Barriers and facilitators to cervical cancer screening among Asian American women: a systematic review

Hira Rohail

Northwestern University

The Graduate School

hirarohail2018@u.northwestern.edu

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Abstract

Objective: To understand barriers and facilitators for obtaining cervical cancer screening in Asian American women age > 18 years.

Data Sources: A systematic review following PRISMA guidelines and using PubMed, EMBASE, and Web of Science to identify studies. Search terms included *cervical cancer screening, Asian American,* and *Pap test*. Additional studies identified manually.

Study Selection: Only articles assessing sociodemographic, healthcare access, or acculturation factors and knowledge, attitudes, and behaviors in Asian American women associated with compliant and noncompliant cervical cancer screening behavior were included.

Data Extraction: Extraction of data by 1 author using predefined data fields.

Data Synthesis: A total of 17 articles met all inclusion criteria. Six groups were studied: Chinese, Filipina, Japanese, Korean, South Asian, and Vietnamese. Age, marital status, education, insurance coverage, time in the US, and English-speaking ability were associated with previous receipt of a Pap test. Young age, unmarried, uninsured, less time in the US and less than fluent English-speaking ability were less likely to have obtained a Pap test. Older age, married, private or public health insurance, more than ten years in the US, and fluent English-speaking ability were more likely to have obtained a Pap test. Variations of this trend were found among the subgroups. Not enough data on knowledge, attitudes, and behaviors to make generalizable statements.

Interventions: Multi-component, community-based interventions using patient navigators, text messages, or lay health workers have varying degrees of success in increasing uptake of Pap tests but can bridge gaps in care and overcome barriers faced by Asian women seeking cervical cancer screenings.

Limitations: Only applicable to the populations discussed. Not applicable to the entire Asian American community or other minority populations.

Conclusion: Successful interventions to increase use of cervical cancer screenings must be targeted in their approach and demonstrate a thorough understanding of the characteristics of individual communities.

Introduction

From 2000 to 2010, the Asian American population was the fastest growing racial group in the US, increasing four times faster than the general population according to the 2010 US Census [1]. An estimated 5% of the general US population, or 14.7 million individuals including 7 million women, identify as Asian American [1]. Despite classification under a single category, Asian Americans are highly heterogeneous and consist of individuals with roots in over 60 countries. The term 'Asian' refers to a person with origins in the "Far East, Southeast Asia, or the Indian subcontinent" [1]. The Chinese (23%) make up the largest share of the Asian American population (Asian alone), followed by Asian Indians (20%) and Filipinos (18%) [1]. These three groups represent over 60% of the Asian American population (Asian alone) in the US. The fastest growing Asian American group from 2010 to 2010 were the Bhutanese [1]. The largest number of Asian Americans live in California, followed by New York, New Jersey, Illinois, Florida, and Texas [1].

The rapid increase of the Asian American population is partially due to immigration, as more than half of Asian Americans were born outside of the US [2]. Because of the high number of foreign births, the health profiles and behaviors of Asian Americans may be distinct from other racial groups in the US. However, few research efforts have been conducted to understand the health needs of the Asian American population [3]. Research which does include Asian Americans often does not disaggregate the 'Asian' moniker. Subsequently, research typically fails to acknowledge or analyze health by subgroup, masking disparities between Asian American subgroups [3].

Since 2000, cancer has been the leading cause of death for Asian Americans [4]. Cancer incidence has steadily decreased since 1992 for Asian Americans and non-Hispanic whites [4]. However, cancer mortality rates have remained constant for Asian Americans while steadily decreasing for non-Hispanic whites [4]. Asian Americans are also less likely to be diagnosed with cancer at a localized stage compared to non-Hispanic whites. 'Localized' cancer is found in "the tissue or organ where it began, and has not spread to nearby lymph nodes or to other parts of the body" [5]. One of the most pronounced disparities in stage of cancer diagnosis between Asian Americans and non-Hispanic whites is for cervical cancer - Asian American women are less likely to be a diagnosed with cervical cancer at a localized stage compared to non-Hispanic white women (43% versus 51%) [4]. Asian American women are also 3.3 years older than non-Hispanic white women at the age of first diagnosis of cervical cancer [6], although, both groups have a similar 5-year survival rate (70%) [4].

The differences in stage of diagnosis and age at first diagnosis between Asian American and non-Hispanic whites is attributed to disparities in cervical cancer screening rates – 83% of non-Hispanic whites report having a cervical cancer screening in the past three years compared to only 71% of Asian Americans [4] and never or rarely screened women are more likely to develop cervical cancer or receive a cervical cancer diagnosis at a later stage compared to women who are screened regularly [7]. While socioeconomic status (SES) largely explains cancer screening disparities between non- Hispanic whites, Latinos, and African Americans, there is insufficient evidence to suggest SES explains low cervical cancer screening rates among Asian Americans [8]. The prevalence of cervical cancer screening further varies within the Asian American population [4]. Other hypotheses suggest barriers to healthcare access and cultural

health beliefs as influencing the use of cervical cancer screening by Asian American women [4][8].

From 2002 to 2013, the incidence and mortality rate for Asian Americans with cervical cancer decreased 3% annually, similar to non-Hispanic whites [4]. In aggregate, Asian American women have a lower cervical cancer incidence rate than Hispanic and black women. Once the numbers are disaggregated, however, disparities emerge in cervical cancer incidence rate. While Chinese (4.5 cases per 100,000 people) and Asian Indian/Pakistani's (4.2 cases per 100,000 people) have the lowest cervical cancer incidence rate among Asian Americans, Vietnamese and Korean have the highest cervical cancer incidence rate among Asian Americans [4]. The incidence rates for Vietnamese and Korean women (18.9 and 11.9 cases per 100,000 people, respectively) were greater than or comparable to incidence rates for Hispanics and blacks (15.5 and 11.5 cases per 100,000 people, respectively) [9].

Additionally, incidence of cervical cancer continue to increase with age for Vietnamese, Korean, Filipina, and Chinese women, contrary to an expected plateau then drop in incidence rates, as happens with non-Hispanic white women. Japanese women are the only Asian American group for which incidence rates decrease with age [9]. Potential explanations for this phenomenon include cultural or healthcare barriers toward receiving a cervical cancer screening and high prevalence of HPV in country of origin [10][11][12]. The human papillomavirus (HPV) causes nearly all cases of cervical cancer [13]. In the US, about 17% of Asian American women have a high-risk of HPV infection compared to 23% of non-Hispanic white women [14]. But globally, the risk of HPV infection in women is much greater in South Asia (7%), East Asia (11%), and Southeast Asia (14%) compared to North American (5%) [12].

The Papanicolaou test (Pap test) is an effective screening technique for the early detection of cervical cancer. Since the onset of the use of the Pap test as a screening method, the incidence of cervical cancer has decreased from 14.8 cases per 100,000 people in 1975 to 6.5 cases per 100,000 people in 2013 in the US [15]. The U.S. Preventive Services Task Force (USPSTF) recommends "cervical cancer in women age 21 to 65 years with cytology (Pap [test]) every 3 years or, for women age 30 to 65 years who want to lengthen the screening interval, screening with a combination of cytology and human papillomavirus (HPV) testing every 5 years" [16].

The differences between Asian Americans and non-Hispanic whites, as well as between groups among Asian Americans, regarding cervical cancer screening, incidence, and mortality rates are not easily explained. Numerous factors conflate to create disparities in cervical cancer screening rates including sociodemographic factors; healthcare access; acculturation (defined as how well immigrants assimilate to the behaviors and beliefs of the host society [17]); and knowledge, attitudes, and behaviors of individuals. The purpose of the current review is to analyze existing research on the cervical cancer screening use of Asian American women stratified by subgroup. The review will describe and qualitatively synthesize the available articles. Specifically, the review will examine the rates of cervical cancer screenings and the barriers and facilitators for use of cervical cancer screening among Asian American women. The review will analyze sociodemographic; acculturation; healthcare access factors; and knowledge, attitudes, and behaviors which increase or decrease the likelihood of having obtained a cervical cancer screening. Further, the review will identify successful interventions and strategies to improve cervical cancer screening use in Asian American women.

Methods

Eligibility Criteria

All observational studies were eligible, regardless of study design. Only participants 18 years or older who self-identified as Chinese, Filipina, Japanese, Korean, South Asian, or Vietnamese were included. The outcome measures were having had a Pap test. The modifying variable categories were sociodemographic, healthcare access, acculturation and knowledge, attitude, and beliefs. Studies needed to include at least one of the modifying variable categories but were not excluded if they did not include all of the modifying variable categories. Articles included in the review must have been published in English in peer-reviewed journals between January 2008 and January 2018. No abstracts, meta-analyses, systematic reviews, or grey literature were included. Articles must have included original primary or secondary data analysis.

Exclusion Criteria

The exclusion criteria were as follows: 1) non-English language publication, 2) published outside of January 2008 and January 2018, 3) population outside of the US, 4) non-peer reviewed study, 5) no original data analysis, 6) non-target age range, 7) no examination of the use of cervical cancer screening services, 8) only aggregated data, and 8) non-Asian target population.

Information Sources

PRISMA reporting guidelines for systematic reviews were followed for the review. The study identification strategy included electronic searches on PubMed, EMBASE, and Web of Science as well as manually scanning reference lists of included articles. The search strategy was created in consultation with a research librarian. All electronic searches were conducted by the author and archived. Comprehensive variations of the following search terms were used on all

databases: *cervical cancer screen**, *Asian American*, and *Pap test*. Table 1 outlines the full electronic search strategy for each database. An initial search on PubMed was conducted on February 9, 2018 and re-run March 29, 2018. EMBASE and Web of Science were searched on March 29, 2018.

Study Selection

After all titles and abstracts were collected from the electronic search, duplicates were removed. Eligibility assessment was performed independently on all studies in an unblinded, standardized manner by 2 reviewers (two colleagues of the author). Both reviewers read the proposal of the review to understand the review objectives. Disagreements between reviewers were resolved by the author. Studies were screened by title and abstract. The full-text of each study was reviewed by the author to ensure all eligibility criteria were met.

Data Collection Process

A form to extract data from the included studies was created for the review. The data was extracted by the author of the study. To ensure accuracy of the data extraction form, data from 10% of the included studies were cross-checked by an independent party (a colleague of the author). Data extracted included: (1) source of data, (2) location data was collected, (3) data collection year(s), (4) subgroups studied, (5) number of participants, (6) age range of participants, (7) explanation of Pap test measurement, 8) outcome measures, and (9) modifying variables. Table 2 is an abbreviated version of the summary data file. Conclusions were based on a qualitative synthesis of the data from the included studies.

Results

Study Selection

A total of 17 articles were identified for inclusion in the review. Electronic searches using the online databases PubMed, EMBASE, and Web of Science yielded 183 studies. An additional wo studies were selected by manually checking reference lists of included articles. After removing duplicates, 137 studies remained. A further 52 studies were removed for being published before 2008. A total of 85 studies were reviewed on the title level of which 24 studies were removed for being incongruent with the eligibility criteria. On the abstract level, 61 studies were reviewed of which 24 were removed for being incongruent with the eligibility criteria. A full-text review of the remaining 37 studies was conducted with 17 total articles being included for review. Reasons for exclusion at the full-text level included duplicate study, not a disaggregated analysis of Asian women, unavailable in journal form, or location outside the US. No unpublished studies were used and only articles part of the initial search strategy were included. Figure 1 outlines the study selection process for the review.

Study Characteristics

The most common data collection method was a self-administered questionnaire (SAQ) (n = 9) followed by interview (n = 6). Secondary analysis of data obtained through the California Health Interview Survey (CHIS) was another common data source (n = 4). CHIS is a random-dial population-based phone survey conducted every two years to provide information on health status and conditions, health-behaviors, health insurance, and access to healthcare for all California residents, regardless of age or ethnicity [18]. The CHIS data used from the included studies were collected from 2001 to 2011, although CHIS was most recently conducted in 2015.

All studies had similar or comparable outcome measurements despite differing methods. The primary outcome measures in all studies were Pap test use either within the past year, within the past three years, or ever. The main eligibility criteria were women at least 18 years of age

who self-identified with an Asian subgroup, although three studies analyzed Pap test use within women age 40 and older.

Each study had varying degrees of bias due to the data collection method. As a survey conducted through telephone landlines, CHIS was susceptible to nonresponse bias and non-coverage bias. However, quality assessment studies found no difference between non-responders and responders [19]. Non-coverage bias, when cell phone-only households, who have different health behaviors than landline-only households, are unable to be contacted, was reduced by weighting the data according to a sample of cell-phone only respondents [19]. This practice was done for the 2007 version of the survey, so the data from prior iterations of the survey (2001, 2003, 2005) are still susceptible to non-coverage bias. All included studies were observational, so were reliant on self-report, which is susceptible to social desirability bias and recall bias. Many of the SAQ's were conducted by community-based organization and participants were recruited, not randomized. Only four studies outside of the CHIS cohort randomized participants. The lack of randomization introduces potential confounding, but the sample populations were often very small and, in many cases, randomization was not possible. Data from CHIS was overrepresented among the studies as were studies analyzing cervical cancer screenings among Vietnamese women (n = 13). A total of six Asian subgroups including Vietnamese were analyzed among the included studies: Chinese (n = 5), Filipina (n = 3), Japanese (n = 2), Korean (n = 6), and South Asian (n = 3). The South Asian, Japanese, and Filipina data were primarily or wholly obtained through CHIS. A significance of <0.1 was used.

Study Analysis (Subgroup)

Table 3 outlines the Pap test rates obtained from the studies with estimates from 14.3 to 88.6% within the past 3 years, depending on subgroup. Table 4 reports sociodemographic,

healthcare access, and acculturation factors as well as knowledge, attitudes, and behaviors associated with previous Pap test use by subgroup.

Chinese

For Chinese American women, the sociodemographic variables age, marital status, employment, and income were associated with previous cervical cancer screening. Younger [20][21][22][23], unmarried [21][22], unemployed [22] and income less than $10,000 [22] were factors associated with lower likelihood of having received a Pap test. Married women were more likely to meet the Pap test screening guidelines [23].

For Chinese American women, the healthcare variables insurance coverage and source of healthcare were associated with previous cervical cancer screening. Specifically, Chinese American women who were uninsured [22], had seen a doctor less than one time in the past three months [20][23], or had trouble communicating with providers [24] were less likely to have had a Pap test. Having public or private health insurance was associated with having had a Pap test [20].

For Chinese American women, the acculturation variables time spent in the US and English-speaking ability were associated with previous cervical cancer screening. Specifically, more time spent in the US (at least 25% of lifetime) [21][22] and English proficiency [20][21][22] were associated with increased likelihood of having had a Pap test. Chinese women who spent less than ten years in the US were less likely to have had a Pap test [22][24].

Knowledge, attitudes, and behavior of Chinese American women that predicted previous use of the Pap test included knowledge of the Pap test to detect cervical cancer and previous use of mammography [22][21]. Chinese American women who lacked knowledge about the Pap test were less likely to be have been screened [22].

Filipina

For Filipina Americans, the sociodemographic variables age, marital status, and education were associated with previous cervical cancer screening. Filipina American women older than 30 [20][25] were more likely to have had a Pap test compared to younger women. Filipina American women who were unmarried [20] or had an education less than a college degree [20] were less likely to have had a Pap test. For healthcare variables, insurance coverage and healthcare seeking behavior were associated with previous cervical cancer screening. Filipina American women who were not insured [20], did not have or had not seen a private physician in more than one year [20][24], or did not have a usual source of clinic/hospital [24] were less likely to have had a Pap test. For Filipina American women, the acculturation variable time spent in the US was associated with previous cervical cancer screening. Specifically, more time spent in the US (more than 25% of lifetime) [20] was associated with a higher likelihood of having had a Pap test. Knowledge, attitudes, and behavior of Filipina American women that predicted previous use of the Pap test included comfort with the Pap test [25].

Japanese

For Japanese American women, the sociodemographic variables age, marital status, and education were associated with previous cervical cancer screening. Japanese American women between ages 21-39 and ages 50-65 [20], unmarried [20], or had an education less than a college degree [20] were less likely to have received a Pap test. The healthcare variables insurance coverage, physician visits, and distance to a clinic were associated with previous cervical cancer screening. Specifically, Japanese American women who were uninsured [20] or had not seen a physician in the past year [20] were less likely to have received a Pap test. Distance to an Asian clinic that was language concordant was an enabling factor which increased the likelihood of

having received a Pap test [22]. For acculturation variables, more than 25% of lifetime in the US was associated with a greater likelihood of previous Pap test use [20]. No significant knowledge, attitudes, or behaviors towards cervical cancer screenings were found for Japanese American women.

Korean

For Korean American women, the sociodemographic variables age, marital status, education, and income were associated with previous cervical cancer screening. Specifically, younger women [22][25][26][27], married [26][27], or income greater than $55,000 were factors associated with a higher likelihood to have received a Pap test. Korean American women with less than a college degree education [20][27] were less likely to have received a Pap test.

For healthcare variables, insurance coverage and usual source of healthcare were associated with previous cervical cancer screening. Specifically, Korean American women who were uninsured [22], had seen a doctor less than once in the past three months [20], or who did not have a usual source of clinic or hospital [24][27] were less likely to have had a Pap test or be compliant with screening guidelines.

For Korean American women, the acculturation variables time spent in the US and English-speaking ability were associated with previous cervical cancer screening. The more time spent in the US (more than 25-50% of lifetime) [20][22] and proficient English [20][24][26] were associated with a higher likelihood of having had a Pap test. Korean American women who spoke a non-English language at home were less likely to have had a Pap test [24].

Knowledge, attitudes, and behavior of Korean American women that predicted previous use of the Pap test included knowledge that the Pap test detected cervical cancer [22] and the belief that the Pap test was beneficial [26]. Korean American women who lacked knowledge

about the Pap test were less likely to have been screened [22]. Older women were more likely to perceive greater barriers and less benefits to Pap test use and were less likely to have received a Pap test [27].

South Asian

For South Asian American women, the sociodemographic variables age, marital status, and education were associated with previous cervical cancer screening. Specifically, middle age (between 30-49 years) [20] was associated with a greater likelihood of having had a Pap test. Unmarried [20] and less than a high school education [28] were factors associated with a decreased likelihood of having received a Pap test.

The healthcare variables insurance coverage, access to care, and distance to a health clinic were associated with previous cervical cancer screening. Uninsured [20], seeing a physician less than twice in the past 12 months [20] and having no usual source of care [24] were factors associated with a lower likelihood of having had a Pap test. Distance to an Asian clinic with concordant language was an enabling factor which increased the likelihood of having received a Pap test [22].

For South Asian American women, the acculturation variables time spent in the US and English-speaking ability were associated with previous cervical cancer screening. More time in the US (more than 25% of lifetime) [20] was associated with a higher likelihood of having had a Pap test while women who spoke a non-English language at home were less likely to have had a Pap test [24][28]. Knowledge, attitudes, and behavior of South Asian American women that predicted previous use of the Pap test included having had a previous breast cancer screening [28] and acknowledging the existence of barriers to cervical cancer screening [28].

Vietnamese

For Vietnamese American women, the sociodemographic variables age, marital status, education, employment, and income were associated with previous cervical cancer screening. Vietnamese American women were more likely to have had a Pap test if they were older and the likelihood they received a Pap test increased with age [20][22][25][29][30][31][32][33][34], while married women were more likely to have obtained a Pap test compared to unmarried women [20][22][25][29][30][31][32][34]. High school or above education was associated with an increased likelihood of having obtained a Pap test [30]. Factors like unemployed [32][34] and less household income [32][34] were associated with a lower likelihood of having had a Pap test.

For healthcare variables, insurance coverage, access to care, physician's language, and physician recommendation were associated with previous cervical cancer screening. Vietnamese American women who were uninsured [29][30][32], had no family physician or healthcare provider [30][29][24], had no physician recommendation for a Pap test [30] [34], saw a physician less than once in the past year [20], or had a doctor who spoke English-only [30] were less likely to have not had a Pap test.

For acculturation variables, time spent in the US, English-speaking abilities, and place of birth were associated with previous cervical cancer screening. More time spent in the US (at least 25% of lifetime or greater than 10 years) [20][30][35] was associated with an increased likelihood of having had a Pap test. The likelihood of having had a Pap test increased as the ability to speak and read English-well approached closer to fluency [24][30]. Vietnamese American women born in the US were also more likely to have had a Pap test compared to Vietnamese American women born outside of the US [30][25].

Knowledge, attitudes, and behavior of Vietnamese American women that predicted previous use of the Pap test included greater perceived risk of cervical cancer [29] and general knowledge about the Pap test such as knowing it can detect cervical cancer early [29]. Lack of knowledge about cervical cancer including not knowing cervical cancer can be asymptomatic or that cervical cancer can be cured if it is detected early decreased the likelihood of having had a Pap test [30][34]. However, Vietnamese American women who did have knowledge of the symptoms of cervical cancer [29][30], were comfortable with the Pap test [25], or who heard of HPV [30][36] were much more likely to have had a Pap test. Attitudes found to decrease the likelihood of previous Pap test use included finding it embarrassing to get a Pap test [29][36] and fear of Pap test results [36][29][3]. Perceived transportation barriers were also associated with a decreased likelihood of having received a Pap test [30][36][29]. Behaviors found to increase likelihood of previous Pap test use included going to the doctor aside from being sick [30].

Discussion

The most common factors associated with previous receipt of cervical cancer screening were age, marital status, education, insurance coverage, length in the US and English-speaking ability. For all subgroups except Korean American women, older women were more likely to have had a Pap test. Similarly, for all subgroups except Japanese American women, married women were more likely to have had a screening. Education was another common predictor, with more educated women more likely to have had a previous Pap test. Insurance was an underlying healthcare factor noted among all six groups, as lack of insurance was significantly associated with not having had a Pap test. For all groups, more time spent in the US increased likelihood of having had a Pap test while for Chinese, Korean, South Asian, and Vietnamese American women, English proficiency increased the likelihood of having had a Pap test.

The findings from this review suggest more acculturated individuals and communities are likely to obtain cervical cancer screenings and may explain why Japanese American women higher cervical cancer screenings rates among all Asian subgroups, as they are one of the oldest immigrant groups and considered to be the most acculturated [9]. The findings of this review also highlight the importance of language acculturation and how difficult it can be for Asian Americans with limited English proficiency to access the healthcare system due to language barriers. But once in the health system, Asian American women, particularly Vietnamese women, as noted in this review, are attentive to and adhere to the recommendations of their physicians. As such, physicians, particularly in free clinics or federally qualified health centers (FQHCs) where many uninsured Asian American women may go for healthcare services, should take the opportunity to discuss and recommend the Pap test along with other cancer screening services. Improving culturally competency in free clinics and FQHC's is key, as legal immigrants within the first five years of their residency do not qualify for public health insurance like Medicaid [37]. Policy barriers which make it difficult for Asian women, particularly new immigrants, to receive health insurance discourage the use of preventive services like the Pap test. Therefore it is essential the healthcare facilities new immigrants use, such free clinics or FQHCs, are attentive to their needs.

Several limitations of this review must be noted. Due to small sample size and variability in results, no overarching knowledge, attitudes or behavior about cervical cancer could be surmised. Because each subgroup in the Asian community has its own culture, the survey technique employed by a majority of the included studies is not a sufficient method of understanding the nuance of each subgroups knowledge, attitudes, and behavior towards cervical cancer. Other limitations of this review include the small sample size of studies, lack of

standardization in study or survey design across studies, overrepresentation of participants from California, overrepresentation of Korean and Vietnamese American women, and focus on a narrow segment of the Asian population in the US. Furthermore, given the diverse and distinct traits of the Asian community, the conclusions drawn from this review are only applicable to groups discussed. The strengths of this review include a recognition of the different cultures which exist under the Asian moniker and how those cultures perceive health differently. Such an analysis is rarely conducted in cancer research and illuminates often-hidden disparities between Asian American groups.

Interventions

As each Asian American subgroup has its own set of determinants influencing cervical cancer screening rates, successful interventions seeking to improve cervical cancer screening rates among Asian American women must have a thorough understanding of the culture of the community. Findings from the following interventions were summarized and analyzed to understand which interventions are most efficacious for improving cervical cancer screenings rates among Asian American women. Table 5 provides a summary of the interventions and key outcomes. Culturally-relevant and community-based interventions have previously been found to improve cancer screenings rates for Asian Americans [38].

Patient Navigation

A community-based randomized trial by Fang et al. [39] sought to improve cervical cancer screening rates in Korean American women using patient navigators. A total of 705 Korean American women were recruited from 22 churches and randomized into a control or intervention group. The control group received a session on general health including information on cervical cancer and where to receive a free or low-cost Pap test. The intervention arm

received a culturally-relevant cancer education program along with patient navigation services. The culturally-relevant cancer education program included bilingual community health educators, location at church sites, and discussions on Korean health beliefs. One year after the intervention, the intervention group had significantly ($p < .01$) higher cervical cancer screening rates compared to the control group. The findings from the study suggest a multicomponent, culturally-relevant community-based intervention with patient navigation can be highly effective for increasing cancer screening rates for underserved populations.

A similar community-based randomized trial by Wang et al. [40] sought to improve cervical cancer screening rates in Chinese American women using patient navigators. A total of 134 Chinese women were recruited from four community-based organizations (CBOs). Two CBOs were randomized into the control group and two CBOs were randomized into the intervention group. The control group received a general health education system which included information on free or low-cost cervical cancer screening services. Meanwhile, the intervention group received an education session on cervical cancer taught by community health educators, a meeting with a Chinese physician, information on free or low-cost cervical cancer screening services, and patient navigation assistance. One year after the program, the intervention group had significantly ($p<0.05$) higher screening rates than the control group. Similar to Fang et al., the findings from this intervention suggest multi-component community-based programs combining education, patient navigation, and culturally relevant materials are successful in improving screening rates. Patient navigation programs are successful in improving the use of Pap tests and can be used to overcome language and healthcare barriers faced by Asian American women while improving cervical cancer knowledge to reduce existing disparities in cervical cancer screening.

Text-Message Intervention

Lee et al. [41] created a text-message based intervention for cervical cancer called Screening (*mScreening*). The intention of the text-message intervention was to increase cervical cancer screening rates in young Korean American women. The intervention was created using a community-based participatory research approach to inform the content of the text messages. A total of 30 women were recruited and received daily messages individually tailored based on a baseline assessment for seven days. The intervention included interactive features like quizzes and the opportunity for discussion with other participants. The results of the intervention included a significant ($p<0.05$) increase in knowledge of cervical cancer and cervical cancer screening guidelines. A text-message based intervention overcomes the language, financial, geographical, and healthcare barriers faced by many Asian American. In addition, the widespread use of mobile devices among youth suggest text-message based interventions can assist in improving cervical cancer screening rates in young Asian American women.

Lay Health Worker

Taylor et al. [42] created an intervention using lay health workers to improve cervical cancer screening rates in Vietnamese American women. Lay health workers are defined as "community members who are not certified health care professionals, but have been trained to promote health or provide health care services within their community" [42, p. 1924]. A total of 234 Vietnamese women who had not had a Pap test in the previous three years were recruited and randomized into a control group or intervention group. The control group received a packet of information on physical activity through the mail. The intervention group received a lay worker home visit with educational materials on cervical cancer. The lay workers were bilingual and all study materials, including materials for the control group, were translated into

Vietnamese. The trial endpoint was Pap test receipt within six months of randomization. There was no significant difference between the control and intervention group in receipt of Pap test for women who had never been screened. The intervention did not analyze knowledge of cervical cancer before and after the intervention. While the results of the intervention had no significant impact on cervical cancer screening uptake, the use of lay health workers can bridge transportation barriers and reduce distance to health workers while improving knowledge of cervical cancer.

Conclusions

The use of cervical cancer screenings is variable across groups within the Asian American population, but certain patterns exist within those subgroups. The most successful interventions to reduce cervical cancer screening disparities are multicomponent, community-based, and overcome the barriers faced Asian American women seeking to use healthcare services, like language, distance, insurance coverage, and age. The future of research in this area must continue to understand the diversity within the Asian American population and halt the tradition of looking at Asian Americans as a homogenous entity in scientific research. This review attempts to add nuance to the discussion of what factors influence cancer screenings in Asian Americans, but also showcases how much more progress must be made for research on this population.

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Appendix

Table 1. Full Search Strategy

Database	Search Terms	Number of Results
PubMed	("uterine cervical neoplasms"[MeSH Terms] OR ("uterine"[All Fields] AND "cervical"[All Fields] AND "neoplasms"[All Fields]) OR "uterine cervical neoplasms"[All Fields] OR ("cervical"[All Fields] AND "cancer"[All Fields]) OR "cervical cancer"[All Fields]) AND ("diagnosis"[Subheading] OR "diagnosis"[All Fields] OR "screening"[All Fields] OR "mass screening"[MeSH Terms] OR ("mass"[All Fields] AND "screening"[All Fields]) OR "mass screening"[All Fields] OR "screening"[All Fields] OR "early detection of cancer"[MeSH Terms] OR ("early"[All Fields] AND "detection"[All Fields] AND	N = 89

	"cancer"[All Fields]) OR "early detection of cancer"[All Fields]) AND ("asian americans"[MeSH Terms] OR ("asian"[All Fields] AND "americans"[All Fields]) OR "asian americans"[All Fields] OR ("asian"[All Fields] AND "american"[All Fields]) OR "asian american"[All Fields]) AND ("Papanicolaou test"[MeSH Terms] OR ("Papanicolaou"[All Fields] AND "test"[All Fields]) OR "Papanicolaou test"[All Fields] OR ("Pap"[All Fields] AND "test"[All Fields]) OR "Pap test"[All Fields])	
EMBASE	'cervical cancer screening':ti,ab,kw AND 'Asian American':ti,ab,kw	N = 31
Web of Science	TOPIC:(cervical cancer screening) *AND*TOPIC: (Asian American) *AND*TOPIC: (Pap test) Timespan: All years. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S,	N = 63

Figure 1. Flow diagram outlining the selection of the studies included in this review.

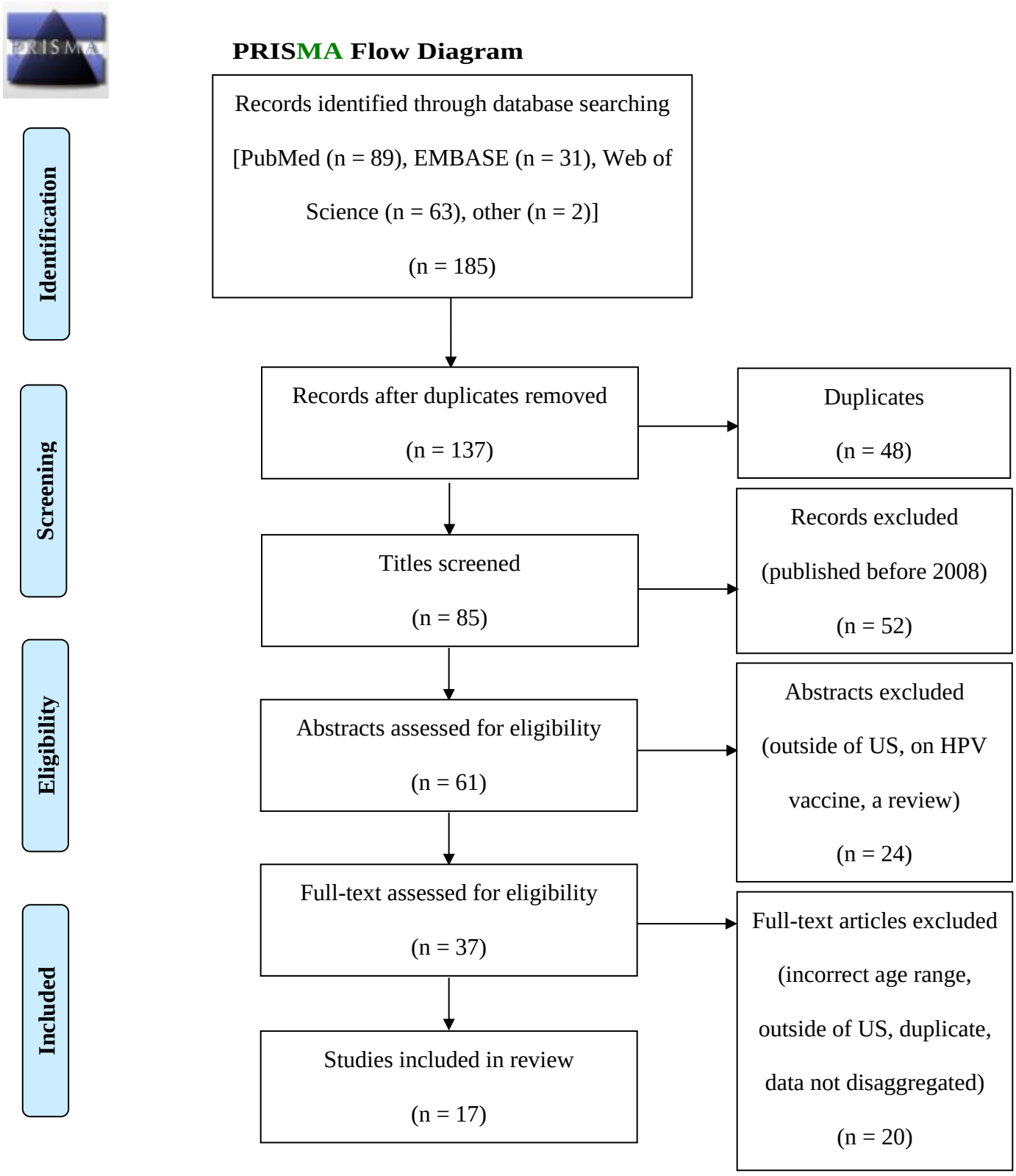

Table 2. Summary of the 17 Included Studies

Reference	Data source	State(s)	Data collection year(s)	Subgroup(s)	# of participants	Age of participants (years)
Chawla et al. [20]	CHIS	California	2001, 2003, 2005, 2007, 2009	Chinese, Filipina, Japanese, Korean, South Asian, Vietnamese	7865	21–64
Chen & Wang [21]	SAQ	New York	-	Chinese	35	18-77
Do [29]	SAQ	Texas, Massachusetts, New Jersey, North Carolina, Virginia	2010	Vietnamese	265	18+
Lee, Menon, & Fogg [26]	Interview	Illinois	2003 and 2004	Korean	189	40+

Lee et al. [27]	Interview	Illinois	-	Korean	189	40+
Ma et al. (2009) [22]	Interview	Pennsylvania, New Jersey, New York City	2005 and 2006	Chinese, Korean, Vietnamese, Cambodian	1049	18+
Ma et al. (2012) [30]	SAQ	-	-	Vietnamese	1450	20-70
Ma et al. (2013) [36]	SAQ	-	-	Vietnamese	1450	20-70
Menon, Szalacha, & Prabhughate [28]	Interview	Illinois	-	South Asian	198	40+
Nguyen & Clark [31]	SAQ	Virginia	-	Vietnamese	111	18-70
Nguyen, Clark, & Belgrave [32]	Interview	Virginia	2010 and 2011	Vietnamese	100	18+
Nguyen, Hood, &	SAQ	Virginia	2010 and 2011	Vietnamese	111	18-70

Belgrave [33]						
Pourat et al. [24]	CHIS	California	2003	Chinese, Filipina, Japanese, Korean, South Asian, Vietnamese	2161	18-65+
Sentell et al. [23]	CHIS	California	2007	Chinese	632	21-65
Taylor et al. [34]	Interview	Washington	2006 and 207	Vietnamese	1532	20-79
Tung [35]	SAQ	-	-	Vietnamese	80	20-65
Yoo et al. [25]	SAQ	California	-	Vietnamese, Korean, Filipina	304	18-28

Table 3. Pap test rates by subgroup (%)

Subgroup	Data years	Pap ever	Pap within the past 3 years	Pap within the past 1 year	Reference
Chinese	2001, 2003, 2005, 2007, 2009	-	77.6	-	[20]
Chinese	-	-	-	37.1	[21]
Chinese	2003	-	69.0	-	[24]
Chinese	2007	-	63.2	-	[23]
Filipina	2001, 2003, 2005, 2007, 2009	-	83.6	-	[20]
Filipina	2003	-	69.0	-	[24]
Japanese	2001, 2003, 2005, 2007, 2009	-	75.0	-	[20]
Japanese	2003	-	75.0	-	[24]
Korean	2001, 2003, 2005, 2007, 2009	-	76.8	-	[20]
Korean	-	84.6	65.6	-	[27]
Korean	2003	-	68	-	[24]

South Asian	2001, 2003, 2005, 2007, 2009	-	78.6	-	[20]
South Asian	-	32.1	-	-	[28]
South Asian	2003	-	73	-	[24]
Vietnamese	2001, 2003, 2005, 2007, 2009	-	80.0	-	[20]
Vietnamese	2010	74.7	-	45.3	[29]
Vietnamese	-	52.8	-	-	[30]
Vietnamese	-	52.8	-	-	[36]
Vietnamese	2010. 2011	65	-	-	[33]
Vietnamese	2003	-	70	-	[24]
Vietnamese	2006, 2007	16.9	14.3	-	[34]
Vietnamese	-	62.5	-	-	[35]

Table 4. Factors reported to be associated with previous receipt of Pap test

Category	Risk Factor	Subgroup	Reference
Socio-demographic status	Age	Chinese, Filipina, Japanese, Korean, South Asian, Vietnamese	[20][21][22][23][25][26] [27][29][30][31][33][34]
	Marital status	Chinese, Filipina, Japanese, Korean, South Asian, Vietnamese	[20][21][22][23][26][27] [29][30][31][32][34]
	Employment	Chinese, Vietnamese	[22][32][34]
	Income	Chinese	[20][22]
	Education	Filipina, Japanese, Korean, South Asian, Vietnamese	[20][27][28][30]

Healthcare Access	Insurance	Chinese, Filipina, Japanese, Korean, South Asian, Vietnamese	[20][22][29][30][32]
	Usual source of care	Chinese, Japanese, Vietnamese	[20][21][23][24][29][30]
	Communication with physicians	Chinese	[24]
	Distance to clinic	Japanese, South Asian	[24]
	Physician language	Vietnamese	[30]
	Physician recommendation	Vietnamese	[30][32]
	Physician gender	Vietnamese	[34]
Acculturation	Time spent in US	Chinese, Filipina, Japanese, Korean, South Asian, Vietnamese	[20][21][22][24][30][34]

	English-speaking ability	Chinese, Korean, South Asian, Vietnamese	[20][21][22][24][26][30]
	Place of birth	Vietnamese	[25][29][30]
Knowledge, Attitude, and Behaviors	Know what Pap test detects	Chinese, Korean, Vietnamese	[21][22][29][30]
	Previous use of mammography	Chinese, South Asian	[21][28]
	Comfort with Pap test	Filipina, Vietnamese	[25]
	Belief Pap test was beneficial	Korean	[26]
	Acknowledging existence of barriers to screening	South Asian	[28]
	Perceived risk of cervical cancer	Vietnamese	[29]
	Early screening can prevent cervical cancer	Vietnamese	[30][34]
	Getting Pap test is embarrassing	Vietnamese	[29][36]

	Fear of Pap test results	Vietnamese	[29][35][36]
	Use of doctor aside from being sick	Vietnamese	[30]
	Transportation barriers	Vietnamese	[29][30][36]

Table 5. Summary of interventions for improving Pap test rates among Asian American women

Population	Intervention	Outcome	Reference
Korean	Patient Navigation	Increased Pap test screening	[39]
Chinese	Patient Navigation	Increased Pap test screening	[40]
Korean	Text-Message Intervention	Increase in knowledge of cervical cancer and guidelines	[41]
Vietnamese	Lay Health Worker	More likely to report Pap testing	[42]