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**Quality Improvement Intervention to Improve HPV Immunization Rates in Rural Primary
Care Settings: Policy Recommendations from Post Intervention Survey**

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ABSTRACT

It is estimated that 8 billion dollars annually fund the prevention and treatment of Human Papillomavirus (HPV) associated cancers in the U.S. The HPV vaccine is the most effective way in preventing associated cancers when administered on-time, during adolescence. With HPV vaccination rates remaining low across the country, organizations have been researching effective interventions to improve uptake of the vaccine. In this paper we conducted a descriptive analysis of a survey completed by clinicians upon completion of an eighteen-month quality improvement (QI) intervention to increase HPV vaccination rates in rural primary care settings. New research indicates that differences in HPV vaccination rates may be related to clinic characteristics such as provider type, number of adolescent patients, staff confidence in vaccine recommendation and prioritization of quality improvement activities instead of patient differences (Hatch et al., 2022). Our evaluation explored differences among primary care specialty (family medicine and pediatric) as it relates to the likeliness of using QI processes in the future and the helpfulness of study materials and tools. We also explored differences in survey responses based on clinic ownership. We used standard survey analysis (reliability, frequency, mean and standard deviation) in SPSS to analyze the data. Reliability (Cronbach Alpha) of the survey was strong (0.89) and results suggest minor differences between primary care specialties as well as differences in clinic ownership type. This analysis provides context from the clinic's perspective on the impact of implementing quality improvement interventions in rural primary care settings. Implications to practice and policy will be discussed as a means to support rural primary care clinics in HPV QI activities leading to improved HPV vaccination rates.

CHAPTER 1: INTRODUCTION

Since June of 2006, the Human Papillomavirus (HPV) vaccine has been used to prevent cancers of the anus, throat, cervix, vulvar, vaginal and penis. HPV vaccination is a two-dose series (0, 6-12 months) for persons who initiate vaccination at ages 9 through 14 years and a three-dose series (0, 1-2, 6 months) for persons who initiate vaccination at ages 15 through 45 years, and for immunocompromised persons. When the vaccine is administered during adolescence, the HPV vaccine has the best chance of protecting people from these cancers later in their life. Since the vaccines inception into routine adolescent preventative care, vaccination rates are significantly low across the United States and even more so in rural communities. Healthy People 2030, which is a national initiative aimed at improving health outcomes in the U.S., set a goal to increase the amount of adolescents ages 13-15 who received the vaccine at 80%. In 2020, the National Immunization Survey of Adolescents (NIS-Teen) released data showing that 58.6% of teens aged 13-17 were up-to-date on their HPV vaccine and only 75.1% had started the vaccine series (Pingali et al., 2021). For comparison, the Tdap vaccine, which in most states is a vaccine required for school attendance, remains steady at 89.6% for teens ages 13-17 (Pingali et al., 2021). There are also significant rural disparities among HPV vaccine: 47.4% adolescents ages 13-17 being up-to-date and only 65.3% having initiated the HPV vaccination series (Pingali et al., 2021).

The Rural Adolescent Vaccine Enterprise (RAVE), funded by the American Cancer Society and awarded to Oregon Health and Science University, is working to better understand the barriers that rural primary care practices face in delivering the HPV vaccine. This stepped-wedge cluster randomized trial aims at testing novel interventions in rural primary care clinics and community-based organizations to increase HPV vaccination completion rates among

adolescents aged 11-17 years old (Carney et al., 2019). There are four aims to this study that are outlined in Table 1 and Figure 1 shows the study design. Aim 1 used qualitative analysis to understand a baseline assessment of how clinics are currently addressing HPV vaccine uptake within their organization through an observation visit by the study team (Gunn et al., 2020). Aim 2 is defined as the intervention portion of the study where practice facilitation is used to guide change needed to improve HPV vaccination rates that's tailored to the needs of the individual clinics. There were 151 clinics that met the eligibility criteria and 46 were randomized to one of five, 18-month, intervention arms. Clinic representation across the state was strong (Figure 2) and the study team had support from state immunization staff, along with utilizing existing clinic relationships, to recruit aim 2 clinics. Aim 2 participating clinics had to meet the inclusion criteria of meeting the Oregon Rural Health definition or having a Rural-Urban Commuting Area (RUCA) code greater than 4, be a family medicine or pediatric clinic, participate in the Vaccines for Children Program, have >10 patients 11-12 years old and >20 patients 13-17 years old. Inclusion and exclusion criteria for aim 2 can be found in the consort diagram below (Figure 3). Before randomization, clinics were stratified based on if they were defined as pediatric, family medicine or both. Five clinics dropped out before their intervention arm, for reasoning that includes no longer meeting the inclusion criteria or unable to begin intervention, creating a final N of 41 participating clinics: 27 participating family medicine clinics, 12 pediatric and 2 defined as both. Aim 3 explores if an evidence-based social marketing campaign, implemented between the intervention clinics and a community organization of their choice, improves HPV vaccine readiness within the community. Finally, Aim 4 focuses on sharing findings from our research with local, state and national partners through literature and the design of a toolkit.

Table 1: RAVE Study Aims (Carney et al., 2019)

RAVE Study Aims	Description
Aim 1: Complete a baseline assessment to understand how practices are addressing HPV vaccination in their practice.	In this aim we used Oregon’s immunization registry, ALERT IIS, to identify rural primary care clinics with high and low HPV vaccination rates. We recruited 12 clinics to participate in this aim in which we used observational qualitative analyst to assess workflows and practices within the clinic as well as assessing any community efforts to address vaccination practices. The outcome of this aim can be viewed in the Journal of Preventative Medicine (Gunn et al., 2020).
Aim 2: Implement and test the effectiveness of practice led interventions to increase HPV vaccination rates and decrease missed-opportunities for vaccination.	This aim of the study incorporates the stepped-wedge cluster randomized trial design by assigning recruited clinics to different intervention arms. 46 out of 151 eligible clinics were stratified to arms based on family medicine or pediatric designation. Clinics are assigned a practice facilitator to assist in identifying tailored approaches to improve HPV vaccination rates based on the clinic and community needs. The practice facilitator will provide baseline quality improvement guidance and support the practice in identifying tools and resources for process improvement related to immunizations.
Aim 3: Exploring evidence-based social marketing campaigns, implemented partnership with community organizations and participating practices will impact HPV vaccine readiness.	Each clinic that is randomized to an intervention will attempt to engage with a community partner 6 months into their arm. The clinic and community partner will work together for 12 months to design and implement an evidence-based community-level intervention. This aim specifically explores if a community-based partnership brings "vaccine ready" adolescents and parents to the clinic and increases HPV vaccination rates. This is an exploratory aim.
Aim 4: Sharing research findings through a toolkit with practices, state public health programs and ACO's.	The purpose of this aim is to create a toolkit using outcomes from this study that can be used by both clinics and community organizations to improve HPV vaccination rates.

Figure 1: Study Design (Carney et al., 2019)

YEAR 1 July '18 - June '19		YEAR 2 July '19 - June '20				YEAR 3 July '20 - June '21				YEAR 4 July '21 - June '22				YEAR 5 July '22 - June '23			
July '18 - May '19	June '19 - August '19	September '19 - November	December '19 - February '20	March '20 - May '20	June '20 - August '20	September '20 - November	December '20 - February '21	March '21 - May '21	June '21 - August '21	September '21 - November	December '21 - February '22	March '22 - May '22	June '22 - August '22	September '22 - November	December '22 - June '23		
Observation Period		Intervention Period												Analysis & Dissemination Period			
Practice Selection & Randomization; PF Training: Aim 1		Intervention Group 1 (n=9) Practice-ONLY Community-based Partnerships						Aims 2 & 3						Data Analysis/ Interpretation of Results		Toolkit Development & Dissemination: Aim 4	
		Control Period		Intervention Group 2 (n=9) Practice-ONLY Community-based Partnerships				Follow-up Period									
		Control Period		Intervention Group 3 (n=9) Practice-ONLY Community-based Partnerships				Follow-up Period									
		Control Period		Intervention Group 4 (n=9) Practice-ONLY Community-based Partnerships				Follow-up Period									
		Control Period		Intervention Group 5 (n=10) Practice-ONLY Community-based Partnerships				Follow-up Period									

Figure 2: RAVE Clinic Representation

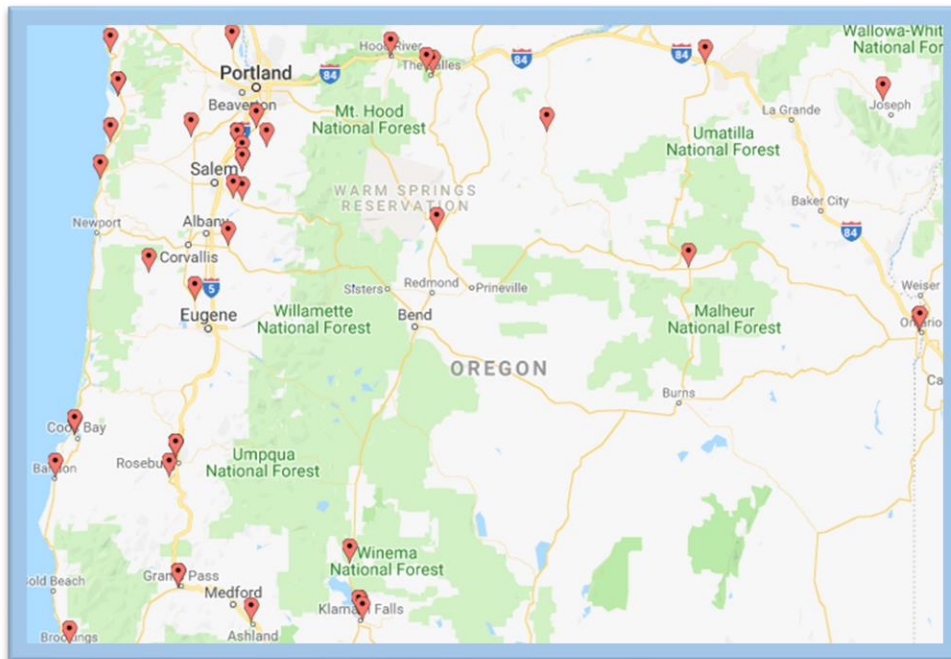
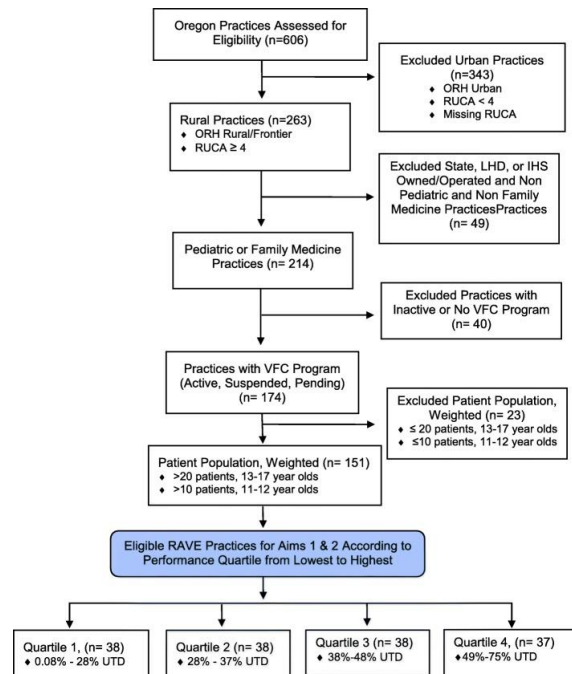


Figure 3: RAVE Consort Diagram (Carney et al., 2019)



In this paper we will be analyzing and evaluating a survey administered to participating clinic staff at completion of their 18-month RAVE intervention. This post-intervention evaluation survey asks questions related to: helpfulness of study activities and materials, likelihood of using quality improvement tools and processes in the future, agreement on working with a practice facilitator, and the clinic's future improvement priorities. For the purposes of this paper we will be evaluating only the helpfulness of study materials and activities and the likelihood of using quality improvement processes in the future. In alignment with these two variables we will explore any differences in survey responses by primary care specialty (family medicine or pediatrics) and clinic ownership type such as clinician/group, hospital/health system, Federally Qualified Health Center (FQHC), Academic Health Center (AHC) and Rural Health Center (RHC). This survey provides key information that will support future research studies related to implementing HPV vaccination interventions at the clinic level. In addition, survey results may suggest that policy changes be made at the state and federal level to improve HPV

vaccination rates in rural primary care clinics. Evaluating and understanding clinic perspectives on implementation science is vital to the creation of future research and policy change.

CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

It is estimated that the annual direct medical costs at preventing and treating HPV-associated cancers is approximately 8 billion U.S. dollars (Chesson et al., 2012). Prevention of HPV-associated cancers includes living a healthy lifestyle, regular Pap screening and/or HPV testing, and most importantly, on-time vaccination (CDC, 2021). While the HPV vaccine has been available for over 16 years, data suggests that rural areas see significantly lower HPV vaccination rates compared to urban areas. A recent study published by the Journal of Rural Medicine suggests that much of our urban and rural HPV vaccination rate disparities may be due to clinic-level differences as opposed to patient differences such as income level. Clinic-level characteristics include the types of providers, number of adolescent patients, staff confidence in vaccine recommendation and prioritization of quality improvement activities (Hatch et al., 2022). As such, having a pediatrician and larger panel of adolescent patients was associated with higher HPV vaccination rates due to a combination of standardized immunization workflows, familiarity and confidence in recommending vaccines and an overall higher priority of adolescent health outcomes (Hatch et al., 2022). This research is important because modifying and creating interventions to address clinic characteristics is easier than addressing social and economic health factors.

Similar to the RAVE study, other research is being conducted to understand interventions that lead to an increase in HPV vaccination rates across the U.S. A simulation study was conducted that specifically looked to identify interventions that were cost-effective to help inform policy change. The three interventions that they studied were: state-wide reminder recall,

school-located vaccines and quality improvement in primary care clinics. When modeling outcomes to compare locations that had an intervention to those that did not, the presence of an intervention was more cost-effective at preventing HPV than no intervention at all (Spencer et al., 2020). What they found was that quality improvement had the lowest cost but was not very impactful and school-located vaccines had the highest cost but was most impactful. The outcome of this study recommended to policy makers that support, including funding of quality improvement in primary care settings, should be considered at the very minimum to increase HPV vaccination rates among their communities (Spencer et al., 2020).

Significant research is being conducted worldwide to evaluate specific interventions for increasing HPV vaccination rates. However, little has been studied from the clinic perspective about the impacts these interventions have on their day-to-day practices (Mavundza, 2021). A recently published report studied the perspective of quality improvement leaders in healthcare systems and reviewed how they prioritized HPV quality improvement initiatives (Gradbert, 2021). The study conducted phone interviews with 17 quality improvement leaders from differing states and healthcare, whom all agreed on the importance of on-time vaccination. The study showed trends in clinic level barriers such as limited provider and clinic staff time, lack of robust data and competing clinical improvement projects with a tie to quality money (Gradbert, 2021). This study suggests a need to identify and understand quality improvement project perspectives at the clinic level to support the formation of future funding and research.

Prior to the COVID-19 pandemic, rural clinician/solo-owned practices showed to have lower QI capacity compared to urban clinics (Fagnan et al., 2021) and since the COVID-19 pandemic, resources in the healthcare system, particularly workforce shortages, have become scarce (Oster et al., 2022). Quality improvement in practice is resource intensive and requires

dedicated staff to be successful (Spencer et al., 2020). In this evaluation we will explore differences among survey responses for the helpfulness of study materials and activities and the likelihood of using quality improvement processes post intervention. We would like to better understand if there are differing perceptions in QI uptake among clinics that specialize in pediatrics or family medicine. As well as the type of clinic ownership such as clinician/group owned, hospital/health system, FQHC's, AHC's and RHC's. With little known out the clinician perspective of quality improvement activities in practice it's critical that we understand characteristics that impact QI uptake as we fund future improvement projects and advise policy makers. Findings from this study can inform clinics and their staff on helpful QI tools, materials and processes to increase HPV vaccination rates in rural primary care settings as well as barriers associated with QI uptake. This evaluation will also help researchers understand the feasibility of quality improvement from the clinics perspective and the impact it has on their practice. It may also suggest future implications to policy change, such as mandating the HPV vaccine or improving QI funding, and the direct effect it may have in rural primary care clinics throughout Oregon in narrowing the gap between urban and rural health disparities.

CHAPTER 3: METHODS

Two main independent variables were identified and analyzed to understand differences or similarities reported by clinics in the helpfulness of study materials and activities and the likelihood of using quality improvement processes in the future. Clinic ownership includes categories of Clinician or group owned, hospital or health system, academic health center, rural health center and federally qualified health center. Survey respondents had the option of choosing one or more clinic characteristics that best represents their ownership. For our analysis we only studied singular characteristics; we did not study multiple types of ownership. Primary care

specialty is the other independent variable which includes the categories family medicine, pediatrics or both. This variable was not included in the post-intervention survey and was collected by study team in the “Clinic Management Form” located in the studies REDCap database. Primary care specialty and clinic ownership type are not mutually exclusive and we did not analyze specific differences among these variables (i.e. family medicine and hospital/health system; pediatric and clinician/group owned; family medicine and hospital/health system and AHC; etc.). We summarized our variables by frequency using the statistical software IBM SPSS version 29.

There are two main dependent variables used in this analysis and can be found in Appendix A. The first variable is measuring the helpfulness of study materials and states, “Please rate the helpfulness of the following RAVE activities and materials.” Options for survey respondents for the helpfulness of study activities and materials includes: participating in monthly study meetings with a facilitator, collaborating with community partners, reviewing quarterly data and utilizing that data for workflow changes, participating in a quality improvement change assessment, using the study binder and flash drive containing resources and using templates to track Plan-Do-Study-Act cycles (PDSA). The second dependent variable asks clinic staff to identify “how likely is your clinic to use the following quality improvement processes in the future?” The survey respondents’ options for the likeliness of QI processes in the future includes: aim statements/SMART goals, Fishbone diagrams, PDSA cycles, workflow mapping, run charts and change concepts. Both variables include Likert scale questions that were developed into numerical values in order to calculate the mean and standard deviation for each question as well as an overall mean and standard deviation of all questions. In addition, we conducted a reliability analysis for the helpfulness and likeliness variables using Cronbach’s

alpha (0-1). The alpha range used in this analysis to determine strong reliability of the dependent variables was .65 – 1.0.

CHAPTER 4: RESULTS

Clinic Sample Description

Participants (N=41) were eligible to fill out the survey and invited to complete it immediately following the final meeting during the eighteenth month of their intervention arm. The results of the final survey (N=36) showed a response rate of 88%. Table 2 illustrates the total responses to clinic ownership (clinician or solo-owned, hospital or health system, federally qualified, academic or rural health center) was 47 supporting that clinics had the opportunity in the survey to choose more than one ownership type. Table 2 also shows the designation by the study team of primary care specialty as family medicine, pediatrics or both. Out of the 36 clinics that completed the survey, 63.9% were family medicine, 30.6% were pediatric and 5.6% identified as both a family medicine and pediatric clinic.

Table 2: Clinic Ownership and Primary Care Specialty

	Total Responses (N=47)
Clinic Ownership	
Clinician owned or group owned	11
Hospital or Health system owned	12
Federally Qualified Health Center (FQHC)	8
Academic Health Center (AHC)	2
Rural Health Center (RHC)	14
Primary Care Specialty	N= 36 (100.0)

Family Medicine	23 (63.9)
Pediatrics	11 (30.6)
Both	2 (5.6)

Reliability of Helpfulness and Likeliness Measures

To understand the reliability of our two dependent variables, helpfulness of the study materials and likeliness of using QI processes in the future, Cronbach’s Alpha was used with a range of 0.65 - 1.0 being a strong measure. Table 3 shows the reliability scores for the survey questions, “How likely is your clinic to use the following QI processes” and “please rate the helpfulness of the following study materials”. For the likeliness of using QI processes in the future, there were six sub-questions and had a total reliability score of 0.79. For the helpfulness of study materials there were seven sub-questions and had a total reliability score of 0.88. The combined alpha for both questions was 0.89, indicating the survey questions were a consistent measure when conducting our analysis.

Table 3: Reliability Scores for Helpfulness and Likeliness Scores

	Mean	Std. Deviation	Cronbach’s Alpha
Likeliness of the QI process			0.79
Aim statement	4.34	0.91	
Fishbone Diagram	3.31	1.26	
PDSA cycles	4.54	0.85	
Workflow Mapping	4.31	0.87	
Run Charts	3.80	1.18	
Change concepts	3.86	1.12	
Helpfulness of program materials			0.88
Meeting with Facilitator	4.41	1.08	
Collaborating with community org.	3.89	1.15	
Reviewing quarterly data	4.19	1.18	
Utilizing data for workflow changes	4.11	1.15	
Participating in QICA	4.00	1.21	
Using program materials provided by study team	3.56	1.05	
Using templates to track PDSA cycles	3.90	1.20	
Combined Alpha			0.89

Mean and Standard Deviation Among Variables

In order to determine any differences among primary care specialty and clinic ownership in their responses to the survey questions we compared their means and standard deviations. Table 4 shows the means and standard deviation for each question among primary care specialties and clinic ownership as well as an overall mean and standard deviation. For clinic specialty, family medicine clinics showed a higher mean of 4.15, 4.05 and 4.10 for both survey questions as well as the overall mean compared to the means of pediatric clinics. Family medicine clinics reported having a lower standard deviation of 0.74 and 0.65 for both likeliness and helpfulness questions compared to pediatric clinics that had standard deviations of 0.79 and 1.05. Looking at comparisons between family medicine, pediatrics and both, we will ignore the results for clinics that identified as both due to the small sample size, however it's included in Table 4 for reference. This will also remain true for AHC ownership with a small sample (N=2). Differences in means and standard deviation for clinic ownership show that clinician group owned clinics had the highest mean (4.26) for the likeliness to use QI processes in the future compared to other types of ownership. For the helpfulness of study materials and activities, clinician/group owned and FQHC's had the highest mean score of 4.06 compared to other types of ownership. Overall mean scores indicate that clinician/group owned showed to have the highest mean of 4.12 with hospital/health system (4.10) and RHC (3.94) following. The lowest standard deviation for the likeliness survey question was among clinician/group owned (0.64) however this type of ownership showed the highest standard deviation for the helpfulness survey question (1.12). Overall the lowest reported standard deviation was among RHC's (0.40) and the highest was among clinician/group owned (0.79).

Table 4: Mean and Standard Deviation for Helpfulness and Likeliness Scores by Primary Care Specialty and Clinic Ownership

	Primary Care Specialty			Clinic Ownership				
	Family Medicine (N=23)	Pediatrics (N=11)	Both (N=2)	Clinician /Group (N=11)	Hospital/ Health System (N=12)	FQHC (N=8)	AHC (N=2)	RHC (N=14)
Likeliness								
Mean (SD)	4.15 (0.74)	3.92 (0.79)	3.80 (0.35)	4.26 (0.64)	4.17 (0.77)	3.69 (0.78)	3.50 (1.65)	3.91 (0.76)
Helpfulness								
Mean (SD)	4.05 (0.65)	4.00 (1.05)	4.15 (0.02)	4.06 (1.12)	4.04 (0.82)	4.06 (0.47)	3.86 (0.20)	3.98 (0.22)
Overall								
Mean (SD)	4.10 (0.62)	3.96 (0.72)	4.00 (0.19)	4.12 (0.79)	4.10 (0.68)	3.90 (0.47)	3.70 (0.72)	3.94 (0.40)

CHAPTER 5: DISCUSSION

As HPV vaccination rates remain below the Healthy People 2030 target, researchers continue to study what interventions are the most effective in improving HPV vaccination rates. Studies have shown that differences related to clinic characteristics, such as the ones in our analysis, may be a contributing factor in HPV vaccination status rather than differences among patient demographics (Hatch, et al., 2022). Our analysis aimed to understand if primary care specialty and clinic ownership plays a role in improving HPV vaccination rates in rural Oregon by examining, from the clinic’s perspectives on the helpfulness of a best practice QI intervention and the likeliness of using these QI processes in the future.

Study Strengths and Weaknesses

Several strengths and weaknesses should be noted for this analysis including the strong survey response rate at 88% survey’s completed. Another strength is that only five clinics dropped out of the study for reasons including no longer meeting the inclusion criteria or being

unable to begin the intervention. This is included as a noteworthy strength because study enrollment began in 2018 (pre-pandemic) and study engagement was throughout the COVID-19 pandemic (2018-2022). The last notable strength is the outcome of the survey responses to the dependent variables which indicate that the quality improvement tools and study materials were helpful and that clinics were likely to use them in the future. This strength is valuable and the outcome should be applied to future quality improvement implementation research. With any survey, there will be limitations in how the respondents interpret and choose their answers. For this study, due to the timing of the intervention, staff turnover may have been a factor and the person filling out the survey may not have been involved in the study for the majority of the eighteen months. In addition, we saw some discrepancies in how respondents interpreted several of our survey questions. For example, when asked the number of providers associated with their clinic, some respondents shared the total number in their organization as opposed to the clinic that participated in the study.

There were several quantitative questions not included in the analysis and that includes patient characteristics such as number of patients seen in one week, number of adolescents that seek care with the clinic, as well as patient race and ethnicity estimates. This survey question was collected as a means to compare pre-intervention survey data and the research team will be using this data in other literature. There was also a third Likert scale question in our survey addressing the level of agreement in working with a practice facilitator which was excluded from our analysis due to its lack of contribution in helping us understand our research question. Lastly, the qualitative survey questions were also excluded due to time constraints. These questions include several open-ended responses such as: if eighteen months was the right amount of time to complete the intervention, factors that could affect future intervention participation and quality

improvement topics that the clinic would like to focus on in the future. Because the survey was created prior to the COVID-19 pandemic, excluding the qualitative data creates a limitation in understanding the clinic's perspective on the impact of COVID-19 on QI capacity during a pandemic with the shifting of priorities and resources. These qualitative questions will be beneficial to helping us understand our research question and will be added in the evaluation at a later time. The biggest limitation is that we were unable to include HPV vaccination data associated with these clinics as the study's main effects paper is still in progress. HPV initiation and completion rates associated with these clinics during the QI intervention could provide perspective between a perception and reality for our independent variables and their responses to the helpfulness of study materials and tools and the likeliness of using them in the future.

Implications to Practice

Our results indicate only minor differences among primary care specialty as well as clinic ownership as it relates to the helpfulness of study materials and tools and the likeliness of using QI processes in the future. However, it's still important to discuss what we do know about differences in clinic ownership and specialty and the implications this has on QI implementation in the rural setting. Historically, health systems prove to have a stronger and more resourced QI infrastructure with characteristics such as dedicated QI staff, robust electronic health records and motivated leaders in meeting quality measures linked to financial reimbursement (Grabert et al., 2021). In addition, a national survey administered to immunization coordinators at the state level found that priorities change when working with health systems and improvements are identified by what can be implemented across the entire health system (Grabert et al., 2021). Thinking of this from the rural perspective, these clinics may be disconnected from their health systems leaders and designated QI staff as well as rural populations have different needs in how health

care is delivered. It's possible that health systems are not providing their rural primary care clinics with equitable resources needed in conducting QI interventions that benefit the people they serve. FQHC's and RHC's also have access to quality improvement incentives that provide financial incentives through increased reimbursement when quality measures are met. Resources such as local presence of a QI specialist and improved QI funding may be the turning point in utilization and uptake of QI resources.

Primary care specialty may also play an important role in QI uptake as it relates to improving HPV vaccination rates. Literature supports that the presence of a pediatrician is associated with a higher percent of adolescents being up-to-date on the HPV vaccine and pediatric clinics may have standardized workflows related to vaccine uptake and provide stronger vaccine recommendations leading to improved vaccine uptake outcomes (Hatch et al., 2022). In our study, we had half as many pediatric clinics as we did family medicine clinics and could mean that the likelihood of receiving on-time HPV vaccination in rural Oregon increases if you have access to a pediatrician. With more family medicine clinics serving adolescents in rural Oregon it's crucial that we develop ways to support them in improving HPV vaccination rates. One way this can be done is by providing family medicine clinicians with stronger training for recommending adolescent vaccines, especially as it relates to motivational interviewing and applying that to discussions around vaccine hesitancy. Another way could be working with family medicine clinics in implementing routine vaccine workflows that are needed for the pediatric population. With differing needs in QI support in rural primary care clinics, this poses the question of what can be done to eliminate any barriers associated with QI uptake in the rural setting?

Implications to Policy

Exploring ways to improve HPV vaccination rates other than QI interventions may be necessary to support rural primary care clinics. Public health professionals can impact patient care through policy change at a variety of bureaucratic levels. In the U.S., vaccination policies are located at the state level in which states impose a variety of different regulations to prevent the spread of diseases. A few examples of vaccine policies at the state level include mandating vaccines for school entry, the types of providers that can administer vaccines, reporting vaccination data to a registry, coverage and reimbursement of vaccines by insurance companies and quality measures. Vaccine policies implemented by states play a crucial role in limiting the spread of vaccine preventable diseases, which in the case of HPV vaccination, reduces cancer. We will now explore several ways that vaccine policies in Oregon can change in order to improve HPV vaccination rates in rural primary care clinics.

Several states in the U.S. have imposed mandating the HPV vaccine as part of school-entry for adolescents in an effort to improve vaccination rates. A cross-sectional study was conducted to understand the different statute and regulatory interventions used to increase HPV vaccine uptake in the U.S. There are 34 states and the District of Columbia that have statutes related to the finance, recommendation, public awareness and education and reporting of the HPV vaccine. Out of the 34 states, only 3 have a statute for HPV vaccine in order for school-entry (Hoss, et al., 2019). Rhode Island is one of these states and has the highest up-to-date HPV vaccination rates in the country at 83.2% and is the only state to meet the Healthy People 2030 goal of 80%. In Oregon, the only mandated vaccine for school-entry among adolescents is the Tdap vaccine. ALERT IIS, the immunization registry in Oregon, supports that some counties see up to a 50% difference in Tdap vaccination rates compared to HPV vaccination rates with the biggest gaps present in rural areas (Carney et al., 2019). This data suggests that mandating the

HPV vaccine could be an effective policy change and have a direct effect on HPV vaccination rates in rural Oregon. While regulatory enforcement is the biggest barrier in implementing this policy (Hoss, et al., 2019), Oregon has a robust infrastructure for enforcing vaccination laws making them a strong candidate in implementing this policy (ORS, 2022). Much of the literature suggests that successfully implementing QI interventions requires a large amount of resources and takes away from direct patient care, therefore mandating the HPV vaccine in Oregon may be a viable option in improving HPV vaccination rates through policy change. Mandating HPV vaccination will also improve population-level health, as seen in response to the COVID-19 pandemic, with primary care practices taking on the responsibility for community health and becoming a valuable player as a public health resource in their communities.

The last policy idea to explore that would support rural primary care clinics in implementation of QI interventions involves a newer phenomenon in healthcare reimbursement called pay for performance. As Oregon worked to expand Medicaid and the implementation of Coordinated Care Organizations (CCO's), they also changed the way in which Medicaid participating providers get reimbursed for performance instead of services. How this works is that a portion of Medicaid reimbursement is withheld from providers and can only be received if they meet certain quality metrics. This model is innovative and has helped Oregon's healthcare system and patient health outcomes immensely, however for some healthcare organizations, this model has had its short comings.

Let's discuss this from a hypothetical standpoint: a health care clinic with an adolescent panel size of 500 patients spends an entire year on a QI process to recall all adolescent patients for immunizations before their 13th birthday (Immunizations for Adolescents Combo 2). If the clinic misses this metric by even one patient, none of the quality money that was withheld for

that metric will be reimbursed that year. From a rural perspective, let's look at this example: there are two rural pediatric clinics serving the entire county of pediatric patients. Clinic A has a policy that they only serve patients who accept vaccines and Clinic B has a policy that they do not turn anyone away regardless of their intent to vaccinate. Clinic A meets the quality metric every year and gets their Medicaid reimbursement however Clinic B will never meet the quality metric for on-time adolescent vaccination because they serve all the vaccine hesitant families in their county. With Clinic B not able to receive Medicaid reimbursement for the adolescent vaccine metric, this could have serious implications. The quality metric reimbursement could be the difference between maintaining QI support staff and conducting other QI interventions to improve all patient outcomes for a more high-risk patient population.

Several changes should be made to this model to ensure healthcare organizations receive equitable financial reimbursement for quality measures reflective of the patient population they serve. One method in doing this would be to include an exception clause for serving a primarily vaccine hesitant population in which the clinic must demonstrate that quality money is used to educate and support their vaccine hesitant patients. Some examples of how providers can demonstrate this is by participating in motivational interview trainings and putting on workshops with parents to improve vaccine confidence. Implications of changes to this model could mean that rural primary care clinics have the resources and infrastructure needed to conduct QI interventions and work to improve HPV vaccination rates in their communities.

Literature supporting the clinics perspective on QI related studies is limited, indicating the need for continued research. Further work for our study team should explore any differences around QI uptake related to the number and type of providers and the number of adolescent patients seen at the clinic as well as the specific QI materials, tools and processes that seemed

most effective. Integrating HPV vaccination data for these clinics will also be critical in understanding the impact of our study on rural primary care clinics. After further analysis and incorporation of qualitative data, this paper will be reviewed by study investigators and submitted in a scholarly journal for review. As researchers work to understand new and existing differences in the delivery of healthcare among rural and urban settings, it is vital that we listen to the needs of rural communities. Providing equitable resources to support rural healthcare must be done to improve health outcomes and delivery for all Oregonians.

REFERENCES

- Carney, P. A., Hatch, B., Stock, I., Dickinson, C., Davis, M., Larsen, R., Valenzuela, S., Marino, M., Darden, P. M., Gunn, R., Ferrara, L., & Fagnan, L. J. (2019). A stepped-wedge cluster randomized trial designed to improve completion of HPV vaccine series and reduce missed opportunities to vaccinate in rural primary care practices. *Implementation Science: IS*, *14*(1), 30. <https://doi.org/10.1186/s13012-019-0871-9>
- Centers for Disease Control and Prevention. (2021, December 14). *What can I do to reduce my risk of cervical cancer?* Cervical Cancer. Retrieved September 18, 2022, from https://www.cdc.gov/cancer/cervical/basic_info/prevention.htm
- Chesson, H. W., Ekwueme, D. U., Saraiya, M., Watson, M., Lowy, D. R., & Markowitz, L. E. (2012). Estimates of the annual direct medical costs of the prevention and treatment of disease associated with human papillomavirus in the United States. *Vaccine*, *30*(42), 6016–6019. <https://doi.org/10.1016/j.vaccine.2012.07.056>
- Explore HPV Vaccination in the United States / *2022 Annual*. (n.d.). America's Health Rankings. Retrieved March 5, 2023, from

https://www.americashealthrankings.org/explore/annual/measure/Immunize_HPV/state/ALL

Fagnan, L. J., Ramsey, K., Dickinson, C., Kline, T., & Parchman, M. L. (2021). Place Matters: Closing the Gap on Rural Primary Care Quality Improvement Capacity—the Healthy Hearts Northwest Study. *The Journal of the American Board of Family Medicine*, *34*(4), 753–761. <https://doi.org/10.3122/jabfm.2021.04.210011>

Garcia, A., & Skinner, E. (2020, May 26). *HPV Vaccine: State legislation and regulation*. National Conference of State Legislatures. Retrieved September 18, 2022, from <https://www.ncsl.org/research/health/hpv-vaccine-state-legislation-and-statutes.aspx#:~:text=As%20of%20April%202020%2C%20at,vaccine%20starting%20July%201%2C%202020>.

Grabert, B. K., Heisler-MacKinnon, J., Kurtzman, R., Bjork, A., Wells, K., Brewer, N. T., & Gilkey, M. B. (2021). Partnering with healthcare systems to improve HPV vaccination: The perspective of immunization program managers. *Human Vaccines & Immunotherapeutics*, *17*(12), 5402–5406. <https://doi.org/10.1080/21645515.2021.1993041>

Grabert, B. K., Heisler-MacKinnon, J., Liu, A., Margolis, M. A., Cox, E. D., & Gilkey, M. B. (2021). Prioritizing and implementing HPV vaccination quality improvement programs in healthcare systems: The perspective of quality improvement leaders. *Human Vaccines & Immunotherapeutics*, *17*(10), 3577–3586. <https://doi.org/10.1080/21645515.2021.1913965>

Gunn, R., Ferrara, L. K., Dickinson, C., Stock, I., Griffith-Weprin, J., Wiser, A., Hatch, B., Fagnan, L. J., Carney, P. A., & Davis, M. M. (2020). Human Papillomavirus

- Immunization in Rural Primary Care. *American Journal of Preventive Medicine*, 59(3), 377–385. <https://doi.org/10.1016/j.amepre.2020.03.018>
- Hatch, BA, Valenzuela, S, Darden, PM, et al. Clinic-level differences in human papillomavirus vaccination rates among rural and urban Oregon primary care clinics. *J Rural Health*. 2022; 1- 9. <https://doi.org/10.1111/jrh.12724>
- Hoss, A., Meyerson, B. E., & Zimet, G. D. (2019). State statutes and regulations related to human papillomavirus vaccination. *Human Vaccines & Immunotherapeutics*, 15(7–8), 1519–1526. <https://doi.org/10.1080/21645515.2019.1627817>
- Mavundza, E. J., Iwu-Jaja, C. J., Wiyeh, A. B., Gausi, B., Abdullahi, L. H., Halle-Ekane, G., & Wiysonge, C. S. (2021). A Systematic Review of Interventions to Improve HPV Vaccination Coverage. *Vaccines*, 9(7), 687. <https://doi.org/10.3390/vaccines9070687>
- Oregon Revised Statutes (ORS). Disease and Condition Control; Mass Gatherings; Indoor Air (2022). https://www.oregonlegislature.gov/bills_laws/ors/ors433.html
- Oster, N. V., Patterson, D. G., Skillman, S. M., & Frogner, B. K. (2022, March). *Covid 19 and the Rural Health Workforce: The Impact of Federal Pandemic Funding to Address Workforce Needs*. Center for Health Workforce Studies. Retrieved September 21, 2022, from <https://familymedicine.uw.edu/chws/wp-content/uploads/sites/5/2022/03/Covid-19-and-the-Rural-Health-Workforce-PB-2022.pdf>
- Pingali C, Yankey D, Elam-Evans LD, et al. National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13-17 Years - United States, 2020. *MMWR Morbidity and mortality weekly report*. 2021;70(35):1183-1190.

Spencer, J. C., Brewer, N. T., Trogon, J. G., Weinberger, M., Coyne-Beasley, T., & Wheeler, S.

B. (2020). Cost-effectiveness of Interventions to Increase HPV Vaccine Uptake.

Pediatrics, 146(6), e20200395. <https://doi.org/10.1542/peds.2020-0395>

U.S. Department of Health and Human Services. (2020). *Increase the proportion of adolescents*

who get recommended doses of the HPV vaccine - IID-08. Healthy People 2030.

Retrieved October 30, 2022, from [https://health.gov/healthypeople/objectives-and-](https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iid-08)

[data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-](https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iid-08)

[recommended-doses-hpv-vaccine-iid-08](https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iid-08)

APPENDICES

Appendix A: Clinic Survey Post-Intervention Evaluation

SECTION 1. CLINIC CHARACTERISTICS

Please characterize your clinic setting by checking all relevant features below:

- Clinician-owned solo or group clinic
- Hospital/health system owned
- Federally Qualified Health Center or look-alike
- Academic health center/faculty clinic
- Rural Health Clinic
- Other

Please describe

How many clinicians are associated with your clinic (include MD, DO, Nurse Practitioners, Physician Assistants)?

MD/DO

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

NP/ANP

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

PA

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

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Other

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Other, please describe

How many other staff are involved in care for adolescents at your clinic?

Dentist

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Pharmacist

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Nurse

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Care Manager / Coordinator

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Medical Assistant

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Community Health Worker

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Social Worker

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

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Behavioral Health Specialist

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

Other

(-Please write "n/a" if your practice does not have this role -Please write "0" for none in the role currently (e.g., hiring))

SECTION 2. PATIENT PANEL CHARACTERISTICS

Please estimate the total number of patients seen at your clinic in a typical week:

Please estimate the percentage of active patients that are adolescents (age 11-17 years):

PLEASE ESTIMATE THE PERCENT OF YOUR ACTIVE PATIENTS THAT FALL IN THE FOLLOWING CATEGORIES:

White

Black / African American

American Indian or Alaska Native

Asian

Native Hawaiian or Other Pacific Islander

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Other Race / Mixed Race

Should total to 100%

PLEASE ESTIMATE THE PERCENT OF YOUR PATIENTS THAT FALL INTO THE FOLLOWING CATEGORIES:

Hispanic or Latino

Non-Hispanic or Latino

SECTION 3. EVALUATION**Please rate the helpfulness of the following RAVE activities and materials:**

	Very helpful	Somewhat helpful	Neither helpful nor unhelpful	Somewhat unhelpful	Very unhelpful	NA
Participating in monthly RAVE meeting with facilitator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborating with a community organization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviewing quarterly data that was provided from ALERT IIS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utilizing ALERT IIS for clinic workflow changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in Quality improvement change assessments (QICA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the binder/flashdrive provided by the RAVE team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using templates provided to track Plan-Do-Study-Act (PDSA) cycles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How likely is your clinic to use the following quality improvement processes?

	Very likely	Somewhat likely	Neither helpful nor likely	Somewhat unlikely	Very unlikely	NA
Aim statements/SMART goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishbone diagram	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plan-Do-Study-Act (PDSA) cycles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workflow mapping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Run charts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change concepts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What other activities or materials would have been helpful for us to provide during the RAVE project?

We worked together on RAVE for 18 months. Was that the right amount of time?

Rate your level of agreement with the following statements:

	Definitely agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Definitely disagree
The facilitator clearly communicated project expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The facilitator was flexible with practice expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The facilitator was knowledgeable about vaccines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The facilitator was knowledgeable about quality improvement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The facilitator had a positive rapport with our clinic staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The facilitator expressed interest in our clinic's success in this project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our clinic would like to work with this facilitator again	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please share any additional details or feedback on the facilitator.

Would you participate in an ORPRN/OHSU project like RAVE again?

- Definitely yes
- Probably yes
- Not sure
- Probably not
- Definitely not

What factors might affect your future participation in an ORPRN/OHSU project?

What topics are a priority for your clinic improvement work right now or in the near future?