

Article

Online media scans: Applying systematic review techniques to assess statewide human papillomavirus vaccination activities

Emily A. Groene,¹ Inari Mohammed,¹ Keith Horvath,¹ Nicole E. Basta,¹ Nicholas Yared,² Shalini Kulasingam¹

¹Department of Epidemiology and Community Health, University of Minnesota School of Public Health, Minneapolis, MN; Infectious Diseases, University of Toledo Medical Center, Toledo, OH, USA

Significance for public health

Disparities in human papillomavirus (HPV) vaccination uptake have been identified on national, regional, and state levels despite the proven safety and efficacy of the HPV vaccine. It is of public health importance to identify and understand the gaps among current education, promotion, and research activities to address these disparities. Additionally, the literature is limited in defining systematic methods of media scanning for issues of public health concern. Our study efficiently identifies areas where much focus has been dedicated, as well as those areas where more focus may be needed to improve HPV vaccine uptake. These findings may be useful for identifying opportunities for future research and for targeting future programming.

Abstract

Background. Although the human papillomavirus (HPV) vaccine has been approved for use in adolescents in the US for over a decade, vaccination uptake remains low. Of concern, HPV vaccine coverage is below the national average in Minnesota, USA. To understand the reach of current HPV programming and research, we use an online media scan; this method may be applied to other jurisdictions to gain insight about various public health issues.

Design and Methods. This online media scan describes the nature and scope of ongoing activities to increase HPV vaccination in Minnesota. The media scan included: a) structured internet searches of HPV vaccine health education/promotion activities ongoing in Minnesota since 2013, and b) searches in research databases of the published literature on HPV vaccination in Minnesota from 2013 to 2018.

Results. Searches resulted in 880 online and 142 research article matches, with 40 and 36 meeting selection criteria. Results were categorized by activities focusing on race/ethnicity, sex, health providers, parents, lesbian, gay, bisexual, transgender and queer or questioning (LGBTQ) populations, geographic location, catchup vaccination, and insurance status. Most activities were statewide (52% health education/promotion and 35% research), followed by activities located in entirely urban areas (15% health education/promotion and 41% research) with only 6% of health education/promotion activities and 2% of research activities carried out in entirely rural areas.

Conclusions. A range of local and statewide HPV vaccine health education/promotion and research activities were identified in Minnesota. Several efforts partnered with American Indian and Somali/Somali-American communities, but fewer activities focused on HPV vaccination among LGBTQ youth and HPV vaccination in rural areas.

Introduction

Background

Human papillomavirus (HPV) is the most common sexually transmitted infection in the U.S., leading to the development of several cancers, including cervical, anal, and oropharyngeal cancers.^{1,2} The HPV vaccine was first approved in the US in 2006 for those aged 9-25 years.³ Currently, the Advisory Committee on Immunization Practices (ACIP) recommends the HPV vaccine for routine administration in the United States among 11 or 12 year-old girls and boys.⁴ Two doses are recommended for adolescents who begin the series before age 15 years and three doses for those who begin the series after age 15 years.⁵ Despite consistent evidence of the safety and efficacy of HPV vaccines,⁶ estimated vaccine initiation and completion rates remain low, with only 43.4% of adolescents up to date on their HPV vaccinations. As of 2016, there was higher coverage among girls (49.5%) than among boys (37.5%).⁷ Vaccine coverage also varies by age, with higher initiation and completion of the HPV vaccine series for both male (recommended to receive the HPV vaccine in the US since 2011) and female adolescents (recommended to receive the HPV vaccine in the US since 2006) at age 17 than age 13, suggesting an important role for catchup vaccination.⁷

Increasing HPV vaccination uptake is a public health priority at the national, state and local levels.^{8,9} Vaccine initiation and completion are low in Minnesota, with only 46.9% of adolescents ages 13-17 up to date on the HPV vaccine as of 2017, far from the Healthy People 2020 coverage goal of 80%.^{7,10} Current patterns in healthcare use and health status outcomes in Minnesota suggest that there may be lower HPV vaccine uptake among adolescents from minority racial groups, adolescents in more rural geographic areas, and among adolescents in families with lower income status.^{11,12} While parents can access childhood vaccinations for free through the Minnesota Vaccines for Children (MnVFC) program, disparities persist, potentially due to health utilization disparities or logistic barriers.^{13,14}

Across the U.S., specific populations may have lower HPV vaccination rates than the general population. HPV vaccination rates differ among lesbian, gay, bisexual, transgender, and queer or questioning (LGBTQ) adolescents compared to non-LGBTQ adolescents. Lesbian women are 20% less likely to have received at least one dose of the HPV vaccine than heterosexual women.¹⁵ There is less discussion about sexual minority women in sexual health education and promotion efforts, and there are lower reported levels of awareness of HPV risk and prevention in this population.¹⁵ Studies have found lower rates of HPV vaccination among men who have sex with men (MSM) compared to heterosexual

men. Heterosexual men also benefit from herd immunity from women, who are more likely to have been vaccinated.¹⁶ Children of foreign-born parents also have lower rates of childhood vaccine initiation due to parents' safety concerns about certain vaccines.¹⁷ The Rochester Epidemiology Project in Minnesota found that Somali-American adolescent girls were less likely to complete the HPV series than their white, non-Hispanic peers.¹⁸

To address disparities in HPV vaccine access and uptake, it is important to take an inventory of ongoing of HPV vaccination activities. In this study, we leverage the increasing online presence of health providers, organizations dedicated to improving health, and public health practitioners to ascertain the range of HPV vaccination activities in the state. The internet is widely used as a resource for health programs to communicate their messaging and activities.¹⁹ Researchers may monitor HPV activities by following the activities of local and state public health departments, health providers, and community groups online. This way of retrieving information may serve as a complement to participation in existing public health coordination networks. Therefore, we conducted a formalized internet search using a systematic approach to identify statewide health activities as part of an online media scan of HPV vaccination activities and research. In our increasingly digital age, structured online searches like ours may be an efficient yet comprehensive method of assessing online health education/promotion and research activities for other public health topics and in other states or jurisdictions.

Objectives

In this online media scan, we sought to identify current or recent activities relevant to HPV vaccination education, awareness, access, uptake, and acceptance in Minnesota. Our scan reviewed current efforts to increase vaccine uptake with the goal of informing future research priorities and interventions.²⁰ We also aimed to identify areas, groups, and subgroups for whom HPV vaccination activities may be more limited. To do this, we categorized activities based on the target groups they engaged, including by race/ethnicity, sex, and insurance status; by the intended audience for the messaging with specific regard to health providers, parents, and LGBTQ adolescents; and the areas in which they implemented their programs, including the geographic location, and whether they were aimed at catchup vaccination.²¹

Materials and Methods

Study design

Environmental scans are increasingly carried out to evaluate public health issues and interventions using multiple strategies for information collection including focus groups, surveys, literature reviews, policy analyses, and in-depth interviews among others.²⁰ This can include searches of social media and online reports, otherwise known as media scans.^{22,23} In our media scan of HPV vaccination research and awareness-raising, we developed a strategy following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to identify HPV vaccination activities within Minnesota by searching online program descriptions, reports, or organization websites.²⁴ The scan was conducted between January and July 2018 as a scoping review of recent and ongoing HPV vaccination education/promotion and research activities.

The online media scan consisted of a) structured internet searches of recent and ongoing HPV vaccine health education/pro-

motion activities, and b) database searches in Ovid Medline, Embase/Embase Classic, Scopus, and Web of Science for research published about HPV vaccination in Minnesota (Table 1: Search Strategies for Health Education/Promotion Activities, 2013-2018 and Table 2: Search Strategies for Research Activities, 2013-2018). Results for the internet search included HPV vaccine education materials, reports, or program descriptions for interventions in Minnesota from 2013 to 2018. Research articles included relevant peer-reviewed articles identified in the research databases or scientific presentations found in the online search about HPV vaccination in Minnesota in the same timeframe.

Searches began with general search terms listed in Table 1 and Table 2 to identify ongoing activities in the state of Minnesota. Additional searches were carried out to identify activities focusing on areas of expected disparities. Targeted searches for activities involving American Indian, Somali/Somali-American, Hmong/Hmong-American, and Hispanic/Latino youth were carried out because they represent the largest minority groups in Minnesota. Because of the increasing numbers of new cases of oropharyngeal cancer due to HPV infection in Minnesota, a specific search included that term as well.²⁵ To broaden the research database search, the vaccine-related Medical Subject Headings (MeSH) terms were dropped and all HPV-related articles in Minnesota were included in the final search, then screened.

Categorization of search results was carried about by two researchers independently and checked for concordance. Discordance was discussed and settled by consensus. Each online search in the media scan was carried out by one of two researchers using the Google Chrome browser, and the first four pages of online search results of approximately 10 results per page were examined for eligibility. We reviewed only the first four pages of results due to decreasing relevance of the search with each additional page of results, as each search initially returned approximately 695,000 results. Eligibility inclusion criteria included: current activities defined as still ongoing or taking place in 2013 or later, involving HPV vaccination health education or promotion activities, reports, or program descriptions, and taking place in the state of Minnesota. Exclusion criteria included: a news article, unless it was about a specific program; ads or commercials about pharmaceuticals; and anti-vaccination or misinformation websites. We limited our search reports of ongoing activities from reputable public health or non-profit organizations themselves or reports of organization activities by other reputable sources.

For each eligible activity identified in searches that met the inclusion criteria, the following information was recorded: date accessed, program name, description, organization responsible, location, dates active/published, search terms used, and focus areas of the activities. Researchers cross-checked the timing and accuracy of the health education/promotion activities identified in the search by emailing or calling the contact information found on the corresponding website. Out of 40 health education/promotion activities identified, email or telephone confirmation was received that the information was accurate and that the activities were ongoing during the study period for 35 activities. For the other 5 activities, we did not receive a response by email or phone. Specific outreach populations for HPV vaccination by race or ethnic group were recorded for each activity as specified online or in research articles. Whether the activity targeted individuals by sex was also noted if online media or articles made mention of the target audience for vaccination or the number of adolescents reached in each sex group (male, female, both, or none). The following groups were coded as binary results if the activity was about or for the following groups: health providers, parents, LGBTQ populations, adolescents eligible for catchup vaccination (initiation after age 26,

recommended by vaccination guidelines), and adolescents with no or under-insurance status. Rural-Urban Commuting Area (RUCA) codes are a classification that uses the U.S. Census's Urbanized Area and Urban Cluster definitions in combination with work commuting areas; RUCA codes have been adapted to include approximations by zip code. Using RUCA codes, the Minnesota State Demographer's office classifies MN counties into four county types: entirely rural, town/rural mix, urban/town/rural mix, and entirely urban.²⁶ An activity or research article was assigned one or more county types based on the county or counties it was implemented in or from which it drew its study population. If the loca-

tion of the activity or study was not mentioned directly, we accessed the primary website of the activity or carried out a Google search of the cohort or data set utilized by the study to find the names of the cities or counties where the activity took place. HPV vaccine health education/promotion or research activities that covered multiple counties with different classifications were determined to have multiple geographic classifications. Activities and research articles were classified according to categories of focus if they served or studied specific groups or disparities. Results were tabulated, and frequencies were compared to identify where gaps exist within the state of Minnesota in terms of HPV vaccination

Table 1. Search Strategies for Health Education/Promotion Activities, 2013-2018.

Structured Online Search Strategies for Health Education/Promotion Activities	
General Search Terms	"Vaccine" AND "Minnesota", "HPV" AND "vaccine" AND "Minnesota", "HPV" AND "MN" AND "Immunization", "HPV" AND "Minnesota" AND "vaccine" AND "study", "HPV" AND "Minnesota" AND "immigrant" AND "vaccine", "HPV" AND "vaccination" AND "program" AND "Minnesota", "MDH" AND "HPV" AND "vaccine"
Targeted Search Terms	"Minnesota" AND "HPV" AND "geographic" AND "region" "Minnesota" AND "HPV" AND "vaccine" AND adolescent "Minnesota" AND "HPV" AND "vaccine" AND "catch up" "Minnesota" AND "HPV" AND "vaccine" AND "LGBT" "Minnesota" AND "HPV" AND "vaccine" AND "MSM" "Minnesota" AND "HPV" AND "vaccine" AND "urban" "Minnesota" AND "HPV" AND "vaccine" AND "rural" "HPV" AND "vaccine" AND "Somali" AND "Minnesota" "HPV" AND "vaccine" AND "Hmong" AND "Minnesota" "HPV" AND "vaccine" AND "Hispanic" AND "Minnesota" "HPV" AND "vaccine" AND "Minnesota" AND "American Indian" "HPV" AND "vaccine" AND "Minnesota" AND "providers" "HPV" AND "vaccine" AND "Minnesota" AND "clinician" "Minnesota" AND "HPV" AND "vaccine" AND "oropharyngeal cancer"

Table 2. Search Strategies for Research Activities, 2013-2018.

Research Database Search Strategies for HPV Vaccination Research	
Primary (narrow) search	Ovid Medline (19 articles) 1) "exp Papillomavirus Infections/" OR "HPV.mp." OR "human papilloma virus*.mp." AND 2) "exp VACCINES/" or "vaccine*.mp" or "immuniz*.mp AND 3) "exp MINNESOTA" or "minnesota.mp." Embase Classic + Embase (13 articles) 1) HPV.mp. or exp Wart virus/ AND limit to yr="2013 -Current" AND 2) vaccines.mp. or exp vaccine/ AND limit to yr="2013 -Current" AND 3) Minnesota.mp. or exp Minnesota/ AND limit to yr="2013 -Current" Scopus (13 articles) "hvp" AND "Minnesota" AND "vaccine" Web of Science (7 articles) (TS=(hvp AND Minnesota AND vaccine)) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article)
Secondary (broader) search	Ovid Medline (44 articles) 1) "exp Papillomavirus Infections/" OR "HPV.mp." OR "human papilloma virus*.mp." AND 2) "exp MINNESOTA" or "minnesota.mp." Embase Classic + Embase (20 articles) 1) HPV.mp. or exp Wart virus/ AND limit to yr="2013 -Current" AND 2) vaccines.mp. or exp vaccine/ AND limit to yr="2013 -Current" Scopus (17 articles) "hvp" AND "Minnesota" Web of Science (9 articles) (TS=(hvp AND Minnesota)) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article)

health education/promotion and outreach (see online Appendix for detailed classification of each activity and research article).

Results

A total of 76 activities were identified in the search, including 40 health education/promotion activities and 36 research activities (see Figures 1 and 2 for PRISMA flow charts). Results were classified with the following percent agreement between the two researchers by category: geographic area (78%), specific populations by race/ethnicity (91%), health providers (79%), parents (76%), LGBTQ populations (97%), catch up vaccination (97%) insurance status (91%) and sex (91%); all discrepancies were adjudicated to determine the final categorization.

A summary of HPV vaccination and research activities by geographic area is presented in Figure 3. Activities were often carried out in more than one geographic area, so the following categories are not mutually exclusive. Most research and health education/promotion activities conducted in the last five years are statewide activities (52% of HPV-vaccine health education/promotion activities and 35% of research activities), carried out by organizations such as the Minnesota Department of Health or the Immunization Action Coalition. The second-largest category of health education/promotion activities focuses on entirely urban areas (15% of health education/promotion and 41% of research). Activities were less often identified in urban/town/rural mix and town/rural mix areas than statewide activities and activities in entirely urban areas. Seventeen percent of health education/promo-

tion activities took place in the urban/town/rural mix areas, 11% of health education/promotion activities took place in the town/rural mix areas, and approximately 13% of research activities occurred in urban/town/rural mix areas and 9% in town/rural mix areas. The geographic area that was most lacking in both HPV vaccine health education/promotion activities and research was the entirely rural category, with only 3 health education/promotion activities and one research activity carried out in areas classified as entirely rural.

The categorizations of research and health education/promotion activities for other sub-groups are presented in Figure 4. Health education/promotion activities more often focused on health providers (80% of all education/promotion activities). A high proportion of health education/promotion activities involved parents (53%). Some research has been conducted on HPV vaccination among LGBTQ youth (11%), but few HPV-vaccine health education/promotion activities focus specifically on the LGBTQ community (5%). Insurance status was mentioned more often in health education/promotion activities (23%) than in research activities (8%). Finally, catch-up vaccination was not a frequent focus of health education/promotion activities (5%) or research activities (3%). Most HPV-vaccine health education/promotion activities (78%) and research activities (64%) identified in our search did not focus on specific individuals based on their race or ethnicity, but rather aimed to increase HPV vaccine awareness and education among all eligible youth. For the 40 HPV vaccine health education/promotion activities that did focus on specific populations, 47% were focused on vaccination in the American Indian community, 13% were focused on Somali/Somali-Americans, 13% on Latin Americans, 13% on Asian Americans or Pacific Islanders, and 13% among African Americans. HPV vaccine-related research

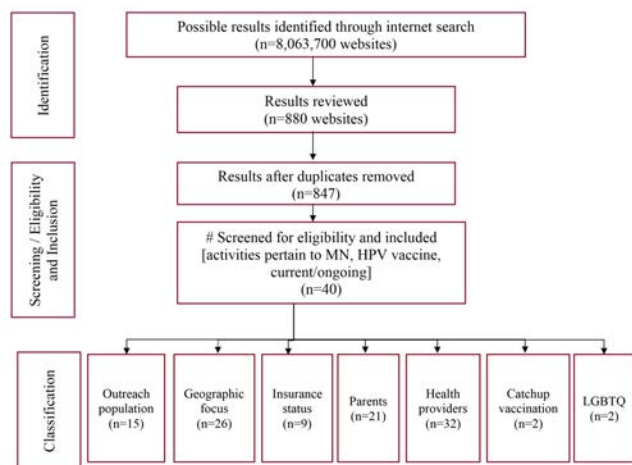


Figure 1. Media Scan Flow Chart – Health Education/Promotion Activities Web Search. The figure above presents the PRISMA inclusion flow chart for the online search. Classification by category is a binary measure as follows: Outreach population (a specific population was mentioned in the activity), Geographic focus (the activity was directed to or carried out in a specific area of Minnesota, not including statewide activities), Insurance status (insurance status was mentioned), parents (the activity was directed at parents), Health providers (the activity was directed at health providers), catchup vaccination (the activity mentioned catchup vaccination), and LGBTQ (the activity mentioned or was directed at LGBTQ youth).

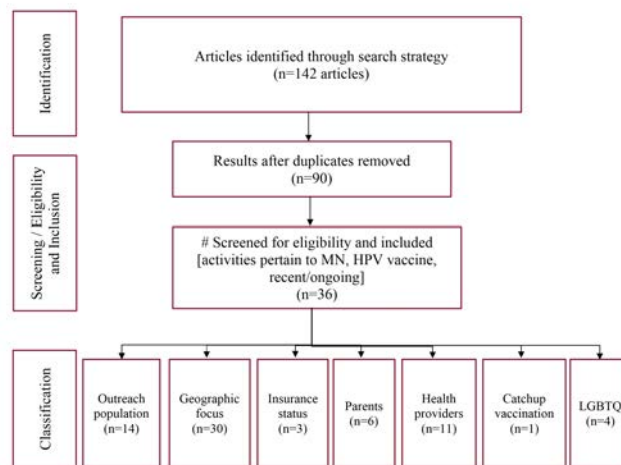


Figure 2. Media Scan Flow Chart – Research Literature Search. The figure above presents the PRISMA inclusion flow chart for the research database search. Classification by category is a binary measure as follows: Outreach population (a specific population was mentioned in the study), Geographic focus (the study was carried out in a specific area of Minnesota, not including statewide research), Insurance status (insurance status was mentioned or controlled for in analyses), parents (the study focused on parents), Health providers (the study focused on health providers), catchup vaccination (catchup vaccination was the focus or was mentioned in the study), and LGBTQ (the study mentioned or focused on LGBTQ youth).

among specific populations investigated vaccine uptake among Somali/Somali-Americans (29%), Latin Americans (29%) Asian Americans/Pacific Islanders (21%), American Indians (14%), while only 7% of research focused on African Americans.

Discussion

This media scan, which applies traditional literature search methodology to an online setting, identified HPV vaccination health education/promotion activities and research to highlight potential disparities. This study identified HPV health education/promotion and research activities in Minnesota to better target interventions to address low HPV vaccination coverage rates. While the assessment of ongoing HPV vaccination activities and categorization of the areas on which they focus may not be generalizable to other jurisdictions, our approach provides an example of tailoring an online systematic review to achieve a particular set of aims and a method that can be applied to various con-

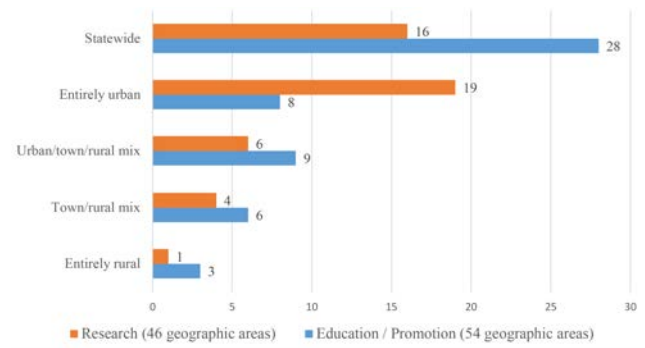


Figure 3. Frequencies of research and education/promotion activities are given by geographic area according to RUCA-based geography types developed by the Minnesota State Demographic Center.²⁵ Activities were carried out in more than one area, with 40 education/promotion activities in 54 geographic areas and 36 research activities in 46 geographic areas according to this geographic taxonomy.



Figure 4. Disparity Categories. a-c). Defined as whether or not the education/promotion or research activity makes specific mention of or is designed for health providers, parents, or LGBTQ adolescents. d-e) Defined as whether or not the activity makes mention of the adolescent's insurance status or catch-up vaccination (vaccination for those not vaccinated between the ages of 9-26). f-g) Activities are classified as either mentioning both vaccination of boys and girls, girls only, or activities that make no mention of gender. Race/ethnicity is classified by mention of specific race/ethnic groups, and these groups are not mutually exclusive. Activities may be recorded as reaching or studying more than one racial/ethnic group.

texts. This approach could be more widely applied to other states or jurisdictions and other research topics within public health and other disciplines.

Our study highlights potential gaps in activities and research occurring geographically, with more activities focused on urban-centered settings, and very little research currently conducted exclusively in rural parts of Minnesota. The entirely rural RUCA classification denotes not only distance from large urban centers, but also greater distances from small and larger towns scattered throughout Minnesota.²⁶ Differential access to health services may pose a larger challenge for statewide efforts, which comprised the majority of health education/promotion and research efforts identified in this study. There are lower levels of HPV vaccine knowledge or awareness of the link between HPV and cancer prevention in rural areas.²⁷

Many HPV health education/promotion and research activities identified involve parents and health providers; a positive result, given the strong role of the parent-health provider interaction in HPV vaccination decision-making.²⁸⁻³⁰ Innovative efforts were used to reach some of Minnesota's largest ethnic and racial minority groups. These included partnerships between Somali community leaders and county departments of health to improve HPV vaccination rates,³¹ and improving medical training through simulations that included scenarios with Somali patients.³² Barriers to cervical cancer prevention among young Korean immigrant women have been identified,³³ and HPV literacy among Hmong Americans has been evaluated.³⁴ Partnerships have been established across state borders to train health providers and share resources in promoting HPV vaccination among the American Indian population.³⁵ However, the only activities that mention outreach to African Americans are statewide reports with demographic breakdowns by race, which may not address gaps in differential uptake of the HPV vaccine. Given that African Americans have the lowest child immunization rate in Minnesota by race after American Indians,¹¹ current activities may need to reconsider how well this population is being reached.

Because our search was limited to information available online, a potential limitation of our methodology is that the list of activities we have identified may not be complete. Of note, we only identified a few activities reported online that were targeting entirely rural populations, both in terms of HPV health education/promotion activities and research. This finding is of consequence because rural location has been associated with provider HPV vaccine recommendation practices and parental HPV vaccine hesitancy, as well as lower HPV vaccine uptake.³⁶⁻³⁸ In addition, attention to health system and logistic barriers may be needed to ensure access to the HPV vaccines provided by the MnVFC program. It is possible that some areas, likely including rural areas, may have fewer resources at the local level and may be less likely to report their programs online. Therefore, we may be underestimating the true number of activities in rural areas.

There may be unmet needs in terms of HPV health education/promotion outreach to LGBTQ populations. Interesting research has been carried out in Minnesota including studies on improving HPV vaccination outreach to gay and bisexual men using social media, and clinical guidance for caring for lesbian patients.^{39,40} There is a greater number of research activities that focus on LGBTQ populations than health education/promotion activities.³⁹⁻⁴² Existing and new HPV vaccine health education/promotion efforts should consider whether they are

meeting the needs of LGBTQ adolescents. For example, sexual minority women may be less likely to have received one dose of the HPV vaccine than heterosexual, mostly heterosexual, or bisexual women. Conversely, heterosexual men may be less likely than gay counterparts to be aware of the vaccine or to worry about HPV-associated cancers.¹⁵ These differences highlight opportunities for targeted education by sexual orientation.

Catchup vaccination plays an important role together with timely initiation and completion of the vaccine series to achieve high vaccination coverage across all groups and age groups. Until nearly all adolescents are receiving the HPV vaccine on time at the recommended ages, catch-up vaccination programs targeting older teens will be an important public health approach to prevent HPV-associated cancers. We identified few activities focused exclusively on catch-up vaccination. Organizations and researchers may wish to consider developing and implementing activities targeting older youth who have missed HPV vaccination to ensure high coverage overall.

Limit of the study

Our strategy may not result in a fully comprehensive list of ongoing activities in the state. Groups without an updated online presence may be overlooked in this study, resulting in under-reporting of activities. Similarly, this study can only provide a cross-sectional overview of ongoing activities and research at the time that the review was conducted. This may not capture changes in HPV vaccination activities over the period studied. This descriptive scan tabulates the number of health education/promotion and research activities but does not assess their quality or impact. Reordering search terms utilized in this search could result in slightly different findings; however, the frequent duplicates returned through the search strategies indicates that our search strategies were somewhat exhaustive. These results provide a broad view of ongoing efforts to increase HPV vaccination among Minnesota youth.

Conclusions

This study identified HPV health education/promotion and research activities in Minnesota through the use of an online media scan and electronic database search. The media scan provided a wide range of research and health education/promotion activities on the state level. We identified a diverse range of activities reported and promoted online by working groups, local public health departments, research organizations, and health providers. The media scan identified a number of attempts to not only understand the challenge of HPV vaccination in specific community groups through research activities, but also to improve service provision by training medical personnel to work with these groups. Evidence about potential HPV vaccination disparities affecting specific populations should be confirmed in future studies and used to inform the design and implementation of HPV vaccine research and education campaigns to ensure that resources are reaching those at greatest risk of missing out on HPV vaccination.

In conclusion, our application of systematic review techniques in this online media scan provided valuable insight into potential gaps in public health activities. Our methodology can be applied to other activities in the health and social sciences.

Correspondence: Emily A. Groene, Department of Epidemiology and Community Health, University of Minnesota School of Public Health, 1300 2nd Avenue S, Minneapolis, MN, 55108, USA.
Tel.: +1.7632482142.

E-mail: groe0074@umn.edu

Key words: media scan, vaccine, disparities, systematic review, human papillomavirus.

Acknowledgements: the authors acknowledge Shanda Hunt, Liaison & Data Curation Specialist to the School of Public Health at the University of Minnesota for providing support that contributed to this research.

Contributions: EG: Primary author, responsible for drafting and revisions according to contributor comments. Carried out searches, designed classification technique and methods, and checked for concordance. IM: Secondary author, carried out searches, checked for concordance, revised draft. KH, NEB, NY: Provided feedback on study design, interpretation and presentation of results. Provided manuscript revisions. SK: Senior author, carried out final review and guided strategy of paper development. Provided feedback on study design, interpretation and presentation of results. Responsible for final review and approval for publication.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: the paper is supported by a Healthcare Delivery Research Program grant from the National Cancer Institute Division of Cancer Control & Population Sciences (NCI 5P30CA077598-19).

Received for publication: 17 May 2019.

Revision received: 25 July 2019.

Accepted for publication: 30 July 2019.

©Copyright: the Author(s), 2019

Licensee PAGEPress, Italy

Journal of Public Health Research 2019;8:1623

doi:10.4081/jphr.2019.1623

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).

References

- Parkin DM, Bray F. Chapter 2: The burden of HPV-related cancers. *Vaccine* 2006;24.
- Mcquillan G, Kruszon-Moran D, Markowitz LE, et al. Prevalence of HPV in Adults Aged 18-69: United States, 2011-2014. *NCHS Data Brief* 2017;1-8.
- Food and Drug Administration. Gardasil Vaccine Safety. August 2009. Available from: <https://www.fda.gov/vaccines-blood-biologics/safety-availability-biologics/gardasil-vaccine-safety>
- Meites E, Kempe A, Markowitz LE. Use of a 2-Dose Schedule for Human Papillomavirus Vaccination. Updated Recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2016;65:1405-8.
- Centers for Disease Control and Prevention. HPV | Questions and Answers | Human Papillomavirus. 2018.. Available from: <https://www.cdc.gov/hpv/parents/questions-answers.html> [cited 2018 Sep 27]
- Lehtinen M, Paavonen J, Wheeler CM, et al. Overall efficacy of HPV-16/18 AS04-adjuvanted vaccine against grade 3 or greater cervical intraepithelial neoplasia: 4-year end-of-study analysis of the randomised, double-blind PATRICIA trial. *Lancet Oncol* 2012;13:89-99.
- Walker TY, Elam-Evans LD, Singleton JA, et al. Morbidity and Mortality Weekly Report National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13-17 Years-United States, 2016. *MMWR Morb Mortal Wkly Rep* 2017;66: 874-82.
- National Foundation for Infectious Diseases. Call to Action. 2014. Available from: <http://www.nfid.org/publications/cta>
- National Conference of State Legislatures. HPV Vaccine: State Legislation and Statutes. 2018. Available from: <http://www.ncsl.org/research/health/hpv-vaccine-state-legislation-and-statutes.aspx>
- Jacobson RM, Rogacki B, Thompson DM, et al. Vaccination Rates among Adolescents in Minnesota as Compared with the United States Not "Above Average." *Minn Med* 2015;38-43.
- MN Community Measurement MD of HS. 2016 Health Care Disparities Report for Minnesota Health Care Programs. 2016. Available from: <https://mncm.org/wp-content/uploads/2017/03/2016-Disparities-Report-Final-2.28.2017.pdf>
- Minnesota Department of Health. 2017 Minnesota Statewide Health Assessment. 2017. Available from: https://www.health.state.mn.us/communities/practice/healthy_mnpartnership/docs/2017MNSatewideHealthAssessment.pdf
- Esposito S, Principi N, Cornaglia G. Barriers to the vaccination of children and adolescents and possible solutions. *Clin Microbiol Infect* 2014;20:25-31.
- Minnesota Department of Health. Minnesota Vaccines for Children Program (MnVFC). Available from: <http://www.health.state.mn.us/divs/idepc/immunize/mnvc/indx.html> [cited 2018 Aug 6].
- Charlton BM, Reisner SL, Agénor M, et al. Sexual Orientation Disparities in Human Papillomavirus Vaccination in a Longitudinal Cohort of U.S. Males and Females. *LGBT Health* 2017;4:202-9.
- Beachler DC, Pinto LA, Kemp TJ, et al. An Examination of HPV16 Natural Immunity in Men Who Have Sex with Men (MSM) in the HPV in Men (HIM) Study. *Cancer Epidemiol Biomarkers Prev* 2018;27:496-502.
- Leeds M, Muscoplat MH. Timeliness of Receipt of Early Childhood Vaccinations Among Children of Immigrants — Minnesota, 2016. *MMWR Morb Mortal Wkly Rep* 2017;66:1125-9.
- Pruitt CN, Reese CS, Grossardt BR, et al. Completion of the Human Papillomavirus Vaccination Series Lags in Somali Adolescents. *J Low Genit Tract Dis* 2013;17:280-8.
- Baker L, Wagner TH, Singer S, Bundorf MK. Use of the Internet and E-mail for Health Care Information. *Jama* 2003;289:2400.
- Wilburn A, Vanderpool RC, Knight JR. Environmental Scanning as a Public Health Tool: Kentucky's Human Papillomavirus Vaccination Project. *Prev Chronic Dis* 2016;13:E109.
- Underwood MPH NL, Gargano LM, Jacobs MPH S, et al. Influence of Sources of Information and Parental Attitudes on Human Papillomavirus Vaccine Uptake among Adolescents. *J Pediatr Adolesc Gynecol* 2016;29:617-22.
- Grajales FJ, Sheps S, Ho K, et al. Social media: a review and tutorial of applications in medicine and health care. *J Med Internet Res* 2014;16:e13.
- Blasi PR, King D, Henrikson NB. HPV Vaccine Public Awareness Campaigns: An Environmental Scan. *Health Promot Pract* 2015;16:897-905.
- Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 2009;6:e1000097.
- Minnesota Department of Health. Oral & pharyngeal cancer:

- MN Public Health Data Access - MN Dept. of Health - MN Data. Available from: https://data.web.health.state.mn.us/cancer_oral [cited 2018 Jul 18].
26. Egbert A, Brower S. Greater Minnesota Refined & Revisited. Minnesota State Demographic Center. 2017. Available from: https://mn.gov/admin/assets/greater-mn-refined-and-revisited-msdc-jan2017_tcm36-273216.pdf
 27. Walker TY, Elam-Evans LD, Yankey D, et al. National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13-17 Years, United States, 2017. *MMWR Morb Mortal Wkly Rep* 2018;67:909-17.
 28. Fu LY, Zimet GD, Latkin CA, Joseph JG. Associations of trust and healthcare provider advice with HPV vaccine acceptance among African American parents. *Vaccine* 2017;35:802-7.
 29. Moss JL, Reiter PL, Rimer BK, Brewer NT. Collaborative patient-provider communication and uptake of adolescent vaccines. *Soc Sci Med* 2016;159:100-7.
 30. Gilkey MB, Moss JL, Coyne-Beasley T, et al. Physician communication about adolescent vaccination: How is human papillomavirus vaccine different? *Prev Med (Baltim)* 2015;77:181-5.
 31. AAP Department of Community and Chapter Affairs and Quality Improvement. Chapters team up with health departments, coalitions to improve HPV vaccination rates. *Am J Public Health* 2016;106:1765-70.
 32. Jones GM, Martin DL, Schempf E. Improving resident communication with vaccine hesitant families through simulation. *Acad Pediatr* 2018;17:e33-e34.
 33. Lee HY, Lee MH. Barriers to Cervical Cancer Screening and Prevention in Young Korean Immigrant Women: Implications for Intervention Development. *J Transcult Nurs* 2017;28:353-62.
 34. Beltran R, Simms T, Lee HY, Kwon M. HPV Literacy and Associated Factors Among Hmong American Immigrants: Implications for Reducing Cervical Cancer Disparity. *J Community Health* 2016;41:603-11.
 35. Scenic Rivers AHEC: Area Health Education Center. HPV Education Project | Cashton, WI | Scenic Rivers AHEC. Available from: <https://www.scenicriversahec.org/hpv> [cited 2018 Nov 19].
 36. Gilkey MB, McRee AL. Provider communication about HPV vaccination: A systematic review. *Hum Vaccin Immunother* 2016;12:1454-68.
 37. Britt RK, Hatten KN, Chappuis SO. Perceived behavioral control, intention to get vaccinated, and usage of online information about the human papillomavirus vaccine. *Heal Psychol Behav Med* 2014;2:52-65.
 38. Crosby RA, Casey BR, Vanderpool R, et al. Uptake of Free HPV Vaccination Among Young Women: A Comparison of Rural Versus Urban Rates HHS Public Access. *J Rural Health* 2011;27:380-4.
 39. Reiter PL, Katz ML, Bauermeister JA, et al. Recruiting Young Gay and Bisexual Men for a Human Papillomavirus Vaccination Intervention Through Social Media: The Effects of Advertisement Content. *JMIR Publ Health Surv* 2017;3:e33.
 40. Rullo JE, Faubion SS. Caring for the Lesbian Patient at Midlife and Beyond. *Menopause* 2017;24:1402-3.
 41. Fitzpatrick C. HPV Vaccine Compatible with Prevalent Types Found in HIV-Positive Men. *MD Magazine*. MD Magazine. 2017 February 15. Available from: <https://www.mdmag.com/conference-coverage/croi-2017/hpv-vaccine-compatible-with-prevalent-types-found-in-hiv-positive-men>
 42. Nelson EJ, Hughes J, Oakes JM, et al. Estimation of geographic variation in human papillomavirus vaccine uptake in men and women: an online survey using facebook recruitment. *J Med Internet Res* 2014;16:e198.