

Comparative study of HPV and Cervical Cancer Knowledge and Beliefs between Mexican Immigrant Women in the US and Peruvian Women

John S. Luque^{1*}; Jonathan Maupin²; Daron G. Ferris^{3,4}

¹ Institute of Public Health, Florida A&M University, Tallahassee, FL, USA

² jmaupin@asu.edu School of Human Evolution and Social Change, Arizona State University, Tempe, AZ, USA

³ dferris@augusta.edu Department of Obstetrics and Gynecology, Augusta University, Augusta, GA, USA

⁴ CerviCusco, Cusco, Peru

*Corresponding author email: john.luque@fam.u.edu

ABSTRACT

Cervical cancer remains one of the major cancers affecting women from developing countries, especially those from socioeconomically disadvantaged backgrounds. In the US, Hispanic immigrant women experience restricted access to health care and higher incidence rates of cervical cancer compared to the non-Hispanic white population. Knowledge of cervical cancer risk factors and symptoms is associated with greater interest in participating in regular cervical cancer screening. To explore knowledge and beliefs about cervical cancer, survey questionnaires were administered to Mexican immigrant women in southeast Georgia, US and to mestizo women - primarily Quechua language dominant speakers - in Cusco, Peru. As part of these survey studies, there was a list of 32 items asking participants to agree or disagree with whether certain symptoms or risk factors could cause cervical cancer and a pile sort of 15 of the most salient items. Cultural consensus analysis was used to calculate overall agreement with a cultural model of cervical cancer risk factor knowledge in each sample independently. For the Georgia sample, there was marginal consensus, but for the Peru sample, there was no consensus. Analysis of cultural competence values and residual agreement show significant differences across education in the Georgia study, with a positive correlation between education and cultural competence ($r=0.50$, $p=0.001$), but not in the Peru study. Likewise, the results of the pile sort data exhibited consensus for the Georgia sample for the cervical cancer risk factors, but not for the Peru sample. The lack of consensus among the Peru sample on either task suggests little widespread knowledge on risk factors of cervical cancer. Additional analyses related to factors associated with screening behaviors from the cultural cancer screening scale indicated more pronounced fatalistic beliefs and catastrophic disease expectations about cervical cancer among the Peruvian women compared to the Mexican immigrant women.

KEYWORDS: cervical cancer screening, human papillomavirus, Hispanics, Peru

Citation: Luque JS et al (2019) Comparative study of HPV and cervical cancer knowledge and beliefs between Mexican immigrant women in the US and Peruvian women. *Cancer Health Disparities* 3: e1-16. doi:10.9777/chd.2019.1007.

INTRODUCTION

Cervical cancer is a disease that is preventable through public health interventions. Early detection of cervical cancer is critical to reduce mortality from the disease. The primary prevention strategy is the administration of the human papilloma virus (HPV) vaccine for adolescents and young adults between 9 and 26 years old. The secondary prevention strategy is cervical cancer screening (the Papanicolaou test with or without and HPV DNA testing or primary HPV DNA testing alone) combined with treatment for any detected pre-cancerous lesions to prevent progression to cervical cancer. Since the primary risk factor for cervical cancer is HPV infection, vaccination has had significant impacts in reducing cervical cancer incidence in countries such as Australia where adoption has been widespread through its school-based vaccination programs (Smith and Canfell, 2017). Other risk factors which may be either independent risk factors for cervical cancer or co-factors modifying the risk in women infected with HPV include immunosuppression (e.g., caused by HIV infection or immunosuppressive drugs), exposure to certain sexually transmitted diseases, long-term use of oral contraceptives, high parity, obesity, eating a diet low in fruits and vegetables, and smoking (Bosch and de Sanjose, 2007).

Despite major advances in cervical cancer prevention worldwide, most cervical cancer deaths continue to occur in developing countries with poor public health infrastructure for organized screening programs. In 2012, there were an estimated 265,700 deaths from cervical cancer, making it the third leading cause of cancer death in developing countries (Torre et al., 2015). In Latin America and the Caribbean, there were an estimated 28,600 cervical cancer deaths (Torre et al., 2015). Cervical cancer incidence rates remain high in many developing countries in Latin America, disproportionately affecting women who are socioeconomically disadvantaged (Lopez et al., 2017). Recent studies have suggested that in some

countries, HPV DNA testing might be a more effective frontline strategy where screening with conventional cytology programs is either unavailable or unreliable (Catarino et al., 2015). Therefore, there have been concerted public health efforts to bolster support for cervical cancer prevention in some countries. For example, in Peru, researchers described the use of self-sampling kits to expand the reach of screening programs into rural areas and the challenges with implementing national cancer control plans (Aguilar et al., 2016). Another project demonstrated that HPV self-sampling testing was a superior method compared to testing by visual inspection by acetic acid (VIA) for reaching rural populations (Levinson et al., 2013).

Concurrent with these medical technology advancements connecting HPV DNA screening and cervical cancer prevention, there is a growing body of research to understand barriers and facilitators to cervical cancer screening and HPV vaccination in special populations experiencing the greatest burden of disease (Aharon et al., 2017; Ginsburg et al., 2017; Mann et al., 2015; Thompson et al., 2014; Vasilevska et al., 2012). Cervical cancer, while a relatively rare diagnosis in the US, is a disease which persists in poor and marginalized communities such as the *colonias* along the US/Mexico border, parts of Appalachia, and other areas of the US characterized by high rates of poverty, low socioeconomic status, and distrust of medical facilities (Scarinci et al., 2010; Smith et al., 2013). While individual behaviors toward screening and vaccination are associated with adherence to medical recommendations, there are also systematic processes which create conditions wherein some population groups are better positioned to access preventive health care. In the US, what is often termed “cancer disparities” in the academic literature has been explained as a byproduct of structural vulnerability, or a situation resulting from a market-based health system which contributes to health disparities by increasing financial barriers for poor and

disenfranchised populations to access preventive health care (Quesada et al., 2011). Disproportionate access to health care may in some cases result in a late-stage cervical cancer diagnosis in patients suffering from a preventable cancer.

For Hispanic immigrants in the US, an additional factor besides socioeconomic status affecting health care access is immigration status. Fear related to seeking or receiving care and difficulties in actually obtaining care linked to immigration status was reported in a study almost 20 years ago during the time of California's controversial Proposition 187, which prohibited undocumented immigrants from accessing non-emergency health care, among other public services (Berk et al., 2000). Since that time, undocumented immigrants in the US have been subject to increasingly anti-immigration policies which have negatively affected their ability to access health insurance programs and health care more generally (Martinez et al., 2015). Undocumented immigrants were further excluded from health care coverage under the provisions of the Affordable Care Act (Alcalá et al., 2017). They often rely on safety net programs which accept patients without insurance and must use referrals, sometimes on a case-by-case basis, to provide the array of health care services that some patients require to manage their health conditions (Castañeda, 2017). Moreover, because of language barriers and lack of familiarity with US health care systems and billing structures, Hispanic immigrants might also experience difficulties in securing a regular health care provider, finding a trusted provider, accessing relevant health education on varied topics from prenatal care to diabetes management, and understanding payment options for different types of medical procedures or office visits (Rhodes et al., 2015).

Medical anthropologists studying cancer prevention seek to understand how people's cultural backgrounds might influence their knowledge, attitudes, and beliefs around behaviors that moderate cancer risk (McMullin, 2016).

Research which examines whether cervical cancer risk factors, and specifically awareness of HPV infection risk, are understood and how such understandings may reflect a cultural model of risk around the disease is the focus of this comparative research study. This comparative study seeks to understand how models of risk are culturally constructed and vary in different US and Latin American contexts.

METHODS

Participant Recruitment

For the Georgia study in 2013, a female, native Spanish speaker research coordinator administered a Spanish-language survey to Mexican immigrant women living in rural, southeast Georgia. To participate in the survey, study inclusion criteria included women who were either actively participating in crop agriculture or had recently participated in this type of work and were between 21 and 65 years of age to align with US cervical cancer screening age guidelines (Committee on Practice Bulletins—Gynecology, 2016). To capture a range of acculturation experiences, equal numbers of participants had lived in the US more than 10 years or for 10 years or less. Thirty-nine participants were recruited from area farms and a poultry processing plant.

For the Peru study in 2014, a female, nurse-midwife research coordinator administered a Spanish-language survey to Peruvian women who were patients of CerviCusco. CerviCusco is a nonprofit clinic in Cusco, Peru which provides cervical cancer screening to over 10,000 women every year. They have a clinic in the city of Cusco but also conduct regular mobile cervical cancer screening outreach to serve patients living in remote mountain villages. Survey participants had either received a Pap test during mobile outreach clinic services (n=20) or had received a Pap test in the CerviCusco clinic (n=10). Participants were between 30 and 49 years old in alignment with cervical cancer screening guidelines in Peru (HPV

Information Centre, 2016). Participants received either a \$10 gift card in Georgia or a useful gift item in Peru for their research participation. Participants in both studies completed a written informed consent process before the survey was administered. The protocols for these research studies were approved by the Institutional Review Boards of Georgia Southern University, Augusta University, and the Peru Ministry of Health.

Measures

Each of the research studies consisted of administering a survey questionnaire. The survey began with open ended questions about health care resources in the community and knowledge about cancer and cervical cancer. These questions were followed by a section on clinical history of Pap tests and results, other health history questions, and knowledge of HPV and the HPV vaccine. Questions about knowledge and beliefs about HPV/cervical cancer were drawn from the Health Information National Trends Survey (National Cancer Institute, 2016). Next, participants were presented with 32 items and asked to agree or disagree with whether each item was a possible cause or risk factor for cervical cancer. These items included both biomedically accepted factors (e.g., HPV, multiple sex partners) and other factors which may be more ethnomedically defined (e.g., abortion, vaginal trauma, stress). Participants were also asked to sort 15 index cards of the most salient items using a constrained pile sort of no more than four piles. In addition, participants were asked to agree or disagree with seven belief statements related to cervical cancer such as, "I am very likely to get cervical cancer sometime in my lifetime." These items and statements were drawn from previous structured research questions about cervical cancer cultural models with Hispanic participants (Chavez et al., 1995; Luque et al., 2010). Participants also completed the 20-item Cultural Cancer Screening Scale (CCSS), which has demonstrated good internal consistency ($\alpha=0.84$) with US Hispanics and identifies cultural factors related to screening behavior (Betancourt et al.,

2010). The CCSS is comprised of the following five constructs: sociocultural deterrents; cancer screening fatalism; symptomatic deterrents; catastrophic disease expectations; and negative beliefs about health professionals. The research coordinators administering the survey also collected sociodemographic data including age, marital status, education, employment status, language preference, housing characteristics, and health insurance coverage. Participants also responded to questions about having a regular provider, whether they visited the doctor in the last year, and smoking status.

Data Analysis

Descriptive statistics for sociodemographic data, correlation analysis of cultural competence values, and bivariate analysis for between sample analysis of CCSS measures were generated using SPSS Statistics V. 24 (SPSS, Inc. Chicago, Illinois). For the quantitative data from the structured questions on risk factor/symptom items, UCINET 6.0 (Analytic Technologies, Lexington, Kentucky) was used to calculate cultural consensus for the overall sample, and each group individually. For the pile sort data, each pile sort was analyzed using Visual Anthropac 1.0 PileSorts (Analytic Technologies, Lexington, Kentucky) to calculate consensus among respondents. Nonmetric multidimensional scaling (MDS) was used to visualize the results of the pile sort analysis and average linkage clustering set to five clusters.

RESULTS

Sociodemographic and Health Characteristics

Despite the wider range of participant ages in the Georgia sample, the average age in both samples was 40 years. The average number of years of schooling in the Georgia sample was 8 years, and in the Peru sample it was 6.5 years. Places of origin for the Mexican immigrant women included Campeche, Cardenas, Guanajuato, Guerrero, Jalisco, Hidalgo, Michoacan, Queretaro,

Tamaulipas, Veracruz, Oaxaca, and San Luis Potosi. The two provinces with the highest percentage of participants were Guanajuato (36%) and Tamaulipas (21%). The Peruvian women were multiethnic women from the greater Cusco region, and two-thirds were Quechua dominant speakers, with the other third either monolingual Spanish speakers or bilingual Quechua/Spanish speakers. Because the participants in Peru were largely covered under the government health insurance program, and most Mexican immigrants in Georgia did not have access to either government or employer provided health insurance, there were major differences in responses to the health insurance question. However, there were similar answers to the question about having a regular provider, with only a third reporting having one in

each sample, yet a smaller percentage of the Mexican immigrant women had received a Pap test in the last three years compared to the Peruvian women (87% vs. 50%), probably since the Peru sample was clinic-based. Despite more recent contact with health care, a smaller percentage of the Peruvian women had heard of HPV (20% vs. 56%) or the HPV vaccine (17% vs. 41%). Similarly, in the Peru sample there was less knowledge about some facts about HPV, for example that HPV could cause cervical cancer or lead to abnormal Pap test results. In the Peru sample, there was even less awareness of the purpose of the HPV vaccine. Other participant sociodemographic characteristics are detailed in Table 1, and HPV knowledge questions are listed in Table 2.

Table 1. Sociodemographic Characteristics.

Characteristics	Georgia, US (n=39) %	Cusco, Peru (n=30) %
Age group (years)		
20-29	28	0
30-39	23	50
40-49	26	50
50-64	23	0
Marital status		
Single/Other	26	13
Married/living with a partner	74	87
Education		
< 11 years	62	67
12 years or HS	33	23
Some college, tech, or higher	5	10
Employed		
Yes	87	67
No	13	33
Language(s) spoken at home		
English	3	0
Spanish	74	27

Quechua	0	63
Spanish & Quechua	0	10
Spanish & English	23	0
Housing		
Rent	51	70
Own	49	20
Other	0	10
Health insurance coverage		
Yes	3	80
No	97	20
Have a regular provider		
Yes	38	30
No	62	70
Visited doctor in last year		
Yes	39	100
No	61	0
Current smoker		
Yes	3	0
No	97	100
Current chronic health condition		
Yes	24	0
No	73	63
Don't know	3	37

Table 2. Cervical Cancer Screening and Knowledge of HPV/HPV Vaccine.

Characteristics	Georgia, US (n=39) %	Cusco, Peru (n=30) %
When was your last Pap test?		
1 year or less	41	80
> 1 year < 3 years	9	7
> 3 years < 5 years	19	3
>5 years	6	0
Never	22	3
Don't know	3	7
Have you heard of HPV?		

Yes	56	20
No	44	67
Don't know	0	13
Do you think HPV causes abnormal Pap tests?		
Yes	49	17
No	23	20
Don't know	28	63
Do you think HPV causes cervical cancer?		
Yes	46	20
No	15	10
Don't know	39	70
Do you think HPV is a sexually transmitted disease?		
Yes	51	27
No	18	3
Don't know	31	70
Have you heard of the HPV vaccine?		
Yes	41	17
No	59	83
Do you think the HPV vaccine is an effective way to prevent HPV infection?		
Yes	87	7
No	8	13
Don't know	5	80

Thoughts and Understanding of Cervical Cancer, HPV and the HPV Vaccine

Participants were asked a series of open-ended questions about cervical cancer, HPV and the HPV vaccine. In the Georgia study, while more than two-thirds of the women had heard about cervical cancer and that it was a serious illness, they admitted they did not know that much about the

disease. For example, a participant explained, "it is cancer of the vagina, I'm not that sure." Another participant answered, "it is in the uterus, I know very little." There were also some accurate explanations such as, "I've heard that you have to do the Pap after you have relations ... you get them in private parts of a woman." There was some awareness of the vaccine to prevent it also, for example, one participant said, "for this reason,

we get checked. They are trying to prevent it with thirteen-year-olds who get three shots." When asked what they had heard about HPV, slightly more than half of the participants did not offer response. Some misconceptions included the belief that one could contract cervical cancer in lavatories or from using tampons. Those who responded to questions about HPV tended to have more information, for example participants responded with answers such as, "the vaccine helps to avoid the high risk of getting the virus," and "that it is important to give to young people before they are sexually active." Participants were generally positive about the HPV vaccine and responded that sources of motivation to receive the vaccine included to be protected, for family reasons, to avoid a hysterectomy, to prevent cancer, and to prevent the illness so you would be able to have sexual relations with other people and then be immune from further infection. Reasons for not getting vaccinated included physical factors such as being pregnant, side effects, allergies, or becoming sterile. Other reasons for not getting vaccinated listed were costs, ignorance, fear, embarrassment and religious beliefs.

In the Peru study, when asked about preventing cervical cancer, women responded that personal hygiene, cleaning with herbs, receiving Pap tests, having only one partner or few partners were all important. Women also spoke about living in peace and having a good relationship with partners. Participants were asked if they had any concerns about the Pap test. One participant responded, "I got my tubes tied, and I am afraid that will cause cancer." Another echoed this concern about tubal ligation and was afraid that it could cause an infection or cancer. Another woman was concerned about her symptoms by expressing, "I have vaginal leakage and am afraid." Regarding the HPV vaccine, motivating factors to receive the vaccine included receiving educational

information and campaigns where the vaccine would be available. Reasons for not getting vaccinated were lack of financial resources, negative beliefs about the effectiveness of vaccines, and fear of side effects, such as childhood deformities, or pain at the injection site.

Cultural Consensus Results for Risk Factors and Symptoms

Participants were asked to agree or disagree with a list of possible risk factors/symptoms that could cause cervical cancer. There was consensus amongst all participants (0.4, SD = 0.03), and for the Georgia sample independently there was marginal consensus with an average cultural competence value of 0.49 (SD = 0.28), an eigenratio of 5.93, and 5% negative competency values. For the Peru sample, there was a lack of consensus, with an average cultural competence value of 0.30 (SD = 0.24), an eigenratio of 1.83, and 10% negative competency scores. The convention for consensus, or a shared cultural model, is to produce an eigenratio of 3.0 or greater. One individual from the Georgia sample and two individuals from the Peru sample were removed from the analysis because there was no variability in their responses since they agreed with all risk factors/symptoms (Table 3). After dividing the two separate samples by education (primary or some secondary, secondary and higher), there was a significant difference in the cultural competence values for the Georgia sample ($t=-2.15$, $p=0.04$), and the higher education sample (0.60, SD = 0.27) exhibited significantly higher competence in the model of knowledge of cervical cancer causes than the lower education sample (0.41, SD = 0.26) (Figure 1). Analysis of residual agreement also showed that higher educated individuals in Georgia are a distinct sub-group, meaning they have higher within than between-group agreement, while lower educated individuals are not a distinct sub-group ($F=4.515$, $p<0.05$).

Table 3. Cultural Consensus Analysis.

Measure	Agree/ Disagree Cusco, Peru (N=28)	Agree/ Disagree Georgia, US (N=38)	Pile Sort Risk Factors Cusco, Peru (N=30)	Pile Sort Risk Factors Georgia, US (N=39)
Eigenratio ^a	1.8	5.9	2.6	7.1
Average Competence	0.30 (± 0.24)	0.49 (± 0.28)	0.30 (± 0.19)	0.61 (± 0.10)

^aEigenvalue ratios of 3.0 or greater and lack of negative competence values indicate a good fit to the consensus model. A competence value of 0.50 indicates an average level of cultural competence.

Notes. For the agree/disagree questions, two participants from the Peru dataset and one participant from the Georgia dataset were removed because of 100% endorsement of all items.

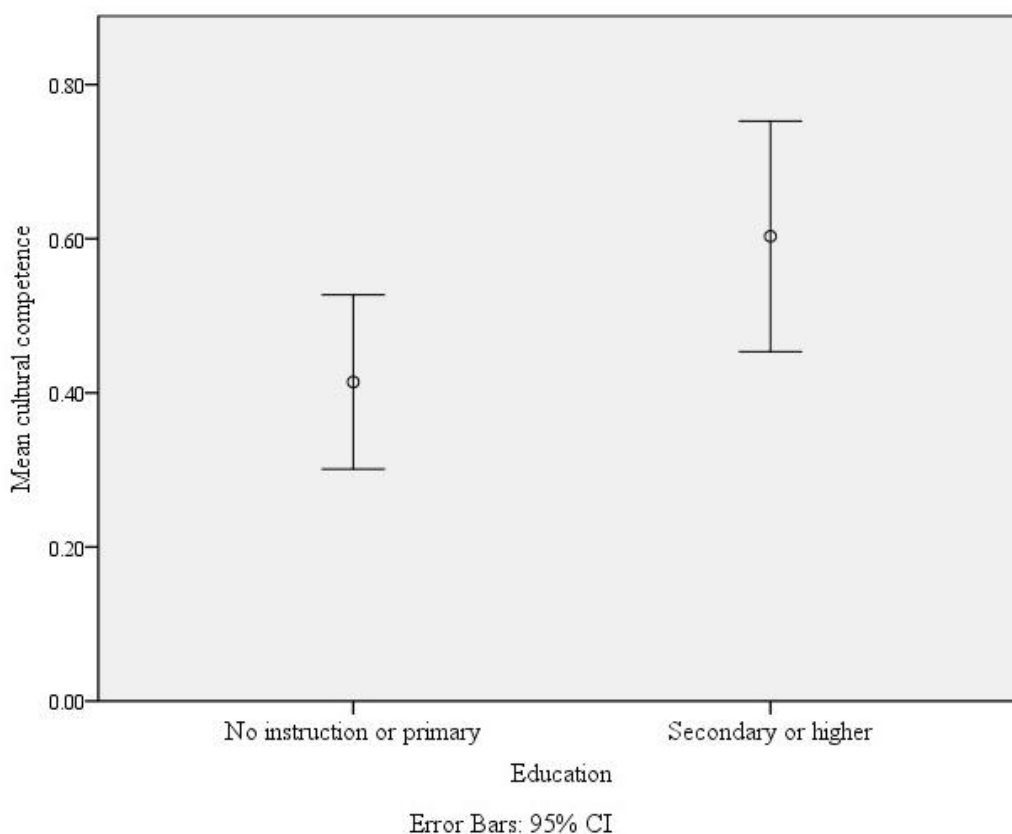


Figure 1. Mean cultural competence by education category, Georgia, US

The average percentage agreement with the items was 70% in the Georgia sample and 60% in the Peru sample (Table 4). When only considering the biomedically defined risk factors, the average

percentage agreement was 74% in the Georgia sample and 76% in the Peru sample. Both samples reported high agreement with HPV as a risk factor for cervical cancer (>80%). The Peru sample

endorsed the following possible cervical cancer risk factors significantly higher (>20% difference) than the Georgia sample: drinking alcohol, smoking, high blood pressure, stress, urinating frequently, fate, worry, pelvic rash, and weight loss.

However, the Georgia sample had higher endorsement (>20% difference) of poor feminine hygiene and use of birth control pills as risk factors.

Table 4. *Endorsement of Cervical Cancer Risk Factors/Symptoms.*

Risk factor/symptom	Georgia, US (n=39) %	Cusco, Peru (n=30) %
Multiple sex partners*	95	97
Poor feminine hygiene	92	73
Spouse with multiple sex partners*	90	87
Not getting regular check-ups*	90	93
Gonorrhea*	87	73
Syphilis*	87	77
Human papilloma virus (HPV)*	85	83
Abnormal vaginal bleeding*	82	87
Sex before age 16 years*	79	80
Abortion	77	87
Vaginal trauma	74	77
HIV infection*	74	87
Yeast infection	74	87
Birth control pills*	72	53
Chlamydia*	72	87
Sex during menstrual period	69	77
Family history	67	77
Many pregnancies	64	80
Smoking*	56	83
Drink alcohol	51	93
Bloody stools	51	63
Diet*	49	53
Pelvic rash	49	80
Chemicals in food	46	67
Urinating frequently	38	67
Fate	31	57
Stress	28	67
Weight loss	23	60

High cholesterol	23	43
High blood pressure	18	50
Worry	16	57
Low income*	13	30
Average endorsement	70	60
Average endorsement of biomedical risk factors*	74	76

*Risk factors/symptoms generally accepted by medical profession.

Notes. Columns represent % who agreed that the risk factor or symptom was a cause of cervical cancer

Similar to the agree/disagree task, there was consensus for the pile sort data in the Georgia sample and no negative competency values (Table 3). The MDS plot had a stress value of 0.13. The MDS plot produced five clusters from the constrained pile sort. The first cluster included family history and destiny, or unmodifiable factors. The second cluster included items about sex and infection—HPV, HIV, multiple sex partners, sex under 16 years old, and lack of a regular Pap test. The third cluster grouped risk factors around reproductive factors—birth control pills, abortion, and multiple pregnancies. The fourth cluster grouped not using condoms and poor feminine hygiene. The fifth cluster included environmental and behavioral risk factors—smoking, poor diet, and chemicals in food. The MDS plot for the Peru sample had high stress value of 0.20, and the pile sort data did not produce consensus.

Cervical Cancer Belief Statements

Study participants responded to seven statements about cervical cancer and were asked to agree or disagree with each statement (Table 5). There was very high agreement in both samples with two statements: 1) that cervical cancer was curable if found early; and 2) that even if treatment were painful, the participant would endure it if it meant living longer. The greatest disagreement was about not wanting to know about a cervical cancer diagnosis, with 63% of Peruvian women not wanting to know compared to only 13% of Mexican immigrant women. Similarly, only half of Peruvian women believed that there was something they could do to prevent cervical cancer compared to 18% of Mexican immigrant women.

Table 5. Endorsement of Cervical Cancer Beliefs.

Statement of cervical cancer beliefs	Georgia, US (n=39) %	Cusco, Peru (n=30) %
I would be afraid to tell my husband or partner if I had cervical cancer	18	37
I need a Pap smear only when I experience vaginal bleeding other than menstruation (or when I experience other symptoms)	28	53
I am very likely to get cervical cancer sometime in my lifetime	62	40
If cervical cancer is found early, it can be cured	95	87
I would undergo cervical cancer treatment that is unpleasant or painful if it would improve my chances of living longer	97	100
I would rather not know if I had cervical cancer	13	63
There is not much I can do to prevent cervical cancer	18	50

Notes. Columns represent % who agreed with the statement.

Cultural Cancer Screening Scale

The cultural cancer screening scale (CCSS) assesses items relevant to cancer screening (Table 6). In the Georgia sample, the internal consistency of the CCSS (20 items) was 0.91, indicating excellent reliability. On the 5-point scale (ranging from 1 = never to 5 = always), the mean values for the subscales were at or below the midpoint on

the scale: (1) catastrophic disease expectations (2.1, SD = 1.5); (2) cancer screening fatalism (2.1, SD = 1.6); (3) sociocultural deterrents (2.5, SD = 0.9); (4) symptomatic deterrents (2.4, SD = 2.4); and (5) negative beliefs about health professionals (1.8, SD = 0.9).

Table 6. Responses from the Cultural Cancer Screening Scale^a.

Characteristics	Georgia, US Mean ±SD	Cusco, Peru Mean ±SD	P-values
Catastrophic Disease Expectations	2.1 ±1.5	4.0 ±0.9	<0.001
Cervical cancer is the worst thing that can happen to a woman			
Cervical cancer is a deadly disease			
Cancer Screening Fatalism	2.2 ±1.6	3.3 ±0.6	<0.001
It is not important to screen regularly for cervical cancer because everyone will eventually die of something anyway			
It is not necessary to screen for cervical cancer regularly because it is in God's hands anyway			
Screening regularly is not very important because if you are meant to get cancer you will get it no matter what you do			
Sociocultural Deterrents	2.5 ±0.9	3.2 ±0.7	0.002
Having problems making an appointment			
Not knowing where I can get a screening exam			
Not being able to get time off work			
Not having transportation to get to my appointment			
Not receiving a reminder call or text for the screening exam			
Having to take care of my child(ren) of family			
Not having health insurance or the money to pay for the exam			
Symptomatic Deterrents	2.4 ±1.6	3.3 ±0.8	0.001
Feeling healthy			
Having several normal screening results			
Not feeling anything abnormal			

Negative Beliefs about Health Professionals	1.8 ±0.9	2.5 ±0.5	<0.001
The health care professionals are not compassionate towards their patients			
Health professionals are always in a hurry and do not have time for their patients			
I don't not feel comfortable with health professionals doing the screening examination			
Some health professionals inappropriately touch their patients during the screening examination			
Health professionals performing screening examinations are not trustworthy			

Notes. Values in **bold** represent summary scale scores for this validated measure.

^aResponse categories for the items in this scale are: 1 = "Never"; 2 = "I don't think so"; 3 = "Neutral"; 4 = "Very sure"; 5 = "Always"

In the Peru sample, the internal consistency of the CCSS was 0.72, indicating acceptable reliability. The mean values for the subscales were significantly higher than the Georgia sample for each construct based on the independent samples *t*-test: (1) catastrophic disease expectations (4.0, SD = 0.9); (2) cancer screening fatalism (3.3, SD = 0.6); (3) sociocultural deterrents (3.2, SD = 0.7); (4) symptomatic deterrents (3.3, SD = 0.8); and (5) negative beliefs about health professionals (2.5, SD = 0.5). For the Peruvian women, the values were above the midpoint value for four of the five subscales. The largest difference in average scores was for catastrophic disease expectations, indicating Peruvian women were more likely to endorse the belief that a diagnosis of cervical cancer was equivalent to a death sentence.

DISCUSSION

To our knowledge, this is only the second study comparing knowledge about cervical cancer using the same survey instrument between Hispanic women in the US and multiethnic women in South America. These results suggest that overall, women in Cusco held beliefs about cervical cancer that are more fatalistic than Mexican immigrant women in Georgia. The higher incidence and

mortality from cervical cancer in Peru might be associated with more fatalistic beliefs about cervical cancer and by extension, cancer. This difference in fatalism scores could also be partially attributed to the Mexican immigrant women having a higher regard for the quality of health services in the US, compared to the Peruvian women's perception of their chances of surviving a diagnosis of cancer in Peru. Negative perceptions toward the quality and accessibility of government health care facilities for the prevention and control of cervical cancer were reported in the results of other survey projects with women in this area of Cusco (Ferris et al., 2015a; Luque et al., 2016).

The presence of consensus among the Georgia sample, and lack of consensus among the Peruvian participants, also suggests differences in the social distribution of knowledge regarding cervical cancer. For while there appears to be a general cultural model among Hispanics in Georgia, with some variation according to education, there is no consensus among the Peru sample either in the agree/disagree or the pile sort task. Similar to Shiu et al.'s (2010) results among a sample of older women in Hong Kong, the lack of consensus on questions regarding cervical cancer indicates little public or general knowledge on the

topic. The explanation given in that study was that there was substantial disagreement about the most highly ranked cervical cancer factors (Shiu et al., 2010). Responses may be based more on personal knowledge or opinion.

Our study results are not dissimilar to a previous survey study which compared responses to cervical cancer knowledge questions between women in the Cusco area with women in Augusta, Georgia—both English- and Spanish-speaking (Han et al., 2012). In this prior comparative study, lower levels of knowledge about cervical cancer were similarly identified among Peruvian women compared to Hispanic women in the US. For example, when asked if HPV could cause an abnormal Pap test, 69% of US Hispanic women answered correctly, compared to 40% of Peruvian Quechua speakers, 27% of Peruvian Spanish speakers, and 39% of bilingual Peruvians. Moreover, in the same study when asked if they were embarrassed to receive a Pap test, 38% of US Hispanic women answered affirmatively, compared to 39% of Peruvian Quechua speakers, 50% of Peruvian Spanish speakers, and 39% of bilingual Peruvians. In that study the reference group for comparison was non-Spanish-speaking women, and the survey found significant differences on cervical cancer knowledge questions—higher knowledge among non-Spanish-speaking women—and on belief questions such as fear and embarrassment of getting a Pap test—less fear and embarrassment among non-Spanish-speaking women.

In our study, in both samples it is possible that there was confusion about the difference between HIV and HPV, suggested by the grouping of these risk factors in the pile sort exercise and the low knowledge levels in response to the HPV and HPV vaccine survey questions. HIV was endorsed by a higher percentage of Peru participants than HPV, but in the Georgia sample, HIV was endorsed by a lower percentage of participants as a risk factor for cervical cancer. Nevertheless, both samples

endorsed HPV as a risk factor for cervical cancer similarly (above 80%).

Importantly, related to HPV vaccination behaviors, previous research in multiple sites in Peru reported that even though 59-71% of low-income 25-65 year old women had low awareness of HPV, the HPV vaccine, and cervical cancer, over 90% would agree to be vaccinated and 58% would be willing to pay some amount for the vaccine (Lee et al., 2010). Our results about the barriers to screening affecting Peruvian women based on the Cultural Cancer Screening Scale for the catastrophic disease expectations and the responses to the belief statements, for example about the questionable benefits of receiving cervical cancer screening, are similar to another study based on focus group discussions with women in four Peruvian cities which reported that many women cited fear, embarrassment, and lack of knowledge as being barriers for not getting a Pap test (Paz-Soldan et al., 2010). In our work to educate gynecologic patients, we have previously developed animated videos to educate patients in their native languages in Peru and Georgia about cervical cancer prevention and treatment procedures to increase understanding of HPV and HPV vaccination awareness (Ferris et al., 2015b; Luque et al., 2017).

Limitations of this study include a small number of questions used in the agree/disagree survey. The 32 questions may not be enough to accurately measure patterns of agreement and variation, particularly with small sample sizes. The limited number of questions also prevents analysis of consensus in any sub-domain (e.g., causes, symptoms, or treatments), which would help in identifying whether the lack of consensus is rooted in specific areas or on the topic in general. However, the lack of consensus among Peruvian participants in the pile sort task, which is not as dependent upon the number of items, may suggest that there is limited agreement on risk factors for cervical cancer overall. However, the pile sort data is limited in terms of the number of

items participants can negotiate in terms of producing piles. Combining pile sort data with rank data for the same items can produce better understanding of how some clusters of cervical cancer risk factors may be perceived as more serious than others. For example, it was previously reported in a prior analysis of the Georgia survey data that the sex-related risk factors were ranked higher compared to the genetic and environmental risk factors (Luque et al., 2014).

CONCLUSION

The comparison of survey studies highlights the potential of exploring knowledge in this domain as well as revealing the limitations in using this type of methodology for a disease which may be poorly understood and the diagnosis perceived as catastrophic. Cervical cancer is highly curable when detected in its early stages, and the goal of the Peru clinic CerviCusco is to bring screening and more timely treatment to women who have unfortunately experienced the burden of the disease in their communities (Ferris et al., 2009). Future studies are planned in Peru to explore the psychological stress produced by screening and diagnosis of cervical cancer to benefit patients in negotiating their treatment and reduce stigma around the disease.

Ethical approval

Research for this article was approved by the research ethics committees of Georgia Southern University, Augusta University, and the Peru Ministry of Health.

Acknowledgements

In Peru, we acknowledge the collaboration of the CerviCusco staff, especially Ms. Wendy Guevara Condorhuaman, and the Peruvian Ministry of Health in Lima. In Georgia, we acknowledge Mrs. Claudia Reyes-Garcia for data collection, Southeast Georgia Communities Project and their team of

promotoras, especially Mrs. Andrea Hinojosa, the Vidalia onion farms, and Claxton Poultry.

Funding

This paper was supported by funding from the National Cancer Institute (R21CA163159, R03CA173105). Content presented is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute.

Conflict of interest

The authors declare that no competing or conflict of interests exist. The funders had no role in study design, writing of the manuscript, or decision to publish.

Authors' contributions

Conception and design: JL

Data analysis: JL, JM

Literature review and manuscript writing: JL, JM, DF

REFERENCES

- Aguilar, A., Pinto, J.A., Araujo, J., Fajardo, W., Bravo, L., Pinillos, L., and Vallejos, C. (2016). Control of cervical cancer in Peru: Current barriers and challenges for the future. *Mol Clin Oncol* 5, 241-245.
- Aharon, D., Calderon, M., Solari, V., Alarcon, P., and Zunt, J. (2017). Barriers to Follow-Up for Abnormal Papanicolaou Smears among Female Sex Workers in Lima, Peru. *PLoS One* 12, e0169327.
- Alcalá, H.E., Chen, J., Langellier, B.A., Roby, D.H., and Ortega, A.N. (2017). Impact of the Affordable Care Act on Health Care Access and Utilization Among Latinos. *J Am Board Fam Med* 30, 52-62.
- Berk, M.L., Schur, C.L., Chavez, L.R., and Frankel, M. (2000). Health care use among undocumented Latino immigrants. *Health Affairs* 19, 51-64.
- Betancourt, H., Flynn, P.M., Riggs, M., and Garberoglio, C. (2010). A cultural research approach to instrument development: the case of breast and cervical cancer screening among Latino and Anglo women. *Health Educ Res* 25, 991-1007.

- Bosch, F.X., and de Sanjose, S. (2007). The epidemiology of human papillomavirus infection and cervical cancer. *Dis Markers* 23, 213-227.
- Castañeda, H. (2017). Stratification by Immigration Status: Contradictory Exclusion and Inclusion after Health Care Reform. In *Unequal Coverage: The Experience of Health Care Reform in the United States*, J. Mulligan, and H. Castañeda, eds. (New York: NYU Press), pp. 37-58.
- Catarino, R., Petignat, P., Dongui, G., and Vassilakos, P. (2015). Cervical cancer screening in developing countries at a crossroad: Emerging technologies and policy choices. *World J Clin Oncol* 6, 281-290.
- Chavez, L.R., Hubbell, F.A., McMullin, J.M., Martinez, R.G., and Mishra, S.I. (1995). Structure and meaning in models of breast and cervical cancer risk factors: a comparison of perceptions among Latinas, Anglo women, and physicians. *Med Anthropol Q* 9, 40-74.
- Committee on Practice Bulletins—Gynecology (2016). Practice Bulletin No. 168 Summary: Cervical Cancer Screening and Prevention. *Obstet Gynecol* 128, 923-925.
- Ferris, D.G., Hupman, C., Waller, J.L., Cudnik, J., and Watkins, C. (2009). Assessment of the impact of cervical cancer prevention educational videos for Quechua- and Spanish-speaking Peruvian women. *J Low Genit Tract Dis* 13, 244-251.
- Ferris, D.G., Shapiro, J., Fowler, C., Cutler, C., Waller, J., and Guevara Condorhuaman, W.S. (2015a). The Impact of Accessible Cervical Cancer Screening in Peru—The Dia del Mercado Project. *J Low Genit Tract Dis* 19, 229-233.
- Ferris, D.G., Condorhuaman, W.S., Waller, J., and Lilienthal, A. (2015b). Impact of a Video Intervention for Rural Peruvian Women With Cervical Neoplasia Before Loop Excisional Procedures. *J Low Genit Tract Dis* 19, 224-228
- Ginsburg, O., Bray, F., Coleman, M.P., Vanderpuye, V., Eniu, A., Kotha, S.R., Sarker, M., Huong, T.T., Allemani, C., Dvaladze, A., et al. (2017). The global burden of women's cancers: a grand challenge in global health. *Lancet* 389, 847-860.
- Han, C.S., Ferris, D.G., Waller, J., Tharp, P., Walter, J., and Allmond, L. (2012). Comparison of knowledge and attitudes toward human papillomavirus, HPV vaccine, pap tests, and cervical cancer between US and Peruvian women. *J Low Genit Tract Dis* 16, 121-126.
- HPV Information Centre (2016). Human Papillomavirus and Related Cancers in Peru. Summary Report (WHO/ICO Information Centre on HPV and Cervical Cancer).
- Lee, F.H., Paz-Soldan, V.A., Carcamo, C., and Garcia, P.J. (2010). Knowledge and attitudes of adult peruvian women vis-a-vis Human Papillomavirus (HPV), cervical cancer, and the HPV vaccine. *J Low Genit Tract Dis* 14, 113-117.
- Levinson, K.L., Abuelo, C., Salmeron, J., Chyung, E., Zou, J., Belinson, S.E., Wang, G., Ortiz, C.S., Vallejos, C.S., and Belinson, J.L. (2013). The Peru Cervical Cancer Prevention Study (PERCAPS): The technology to make screening accessible. *Gynecol Oncol* 129, 318-323.
- Luque, J.S., Castaneda, H., Tyson, D.M., Vargas, N., Proctor, S., and Meade, C.D. (2010). HPV Awareness among Latina Immigrants and Anglo American Women in the Southern U.S.: Cultural Models of Cervical Cancer Risk Factors and Beliefs. *NAPA Bull* 34, 84-104.
- Luque, J.S., Maupin, J.N., Ferris, D.G., and Guevara Condorhuaman, W.S. (2016). Reaching women in the Peruvian Andes through cervical cancer screening campaigns: assessing attitudes of stakeholders and patients. *Patient Prefer Adherence* 10, 2107-2116.
- Luque, J.S., Tarasenko, Y.N., Maupin, J.N., Alfonso, M.L., Watson, L.C., Reyes-Garcia, C., and Ferris, D.G. (2015). Cultural Beliefs and Understandings of Cervical Cancer Among Mexican Immigrant Women in Southeast Georgia. *J Immigr Minor Health* 17, 713-721.
- Luque, J.S., Tarasenko, Y.N., Reyes-Garcia, C., Alfonso, M.L., Suazo, N., Rebing, L., and Ferris, D.G. (2017). Salud es Vida: a Cervical Cancer Screening Intervention for Rural Latina Immigrant Women. *J Cancer Educ* 32, 690-699.
- Lopez, M.S., Baker, E.S., Maza, M., Fontes-Cinra, G., Lopez, A., Carvajal, J.M., Nozar, F., Fiol, V., and Schmeler, K.M. (2017). Cervical cancer prevention and treatment in Latin America. *J Surg Oncol* 115, 615-618.
- Mann, L., Foley, K.L., Tanner, A.E., Sun, C.J., and Rhodes, S.D. (2015). Increasing Cervical Cancer Screening Among US Hispanics/Latinas: A Qualitative Systematic Review. *J Cancer Educ* 30, 374-387.
- Martinez, O., Wu, E., Sandfort, T., Dodge, B., Carballo-Diequez, A., Pinto, R., Rhodes, S., Moya, E., and Chavez-Baray, S. (2015). Evaluating the impact of immigration policies on health status among undocumented immigrants: a systematic review. *J Immigr Minor Health* 17, 947-970.
- McMullin, J. (2016). Cancer. *Ann Rev Anthropology* 45, 251-266.
- National Cancer Institute (2016). Health Information National Trends Survey (HINTS).
- Paz-Soldan, V.A., Nussbaum, L., Bayer, A.M., and Cabrera, L. (2010). Low knowledge of cervical cancer and cervical pap smears among women in Peru, and their ideas of how this could be improved. *Int Q Community Health Educ* 31, 245-263.
- Quesada, J., Hart, L.K., and Bourgois, P. (2011). Structural vulnerability and health: Latino migrant laborers in the United States. *Med Anthropol* 30, 339-362.

- Rhodes, S.D., Mann, L., Simán, F.M., Eunyong, S., Alonzo, J., Downs, M., Lawlor, E., Martinez, O., Sun, C.J., O'Brien, M.C., *et al.* (2015). The Impact of Local Immigration Enforcement Policies on the Health of Immigrant Hispanics/Latinos in the United States. *Am J Public Health* 105, 329-337.
- Scarinci, I.C., Garcia, F.A., Kobetz, E., Partridge, E.E., Brandt, H.M., Bell, M.C., Dignan, M., Ma, G.X., Daye, J.L., and Castle, P.E. (2010). Cervical cancer prevention: new tools and old barriers. *Cancer* 116, 2531-2542.
- Shiu, A.T., Twinn, S.F., Lee, G.C., Chan, C.W., and Kwong, K.K. (2010). Strategies to maximise cervical cancer screening rates among older Hong Kong Chinese women--a cultural consensus analysis study. *J Clin Nurs* 19, 3244-3246.
- Smith, J.S., Brewer, N.T., Saslow, D., Alexander, K., Chernofsky, M.R., Crosby, R., Derting, L., Devlin, L., Dunton, C.J., Engle, J., *et al.* (2013). Recommendations for a national agenda to substantially reduce cervical cancer. *Cancer Causes Control* 24, 1583-1593.
- Smith, M.A., and Canfell, K. (2017). Projected impact of HPV vaccination and primary HPV screening on cervical adenocarcinoma: Example from Australia. *Papillomavirus Res* 3, 134-141.
- Thompson, B., Vilchis, H., Moran, C., Copeland, W., Holte, S., and Duggan, C. (2014). Increasing cervical cancer screening in the United States-Mexico border region. *J Rural Health* 30, 196-205.
- Torre, L.A., Bray, F., Siegel, R.L., Ferlay, J., Lortet-Tieulent, J., and Jemal, A. (2015). Global cancer statistics, 2012. *CA Cancer J Clin* 65, 87-108.
- Vasilevska, M., Ross, S.A., Gesink, D., and Fisman, D.N. (2012). Relative risk of cervical cancer in indigenous women in Australia, Canada, New Zealand, and the United States: a systematic review and meta-analysis. *J Public Health Policy* 33, 148-164.