Research Article
Correlates of Cervical Cancer Screening among Vietnamese American Women

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Objective. Vietnamese American women are at the greatest risk for cervical cancer but have the lowest cervical cancer screening rates. This study was to determine whether demographic and acculturation, healthcare access, and knowledge and beliefs are associated with a prior history of cervical cancer screening among Vietnamese women.

Methods. Vietnamese women (n = 1450) from 30 Vietnamese community-based organizations located in Pennsylvania and New Jersey participated in the study and completed baseline assessments. Logistic regression analyses were performed.

Results. Overall levels of knowledge about cervical cancer screening and human papillomavirus (HPV) are low. Factors in knowledge, attitude, and beliefs domains were significantly associated with Pap test behavior. In multivariate analyses, physician recommendation for screening and having health insurance were positively associated with prior screening.

Conclusion. Understanding the factors that are associated with cervical cancer screening will inform the development of culturally appropriate intervention strategies that would potentially lead to increasing cervical cancer screening rates among Vietnamese women.

1. Introduction

Asian Americans comprise the fastest growing immigrant population in the United States (USA) and currently number about 18 million or 6% of the total USA population [1]. Vietnamese Americans represent the fourth largest subgroup of Asian Americans with 1.6 million individuals [2]. A significant proportion of Vietnamese Americans experience serious socioeconomic difficulties, and those residing in the eastern region of the USA report higher levels of poverty and lower levels of educational achievement as compared with other Asian subgroups nationwide or the USA population [3, 4]. Studies have shown that Vietnamese Americans also have higher rates of certain types of cancers [5]. In comparison to other racial and ethnic groups in the USA, Vietnamese women experience the highest incidence rate of invasive cervical cancer [5, 6]. Due to potential underreporting, the cancer incidence rates among Vietnamese women may be higher [7].

Over the past few decades, significant advances in cervical cancer early detection and prevention have benefitted a large subset of the USA female population by reducing the incidence, prevalence, and mortality rates of this disease; however, these rates have remained elevated in certain population subgroups [8]. These disparities in cervical cancer incidence rates have been attributed, in part, to differences in screening uptake. For example, cervical cancer screening rates are dramatically lower among Vietnamese
American women compared to women in other ethnic and racial subgroups [9], with a prior study reporting that 1 in 3 Vietnamese women had never had a Papanicolaou (Pap) test [10]. Considering the high rates of cervical cancer among Vietnamese American women [5, 6], cervical cancer screening is a critical public health priority. However, there is a lack of knowledge on how to approach this health issue effectively in this population.

Previous studies have indicated that there are substantial barriers that prevent Vietnamese American women from obtaining Pap tests. In addition to the perceived invasive nature of the Pap test itself, Vietnamese women share with other members of their communities common, often insurmountable barriers, including cultural (modesty), linguistic (limited or no English proficiency), and socioeconomic (poverty) barriers and a pervasive unfamiliarity with the USA healthcare system [11–14]. Although each of these barriers has been found to be associated with screening rates in other populations, the impact of these barriers is more profound on this hard-to-reach ethnic group [9, 15, 16]. Evidence of the profound impact of these barriers is indicated by the fact that a substantial majority of Vietnamese (75%) residing in the eastern USA are either medically underserved or uninsured and are not participating in mainstream screening and prevention programs [10]. Thus, screening rates in this subgroup are very low [10]. Even though prior studies of cancer screening behaviors have been conducted among Vietnamese Americans residing in the western or southern USA, studies suggest that there are significant geographic variations in cancer screening behaviors and incidence rates [17, 18]. Hence, there is a need for a better understanding of how these various factors may be associated with cervical cancer screening behaviors of Vietnamese American women residing in the eastern USA, which will inform the development of appropriate strategies that would facilitate the participation of these communities in lifesaving intervention and early detection programs in order to reduce such disparities and improve accessibility and quality of health care for this population.

We have been conducting one of the largest randomized community cancer intervention trials, aimed to increase cervical cancer screening and reduce health system access barriers among medically underserved and low-income Vietnamese women. This randomized controlled trial (RCT) is a five-year study conducted at 30 Vietnamese community organizations in the eastern region of the USA (PA, NJ). The intervention trial, guided by a conceptual framework derived from the Health Belief Model (HBM) and Social Cognitive Theory (SCT), addresses both individual choices and healthcare system barriers. An overview of the intervention trial and primary results will be reported in a separate publication. The purpose of this paper is to analyze the baseline data in order to: (a) determine whether demographic, health access, and KAB (knowledge, attitudes, and beliefs) factors are associated with prior history of cervical cancer screening among Vietnamese American women and (b) to identify important factors that inform the development of culturally appropriate intervention strategies that would lead to reducing cervical cancer screening disparity among Vietnamese women.

2. Methods

2.1. Study Sites and Participants. The Center for Asian Health (Center) has an enduring collaborative relationship with over 250 Asian American organizations represented by the Asian Community Health Coalition (ACHC), a nonprofit 501(c)(3) umbrella organization, established concurrently with the Center in 2000. The Vietnamese community-based organizations (VCOs) included in this study as part of the Coalition serve important social functions, and they represent the ideal milieu for obtaining information on accessibility to needed health services. Their unique status in these communities underscores their importance as an ideal avenue for recruiting community-based participants for the study and intervention delivery. In the present study, participant recruitment took place at 30 Vietnamese CBOs. The CBOs varied in size, with the number of female Vietnamese members in each of these 30 organizations ranging from between 80 to 2500 women. The average age of study participants was 52 years (range: 20 to 70 years). About 42 Vietnamese community leaders were involved in the study. Specifically, they were directly involved in the planning, development, and implementation of the project.

Vietnamese women (n = 1949) were recruited from participating community-based Vietnamese community organizations (n = 30) and assessed for study eligibility. Of the total recruited and assessed, 1518 met the inclusion criteria of self-identified Vietnamese identity, ages 18 to 70, had not had a Pap-test over the past 12 months, and had not been diagnosed with cervical cancer. Of the total eligible women, 1450 consented, completed the baseline survey, and are included in the data analysis for this paper. Participants were compensated $30 for participating in this study. The study was approved by the Temple University Institutional Review Board.

2.2. Data Collection Procedures. Prior to project implementation, community leaders and volunteers participated in training sessions focused on the revision/translation of project aims and significance to Vietnamese women, recruitment strategies, and guidelines for administration of the research instrument as well as data collection, accuracy, and confidentiality. All measures in English were translated, back-translated, and pretested in Vietnamese to ensure the scientific and cultural appropriateness of the instrument for community Vietnamese participants. The 20–30-minute baseline survey was provided in Vietnamese and English versions, and bilingual assistance was available at all sites.

2.3. Measures. The measures collected at baseline assessment include (1) demographics and acculturation; (2) health care access; (3) health behavior and Pap test history; (4) perceptions related to health belief model constructs; (5) knowledge, attitudes, and beliefs of Vietnamese women about cervical cancer; (6) human papillomavirus (HPV-) related...
questions. Our research team investigators hypothesized that these factors mentioned above would affect cervical cancer screening behaviors by serving as either barriers or facilitators to health-seeking behavior change. This paper primarily examines the association of demographic and acculturation characteristics (measured using 8 items), healthcare access barriers (6 items), and knowledge, attitudes, and beliefs about cervical cancer screening (13 items) and HPV-specific knowledge (10 items) with ever having had a Pap test. These measures were validated in a number of our previous studies [10, 13, 19–21]. The findings of HBM constructs and other variables’ association with cervical cancer screening behaviors are being reported in a separate publication [22].

2.4. Statistical Analyses Plan. Univariate logistic regression was used to examine the association between the probability of ever having had a Pap smear test and each variable in the domains of demographic variables, access barriers, knowledge, attitude, and beliefs about cervical cancer. The strength of association was expressed as odds ratio and its 95% confidence interval. Both unadjusted odds ratio and odds ratio adjusted for demographic variables were reported. To examine whether variables in a domain contributed
Among demographic variables (Table 1), Vietnamese women in the 18–40 age group, who did not speak English at all, were unemployed, never married or divorced/separated, had below high school education, and lived in the USA 10 years or less, were less likely to have had a Pap smear test \( (P < 0.01) \) as compared to their peers. Women who were born in the USA, lived in the USA for more than 20 years and had some English reading ability, had a greater likelihood of having ever received a Pap smear test \( (P < 0.01) \). In multivariate analyses, younger age, lower education, unemployment, being married, English speaking ability, and country of birth remained significantly associated with prior Pap test behavior.

With regard to access barriers (Table 2), Vietnamese women who did not have insurance, did not visit a physician regularly or could not get time off for a doctor's appointment were less likely to have ever had a Pap test \( (P < 0.001) \), while women who had received a doctor recommendation for a Pap test, who visited doctors speaking English or both English and Vietnamese or who did not have a preference regarding the gender of their doctors, were likely to have had a Pap test in the past \( (P < 0.001) \). Specifically, receiving a doctor's recommendation for a Pap test was the strongest predictor of obtaining a Pap test (adjusted OR = 9.00, 95% CI = 5.60–14.44, \( P < 0.001 \)), with 87.6% of those who received a recommendation reporting that they had had a Pap test compared to 46.4% of those who had not received a doctor's recommendation for testing. Insurance was the second strongest factor (adjusted OR = 3.41, 95% CI = 2.64–4.39, \( P < 0.001 \)), nearly doubling the Pap test rate (67.5% versus 35.2%).

All 11 items in the knowledge, attitude, and beliefs domain were significantly associated with Pap test behavior \( (P < 0.001) \) (Table 3). In particular, it should be noted that the majority of women (65.8%) held the belief that you only see doctors when you're sick, whereas relatively few women believed that women older than 21 should be regularly screened (38.2%) and that screening was necessary for women not engaging in sexual activities (26.1%). Further, knowledge of cervical cancer symptoms was low in this group, and only 22.7% had ever heard of HPV. In univariate analyses, women with a belief that cancer can be cured if detected early, belief that a Pap test can detect cancer early and prolong time, belief that women over age 21 should have a Pap test regularly, or belief that cancer incidence increases with age, were about twice as likely to have had a Pap test compared to women who did not hold these beliefs.
### Table 3: Associations between Papanicolaou (PAP) testing and knowledge, attitudes, and beliefs.

| Beliefs                                                                 | Total | Ever had a Pap test | Unadjusted odds ratios | Adjusted odds ratios |
|------------------------------------------------------------------------|-------|---------------------|------------------------|----------------------|
|                                                                        |       | Yes (%) | No (%) | Point estimate | 95% CI       | Yes (%) | No (%) | Point estimate | 95% CI       |
| **God or higher power controls cancer**                                |       | 764     | 662    | 46.42         | ******        | 764     | 662    | 46.42         | ******        |
| Yes                                                                    | 21.0  | 148     | 151    | 50.50         | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 41.1  | 262     | 325    | 55.37         | 0.82          | 0.62~1.09| 0.81  | 0.59~1.09|
| No                                                                     | 37.8  | 354     | 186    | 34.44         | 1.94***       | 1.46~2.59| 2.06***| 1.49~2.84|
| **Can have cancer but no symptoms**                                    |       | 762     | 662    | 46.49         | ***           | 762     | 662    | 46.49         | ***           |
| Yes                                                                    | 21.0  | 148     | 49.50  | 141           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 41.1  | 262     | 44.63  | 325           | 0.82          | 0.62~1.09| 0.81  | 0.59~1.09|
| No                                                                     | 37.8  | 354     | 65.56  | 186           | 1.94***       | 1.46~2.59| 2.06***| 1.49~2.84|
| **See doctor only when sick**                                          |       | 762     | 662    | 46.49         | ***           | 762     | 662    | 46.49         | ***           |
| Yes                                                                    | 65.8  | 459     | 48.93  | 479           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 10.8  | 68      | 44.16  | 86            | 0.83          | 0.59~1.16| 0.94  | 0.64~1.39|
| No                                                                     | 23.3  | 235     | 70.78  | 97            | 2.53***       | 1.93~3.31| 3.03***| 2.21~4.18|
| **Cancer can be cured if detected early**                              |       | 765     | 662    | 46.39         | ***           | 765     | 662    | 46.39         | ***           |
| Yes                                                                    | 49.0  | 478     | 68.48  | 220           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 47.3  | 268     | 39.64  | 408           | 0.30***       | 0.24~0.38| 0.31***| 0.24~0.40|
| No                                                                     | 3.7   | 19      | 35.85  | 34            | 0.26***       | 0.14~0.46| 0.27***| 0.14~0.52|
| **Women 21 or older should have Pap test regularly**                   |       | 765     | 655    | 46.13         | ***           | 765     | 655    | 46.13         | ***           |
| Yes                                                                    | 38.2  | 389     | 71.77  | 153           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 54.8  | 337     | 43.26  | 442           | 0.30***       | 0.24~0.38| 0.29  | 0.22~0.38|
| No                                                                     | 7.0   | 39      | 39.39  | 60            | 0.26***       | 0.16~0.40| 0.27***| 0.17~0.45|
| **Pap test necessary for women not engaging in sexual activities**     |       | 764     | 660    | 46.35         | ***           | 764     | 660    | 46.35         | ***           |
| Yes                                                                    | 26.1  | 265     | 71.24  | 107           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 64.0  | 428     | 46.93  | 484           | 0.36***       | 0.28~0.46| 0.32***| 0.23~0.43|
| No                                                                     | 9.8   | 71      | 50.71  | 69            | 0.42***       | 0.28~0.62| 0.43***| 0.27~0.67|
| **Women under 21 but sexually active for 3 years need Pap test**      |       | 764     | 659    | 46.31         | ***           | 764     | 659    | 46.31         | ***           |
| Yes                                                                    | 26.2  | 264     | 70.78  | 109           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 62.5  | 421     | 47.30  | 469           | 0.37***       | 0.29~0.48| 0.32***| 0.24~0.44|
| No                                                                     | 11.2  | 79      | 49.38  | 81            | 0.40***       | 0.28~0.59| 0.41***| 0.27~0.63|
| **Pap test is necessary for women who no longer menstruate**          |       | 758     | 659    | 46.51         | ***           | 758     | 659    | 46.51         | ***           |
| Yes                                                                    | 68.1  | 553     | 57.31  | 412           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 27.0  | 174     | 45.55  | 208           | 0.62***       | 0.49~0.79| 0.54***| 0.41~0.70|
| No                                                                     | 5.0   | 31      | 44.29  | 39            | 0.59*         | 0.36~0.97| 0.68  | 0.40~1.18|
| **Cancer affects women of all ages**                                   |       | 762     | 660    | 46.41         | ***           | 762     | 660    | 46.41         | ***           |
| Yes                                                                    | 45.6  | 443     | 68.26  | 206           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 46.0  | 274     | 41.96  | 379           | 0.34***       | 0.27~0.42| 0.37***| 0.28~0.47|
| No                                                                     | 8.4   | 45      | 37.50  | 75            | 0.28***       | 0.19~0.42| 0.28***| 0.18~0.44|
| **Pap test can detect cancer early and prolong life**                 |       | 762     | 658    | 46.34         | ***           | 762     | 658    | 46.34         | ***           |
| Yes                                                                    | 45.0  | 453     | 70.89  | 186           | 1.00          | Reference| 1.00  | Reference|
| Do not know                                                            | 49.4  | 288     | 41.03  | 414           | 0.29***       | 0.23~0.36| 0.30***| 0.23~0.38|
| No                                                                     | 5.5   | 21      | 26.58  | 58            | 0.15***       | 0.09~0.25| 0.16***| 0.09~0.29|
Table 3: Continued.

| Beliefs                                         | Total | Ever had a Pap test | Unadjusted odds ratios | Adjusted odds ratios |
|------------------------------------------------|-------|---------------------|------------------------|----------------------|
|                                                 | %     | Yes | No | %     | Yes | No | %     | Point estimate | 95% CI | Point estimate | 95% CI |
| Cancer risk increases with increasing age        | 759   | 53.45 | 661 | 46.55 | ***   | *** |
| Yes                                            | 32.3  | 328 | 71.30 | 45.30 | 1.00 | 1.00 |
| Do not know                                     | 59.6  | 390 | 46.04 | 53.96 | 0.34*** | 0.27~0.44 | 0.33*** | 0.25~0.44 |
| No                                             | 8.0   | 41 | 36.28 | 63.72 | 0.23*** | 0.15~0.35 | 0.23*** | 0.15~0.37 |
| Four symptoms of cervical cancer                 |       |       |       |       |       |       |       |       |       |
| No. 1 Vaginal bleeding                           | 769   | 53.03 | 681 | 46.97 | ***   | *** |
| No                                             | 78.6  | 556 | 48.73 | 51.27 | 1.00 | 1.00 |
| Yes                                            | 21.3  | 213 | 68.93 | 31.07 | 2.33*** | 1.79~3.05 | 1.88*** | 1.39~2.53 |
| No. 2 Unusual vaginal discharge                 | 769   | 53.03 | 681 | 46.97 | ***   | *** |
| No                                             | 74.8  | 531 | 48.94 | 51.06 | 1.00 | 1.00 |
| Yes                                            | 25.1  | 238 | 65.21 | 34.79 | 1.96*** | 1.53~2.50 | 1.70*** | 1.29~2.26 |
| No. 3 Pelvic pain                               | 769   | 53.03 | 681 | 46.97 | ***   | *** |
| No                                             | 86.4  | 643 | 51.32 | 48.68 | 1.00 | 1.00 |
| Yes                                            | 13.5  | 126 | 63.96 | 36.04 | 1.68*** | 1.23~2.30 | 1.59* | 1.12~2.27 |
| No. 4 Pain during sexual intercourse            | 769   | 53.03 | 681 | 46.97 | ***   | *** |
| No                                             | 8.51  | 638 | 51.70 | 48.30 | 1.00 | 1.00 |
| Yes                                            | 14.8  | 131 | 60.65 | 39.35 | 1.44* | 1.07~1.93 | 1.34 | 0.96~1.88 |
| Ever heard of HPV                               | 744   | 53.30 | 652 | 46.70 | ***   | *** |
| No                                             | 77.2  | 502 | 46.57 | 53.43 | 1.00 | 1.00 |
| Yes                                            | 22.7  | 242 | 76.10 | 23.90 | 3.65*** | 2.75~4.85 | 4.49*** | 3.15~6.38 |

Note: ‘***’, ‘**’, ‘*’ indicating significance levels of ≤0.001, ≤0.01, and ≤0.05, respectively.

With respect to HPV-specific knowledge (Table 4), women who knew that HPV causes cervical cancer and is sexually transmitted were more likely to have had a Pap test compared to women who did not know this information. Similarly, women who were familiar with HPV risk factors (such as having multiple sexual partners) were more likely to have obtained screening compared with women who did not know the risk factors. Finally, women who believed that HPV infection is rare were less likely to have been previously screened.

The findings from multivariate analyses are presented in Table 5. Given that there was a considerable number of women who did not respond to any of the HPV knowledge items (Table 4), we did not include those items in the multivariate analyses. In multivariate analyses, receiving a doctor’s recommendation for the Pap test, having insurance, and having time-off to see doctors remained strongly associated with having had a prior Pap test (P < 0.001), suggesting that they are independently associated with Pap test behavior even after adjusting for the other access barriers and for demographic variables. In addition, six variables from the knowledge, attitudes, and beliefs domain remained highly significant (P < 0.001, Table 5) in the multivariate logistic model, indicating their independent contributions to Pap test behavior.

4. Discussion

One of the most critical issues in cervical cancer prevention among Vietnamese American women over the past two decades is the persistently low Pap screening rate despite significantly high incidence rate of cervical cancer. Specific challenges and barriers to obtaining screening need to be examined and addressed in this underserved population. Although previous studies in the western region of the USA laid the groundwork for interventions [23–26], they rarely addressed both individual and system barriers that are associated with cervical cancer screening behaviors among Vietnamese women in a single study with a large sample size (n = 1450). In addition, geographic differences may be important to consider, as geographic variations may exist regarding access to healthcare providers and/or healthcare staff who can provide bilingual services. Gresenz et al. (2009) have demonstrated that the considerable language obstacles that exist within some immigrant populations can serve as critical barriers to healthcare and uptake of screening tests [27].

Findings from this population suggest that younger Vietnamese women are less likely to have ever had a Pap smear compared to their older (>60 years) counterparts. This finding is in contrast to a number of studies [16, 28–30], which have been summarized in several recent reviews.
Table 4: Associations between Papanicolaou (PAP) testing and HPV-specific knowledge.

| Associated factors | Ever had a Pap test | Unadjusted odds ratios | Adjusted odds ratios |
|--------------------|---------------------|------------------------|----------------------|
|                    | No. | %   | No. | %   | Point estimate | 95% CI | Point estimate | 95% CI |
| HPV causes cervical cancer | 702 | 54.67 | 582 | 45.33 | 1.00 Reference | 1.00 Reference |
| No                 | 446 | 47.35 | 496 | 52.65 | 3.31 2.51−4.36*** | 3.76 2.70−5.24*** |
| Yes                | 256 | 74.85 | 86  | 25.15 | 3.19 2.45−4.16*** | 3.86 2.78−5.35*** |
| HPV is sexually transmitted | 688 | 54.43 | 576 | 45.57 | 1.00 Reference | 1.00 Reference |
| No                 | 414 | 46.46 | 477 | 53.54 | 1.00 Reference | 1.00 Reference |
| Yes                | 274 | 73.46 | 99  | 26.54 | 3.19 2.45−4.16*** | 3.86 2.78−5.35*** |
| Risk factors for HPV: |      |      |      |      |      |      |      |      |
| (1) Early puberty   | 667 | 54.67 | 553 | 45.33 | 1.00 Reference | 1.00 Reference |
| No                 | 603 | 55.63 | 481 | 44.37 | 0.71 0.50−1.01  | 0.60 0.39−0.90* |
| Yes                | 64  | 47.06 | 72  | 52.94 | 1.78 1.35−2.34*** | 1.58 1.16−2.16*** |
| (2) Multiple sexual partners | 667 | 54.67 | 553 | 45.33 | 1.00 Reference | 1.00 Reference |
| No                 | 451 | 51.13 | 431 | 48.87 | 1.00 Reference | 1.00 Reference |
| Yes                | 216 | 63.91 | 122 | 36.09 | 1.69 1.31−2.19*** | 1.78 1.32−2.40*** |
| (3) Partner has multiple sexual partners | 667 | 54.67 | 553 | 45.33 | 1.00 Reference | 1.00 Reference |
| No                 | 479 | 51.39 | 453 | 48.61 | 1.00 Reference | 1.00 Reference |
| Yes                | 188 | 65.28 | 72  | 34.72 | 1.78 1.35−2.34*** | 1.58 1.16−2.16*** |
| (4) Early initiation of sexual activity | 667 | 54.67 | 553 | 45.33 | 1.00 Reference | 1.00 Reference |
| No                 | 548 | 56.09 | 429 | 43.91 | 1.00 Reference | 1.00 Reference |
| Yes                | 119 | 48.97 | 124 | 51.03 | 0.75 0.57−1.00  | 0.70 0.51−0.96* |
| (5) Failure to use condoms | 667 | 54.67 | 553 | 45.33 | 1.00 Reference | 1.00 Reference |
| No                 | 469 | 56.03 | 368 | 43.97 | 1.00 Reference | 1.00 Reference |
| Yes                | 198 | 51.70 | 185 | 48.30 | 0.84 0.66−1.07  | 0.75 0.57−0.99* |
| (6) Who does HPV affect? | 642 | 53.95 | 548 | 46.05 | 1.00 Reference | 1.00 Reference |
| Men                | 139 | 54.94 | 114 | 45.06 | 1.00 Reference | 1.00 Reference |
| Women              | 254 | 44.25 | 320 | 55.75 | 0.65 0.48−0.88** | 0.60 0.43−0.83** |
| Both               | 249 | 68.60 | 112 | 31.40 | 1.79 1.29−2.50*** | 1.86 1.26−2.74*** |
| (7) HPV is symptomatic | 711 | 54.07 | 604 | 45.93 | 1.00 Reference | 1.00 Reference |
| Always symptomatic | 53  | 46.90 | 60  | 53.10 | 1.00 Reference | 1.00 Reference |
| Sometimes          | 123 | 74.55 | 42  | 25.45 | 3.32 1.99−5.52*** | 3.72 2.08−6.67*** |
| Never              | 26  | 26.26 | 73  | 73.74 | 0.40 0.23−0.72** | 0.42 0.22−0.79** |
| Do not know        | 509 | 54.26 | 429 | 45.74 | 1.34 0.91−1.99  | 1.53 1.00−2.36 |
| (8) HPV is rare    | 701 | 54.51 | 585 | 45.49 | 1.00 Reference | 1.00 Reference |
| No                 | 615 | 62.82 | 364 | 37.18 | 1.00 Reference | 1.00 Reference |
| Yes                | 86  | 28.01 | 221 | 71.99 | 0.23 0.17−0.35*** | 0.23 0.17−0.31*** |

Note: ***, **, * indicating significance levels of ≤0.001, ≤0.01, and ≤0.05, respectively.

[31, 32]. But a recent study of young Asian American women [33] also reported that younger age was associated with lower likelihood of obtaining screening. With increasing age, there was an increase in odds of ever having had a Pap smear test. Our findings that younger Vietnamese women were less likely to have ever had a Pap test may be due, in part, to cultural norms that promote more conservative views about sexual relations among unmarried individuals [12]. Specifically, focus groups among young Asian Americans revealed that premarital sexual behavior was generally not widely acceptable, nor was seeking gynecological examinations prior to marriage, as that might adversely reflect sexual promiscuity [33]. As a result, younger unmarried women may be less likely to seek cervical cancer screening due to the perceived community stigma associated with sexual promiscuity. This would also be consistent with prior findings reporting the common belief that Pap testing is only for women who are married or who have had children [12]. Indeed, in the present study, we found that women who were not married or who were divorced/separated were less likely to have ever had a Pap smear test. Therefore, these findings highlight the need to focus on younger Vietnamese American women or those who are not married who may not engage in screening behaviors due to cultural barriers and beliefs.

Our findings that higher levels of education, English proficiency, employment, access to a physician, physician recommendation, and having health insurance are associated with significantly higher rates of Pap screening and are
Table 5: Factors associated with receipt of prior Pap test in multivariate analyses.

| Variable group                        | Associated factors                                      | Forward selection adjusted odds ratios |
|---------------------------------------|--------------------------------------------------------|----------------------------------------|
|                                       |                                                        | Point estimation | 95% CI                   |
| Access barriers                       |                                                        | ***            |                           |
| Doctor recommendation for testing     |                                                        | 1.00           | Reference                |
| No                                    |                                                        | 1.00           | Reference                |
| Yes                                   |                                                        | 8.45***        | 5.02~14.23               |
| Current health insurance              |                                                        | 1.00           | Reference                |
| No                                    |                                                        | 1.00           | Reference                |
| Yes                                   |                                                        | 3.04***        | 2.25~4.11                |
| Difficulty getting time off to see doctor |                                                        | 1.00           | Reference                |
| No                                    |                                                        | 1.00           | Reference                |
| Yes                                   |                                                        | 0.51***        | 0.38~0.69                |
| Pap test can detect cancer early and prolong life | ***                                                  | 1.00           | Reference                |
| Yes                                   |                                                        | 1.00           | Reference                |
| Do not know                           |                                                        | 0.53*          | 0.32~0.87                |
| No                                    |                                                        | 0.24***        | 0.12~0.48                |
| Ever heard of HPV                     |                                                        | 1.00           | Reference                |
| No                                    |                                                        | 1.00           | Reference                |
| Yes                                   |                                                        | 2.37***        | 1.56~3.59                |
| Can have cancer but no symptoms       |                                                        | ***            |                           |
| Yes                                   |                                                        | 1.00           | Reference                |
| Do not know                           |                                                        | 0.68*          | 0.48~0.97                |
| No                                    |                                                        | 1.47           | 0.98~2.21                |
| Knowledge, attitude, and beliefs      |                                                        | ***            |                           |
| See doctor only when sick             |                                                        | 1.00           | Reference                |
| Yes                                   |                                                        | 1.00           | Reference                |
| Do not know                           |                                                        | 1.21           | 0.78~1.89                |
| No                                    |                                                        | 1.85**         | 1.27~2.70                |
| God or higher power controls cancer   |                                                        | *              |                           |
| Yes                                   |                                                        | 1.00           | Reference                |
| Do not know                           |                                                        | 0.70*          | 0.50~0.98                |
| No                                    |                                                        | 0.55**         | 0.35~0.85                |
| Cancer can be cured if detected early |                                                        | *              |                           |
| Yes                                   |                                                        | 1.00           | Reference                |
| Do not know                           |                                                        | 0.75           | 0.47~1.21                |
| No                                    |                                                        | 0.34**         | 0.16~0.74                |

Note: All demographic variables significant in the univariate logistic regression model (Table 1) were included in the multivariate model.

***, **, * indicating significance levels of ≤0.001, ≤0.01, and ≤0.05, respectively.

Corroborated by other studies [31, 34, 35]. For example, higher educational attainment was associated with greater likelihood of screening, whereas being unemployed was associated with lower likelihood of screening. These associations may be attributed, in part, to differences in knowledge and access to care. Women with higher educational levels may have greater knowledge and understanding regarding the need for cancer screening tests [36, 37]. In addition, as education level is frequently associated with income, women with higher education or who have employment may have greater financial resources with which to obtain preventive care. Women who could not speak English and who were foreign-born were less likely to have ever had a Pap smear test. This is consistent with prior studies that have reported difficulties with English as a significant obstacle to screening for this population [38, 39]. Unfortunately, language issues continue to serve as a barrier to screening as multilingual screening services are extremely limited or unavailable for most Vietnamese American women.

Access barriers continue to remain a challenge in this population [34]. Vietnamese women who do not have a regular healthcare provider were less likely to report ever having had a Pap test, which is consistent with numerous prior studies [16, 28, 31]. Having a physician that one sees for routine healthcare over time is likely to lead to better quality of care and offers more opportunities for discussing prevention and screening options than if one only visits a healthcare provider when one is ill. Further, receiving a physician recommendation for screening was the strongest factor associated with screening, similar to prior published findings [30, 31, 35]. These findings highlight the importance of having access to a regular healthcare provider who can
recommend the appropriate screening tests and remind women to participate in preventive care. Although programs are available that provide low-cost or free cancer screening services for women without health insurance or a healthcare provider, Vietnamese American women are often unaware of these services, not eligible for these programs, or face considerable barriers to accessing such programs. As a result, intervention programs to reduce cervical cancer disparities need to identify and target the subgroups of women who are not able to access or receive these cancer screening programs.

Our study identified 11 factors in the knowledge, attitudes, and beliefs domain that were associated with Vietnamese women's cervical cancer screening behavior. Specifically, a lack of knowledge was associated with poor participation in cervical cancer screening. Other studies have reported that Vietnamese American women may hold various misconceptions about cervical cancer and cervical cancer screening [29, 35]; as a result, these beliefs may prevent women from obtaining the necessary screening. However, women who correctly reported that a Pap smear test can detect cervical cancer early were twice as likely to have had a Pap test compared to women who did not hold this belief. Similarly, women who had heard about human papillomavirus (HPV) were more likely to have had a Pap test.

It should be noted that HPV-specific knowledge was relatively low in this population. Indeed, nearly half of the study participants did not know that HPV can cause cervical cancer or that it was sexually transmitted. In addition, many women could not identify risk factors for HPV infection and over half of the women thought that HPV infection is rare. Further, these findings likely overestimate HPV-related knowledge given that between 9%-18% of respondents left these items blank. However, women who did have knowledge about HPV and its risk factors were more likely to have undergone screening.

Potential limitations of the study include the cross-sectional study design and using self-report to categorize prior screening behavior. In addition, our findings may not be generalizable to Vietnamese residents who are not closely engaged with their communities, and nonparticipants may have different patterns of cancer screening behaviors from the study respondents. However, the findings from the present study offer one of the largest assessments of cervical cancer screening among Vietnamese American women residing in the eastern USA and provide insights regarding identified significant factors for promoting cervical cancer screening in this population.

In summary, this study adds to the literature on cancer health disparities among Vietnamese American women and sheds light on the special health needs of this relatively recent immigrant population. Vietnamese women have the highest incidence rates of cervical cancer in the USA, and numerous factors serve as barriers to their participation in Pap test screening programs. These data help us identify the subgroup of Vietnamese American women who may be underutilizing screening services, as well as significant factors that we can address to enhance screening rates. Intervention programs need to address lack of knowledge and misconceptions regarding preventive care, language difficulties and access issues. Culturally tailored and linguistically appropriate educational materials and navigation assistance to overcome access barriers have been found to be effective in increasing screening rates in other studies [40]. Indeed, although interventions that target women's health beliefs can increase knowledge, the effectiveness of such interventions is likely to be attenuated if access barriers are not adequately addressed. Access barriers, including the cost of screening, lack of insurance, and language difficulties, pose formidable challenges to this population. Community partnerships may be helpful for reducing some access barriers by providing essential infrastructure and resources to facilitate the broad implementation of health promotion programs. In addition, overcoming access barriers may necessitate setting aside additional resources to help underserved communities obtain the recommended healthcare services and/or require changing current healthcare program guidelines, such as expanding the eligibility criteria for state- and/or federally funded programs that provide low-cost cancer screening and prevention services for underserved women.

Conflict of Interests

The Authors declare that there are no conflict of interests.

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