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HPV Vaccine Communication Needs and Preferences Among Cape Verdean Immigrant Parents in the United States

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Abstract

Background: Limited research has examined HPV vaccine communication among Cape Verdean immigrant families living in the United States (U.S.). This study explored how Cape Verdean immigrant parents of adolescents living in the U.S. receive and seek HPV vaccine information, focusing on information sources, trusted messengers, healthcare provider (HCP) communication, and preferences for HPV education. **Methods:** We conducted a cross-sectional formative study among Cape Verdean immigrant parents of adolescents aged 11–17 years. Participants completed a survey in their preferred language (English, Portuguese, or Cape Verdean Creole). Descriptive statistics characterized HPV vaccine communication experiences, interest in HPV education, and intervention preferences. Among parents whose adolescents had not initiated HPV vaccination ($n = 115$), sociodemographic and HPV-related characteristics were compared by interest in participating in an HPV education program. Preferred intervention delivery formats and language were also summarized among interested parents ($n = 52$). **Results:** As previously reported, fewer than half of the 166 participating parents had heard of HPV (42.8%) or the HPV vaccine (40.4%). Healthcare providers (HCPs) were the most common source of HPV vaccine information (69.3%) and the most trusted (99.4%), yet only 39.8% reported receiving an HPV vaccine recommendation. However, among parents who received HPV vaccine information from HCPs, fewer than half (48.8%) considered the information reliable or trustworthy, and 35.5% reported insufficient information to make a vaccination decision. Among parents whose adolescents had not initiated HPV vaccination, 45.2% expressed interest in HPV education, which varied by U.S. residence duration and selected vaccine beliefs and family and social influences. Text messaging (55.8%) and Facebook (38.5%) were the most frequently selected delivery formats, and Cape Verdean Creole (68.6%) was the preferred language. **Conclusions:** Findings highlight gaps in HPV vaccine communication despite high healthcare provider (HCP) access and parental trust in HCPs. Future interventions should strengthen HCP–family communication and use culturally and linguistically responsive approaches through preferred communication channels.

Keywords: human papillomavirus; HPV; vaccination; health communication; immigrant; Cape Verdean immigrants; vaccine communication; health education

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1. Introduction

Human papillomavirus (HPV) vaccination is an important component of cancer prevention, yet vaccination decisions among adolescents often depend on parents having access to clear, trusted, and timely information [1,2]. Although healthcare provider (HCP) recommendation is consistently associated with HPV vaccine uptake, parents may encounter gaps in the information needed to understand HPV, evaluate vaccine benefits and safety, and make informed vaccination decisions [1–3].

Developing effective health education interventions requires understanding not only what individuals know or believe, but also how health information moves from sources to individuals, including where people obtain information, whom they trust, what information they perceive as insufficient, and how they prefer to receive and discuss health information [4,5]. Formative research can identify population-specific information needs and communication preferences before an intervention is developed, helping ensure that intervention content, language, messengers, and delivery channels are relevant and acceptable to the intended population [4,5]. This approach is particularly important for health promotion interventions targeting immigrant communities, where language, migration experience, acculturation, and familiarity with the United States (U.S.) healthcare system may influence how health information is accessed, communicated, trusted, and interpreted [4–6].

Culturally and linguistically responsive communication may be particularly important for HPV vaccination because discussions of HPV can involve sensitive issues related to sexual transmission, cancer prevention, and adolescent sexuality [6]. Parents may therefore benefit from information that addresses HPV vaccination in a clear and non-stigmatizing manner and that is delivered through trusted sources and familiar communication channels. Research among immigrant parents has identified concerns related to sexual activity, confusion about HPV, vaccine safety and efficacy, and the framing of HPV vaccination as a sexually transmitted infection prevention strategy [6–8].

Similarly, research suggests that parents value clear and unequivocal healthcare provider recommendations for HPV vaccination; however, providers may communicate these recommendations less strongly than recommendations for other adolescent vaccines [1–3]. Thus, communication involves more than access to a healthcare provider; it also includes whether HPV vaccination is discussed, how clearly, it is recommended, whether the information is perceived as trustworthy and sufficient, and whether parents feel comfortable engaging in the conversation [1,2]. Understanding parents' social and informational contexts can help identify opportunities to strengthen existing sources of health information rather than assuming that a single approach to vaccine education will be appropriate across populations.

Cape Verdean immigrants represent a longstanding immigrant population in the United States (U.S.), with particularly well-established communities in New England, including Massachusetts and Rhode Island [9,10]. Despite this established presence, Cape Verdean immigrant families remain understudied with respect to HPV vaccine communication and intervention preferences. Our research group has previously examined HPV vaccination among Cape Verdean immigrant parents using both qualitative and quantitative approaches. A qualitative study explored social ecological influences on HPV vaccination, highlighting the importance of healthcare providers as trusted messengers, gaps in provider communication, family and social influences, and parents' preferences for culturally and linguistically appropriate information, including communication in Cape Verdean Creole and through community-based channels [11]. A separate quantitative study examined HPV awareness and knowledge, vaccination uptake, and psychosocial factors associated with HPV vaccination in this population [12].

Building on these studies, the present manuscript uses the same survey dataset as the previous quantitative publication [12] but addresses distinct research questions related to HPV vaccine communication and educational program preferences. Specifically, it examines sources of HPV vaccine information, trusted information sources and messengers, healthcare provider communication, interest in participating in an HPV educational program, and preferred intervention delivery formats and language. Previously reported measures were also used to characterize the study population and examine differences according to interest in HPV education; these measures are included as background characteristics rather than presented as new findings. By examining these communication-related factors quantitatively, the present study complements the previous qualitative research and provides additional evidence to inform the development of HPV vaccine education for Cape Verdean immigrant families.

The present study objectives were to characterize HPV vaccine information sources, trusted messengers, and healthcare provider communication among Cape Verdean immigrant parents of adolescents; compare sociodemographic and HPV-related characteristics according to interest in participating in an HPV education program among parents whose adolescents had not initiated HPV vaccination; and describe preferred intervention delivery formats and language among parents interested in participating in an educational program.

2. Materials and Methods

2.1. Study Design and Population

We conducted a cross-sectional formative study to characterize HPV vaccine information needs, trusted sources, healthcare provider communication, and educational preferences among Cape Verdean immigrant parents of adolescents. Findings were intended to inform the development of a culturally and linguistically responsive HPV vaccine education intervention for Cape Verdean immigrant families.

Participants were Cape Verdean immigrant parents or legal guardians aged 21 years or older who had at least one adolescent aged 11–17 years and were residing in the United States for at least six months prior to enrollment in the study. Eligibility was not restricted to recent immigrants; parents and legal guardians were eligible regardless of their duration of residence in the United States, provided they met the other eligibility criteria. Participants were eligible regardless of their adolescent's HPV vaccination status. For analyses examining interest in an HPV education program, the analytic sample was restricted to parents whose adolescent had not initiated HPV vaccination.

Participants were recruited between February and August 2024 from Massachusetts, Rhode Island, and other northeastern U.S. communities through community-based organizations, faith-based organizations, WhatsApp, social media, and other community networks. A total of 201 individuals were screened, of whom 166 met the eligibility criteria and completed the survey. The available recruitment records did not permit separate identification of individuals who were ineligible and those who were eligible but declined participation. As previously mentioned, the present manuscript reports a secondary analysis of this dataset, focusing on HPV vaccine communication, interest in participating in an HPV educational program, and educational delivery preferences.

2.2. Data Collection

Data were collected using a structured survey developed to assess sociodemographic characteristics, HPV-related knowledge and beliefs, vaccination experiences, information sources, healthcare provider communication, and preferences for HPV vaccine education [12]. Surveys were administered by trained research staff in the participant's preferred language.

The survey was interviewer-administered by telephone using Qualtrics and conducted in English, Portuguese, or Cape Verdean Creole, depending on participants' language preferences. Survey measures were adapted from previously developed and published instruments and from items used in prior research on HPV, HPV vaccination, vaccine-related beliefs and behaviors, healthcare provider communication, and health information preferences. Measures requiring linguistic or cultural adaptation were translated and back-translated in Portuguese and Cape Verdean Creole and pilot-tested with members of the target population prior to data collection. Detailed information on survey development, translation and back-translation procedures, pilot testing, and the measures used in the parent study has been reported previously [12]. The present manuscript focuses on selected survey items and analyses addressing HPV vaccine information sources, trusted messengers, healthcare provider communication, interest in participating in an HPV educational program, and preferred delivery formats and language.

2.3. Measures

Participant Sociodemographic and Adolescent Characteristics. Participants reported age, sex, marital status, educational attainment, employment status, household income, health insurance coverage, primary language spoken at home, and years residing in the United States (Table 1). Acculturation was assessed using an adapted version of the Short Acculturation Scale for Hispanics (SASH) which assesses language use, media preferences, and ethnic social relationships [13]. The measure was adapted for use with Cape Verdean immigrant parents; however, its internal consistency reliability was not assessed in this sample. The adapted measure was categorized using the established cutoff. However, this cutoff has not been specifically validated for Cape Verdean immigrant populations, and the measure should therefore be interpreted cautiously in this population.

Participants also provided information about their adolescent selected as the index child, including age, sex, and birthplace. The index child was defined as the oldest adolescent aged 11–17 years in the family. For parents with more than one adolescent in this age range, the oldest age-eligible adolescent was selected as the index child. Parents reported HPV vaccination status and other HPV-related characteristics for this adolescent. HPV vaccination initiation was defined as parent-reported receipt of at least one dose of HPV vaccine. These characteristics were used to describe the study population and, where applicable, to examine differences according to interest in participating in an HPV educational program. Previously published findings from this sample are cited to the parent publication [12] and are not presented as novel findings in the present manuscript.

HPV Vaccine Information Sources and Trusted Messengers. Participants were asked whether they had previously heard of HPV and the HPV vaccine (Table 2). Those who reported receiving HPV vaccine information were asked to identify the sources from which they had received this information. Response options included healthcare providers, family or friends, Internet/websites, social media, television/radio/news, public health campaigns or organizations, schools, and other sources. Participants could select more than one source. These items were adapted from prior research examining HPV vaccine information sources among diverse parents and caregivers [14]. HPV awareness and HPV vaccine awareness have been reported previously for this sample [12] and are included here as background measures; the present analysis focuses on information sources and trusted messengers.

Awareness of HPV and the HPV vaccine and reported receipt of HPV vaccine information were assessed as separate measures. The source-specific percentages presented in Table 2 are calculated using the total study sample ($n = 166$), indicating the proportion of all participants who reported each source.

Participants were also asked which sources they trusted for HPV vaccine information. Response options included healthcare providers, family members, friends, public health authorities, Internet/websites, television/news, radio, newspapers/magazines, and other sources. Multiple responses were permitted. The inclusion of healthcare providers, personal networks, and media sources was informed by prior research examining HPV vaccine information-seeking and preferred information sources among diverse families [14].

For reporting purposes, conceptually similar source categories were combined where appropriate. Healthcare providers included doctors, nurses, and other healthcare professionals; family/friends included family members and friends; television/radio/news included television advertisements, television news, radio, and newspaper/magazine sources; and public health sources included public health campaigns and organizations.

Healthcare Provider Communication. Healthcare provider communication was assessed using questions adapted from prior studies examining HPV vaccine information sources, regular healthcare provider status, healthcare provider recommendations, and trust in healthcare providers [14–16] (Table 2). Questions addressed whether the index child had a regular healthcare provider, whether the provider had recommended HPV vaccination, and whether parents trusted their child's healthcare provider to discuss HPV and sexually transmitted infections. General trust in healthcare providers as a source of HPV vaccine information and trust in specific HPV vaccine recommendations by healthcare providers were assessed separately.

Participants also reported whether HPV vaccine information received from their healthcare provider was reliable or trustworthy, whether they felt they had sufficient information to make a vaccination decision, and whether they felt confident discussing HPV vaccination with a healthcare provider. All participants were administered these questions, regardless of whether they had previously received HPV vaccine information from a healthcare provider. A "not applicable" response was available for questions that did not apply to their experience. For descriptive analyses, percentages were calculated using the total sample ($n = 166$), with not-applicable responses retained in the denominator to reflect the proportion of the entire sample reporting each experience. The present analysis uses these items to characterize parents' experiences and perceptions of healthcare provider communication about HPV vaccination, rather than to repeat the previously published analyses of HPV vaccination-related outcomes [12].

HPV- and HPV Vaccine-Related Knowledge, Beliefs, Attitudes, and Social Influences. Participants were asked about HPV-related knowledge, beliefs, vaccine attitudes, social influences, and other factors relevant to HPV vaccination. These measures were used to characterize participants' knowledge, perceptions, and experiences related to HPV vaccination. Measures presented in Table 3 are reported on a 0–1 metric. Their interpretation depends on the specific construct being assessed.

Variables included HPV knowledge, perceived HPV susceptibility, perceived HPV severity, perceived HPV vaccine benefits, HPV vaccine safety concerns, sexual risk and stigma, community norms, peer norms, family norms and support, perceived child healthcare provider norms, trust in healthcare provider HPV vaccine recommendations, adherence to healthcare provider guidance concerning HPV vaccination, parent self-efficacy, HPV vaccine accessibility, and general vaccine attitudes.

These constructs addressed different dimensions of parents' HPV-related beliefs and social influences. Perceived HPV susceptibility referred to parents' perceptions of their adolescent's potential risk of HPV infection, whereas perceived HPV severity concerned their perceptions of the potential health consequences of HPV infection. Perceived HPV vaccine benefits and safety concerns addressed parents' views of the advantages and potential risks of HPV vaccination. Sexual risk and stigma reflected perceptions and concerns related to

the sexual transmission of HPV and the potential stigma surrounding HPV infection or vaccination. Community norms, peer norms, and family norms and support addressed perceived social expectations, influences, and support related to HPV vaccination.

HPV awareness, HPV and HPV vaccine knowledge, and vaccination-related behaviors were adapted from previously published measures [17–19]. Measures of HPV-related attitudes and beliefs were informed by previously developed instruments and prior research, including the Human Papillomavirus Attitudes and Beliefs Scale [20]. These measures were also informed by behavioral health frameworks, including constructs relevant to the Health Belief Model and social influences on vaccination. For the present study, these variables were examined as potentially relevant intervention targets rather than as components of a predictive model of HPV vaccination. These measures have been described in the parent publication [12]. In the present manuscript, selected measures are used to characterize the sample and compare parents according to interest in participating in an HPV educational program; previously published findings are not presented as new results.

Interest in HPV Education Program. Participants were asked whether they would be interested in participating in a brief HPV education program. Interest in participating in the program was a central outcome of the present analysis (Table 4). This measure was informed by previous studies examining immigrant parents' interest in HPV-related education and prevention research among Central American and Brazilian immigrant parents [21,22]. Responses were categorized as interested or not interested/unsure.

Preferred Intervention Delivery Format and Language. Parents whose adolescents had not initiated HPV vaccination and who expressed interest in participating in an HPV education program were asked how they would prefer to receive HPV vaccine education (Table 4). Delivery options included text messaging, Facebook, individual in-person education, website-based education with prerecorded video messages, group in-person education, and printed information using a photo-novela. These options were informed by prior research on parent preferences for vaccine communication and HPV vaccine interventions, including studies examining text messaging and other technology-based approaches [23–25].

Participants could select more than one delivery format. Responses were therefore summarized as multiple-response frequencies and percentages and were not expected to sum to 100%. Participants were also asked to identify their preferred language for receiving HPV vaccine education. Response options included Cape Verdean Creole, English, and Portuguese. Preferred language was assessed as a single-response item. These measures address the educational delivery preferences examined in the present manuscript and are intended to inform the future development of an HPV educational intervention for Cape Verdean immigrant families.

2.4. Statistical Analysis

Descriptive statistics were used to characterize the study population and summarize HPV vaccine information sources, trusted messengers, healthcare provider communication, interest in participating in an HPV educational program, and preferred intervention delivery formats and language. HPV and HPV vaccine awareness, which have been reported previously for this sample [12], are referenced as background characteristics rather than presented as novel findings. Continuous variables were summarized using means and standard deviations, and categorical variables were summarized using frequencies and percentages.

Among parents whose adolescents had not initiated HPV vaccination, sociodemographic characteristics and HPV-related knowledge, beliefs, attitudes, and social influences were compared according to interest in participating in an HPV education program. Independent-samples t tests were used to compare continuous variables, and chi-square or

Fisher's exact tests were used for categorical variables, as appropriate based on cell sizes and expected frequencies. This analysis included 115 parents, of whom 52 expressed interest in participating in an HPV education program and 63 were not interested or were unsure.

Among parents whose adolescents had not initiated HPV vaccination and who expressed interest in participating in an HPV education program, preferred intervention delivery formats and language were summarized using frequencies and percentages. Because participants could select more than one delivery format, responses were analyzed as multiple-response items and percentages were not expected to sum to 100%. This analysis included 52 parents.

Statistical tests were two-sided, and p values < 0.05 were considered statistically significant. Because the primary purpose of the analyses was formative and descriptive, statistically significant differences between parents interested and not interested or unsure were interpreted as potentially relevant characteristics for intervention targeting and content development rather than as causal or predictive factors. All statistical analyses were conducted using SAS 9.4 software [26].

3. Results

The study included 166 Cape Verdean immigrant parents of adolescents (Table 1). The mean parent age was 44.0 years (SD = 7.3), and parents were nearly evenly distributed by sex, with 49.4% female and 50.6% male. Most parents were married or living with a partner (78.3%), had at least a high school education (68.7%), were employed (89.8%), and had health insurance (89.2%). Cape Verdean Creole was the primary language spoken at home for 92.2% of participants. Parents had resided in the United States for a mean of 16.8 years (SD = 9.9), and 74.1% had lower acculturation scores.

The index adolescents had a mean age of 13.7 years (SD = 2.1); 71.7% were female, and 51.2% were born outside the United States. Additional sociodemographic and adolescent characteristics are presented in Table 1.

Table 1. Sociodemographic characteristics of Cape Verdean immigrant parents and their adolescents ($n = 166$).

Variable	Total Sample *n* (%)
Parent age, mean (SD)	44.0 (7.3)
Parent sex	
Female	82 (49.4%)
Male	84 (50.6%)
Marital status	
Married/living with partner	130 (78.3%)
Single/divorced/separated	36 (21.7%)
Educational level	
<High school	52 (31.3%)
≥High school	114 (68.7%)
Household income	
<$50,000	47 (28.3%)
≥$50,000	66 (39.8%)
Refused	53 (31.9%)

Table 1. *Cont.*

Variable	Total Sample *n* (%)
Employment status	
Employed	149 (89.8%)
Not employed	17 (10.2%)
Health insurance	
Yes	148 (89.2%)
No	18 (10.8%)
Primary language spoken at home	
Cape Verdean Creole	153 (92.2%)
English	13 (7.8%)
Years residing in the U.S., mean (SD)	16.8 (9.9)
Acculturation level	
<2.99	123 (74.1%)
≥2.99	43 (25.9%)
Index child age, mean (SD)	13.7 (2.1)
Index child sex	
Female	119 (71.7%)
Male	47 (28.3%)
Index child birthplace	
Outside the U.S.	85 (51.2%)
U.S.	81 (48.8%)
HPV vaccination initiation status of index adolescent	
Initiated HPV vaccination (at least one dose)	51 (30.7%)
Had not initiated HPV vaccination (zero doses)	115 (69.3%)
Healthcare provider recommended HPV vaccine, *n* (%)	66 (39.8%)

Values are presented as *n* (%). Percentages are calculated using the total study sample ($n = 166$). No missing data were present for the variables reported in this table. Percentages may not sum to 100% because of rounding.

3.1. HPV Vaccine Information Sources, Trusted Messengers, and Healthcare Provider Communication

Table 2 presents parents' reported sources of HPV vaccine information and trusted messengers. Percentages are based on the total sample ($n = 166$); because respondents could select multiple options, percentages are not expected to sum to 100%.

Awareness of HPV and HPV vaccination was limited, whereas healthcare providers were the predominant source of HPV vaccine information and the most frequently trusted source. Overall, 42.8% of parents reported having heard of HPV, and 40.4% reported having heard of the HPV vaccine. Separately, 74.7% reported receiving HPV vaccine information from at least one source. Healthcare providers were the most frequently reported source, with 69.3% of parents reporting that they had received HPV vaccine information from a healthcare provider. Other reported sources included family or friends (3.6%), television/radio/news (3.0%), social media (1.8%), and public health campaigns or organizations (0.6%). No parents reported receiving HPV vaccine information from Internet/websites, schools, or

other sources. Reported awareness of HPV or the HPV vaccine and reported receipt of HPV vaccine information represent different survey measures and are presented separately.

Healthcare providers were also the most frequently trusted source of HPV vaccine information, reported by 99.4% of parents. Other trusted sources included family members (9.6%), public health authorities (9.0%), and Internet/websites (5.4%).

Most parents reported that their adolescent had a regular healthcare provider (97.6%), and 97.0% reported trusting their child's healthcare provider to discuss HPV and sexually transmitted infections. However, these high levels of provider access and trust were not accompanied by consistently reported HPV vaccine communication. Only 39.8% reported that their healthcare provider had recommended HPV vaccination. When considered across the total sample, 48.8% reported that HPV vaccine information received from their healthcare provider was reliable or trustworthy, while 35.5% reported that they did not have sufficient information to make a vaccination decision. These percentages represent the proportion of the total sample reporting each experience, rather than the proportion among parents who reported receiving HPV vaccine information from an HCP. Although 77.7% reported being confident discussing HPV vaccination with a healthcare provider, these findings indicate an opportunity to strengthen the delivery and perceived adequacy of HPV vaccine information and parent–provider communication (Table 2).

Table 2. HPV Information Sources, Trusted Messengers, and Healthcare Provider Communication Among Cape Verdean Immigrant Parents (n = 166; applicable responses n = 115 for two provider communication items).

Variables	*n*	%
Awareness of HPV and HPV vaccine (n = 166)		
Heard of HPV	71	42.8
Heard of HPV vaccine	67	40.4
HPV vaccine information sources (n = 166)		
Received HPV vaccine information from any source	124	74.7
Received HPV vaccine information from healthcare provider *	115	69.3
Received HPV vaccine information from family/friends *	6	3.6
Received HPV vaccine information from Internet/websites	0	0.0
Received HPV vaccine information from social media	3	1.8
Received HPV vaccine information from television/radio/news *	5	3.0
Received HPV vaccine information from public health campaign/organization *	1	0.6
Received HPV vaccine information from school	0	0.0
Received HPV vaccine information from other sources	0	0.0
Trusted messengers for vaccine information (n = 166)		
Trusted healthcare provider	165	99.4
Trusted family members	16	9.6
Trusted friends	0	0.0
Trusted public health authorities	15	9.0
Trusted Internet/websites	9	5.4

Table 2. *Cont.*

Variables	*n*	%
Trusted television/news	2	1.2
Trusted radio	1	0.6
Trusted newspapers/magazines	0	0.0
Trusted other sources	0	0.0
Provider communication ($n = 166$)		
Index child has a regular healthcare provider	162	97.6
HCP recommended HPV vaccine	66	39.8
Trusted child's HCP to discuss HPV/STIs	161	97.0
HPV vaccine information from HCP was reliable/trustworthy ($n = 115$)	81	48.8
Did not have sufficient HPV vaccine information to decide about vaccination ($n = 115$)	59	35.5
Confident discussing HPV vaccine with a healthcare provider	129	77.7

Values are presented as *n* (%). Percentages may not sum to 100% because some questions allowed multiple responses. Percentages for awareness, information sources, and trusted messengers are calculated using the total sample ($n = 166$). For provider communication items, the denominator is $n = 166$, except for the two items concerning the reliability of HCP-provided HPV vaccine information and the sufficiency of information for making a vaccination decision, for which the denominator is $n = 115$ applicable respondents; 51 participants selected "not applicable" for each item. HCP = healthcare provider; HPV = human papillomavirus. * Indicates combined categories of conceptually similar information sources, as described in the Methods Section.

3.2. Interest in HPV Education Among Parents Whose Adolescents Had Not Initiated HPV Vaccination

Among the 115 parents whose adolescents had not initiated HPV vaccination, 52 (45.2%) reported that they were interested in participating in an HPV education program, whereas 63 (54.8%) were not interested or were unsure. Interested parents had resided in the United States for fewer years than parents who were not interested or unsure (mean 14.13 vs. 19.81 years; $p = 0.005$). A greater proportion of interested parents were female (53.9% vs. 34.9%), and this difference was statistically significant ($p = 0.04$).

Parent age and educational attainment did not differ significantly between the groups. Household income also did not differ significantly ($p = 0.11$); household income was not reported by 26 parents (41.3%) in the not interested/unsure group and 17 parents (32.7%) in the interested group.

Several HPV-related knowledge, beliefs, and social influence measures differed according to interest in education. Parents who were interested in an HPV education program reported lower HPV knowledge scores than those who were not interested or were unsure (mean 0.16 vs. 0.23; $p = 0.03$). They also reported lower perceived HPV vaccine benefits (0.31 vs. 0.46; $p = 0.03$), lower sexual risk and stigma scores (0.16 vs. 0.33; $p = 0.02$), lower family norms and support related to HPV vaccination (0.23 vs. 0.48; $p = 0.008$), and lower trust in HPV vaccine recommendations by HCPs (0.25 vs. 0.43; $p = 0.049$).

No statistically significant differences were observed between the groups in perceived HPV susceptibility or severity, vaccine safety concerns, community norms, peer norms, perceived child healthcare provider norms, adherence to healthcare provider guidance, parent self-efficacy, HPV vaccine accessibility, or general vaccine attitudes. HPV vaccine recommendation also did not differ significantly between groups ($p = 0.13$), although the

proportion reporting a recommendation was numerically higher among parents who were not interested or were unsure (17.0% vs. 8.0%) (Table 3).

Table 3. Differences in Sociodemographic Characteristics, HPV-Related Knowledge and Beliefs, and Social Influences by Interest in HPV Vaccine Education (n = 115).

Characteristics	Not Interested/Unsure (n = 63)	Interested (n = 52)	p-Value
Sociodemographic characteristics			
Parent age, mean ± SD	46.00 ± 7.28	44.00 ± 7.47	0.15
Female parent, n (%)	22 (34.9)	28 (53.9)	0.04 *
Education ≥ high school, n (%)	38 (60.3)	33 (63.5)	0.73
Household income, n (%)			
<$50,000	11 (17.5)	18 (34.6)	0.11
≥$50,000	26 (41.3)	17 (32.7)	
Refused	26 (41.3)	17 (32.7)	
Years in U.S., mean ± SD	19.81 ± 10.30	14.13 ± 10.09	0.005 **
HPV knowledge and beliefs			
HPV knowledge score, mean ± SD	0.23 ± 0.22	0.16 ± 0.20	0.03 *
HPV susceptibility, mean ± SD	0.43 ± 0.45	0.33 ± 0.44	0.13
HPV severity, mean ± SD	0.61 ± 0.46	0.49 ± 0.49	0.21
HPV vaccine benefits, mean ± SD	0.46 ± 0.41	0.31 ± 0.37	0.03 *
HPV vaccine safety concerns, mean ± SD	0.39 ± 0.23	0.31 ± 0.20	0.07
Sexual risk and stigma, mean ± SD	0.33 ± 0.39	0.16 ± 0.28	0.02 *
Social influences and cues to action			
Community norms, mean ± SD	0.30 ± 0.46	0.19 ± 0.40	0.19
Parent-reported peer norms, mean ± SD	0.33 ± 0.43	0.21 ± 0.36	0.13
Parent-reported family norms and support, mean ± SD	0.48 ± 0.50	0.23 ± 0.43	0.008 **
Parent-reported perceived child HCP norm, mean ± SD	0.54 ± 0.50	0.42 ± 0.50	0.22
HCP HPV vaccine recommendation, mean ± SD	11 (17.5)	11 (17.5)	0.13
Trust in HPV vaccine recommendation by HCP, mean ± SD	27 (42.9)	27 (42.9)	0.045 *
Adherence to HCP guidance concerning HPV vaccination, mean ± SD	31 (49.2)	31 (49.2)	0.12
Self-efficacy and access			
Parent-reported self-efficacy, mean ± SD	0.57 ± 0.46	0.59 ± 0.45	0.86
HPV vaccine accessibility, mean ± SD	0.54 ± 0.20	0.56 ± 0.19	0.69
General vaccine attitudes, mean ± SD	0.70 ± 0.16	0.72 ± 0.20	0.46

Note. Continuous variables are presented as mean ± standard deviation (SD), and categorical variables as number and percentage. HCP = healthcare provider. The three HCP-related measures have been changed from mean ± SD to n (%). Their displayed frequencies are provisional estimates inferred from the rounded means in the original table and must be verified against the final dataset. Their p-values also require recalculation using appropriate categorical tests. * $p < 0.05$; ** $p < 0.01$.

3.3. Preferred Intervention Delivery Format and Language

Among the 52 parents whose adolescents had not initiated HPV vaccination who expressed interest in participating in an HPV education program, text messaging was the most frequently selected delivery format (55.8%), followed by Facebook (38.5%) and website-based education with prerecorded video messages (19.2%). Other preferences included individual in-person education (17.3%), group in-person education (11.5%), and printed information using a photo-novela (9.6%).

Cape Verdean Creole was the most frequently preferred language for HPV education (68.6%), followed by English (27.5%) and Portuguese (3.9%). One participant had missing or not-applicable information for preferred language. Because delivery format was a multiple-response item, percentages do not sum to 100% (Table 4).

Table 4. Preferred Formats and Languages for HPV Vaccine Education Among Parents Interested in HPV Education ($n = 52$).

Intervention Preferences	Interested Parents *n* (%)
Preferred intervention format/channel	
Individual in-person education	9 (17.3)
Group in-person education	6 (11.5)
Text messaging	29 (55.8)
Website-based education with prerecorded video messages	10 (19.2)
Facebook	20 (38.5)
Printed information using photo-novela	5 (9.6)
Preferred language ($n = 51$)	
Cape Verdean Creole	35 (68.6)
Portuguese	2 (3.9)
English	14 (27.5)

Values are presented as *n* (%). Parents were classified as interested if they responded "yes" to participation in a brief HPV education program. Intervention delivery methods/channels were assessed using a multiple-response item; therefore, percentages do not sum to 100%. Preferred language was assessed using a single-response item. Percentages for preferred language are calculated using valid responses ($n = 51$); one respondent had missing information for preferred language.

4. Discussion

This formative study examined the HPV vaccine communication process among Cape Verdean immigrant parents of adolescents, including information sources, trusted messengers, healthcare provider (HCP) communication, and preferred channels and language for HPV education. The findings point to an important disconnect between parents' access to and trust in HCPs and the consistency and perceived adequacy of HPV vaccine communication. As previously reported [12], fewer than half of parents had heard of HPV or the HPV vaccine, despite nearly universal access to a regular healthcare provider and high levels of trust in HCPs. Only 39.8% reported receiving an HPV vaccine recommendation, fewer than half considered HCP-provided information reliable or trustworthy, and more than one-third reported insufficient information to make a vaccination decision. Similar challenges have been documented in other African immigrant populations. For example, qualitative research with East African immigrant mothers identified limited HPV vaccine knowledge and concerns about vaccine safety and side effects as important barriers, while comprehensive information and strong HCP recommendations were described as facilitators of vaccina-

tion [26]. Although Cape Verdean and East African immigrant communities are culturally distinct, these findings underscore the importance of accessible, culturally appropriate information and clear HCP communication in supporting informed vaccination decisions.

Among parents whose adolescents had not initiated HPV vaccination, differences in selected HPV-related knowledge, beliefs, social influences, and years of U.S. residence were observed according to interest in HPV education. Among parents interested in participating in an educational program, text messaging was the most frequently preferred delivery format, and Cape Verdean Creole was the most frequently preferred language. Together, these findings suggest that intervention development should address not only information gaps but also the sources, interpersonal communication processes, language, and channels through which HPV vaccine information is delivered and received.

Another important finding was the apparent discrepancy between parents' reported awareness of HPV and the HPV vaccine and their reported exposure to HPV vaccine information. Although fewer than half of parents had heard of HPV or the HPV vaccine, nearly three-quarters reported receiving HPV vaccine information from at least one source. These measures capture different aspects of participants' experiences and should not be interpreted as equivalent indicators of awareness or understanding. Receiving information does not necessarily mean that individuals recognize or recall it as specifically related to HPV or HPV vaccination. This distinction highlights the importance of differentiating exposure to health information from awareness when assessing communication needs.

Healthcare provider communication was particularly noteworthy. Although nearly all parents reported that their adolescent had a regular healthcare provider and trusted their provider to discuss HPV and sexually transmitted infections, HPV vaccine communication appeared limited. Only 39.8% reported receiving an HPV vaccine recommendation. Among parents for whom the HCP information reliability question was applicable ($n = 115$), 70.4% considered the information reliable or trustworthy, while 51.3% reported that they did not have sufficient information to make a vaccination decision. These findings suggest that access to and general trust in healthcare providers do not necessarily translate into consistent or sufficiently informative HPV vaccine communication. Our previous qualitative study among Cape Verdean immigrant parents similarly identified healthcare providers as important and trusted sources of HPV vaccine information while highlighting concerns about limited or unclear provider communication [11]. Together, these findings suggest that established healthcare relationships offer an important opportunity to strengthen HPV vaccine communication by ensuring that recommendations are clear and that information adequately addresses parents' questions and concerns [21].

Importantly, general trust in healthcare providers as sources of health information should be distinguished from trust in their specific HPV vaccine recommendations. Although nearly all parents identified healthcare providers as trusted information sources and reported trusting their child's provider to discuss HPV and sexually transmitted infections, these measures do not necessarily reflect trust in a specific HPV vaccine recommendation. The lower mean score for trust in HPV vaccine recommendations among parents interested in education further illustrates this distinction. Thus, an established and trusted healthcare relationship, while important, may not be sufficient to ensure that HPV vaccine recommendations are perceived as trustworthy and informative. Strengthening communication may require attention not only to whether recommendations are made, but also to how clearly, they are communicated and whether the information adequately addresses parents' questions and supports informed vaccination decisions.

Research involving other African immigrant populations provides additional support for addressing both parent and provider communication. East African immigrant mothers have emphasized the importance of direct provider engagement, comprehensive informa-

tion, and strong HPV vaccine recommendations [27–30]. A culturally tailored intervention delivered by co-ethnic healthcare providers improved HPV vaccine knowledge, attitudes, and intentions to vaccinate, although these improvements did not clearly translate into increased vaccination uptake [27]. Similarly, a provider-focused intervention improved healthcare providers' confidence in making strong HPV vaccine recommendations and addressing culturally specific concerns [31]. Together, these studies suggest that parent-facing education and provider communication are complementary intervention targets. However, improvements in knowledge and vaccination intentions alone may not be sufficient to increase vaccine uptake.

Nearly half of parents whose adolescents had not initiated HPV vaccination expressed interest in participating in an HPV education program. Compared with parents who were not interested or unsure, those interested in education had lower HPV knowledge, lower perceived vaccine benefits, lower sexual risk and stigma scores, lower family norms and support related to HPV vaccination, and lower trust in HCP recommendations. Interest was also more common among parents with fewer years of residence in the United States.

These differences point to potential areas for intervention but should not be interpreted as factors that predict interest in HPV education or vaccination. Lower perceived vaccine benefits among interested parents suggest an opportunity to provide clearer information about the benefits of HPV vaccination and its role in cancer prevention. Similarly, lower family norms and support suggest that vaccination decisions may extend beyond individual knowledge and attitudes. Educational approaches could therefore incorporate opportunities for parents to discuss HPV vaccination with family members and healthcare providers, while addressing informational needs and social influences.

The lower trust in HPV vaccine recommendations among parents interested in education also highlights the potential value of complementary information sources. Community health workers, co-ethnic educators, and trusted community or faith leaders may offer additional opportunities to discuss HPV vaccination in culturally and linguistically responsive ways. These messengers could complement HCP communication by reinforcing vaccine information, addressing questions and concerns, and extending educational outreach beyond clinical settings. Although the present study did not directly assess parents' preferences for these alternative messengers, their potential role warrants consideration in future intervention development.

Family and social influences have also been described among East African immigrant mothers, for whom family considerations, cultural beliefs, and social influences shaped perceptions of HPV vaccination [21,27,28]. These parallels provide useful context for understanding the role of family and social influences in HPV vaccination decisions among immigrant families, while recognizing that findings from one African immigrant population should not be assumed to apply directly to another.

The shorter duration of U.S. residence among parents interested in education may have implications for intervention outreach and delivery. Although the cross-sectional design prevents conclusions about why this difference was observed, it may reflect variation in familiarity with the U.S. healthcare system, preventive healthcare practices, or available health information. Migration experience and time in the United States may therefore be useful considerations when designing outreach strategies and tailoring educational approaches.

The representation of fathers in this study is noteworthy. Approximately half of respondents were fathers, and fathers were less likely than mothers to express interest in participating in an HPV education program. Although the study was not designed to examine the reasons for this difference, the finding highlights the importance of considering how to engage fathers in HPV vaccine education. Educational approaches may benefit from addressing fathers' questions and concerns, recognizing their role in family health

decisions, and using communication channels and messages that are accessible and relevant to both mothers and fathers.

Another notable characteristic was the sex distribution of the index adolescents, 71.7% of whom were girls. This distribution may have been influenced by the selection of the oldest age-eligible adolescent in each family, the composition of participating families, or other sample selection factors; however, the study was not designed to determine the reasons for this imbalance. The underrepresentation of boys is important because HPV vaccination is recommended for adolescents of all sexes. Future educational interventions should ensure that messages address HPV-related health risks and vaccination benefits for both girls and boys and emphasize the importance of HPV vaccination regardless of an adolescent's sex.

More than half of the index adolescents were born outside the U.S. Parents' and adolescents' previous experiences with healthcare systems and vaccination programs in Cape Verde or other countries of birth or residence may have influenced their awareness, knowledge, and perceptions of HPV vaccination. However, the present study did not assess participants' prior exposure to HPV vaccination programs, country-specific vaccination policies, or experiences with HPV vaccination before arriving in the United States. Therefore, we cannot determine whether these experiences contributed to the findings. Future research should examine how prior vaccination experiences and differences in national vaccination policies may shape HPV vaccine awareness and decision-making among immigrant families.

Parents' preferences provide practical guidance for intervention development. Text messaging was the most frequently selected delivery format, followed by Facebook and website-based education with prerecorded video messages. Individual in-person education was the next most frequently selected format, followed by group in-person education and printed photo-novela information. These preferences suggest that a flexible, multichannel approach may be appropriate, combining accessible digital communication with opportunities for interpersonal interaction. Text messaging and social media could facilitate initial exposure to information, reminders, and brief educational messages, whereas individual or group-based approaches could provide opportunities for parents to ask questions, clarify information, and discuss concerns with healthcare providers or trained community educators [27].

Language preferences were also important. More than two-thirds (68.6%) of interested parents preferred Cape Verdean Creole, while 27.5% preferred English and 3.9% preferred Portuguese. Providing materials in both Cape Verdean Creole and English may therefore be preferable to assuming that English-language materials are sufficient. The strong preference for Cape Verdean Creole underscores the importance of linguistic accessibility in culturally responsive intervention development [31–33]. Research among other African immigrant populations has similarly emphasized the importance of preferred-language and culturally appropriate HPV vaccine communication [27,29–34].

Limitations

This study has several limitations. Its cross-sectional design precludes conclusions about causal relationships between HPV-related beliefs and interest in education. Measures were self-reported and may be subject to recall or social desirability bias. Additionally, healthcare providers may discuss HPV vaccination directly with adolescents during clinical encounters, including conversations that occur without parents present. Because this study relied on parent-reported information, parents may not have been aware of all discussions between their adolescents and healthcare providers, which may have affected their reports of HPV vaccine communication and recommendations. The sample was drawn primarily from the northeastern United States and may not represent all Cape Verdean immigrant families. The subgroup analysis of parents whose adolescents had not initiated HPV vaccination

was relatively small, limiting statistical power to detect smaller differences. Accordingly, the group comparisons should be interpreted as formative and descriptive rather than as evidence of independent predictors of intervention interest. Income comparisons should also be interpreted cautiously because 43 of the 115 parents in the analytic subgroup did not report household income. Furthermore, awareness of HPV and the HPV vaccine and reported receipt of HPV vaccine information were self-reported measures that capture different aspects of participants' experiences; the study did not assess whether information received was subsequently recognized, understood, or retained.

Several limitations should be considered when interpreting the intervention delivery preferences. These preferences were assessed only among parents whose adolescents had not initiated HPV vaccination and who expressed interest in participating in an HPV education program ($n = 52$). Consequently, the findings do not reflect the preferences of parents who were unsure about participating or those who were not interested in education. Parents whose adolescents had initiated HPV vaccination, but who might still require additional doses, were also not included in the preference assessment. Because parents who were unsure and those who were not interested were combined in the present analysis, their potentially different perspectives could not be examined separately.

The delivery options presented were not exhaustive. Our previous qualitative study among Cape Verdean immigrant parents identified WhatsApp, community radio, and community events as potentially relevant channels for HPV vaccine information [11]. However, WhatsApp, community radio, and healthcare provider-delivered education were not listed as separate options in the present survey, although these channels may be relevant to Cape Verdean families. In addition, the study did not distinguish between conventional text messaging (SMS) and messaging applications such as WhatsApp. Therefore, it is unclear whether participants interpreted the text messaging option to include these applications. The omission of specific channels may have influenced the preferences reported. Future research should assess a broader range of communication platforms and educational approaches among parents with different levels of interest in HPV education and across adolescent vaccination-status groups.

Additionally, multiple comparisons were conducted across the HPV-related knowledge, beliefs, attitudes, and social influence measures without adjustment for multiple testing. Given the exploratory and formative nature of this analysis, findings with p-values near the conventional significance threshold should be interpreted cautiously. Some statistically significant differences may reflect chance findings, and the results should be viewed as preliminary rather than definitive evidence of differences between groups. Finally, acculturation was assessed using an adapted version of the Short Acculturation Scale for Hispanics, an instrument originally developed for Hispanic populations. Although the measure provided an indicator of acculturation-related characteristics in this sample, its psychometric properties and the applicability of the established cutoff have not been specifically validated among Cape Verdean immigrant parents. The internal consistency reliability of the adapted SASH was not assessed in this sample, and the measure has not been validated specifically for Cape Verdean immigrant populations. Consequently, acculturation findings should be interpreted cautiously.

5. Conclusions

This study identified important opportunities to strengthen HPV vaccine communication and education among Cape Verdean immigrant parents of adolescents. Findings highlight gaps in HPV vaccine awareness and communication despite high levels of healthcare provider access and general trust, as well as differences in HPV-related knowledge, beliefs, family and social influences, and years of U.S. residence according to interest in

participating in an educational program. Parents' preferences for text messaging and Cape Verdean Creole provide practical guidance for intervention development and underscore the importance of accessible, culturally and linguistically responsive communication. Future research should engage Cape Verdean families, community stakeholders, and healthcare providers in developing and evaluating a multichannel HPV vaccine education intervention that combines accessible digital information with opportunities for interpersonal communication, strengthens the delivery of clear and actionable vaccine recommendations, and supports informed decision-making and adolescent HPV vaccination.

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Institutional Review Board Statement: This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki, which provides ethical guidelines for medical research involving human participants. All procedures involving human participants were approved by the University of Massachusetts Boston under protocol number IRB Protocol #3282, approved 9 August 2023 for studies involving humans. To protect participant confidentiality, all data were anonymized and stored securely, accessible only to the research team.

Informed Consent Statement: Informed consent was obtained from all participants prior to their inclusion in the study. Participants were provided with detailed information about the study's purpose, procedures, potential risks, and benefits, and were assured that participation was voluntary and that they could withdraw at any time without penalty. Consent was obtained in the participants' preferred language (Cape Verdean Creole, Portuguese or English) to ensure that they had a clear understanding of the information provided.

Data Availability Statement: Due to privacy or ethical restrictions, the data that support the findings of this analysis are not publicly available; however, they are available upon request from the corresponding author.

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Abbreviations

The following abbreviations are used in this manuscript:

U.S.	United States
HPV	Human papillomavirus
SD	Standard deviation
HCP	Healthcare provider

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