groups focused on HPV vaccination.

All Round 2 grantees also formed or continued relationships with state and/or local public health agencies. Seven grantees engaged public health department representatives in their environmental scan activities (e.g., interviews). Some health departments provided data for vaccination rate analyses or assisted with other environmental scan activities. Six grantees described partnerships with public health departments, including working together on campaigns or as part of state/local HPV vaccine coalitions.

Ten grantees involved parents in their environmental scans through interviews, surveys, or focus groups. Some grantees assessed parent knowledge about the vaccine, and many asked about barriers and facilitators to vaccination, as well as factors that influenced their decision to vaccinate (e.g., vaccine

hesitancy). Three grantees conducted educational sessions for parents or the lay public about HPV and HPV vaccination, two grantees developed HPV vaccine social media campaigns targeted at parents, and one grantee created an infographic for parents. One grantee included adolescents in its focus groups.

Figure 1. Grantee Linkages with State and Local Stakeholders



Grantees also formed linkages with cancer organizations/coalitions (n=10), HPV vaccine organizations/coalitions (n=7), community/nonprofit organizations (n=6), and immunization organizations (n=6). Many of these organizations participated in environmental scans and some assisted grantees in planning or implementing their scans (e.g., provided input on surveys, facilitated interactions with other stakeholders). Grantees noted plans to continue working with many of these organizations to conduct research and/or promote HPV vaccination in their catchment areas.

Grantees also developed relationships with researchers within their own institutions (n=5) and at other institutions (n=6). These researchers helped develop and implement environmental scan activities and interventions and served in an advisory capacity for the projects.

More than half of grantees (n=7) reported linkages with vaccine manufacturers, who many grantees noted helped facilitate linkages with other stakeholders in the community. Other linkages included schools (n=6), policymakers (n=4), faith-based organizations (n=3), Area Health Education Centers (n=3), and insurance companies (n=1).

The types of linkages formed by Round 2 grantees were similar to those reported by Round 1 grantees in their final reports.[†] All grantees in both rounds formed linkages with healthcare providers, clinics, hospitals, and/or healthcare systems and state and/or local public health agencies. The percentage of grantees engaging with community organizations, immunization organizations, professional organizations, researchers at other academic institutions, policymakers, and schools also were similar between the two rounds of funding. A higher percentage of Round 2 than Round 1 grantees reported forming linkages with cancer organizations such as the American Cancer Society (ACS) and HPV coalitions and workgroups (see *HPV Coalitions and Workgroups*). Also, Round 2 grantees more often reported interacting with parents and vaccine manufacturers.

Environmental Scans

Round 2 grantees used a number of approaches to learn about the HPV vaccination landscape in their catchment areas (Figure 2). Each grantee conducted or is conducting between three and eight activities as part of its environmental scan. Four grantees formed advisory boards to provide input on environmental scan plans, help overcome obstacles, and assist in interpretation of results. These advisory boards have consisted of multidisciplinary experts from their own institutions and other universities and organizations.

[†] These comparisons are based on reports submitted by 2014 grantees at the end of their one-year funding period. Many 2014 grantees have continued to form and strengthen linkages since that time.

HPV Coalitions and Workgroups

Among the 18 cancer centers that received Round 1 supplement funding, 6 reported establishing HPV-focused coalitions or workgroups, several of which are still active. However, few of the Round 1 grantees reported interacting with existing HPV-focused organizations. In contrast, 10 of the 12 Round 2 grantees described partnerships and participation with local and regional HPV coalitions (n=7 grantees) and/or work groups (n=6 grantees). One additional grantee is discussing opportunities to build an HPV coalition with collaborators, including the state Department of Health and the state ACS chapter. This shift is likely due to the increase in the number of HPV coalitions, roundtables, and workgroups over the past three years.

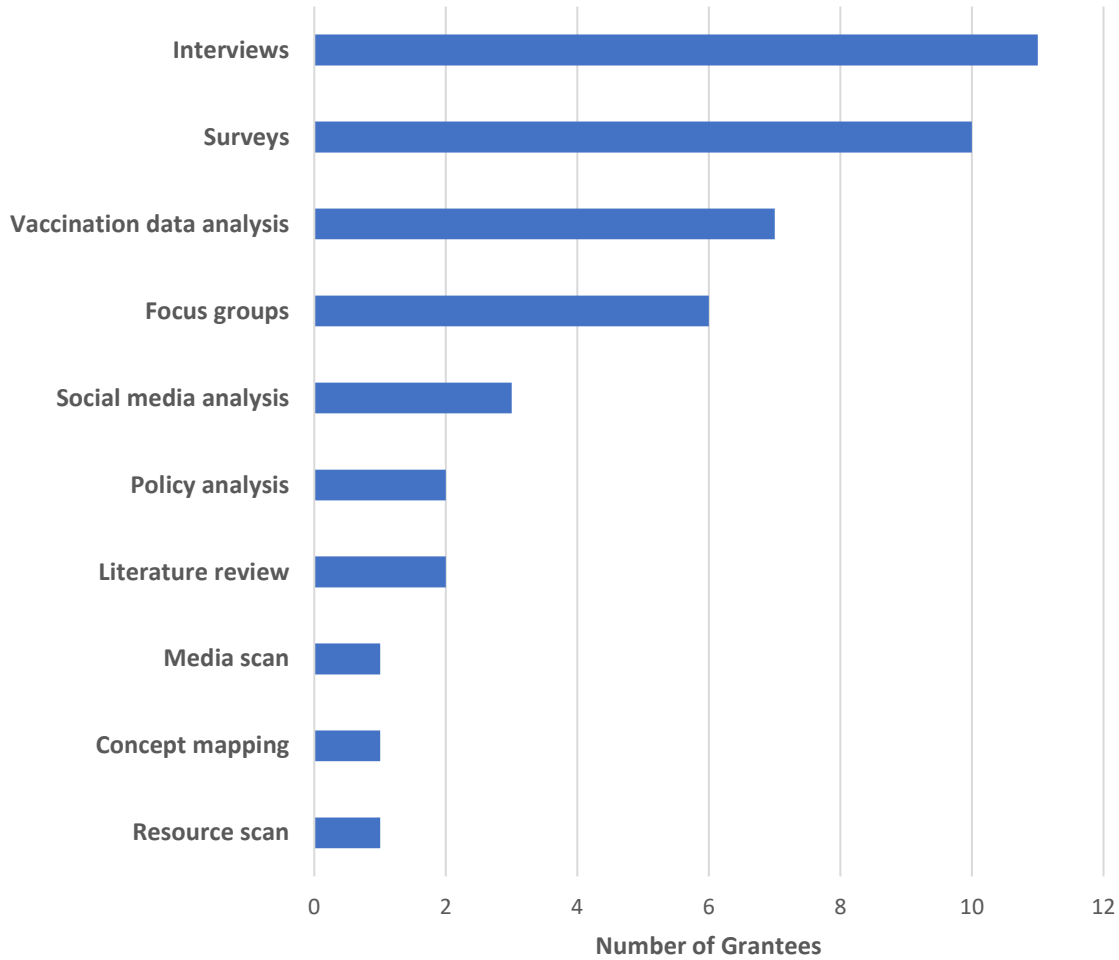
Coalitions with which Round 2 grantees participated include:

- California HPV Vaccination Roundtable
- Vermont HPV Roundtable
- Live HPV Cancer Free (New Hampshire HPV coalition)
- Oregon statewide HPV coalition
- Intermountain West HPV Vaccination Coalition
- Texas HPV Coalition
- Indiana State HPV Roundtable
- Michigan HPV Cancer Prevention Alliance
- Greater Philadelphia HPV Immunization Coalition (launched by Thomas Jefferson University Sidney Kimmel Cancer Center during the supplement period).

HPV-focused workgroups include workgroups of state cancer consortia, cancer control planning groups, and immunization coalitions, as well as other statewide workgroups focused on increasing HPV vaccination.

Environmental scan activities were designed to achieve one or more of a number of goals (Figure 3). All grantees solicited information about barriers and challenges to HPV vaccine uptake, and eight grantees reported efforts to identify facilitators. Nine grantees characterized attitudes and beliefs about the HPV vaccine, and five grantees tried to gain insight into reasons underlying parents' decision to vaccinate (including vaccine hesitancy). Many grantees (n=8) assessed knowledge of HPV and the HPV vaccine among parents, providers, and/or other stakeholders. Seven grantees compiled information about local and regional activities promoting HPV vaccination, and six grantees investigated the practices of providers and clinics related to HPV vaccination. Seven grantees reported efforts to characterize HPV vaccination rates in their catchment areas. Half of grantees solicited information from stakeholders about priorities and opportunities to increase HPV vaccination. Other environmental scan goals included developing partnerships and collaborations (n=3), identifying research (n=2), identifying relevant policies (n=2), developing intervention/education (n=1), and characterizing local news coverage of the HPV vaccine (n=1). In general, environmental scan activity goals were similar between Round 1 and Round 2 grantees.

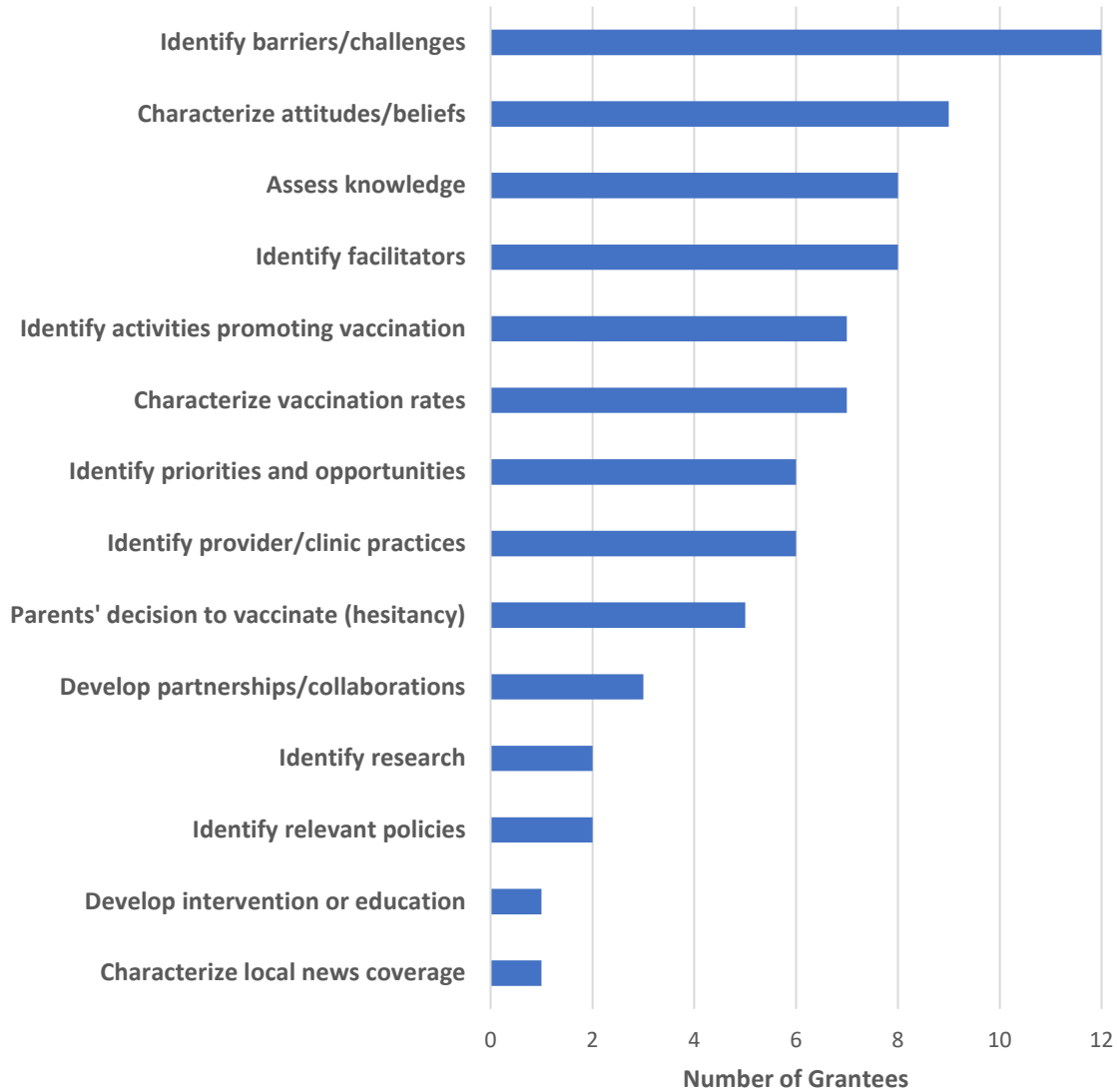
Figure 2. Environmental Scan Activities



HPV Vaccination Rate Analyses

Data from National Immunization Survey-Teen (NIS-Teen) are used to monitor vaccination rates among U.S. adolescents. NIS-Teen provides critical information on national and state vaccination trends; however, due to sampling methods and sample size constraints, NIS-Teen provides vaccination coverage estimates for only a few local areas and territories.¹³ Data on local vaccination rates and factors are important both for tailoring interventions and for measuring the local impact of these interventions. Seven grantees reported that they had analyzed or are analyzing state-, county-, or local-level HPV vaccination rate data. Of these, four used state immunization registry data, one used health plan/health system data collected by the state, one used county immunization survey data, and one used city immunization registry data. Four grantees (including three that reported vaccination rates and one that did not) noted inconsistent entry of HPV vaccinations as a limitation of their state immunization registries. Duplicate records also were noted as a limitation of registries.

Figure 3. Environmental Scan Goals



Policy Analyses and Related Activities

As of June 2018, 42 states and territories had introduced legislation to require the HPV vaccine, fund the vaccine, or educate the public or school children about the vaccine. At least 25 states and territories have enacted some type of legislation related to the vaccine.^{14‡} Two 2014 grantees conducted policy analyses as part of their environmental scans, which included a review of federal, state, and/or county policies. One of these grantees noted that vaccination policies vary widely across the United States and stated that increased coordination among stakeholders could help achieve beneficial HPV vaccine-related legislation.

[‡] A comprehensive list of state actions and introduced legislation related to HPV vaccination can be found on the National Conference of State Legislatures (NCSL) [HPV Vaccine: State Legislation and Statutes](#) website.

In the United States, school entry requirements for vaccination have improved coverage of other adolescent vaccines, including MenACWY and Tdap.¹⁵ In the years following introduction of the HPV vaccine, there was debate and controversy regarding school entry requirements.¹⁶ Four jurisdictions/territories currently require HPV vaccination for school attendance: Rhode Island, Virginia, the District of Columbia, and Puerto Rico; Hawaii will implement a requirement in 2020.^{14,17} Several Round 1 grantees noted that stakeholders in their catchment areas thought school entry requirements would be an effective strategy for increasing HPV vaccination rates, but only one Round 2 grantee specifically noted lack of a school entry requirement as an important barrier. The apparent decrease in attention to school entry requirements may be due to questions about their effectiveness for HPV vaccination (particularly requirements with liberal opt-out policies) or continuing challenges in enacting them.¹⁸ Despite little discussion about school entry requirements, five Round 2 grantees reported interacting with representatives from schools (most often, school nurses) as part of their environmental scan activities, and others acknowledged schools as important partners in promoting HPV vaccination.

Use of nontraditional vaccination sites—such as pharmacies—has been suggested as a strategy for increasing access to HPV vaccination.⁶ As of January 2019, all but two states allow pharmacists to administer the HPV vaccine, but many states do not allow pharmacists to administer the vaccine to younger adolescents or require younger adolescents to have a physician prescription in order to be vaccinated by a pharmacist.¹⁹ Two grantees engaged pharmacists or pharmacies in their environmental scan activities, and one of these grantees found that pharmacists are comfortable with vaccine administration but are concerned about being viewed as competitors with local healthcare providers. One other grantee cited inadequate access to the vaccine as a barrier and cited the inability of pharmacists to vaccinate individuals under age 18 as a contributor to this issue.

Barriers Identified by Stakeholders

Through their environmental scans, Round 2 grantees gathered information from stakeholders in their catchment areas—including providers, public health professionals, health system administrators, parents, and community organizations and advocates—about barriers to HPV vaccination (Table 4). The most commonly reported barriers were parent lack of knowledge and parent concerns about safety and side effects. Another key barrier relates to provider recommendation of the HPV vaccine—some providers fail to deliver a strong recommendation (or, in some cases, any recommendation at all) and/or do not effectively communicate with parents about the vaccine.

Another barrier reported was parent exposure to negative information or misinformation about the vaccine, which influences their decision to vaccinate. Parents may believe that their child is at low risk of HPV-related disease or too young to be vaccinated. Another barrier to initiation and completion of the vaccine series is suboptimal access to the vaccine—parents/patients may not have adequate transportation and the vaccine may not be available at convenient locations (e.g., pharmacy, schools). Mistrust of the medical system, cultural/religious beliefs, concerns about cost, and fear of riskier sexual behavior/stigma also were reported as barriers.

Another provider-related barrier reported by stakeholders was suboptimal workflow or processes related to the vaccine, including lack of reminder recall, insufficient training for staff, and lack of educational resources. Some stakeholders also indicated that providers have inadequate knowledge of the vaccine and are concerned about parent pushback.

Table 4. Barriers Identified by Environmental Scans (# Grantees Reporting)

Parents	Providers
<ul style="list-style-type: none"> > Lack of knowledge (5) > Concerns about safety and side effects (5) > Exposure to negative information, misinformation (3) > Belief that child is too young or low risk (3) > Access barriers (3) > Mistrust of medical system (2) > Cultural/religious barriers (2) > Concerns about cost (2) > Fear of riskier health behaviors/stigma of sexual activity (2) > Failure to return to complete series (1) > Competing priorities (1) > Lower priority than other vaccines (1) > Refusal (no reason) (1) 	<ul style="list-style-type: none"> > No recommendation, lack of strong recommendation, or poor communication (4) > Suboptimal workflow/processes, use of available resources (3) > Inadequate knowledge (2) > Concern about parent pushback (1)
	System/Other
	<ul style="list-style-type: none"> > Lack of resources to promote vaccine (3) > Lack of school requirement (1)

Stakeholders also reported that there are insufficient resources available to promote the vaccine, and one grantee cited lack of a school requirement for HPV vaccination as a barrier.

Round 2 grantees reported fewer barriers than Round 1 grantees (about 5 per grantee for Round 2 vs 10 per grantee for Round 1). In general, the types of barriers reported were similar between the two rounds of grantees. Lack of parent knowledge and parent concerns about safety were among the most highly cited barriers by both sets of grantees. The most highly cited provider-related barrier among Round 1 grantees was provider lack of time; however, this was not reported by Round 2 grantees, which may be due to integration of HPV vaccination into normal clinical workflows. Lack of a strong provider recommendation, the provider barrier most commonly cited by Round 2 grantees, also was reported by many Round 1 grantees.

Interventions and Outreach

Five Round 2 grantees implemented or developed a total of 11 interventions or educational resources related to HPV vaccination during their funding periods. Nine of these interventions included a focus on education, including education of parents/lay public (n=7) and/or providers (n=4). Educational interventions for parents/lay public included workshops and health fairs sponsored by a healthcare system, an educational session for West African women, a presentation at a church, development of a website, social media campaigns, development of infographics, and publications in local newspapers. Educational interventions targeted at providers included educational sessions in medical offices or healthcare systems, development of infographics, and development of a website. One grantee developed and implemented a quality improvement intervention for primary care practices.

Dissemination

All Round 2 grantees have disseminated or plan to disseminate the results of their environmental scans to their local/regional stakeholders and/or to the broader research and public health communities. Two grantees have published three papers, and another grantee has submitted two manuscripts for review. Grantees collectively described plans for 45 more manuscripts on various aspects of their work. Seven grantees have collectively given 28 presentations (oral or poster) at institutional, state, or national conferences.

ROUND 1 AND 2 GRANTEES: MOVING BEYOND SUPPLEMENT FUNDING

The long-term goal of both supplemental funding opportunities was to develop or expand applied research to increase HPV vaccination. Most Round 1 grantees have continued their work on HPV vaccination over the past three years, and many Round 2 grantees described plans for ongoing research and outreach.

Research and Related Activities

Round 1 grantees described several initiatives and research projects undertaken or continued since the end of their supplement funding periods. Many grantees have conducted provider training sessions or quality-improvement initiatives, including efforts targeting school nurses, Vaccines for Children program providers, rural providers, and others. Several of these programs were done in collaboration with partners such as ACS, AAP, Area Health Education Centers, and state/local cancer organizations. Two grantees have pursued opportunities to engage pharmacists in HPV vaccination—one through an ACS-funded pilot project and another through development of a toolkit to promote pharmacy-based vaccination. Community-targeted education and outreach efforts have included social media campaigns and screenings of *Someone You Love*. Grantees also have helped plan local and regional meetings focused on HPV and advocated for policies promoting HPV vaccination.

Round 1 grantees have collectively obtained 25 grants to support their continued HPV vaccine-related research or outreach. Of these, nine were awarded by NCI and one by the National Institute of Child Health and Human Development. Other funding sources include ACS, AAP, Area Health and Education Centers, cancer centers/institutions, and private foundations. One of the NCI-funded grants—a program project that will test health-system interventions to promote HPV vaccine uptake and other cervical cancer prevention services in Appalachia—is a collaboration between two Round 1 grantees and two other institutions. Since 2015, Round 1 grantees have published a total of 63 journal articles related to their HPV vaccine work.

In their final reports, Round 2 grantees described plans to continue or build on environmental scan results through future research. Five grantees already have received funding for HPV vaccine-related projects through four NCI-funded awards, three institutional awards, and one award from a private foundation. Three of these projects involve social media research or outreach, two are focused on HPV vaccination in rural adolescents, two involve development of provider-level training/intervention, and one is exploring use of dental hygienists to promote HPV vaccination. Three additional research grants have been submitted and are still under consideration. Some grantees reported they are gathering and analyzing additional local data to inform future research and interventions related to HPV vaccination.

Leveraging of Resources to Achieve Sustainability

Round 1 and Round 2 grantees were asked how they leveraged or planned to leverage resources to sustain their cancer centers' HPV vaccine work. Many grantees cited grant funding from NCI and other organizations (see above). Nearly all grantees reported that they plan to carry on their HPV vaccination work through continued involvement with local/regional coalitions, organizations, or workgroups. They also reported continuing partnerships with local stakeholders, including local ACS and AAP chapters, health departments, and health systems. One grantee is creating a website that will serve as a conduit for information about HPV vaccination and a portal to facilitate collaborations among stakeholders.

Many grantees—from both Rounds 1 and 2—reported that their centers' community outreach and engagement initiatives have been informed by or will be leveraged to continue their HPV vaccination work. Grantees also noted the importance of support from cancer center leadership, in some cases including institutional funding. One grantee institution will be awarding four Community Partnership Program grants to organizations in its community to address HPV vaccination.

LESSONS LEARNED

Grantees discussed several lessons learned and opportunities based on input from stakeholders and their experiences conducting their environmental scans. These relate to HPV vaccine uptake and promotion, as well as research on HPV vaccination. In general, Round 1 and Round 2 grantees highlighted similar lessons learned—the most commonly cited theme for both sets of grantees was the importance of partnerships. Round 2 grantees were more likely to share research-related challenges and highlight differences among populations. Round 1 grantees were more likely to emphasize the need for provider training and clinic-based quality-improvement initiatives.

HPV Vaccine Uptake and Promotion

- The factors that influence HPV vaccination are complex. Despite concerted efforts and agreement among many stakeholders that HPV vaccination is important, low vaccination rates persist. Sustained efforts—as well as leadership and infrastructure support—are needed to promote continued progress.
- Partnerships are critical for research on and promotion of HPV vaccination. Some of the most effective partnerships are those with people outside of the cancer community. Collaborations with non-research groups are important for enacting change. It takes time to develop relationships with community organizations.
- Providers play a pivotal role in recommending HPV vaccination. Strong recommendations and parent communication are key. Provider education is important but not sufficient.
- Clinic-/practice-based interventions are needed. Many clinics need support to carry out quality-improvement initiatives and sustain improvements. All staff should be educated and involved in quality-improvement activities. Many practices need more help improving their HPV vaccine series completion rates rather than their initiation rates.
- Parent education remains an important priority to counteract misinformation. Future communication campaigns should target parents who have not been reached by past campaigns (e.g., individuals with lower socioeconomic status, recent immigrants, non-English speakers).

- Social media plays a role in information sharing and provides a tool to interface with parents. However, it also can be used to activate anti-vaccination initiatives and spread misinformation and distrust in the medical system. There is a need to determine how best to counteract anti-vaccine information and the vaccine hesitancy it can cause. One possible approach is to use strategies similar to those used by the anti-vaccine movement (e.g., use personal stories to create engagement).
- There is tremendous variation in HPV vaccine uptake, even within cancer center catchment areas. Differences were observed among racial/ethnic groups and rural/urban populations, but also within rural populations. One grantee noted that regional motivators to vaccination differ, so messaging that may work in one rural community may not work in another.
- Rural communities experience a number of challenges. Some rural public health programs do not have resources to promote HPV vaccination or to devote to immunization in general. Many children in rural areas are seen by family practice providers who see very few adolescents and, thus, may not be comfortable making strong recommendations.
- Many grantees discovered numerous local and regional efforts related to HPV vaccination, but some noted that there was limited coordination among groups.

Research on HPV Vaccination

- Engaging stakeholders is time-intensive and should be conducted by seasoned researchers. In-person outreach often is the most effective strategy. Snowball sampling and leveraging of “on-the-ground” staff have helped engage rural residents.
- “Competitor” healthcare systems may be hesitant about participating in research. “Neutral” partner organizations (e.g., ACS, health departments, pharmaceutical representatives) can help broker these relationships.
- Engaging non-cancer care settings in research is challenging due to competing priorities. More personal engagement and incentives may help address this challenge.
- Physicians often do not want to complete surveys. Personal incentives can be a successful strategy for increasing response rates.
- It is challenging to recruit parents who are truly undecided about whether to vaccinate their children against HPV.
- Use of social media platforms to reach parents can be challenging because anti-vaccination groups can be very vocal and drown out other points of view.

CONCLUSIONS

HPV vaccine uptake has improved in the years since NCI awarded the first administrative supplements focused on HPV vaccination. In the United States, the percentage of adolescents who started the HPV vaccine series increased an average of 5 percentage points each year between 2013 and 2017,²⁰ and just over half of adolescents aged 13–17 were up to date on their HPV vaccinations in 2018.¹² While this represents real progress, HPV vaccine uptake is far below the national average in many areas of the country. In addition, while vaccination rates among males continued to rise in 2018, little progress was observed for females.¹² In 2018, the President’s Cancer Panel issued a report reiterating the value of HPV vaccination and calling on stakeholders to build on the momentum built over the previous five years.²¹ A strong national commitment to increasing HPV vaccine uptake is essential, but local and regional efforts are equally critical, particularly in areas where vaccination rates are lower than average.

The 12 NCI-designated cancer centers that received the second round of administrative supplements are building on the momentum that started when the first 18 centers were funded in 2014. Round 2 grantees used a variety of approaches to gain insight into HPV vaccination rates, barriers that interfere with vaccination, and opportunities to increase uptake in their catchment areas. Several research projects have grown out of the work funded by both rounds of supplement awards. All grantees enhanced existing relationships and created new linkages with local and regional stakeholders. In many cases, these relationships have been bolstered through participation in formal coalitions and workgroups that have persisted or will persist well beyond the end of the supplement funding period. The cancer centers—those that received the supplements and many that did not—have shown their commitment to HPV vaccination as they continue to hold annual meetings on the topic and use the power of their collective voice to promote vaccine uptake.

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