



## Cervical Cancer Screening in Rural Honduras: Health Survey and HPV Results among Health Fair Participants

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### Abstract

**Background:** Incidence of and mortality from cervical cancer can be reduced through education, prevention, and screening. Cervical cancer has the highest incidence of all female cancers in Honduras and is the leading cause of cancer deaths among Honduran women. We developed a survey to examine women's knowledge, barriers, and perceptions of cervical cancer among women attending a health fair (Jornada) in rural El Rosario, Honduras.

**Methods:** Women received a clinical breast exam, Pap test, HPV test, colposcopy if needed, breast self-exam education, and a verbally administered survey. Honduran medical students recorded the women's responses on a paper questionnaire. The questionnaires were sent to the Norris Cotton Cancer Center of the US to be entered, linked to the HPV results, and maintained in a database. Analyses included frequency distributions stratified by HPV results, and by self-report of prior Pap test.

**Results:** 449 women consented to participate, received care, and completed the survey. 30% of participants reported no prior Pap test. 34% agreed that access to Pap testing was a barrier; 48% reported that it would normally take > 1 hour to travel to the nearest Pap test location (clinic, health brigades or health center). 47% had not heard of HPV, yet 90% reported they would choose to vaccinate themselves or their daughters if given the opportunity. 97% reported that doing something good for their health was a very important reason for attending the Jornada. 16% tested positive for HPV; 3% tested positive for high-risk HPV genotypes 16/18.

**Conclusions:** Although we found many women in the El Rosario region to be at increased risk of cervical cancer, the majority reported being motivated to take action for their own health. Although gaps exist in women's knowledge of cervical cancer risk, screening, and prevention, health fairs and education programs could help improve cancer control in rural regions.

### Keywords

Honduras, Cervical cancer, HPV, Pap, Cancer screening, Health surveys

### Background

Infection with virulent strains of Human Papillomavirus (HPV) is a major cause of cervical cancer, with HPV 16 and 18 accounting for 70% of all cases [1-3]. Screening for cervical cancer can decrease both incidence and mortality through early detection and treatment of precancerous and cancerous lesions. The disproportionate burden of cervical cancer in low and middle income countries and other low resource settings is due to both lack of screening and geographic differences in HPV infection prevalence [4]. The 2012 age adjusted incidence of cervical cancer in Central America is almost four times that of North America (23.5 v. 6.6 cases per 100,000), as is cervical cancer mortality (8.9 v. 2.6 deaths per 100,000 for Central v. North America) [5].

Honduras has the third highest cervical cancer incidence in Central America [5] and is the second poorest country in the hemisphere (after Haiti) [6], with cervical cancer being the leading cause of cancer incidence (29.4 cases per 100,000) and death (14.1 per 100,000) [7]. The young adult population (ages 15-29) of Honduras is projected to increase over the next three decades [6]. More than a fifth of girls between 15 and 19 years of age (21.5%) have had at least one pregnancy, and 59% of reported sexual assaults occur among this age group [8].

Cervical cancer is a preventable disease, therefore countries and populations without screening programs have a tremendous burden for cancer control. Population based cancer control programs

tailored for low resource settings are a key objective of national and international stakeholders. The World Health Organization, Pan American Health Organization, and national leaders are focused on cervical cancer screening programs, with Honduras as a notable example [7,8]. For over 7 years, participatory field research in rural Honduras has sought to develop community driven cervical cancer education and prevention programs. Efforts have also been made to determine the prevalence of HPV among Honduran women, although to date these have primarily focused in urban areas [9,10]. With an estimated 26% of Honduran women aged 15-49 having received a Papanicolaou (Pap) screening test annually [11], understanding basic epidemiologic patterns of cervical cancer screening access, utilization, and outcomes is a prerequisite for developing effective tailored cancer control programs.

As part of a community based cervical cancer screening and health education fair in the rural Locomapa region of Honduras, we implemented a survey to help understand factors associated with increased risk of cervical cancer such as women's demographics and their health care access to cervical cancer screening. The study's analytic objectives were to describe women's cervical cancer screening history, knowledge and perceptions regarding cervical cancer, and HPV status.

## Methods

### Population and setting

In 2013 physician leaders (Bejarano, Barrientos and Portillo) actively involved in Honduran cancer control efforts conducted a two day cancer screening and health education fair ("La Gran Jornada Contra el Cancer" - Jornada) in the El Rosario area of the Locomapa region. The Locomapa region of Honduras is comprised of 133 villages and communities and located in a mountainous area approximately three hours' drive from San Pedro Sula, the largest city in Honduras. El Rosario is considered a relatively large village with approximately 400 residents. Our research study was conducted as part of this Jornada.

The Jornada effort was a collaboration of Honduran and United States (US) partners: La Liga Contra el Cancer (a Honduran cancer treatment center), the Norris Cotton Cancer Center (NCCC) of the US (a National Cancer Institute Comprehensive Cancer Center located in Lebanon, New Hampshire US), the Health and Development Committee (HDC) of El Rosario, and the Americans Caring Teaching Sharing (ACTS) nongovernmental community development organization of the US. The purpose of the fair was to 1) provide cervical cancer screening and education to women from the immediate and surrounding communities and 2) to test the feasibility of a large mobile screening event in a remote rural Honduran area.

Women attending the Jornada received a demographic and health survey, Pap test, HPV test, colposcopy if needed, breast self-exam education, and clinical breast exam. Clinical care was provided to all women and each woman was invited to participate in the research component (our study). Women provided verbal informed consent (collected by Honduran medical students) to have their data entered into a research database. The same care was provided whether a woman chose to consent to research or not. No additional data, samples, or tests were involved in the research component. All research activities were approved by the Institutional Review Board / Committee for the Protection of Human Subjects of the Geisel School of Medicine at Dartmouth, Lebanon, New Hampshire US and by the Honduran College of Physicians.

### Health survey

A survey with 25 questions was developed by the physician and research team and translated into Spanish [Appendix A \(Additional file 1 survey-2, Additional file 2 HPV types-2\)](#). The survey was based, in part, on the Cervical Cancer Awareness Measure (Cervical CAM), and was adapted to the study and the local population. Honduran medical students administered the survey verbally in

Spanish and recorded the women's responses by hand to the paper form. The following data domains were included: 1. Registration and demographic information; 2. Personal and family history of cervical cancer; 3. Knowledge about cervical cancer; and 4. Access and barriers to screening. The surveys were sent to NCCC of the US to be entered into the database.

### HPV testing

HPV swab specimens were collected during routine Pap smear testing procedures. HPV swabs were analyzed for HPV types in the US in the Department of Pathology at the Geisel School of Medicine at Dartmouth /NCCC of Dartmouth-Hitchcock Medical Center (Lebanon, New Hampshire US). Results were reported both to the researchers and to the Honduran Jornada physicians and entered into the research database containing the survey results. The physicians hand delivered explanatory letters to each woman with high risk HPV and encouraged them to pursue follow up care offered at no charge at La Liga Contra el Cancer.

### Analysis

Participants demographics and responses to the survey are reported in frequency distributions by self-report of prior Pap test and by HPV status. Figures display women's responses to barrier or access questions and reasons for coming to the Jornada based on a Likert scale. Analyses were conducted in SAS 9.4 (Cary, North Carolina US).

## Results

### Demographics

A total of 449 women ages 18 and older consented to participate, received care, and completed the survey. Almost all of the women attending the Jornada had at least one child and almost 75% with children had their first child at age 20 or younger. The women did not use condoms (99%) and the majority (57%) reported one lifetime sexual partner. Over a quarter of the participants were older than 50 years, and 27% were less than 30 years old. A third of the women have resided in the Locomapa region their entire lives ([Table 1](#)). Less than a third of women, the majority being younger women, reported no prior Pap test. Among the 70% reporting having had a prior Pap test, location for prior tests was at a clinic (58%) followed by health brigades and health centers (Brigada, 18%; Health Center 16%; [table 2](#)). Nineteen percent of women had an abnormal result from their last Pap test. Among women with a family history of cervical cancer, 85% reported having a prior Pap test ([Table 1](#)).

### Knowledge, access, barriers and perceptions

Most women (84%) had heard about cervical cancer screening but nearly half had not heard of HPV prior to attending the Jornada. Among women who had not had a prior Pap test, 43% had not heard of cervical cancer screening. Ninety percent reported that they would want themselves and/or their daughters to be vaccinated against HPV if given the opportunity ([Table 1](#)).

We found that knowledge of a community based screening fair was largely driven by community leaders' advocacy. Just over 50% of women walked to the Jornada and the majority indicated that walking would be their mode of travel to receive healthcare. One third of the women used the free transportation provided for the screening event. A third of women agreed access is a barrier to cervical cancer screening.

Women's perceptions of barriers to cervical cancer screening were reported ([Figure 1](#)). Thirty-four percent agreed or strongly agreed that access to Pap test was a barrier. Uncertainty about appropriate screening frequency was a barrier for a third of women, and 22% found it difficult to "get away" for screening.

Women were asked about the relative importance of reasons for attending the Jornada ([Figure 2](#)). Ninety-seven percent of women felt that "doing something good for their health" was very important.

**Table 1:** Characteristics of participants in a cervical cancer screening event in the Locomapa region, Honduras.

Participants' Characteristics <sup>a</sup>	Overall N = 449 N (column %)	Prior Pap N = 316	No Prior Pap (N = 133)	HPV Positive N = 71	HPV 16/18 N = 15
<b>Sociodemographic</b>					
<b>Age category (years)</b>					
< 21	20 (4.5)	6 (1.9)	14 (10.5)	4 (5.6)	0 (0.0)
21-25	45 (10.0)	15 (4.8)	30 (22.6)	6 (8.5)	2 (13.3)
26-30	58 (12.9)	29 (9.2)	29 (21.8)	12 (16.9)	3 (20.0)
31-35	71 (15.8)	54 (17.1)	17 (12.8)	8 (11.3)	2 (13.3)
36-40	54 (12.0)	36 (11.4)	18 (13.5)	10 (14.1)	2 (13.3)
41-45	40 (8.9)	36 (11.4)	4 (3.0)	2 (2.8)	0 (0.0)
46-50	41 (9.1)	34 (10.7)	7 (5.3)	10 (14.1)	3 (20.0)
> 50	120 (26.7)	106 (33.5)	14 (10.5)	19 (26.8)	3 (20.0)
<b>Years of education</b>					
None	72 (16.6)	39 (12.8)	33 (25.4)	15 (22.7)	3 (23.1)
1-3	76 (17.5)	54 (17.8)	22 (16.9)	12 (18.2)	2 (15.4)
4-6	240 (55.3)	182 (59.9)	58 (44.6)	29 (43.9)	6 (46.2)
7-9	22 (5.1)	16 (5.3)	6 (4.6)	4 (6.1)	0 (0.0)
> 9	24 (5.5)	13 (4.3)	11 (8.5)	6 (9.1)	2 (15.4)
<b>% of Life residing in locomapa region</b>					
100	129 (31.7)	91 (31.5)	38 (32.2)	18 (27.3)	7 (63.6)
50- < 100	110 (27.0)	90 (31.1)	20 (17.0)	18 (27.3)	3 (27.3)
< 50	168 (41.3)	108 (37.4)	60 (50.8)	30 (45.5)	1 (9.1)
<b>Personal and Family History</b>					
<b>Age at first menstrual period (yrs.)</b>					
< 13	76 (17.0)	53 (16.8)	23 (17.3)	11 (15.7)	4 (23.7)
13-14	235 (52.5)	162 (51.4)	73 (54.9)	38 (54.3)	8 (53.3)
> 14	137 (30.6)	100 (31.8)	37 (27.8)	21 (30.0)	3 (20.0)
<b>Number of children</b>					
None	7 (1.6)	3 (1.0)	4 (3.0)	3 (4.2)	1 (6.7)
1-2	124 (27.6)	73 (23.1)	51 (38.4)	20 (28.2)	4 (26.7)
3-4	132 (29.4)	105 (33.2)	27 (20.3)	20 (28.2)	2 (13.3)
5-8	136 (30.3)	101 (32.0)	35 (26.3)	18 (25.4)	6 (40.0)
> 8	50 (11.1)	34 (10.8)	16 (12.0)	10 (14.1)	2 (13.3)
<b>Age at birth of first child (yrs.)</b>					
< 18	172 (39.1)	105 (33.7)	67 (52.3)	29 (43.3)	9 (64.3)
18-20	157 (35.7)	118 (37.8)	39 (30.5)	18 (26.9)	0 (0.0)
21-25	87 (19.8)	69 (22.1)	18 (14.1)	14 (20.9)	3 (21.4)
> 25	24 (5.5)	20 (6.4)	4 (3.1)	6 (9.0)	2 (14.3)
<b>Number of sexual partners (cumulative)</b>					
1	256 (57.0)	181 (57.3)	75 (56.4)	35 (49.3)	12 (80.0)
2	180 (40.1)	123 (38.9)	57 (42.9)	31 (43.7)	2 (13.3)
3-5	13 (2.9)	12 (3.8)	1 (1.0)	5 (7.0)	1 (6.7)
<b>Regularly use family planning method</b>					
Oral contraceptives	119 (26.5)	93 (33.0)	26 (20.2)	19 (28.8)	7 (50.0)
Condom	1 (< 1)	1 (< 1)	0 (0.0)	1 (1.5)	0 (0.0)
Other	98 (21.8)	69 (24.5)	47 (36.4)	12 (18.2)	1 (7.1)
None	193 (47.0)	137 (48.6)	56 (43.4)	34 (51.5)	6 (42.9)
<b>Family history of cervical cancer with first degree relative</b>					
None	417 (95.4)	289 (94.4)	128 (97.7)	67 (95.7)	14 (93.3)
One or more	20 (4.6)	17 (5.6)	3 (2.3)	3 (4.3)	1 (6.7)
<b>Knowledge and perceptions</b>					
<b>Had heard about cervical cancer screening tests before Jornada</b>					
Yes - Pap test	336 (74.8)	271 (85.8)	65 (48.9)	54 (76.1)	10 (66.7)
Yes - doctor inspects cervix	39 (8.7)	29 (9.2)	10 (7.5)	5 (7.0)	10 (6.67)
Yes - Pap test and doctor inspects cervix	2 (< 1)	1 (< 1)	1 (1.5)	0 (0.0)	0 (0.0)
No	72 (16.0)	15 (4.8)	57 (42.9)	12 (16.9)	4 (26.7)
<b>Had heard about human papillomavirus before Jornada</b>					
Yes - Heard that HPV can cause cervical cancer	183 (41.3)	138 (44.1)	45 (34.6)	34 (48.6)	6 (40.0)
Yes - Had NOT heard that HPV can cause cervical cancer	49 (11.1)	38 (12.1)	11 (8.5)	7 (10.0)	3 (20.0)
No	211 (47.6)	137 (43.8)	74 (56.9)	29 (41.4)	6 (40.0)
<b>If given opportunity, would want to get HPV vaccine</b>					
Yes	398 (90.1)	280 (89.7)	118 (90.8)	61 (87.1)	3 (20.0)
No	44 (9.9)	32 (10.3)	12 (9.2)	9 (12.9)	12 (80.0)

If given opportunity, would you want daughter(s) to get HPV vaccine					
Yes	398 (89.8)	280 (90.0)	118 (89.4)	63 (88.7)	3 (20.0)
No	45 (10.2)	31 (10.0)	14 (10.6)	8 (11.3)	12 (80.0)
<b>Access</b>					
<b>How they heard about the Jornada<sup>b</sup></b>					
Community leader	291 (64.8)	201 (63.6)	90 (67.7)	43 (60.6)	10 (66.7)
Radio	28 (6.2)	23 (7.3)	5 (3.8)	2 (2.8)	0 (0.0)
Television	2 (< 1)	2 (< 1)	0 (0.0)	0 (0.0)	0 (0.0)
Told by family/friends	131 (29.2)	97 (30.7)	34 (25.6)	27 (38.0)	5 (33.3)
Other	19 (4.2)	14 (4.4)	5 (3.8)	0 (0.0)	0 (0.0)
<b>Mode of transportation to screening event</b>					
Bus provided for event	166 (37.1)	111 (35.2)	55 (41.4)	30 (42.3)	8 (53.3)
Public bus	5 (1.1)	3 (1.0)	2 (1.5)	1 (1.4)	0 (0.0)
Car/Truck	22 (4.9)	21 (6.7)	1 (1.0)	7 (9.9)	2 (13.3)
Walked	246 (54.9)	172 (54.6)	74 (55.6)	32 (45.1)	5 (33.3)
Horse/Cart	4 (1.0)	4 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)
Other	5 (1.1)	4 (1.3)	1 (1.0)	1 (1.4)	0 (0.0)
<b>Mode of transportation most likely to use when seeking healthcare</b>					
Bus	160 (35.9)	106 (33.8)	54 (40.9)	28 (39.4)	6 (40.0)
Car/Truck	5 (1.1)	5 (1.6)	0 (0.0)	2 (2.8)	1 (6.7)
Walking	277 (62.1)	199 (63.4)	78 (59.1)	41 (57.8)	8 (53.3)
Horse/Cart	1 (< 1)	1 (< 1)	0 (0.0)	0 (0.0)	0 (0.0)
Other	3 (1.0)	3 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)
<b>Time to nearest Pap test location</b>					
≤ 30 min.	156 (34.8)	125 (39.6)	31 (23.5)	25 (35.2)	5 (33.3)
> 30 min. - 1 hour	75 (16.7)	50 (15.8)	25 (18.9)	11 (15.5)	2 (13.3)
> 1-2 hours	131 (29.2)	91 (28.8)	40 (30.3)	24 (33.8)	5 (33.3)
> 2 hours	86 (19.2)	50 (15.8)	36 (27.3)	11 (15.5)	3 (20.0)

<sup>a</sup>Missing (N): Education (15), % of Life residing in Locomapa region (42), Age at first menstrual period (1), Number of children (7), Age at first birth (9), Regular use of family planning method (38), Family history of cervical cancer (12), Heard of cervical cancer screening test with prior Pap test (67), Heard of HPV before Jornada (6), If given opportunity, would want to get HPV vaccine (7), If given opportunity, would you want daughter(s) to get HPV vaccine (6), Mode of transportation to screening event(1), Mode of transportation most likely to use when seeking healthcare (3), Time to nearest Pap test location (1).

<sup>b</sup>Not mutually exclusive

**Table 2:** Characteristics of participants who reported having had a prior pap test.

Cervical Cancer Screening History <sup>a</sup>	N (%)
<b>Self-report of last Pap test</b>	
< 1 year ago	51 (16.2)
1-2 years ago	140 (44.4)
2-3 years ago	55 (17.5)
> 3 years ago	66 (21.0)
Not sure	3 (1.0)
<b>Setting of last Pap test</b>	
Brigada	56 (17.9)
Clinic	181 (57.8)
Health Center	51 (16.3)
Hospital	22 (7.0)
Provider in village	1 (< 1)
Not sure	2 (< 1)
<b>Result of last Pap test</b>	
Normal	216 (68.8)
Abnormal	61 (19.4)
Not received	26 (8.6)
Not sure	11 (3.5)
<b>Usual frequency of Pap test</b>	
Every 6 months	38 (12.0)
Every year	126 (39.6)
Within 3 years	13 (4.1)
Do not have Pap test done regularly	120 (37.7)
Not sure	21 (6.6)
<b>History of procedures<sup>b</sup> as a result of Pap</b>	
Yes	26 (6.0)
No	406 (94.0)

<sup>a</sup>Missing (N): Self-report of last Pap test (1), Setting of last Pap test (3), Result of Pap test (2), Usual frequency of Pap test (131), History of procedures as a result of Pap (17).

<sup>b</sup>Cryotherapy, colposcopy, or LEEP.

Participation in a community event was very important to 78% of the women, as was attendance of friends and relatives (61%). Half of the

women felt that a current health concern was very important in their decision to attend the Jornada.

## HPV results

Sixteen percent of women tested positive for HPV; 3% tested positive for the high risk HPV genotypes 16 and 18. Overall and age specific data are seen in figure 3. Women aged 18 to 24 years had the highest percentage of HPV positive tests (19%), but presence of HPV 16/18 was fairly consistent across the age groups, except among 55-64 year olds where HPV 16/18 was absent (Figure 3).

## Discussion

This study provides important evidence on screening practices and knowledge, perceptions of, and access to cervical cancer screening in a rural region of Honduras. Women were motivated to attend the Jornada because it was a positive action for their own health, because it was a community event, and friends/relatives were also attending. This finding corroborates and builds on earlier work by Garrett and Barrington: through focus groups and individual interviews, they found that women in rural Honduras employ self love and social support to overcome barriers to cervical cancer screening [12].

As a developing country, Honduras faces tremendous challenges in healthcare delivery, with special issues in rural regions. Although access to cervical cancer screening is a barrier in this rural region, the study population for ages 18 to 49 is relatively well screened: 39% report usual annual Pap test, 16% report usual 6 month Pap test (data not shown) compared to 26% of Honduran women ages 15-49 overall receiving annual Pap tests [11]. This may be explained by the presence of the clinic (the setting in which most reported receiving care) and ACTS's work in El Rosario over the past 25 years.

HPV infections, smoking, early age at first birth, parity, long term use of hormonal contraceptives, and having several sexual partners are factors associated with increased risk of cervical cancer [1,13-15]. While smoking history was not obtained on the Jornada health survey

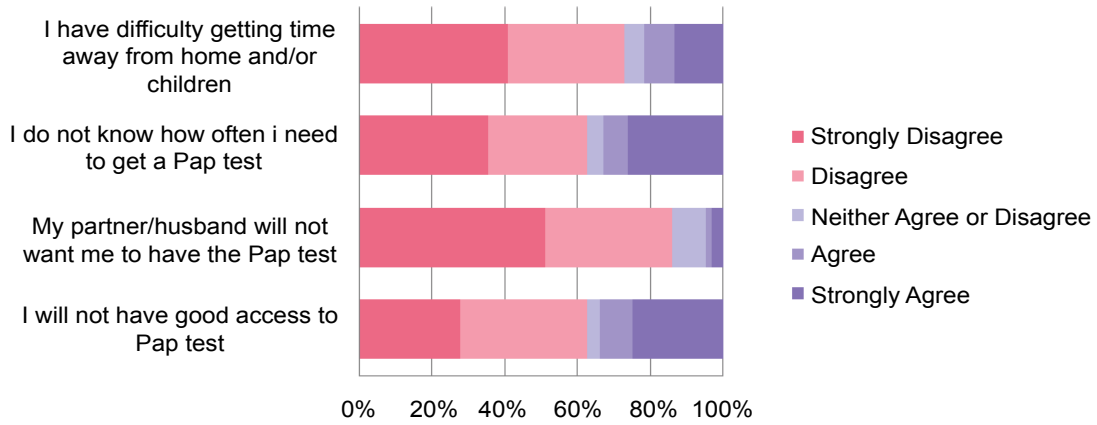


Figure 1: Perceived barriers to cervical cancer screening among participants in a screening event (Locomapa region, Honduras).

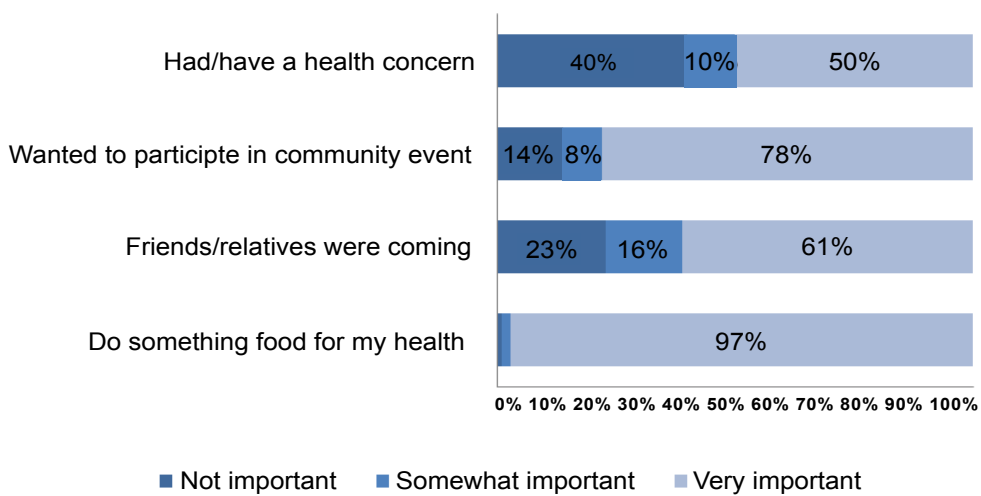


Figure 2: Perceptions about cervical cancer screening among participants in a screening event (Locomapa region, Honduras).

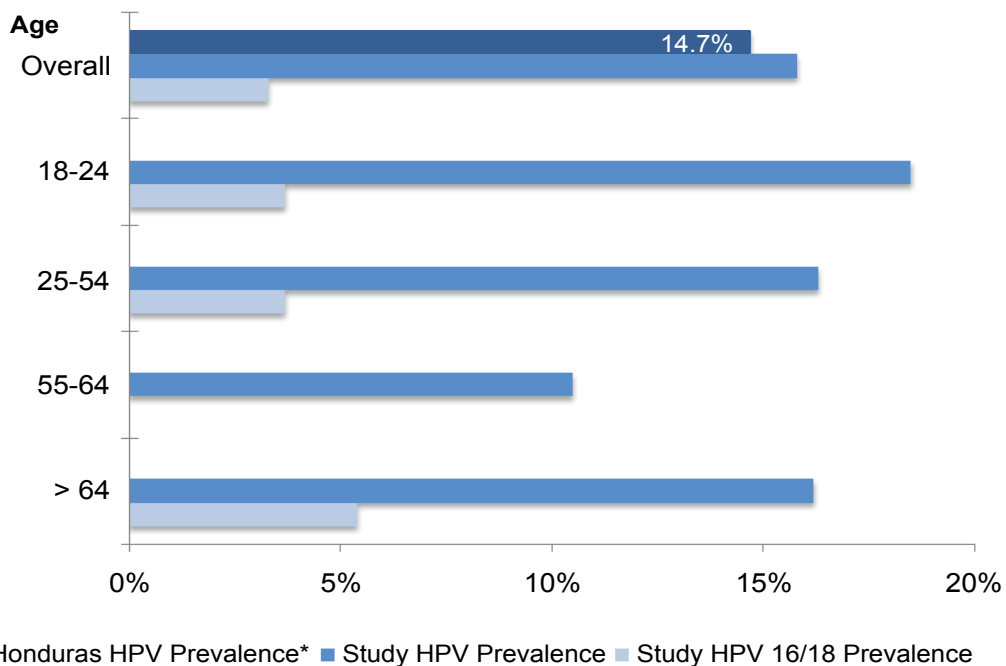


Figure 3: Prevalence of HPV and HPV 16/18 among participants in a screening event (Locomapa region, Honduras) [\*Bruni, et al. 2016].



due to its extremely low cultural and economic availability, women in the Locomapa region who participated in this study were found to be at increased risk for cervical cancer with 39% of the women having first birth before age 18, 71% having 3 or more children and 43% having more than one sexual partner (Table 1). In addition, 50% of those who were positive for HPV 16/18 used oral contraceptives.

Since infection with certain types of HPV has been demonstrated to be within the causal pathway for cervical cancer, reducing the risk of cervical cancer in Latin American countries by prophylactic HPV vaccine is supported as the primary prevention of cervical cancer [2]. In an urban based study, Tábora, et al. estimated that implementing an HPV vaccination program has the potential of preventing about half of the cervical cancer cases in Honduras [15]. However, there is little information on the population based prevalence estimates of high risk HPV subtypes for both rural and urban regions of Honduras. Our findings that women are motivated to take action for their own health and that they respond positively to programs conducted as community events suggests that a vaccination program, particularly one implemented in the health fair model, could be successful.

While this study provides important insights for healthcare delivery in low resource settings, there are limitations associated with our study. We did not collect all risk factors such as HIV and smoking status. In addition, given the presence of a clinic in El Rosario, some of the results of our study, such as % of women reporting having annual Pap tests, may not be generalizable to other rural Honduran regions.

Our study identified an important knowledge gap for cervical cancer screening since most women did not know that infection with HPV could cause cervical cancer. Education about HPV and its etiologic role in cervical cancer is clearly needed, particularly if HPV vaccination is to become part of Honduras's cancer control strategy. The overwhelming interest in HPV vaccination uptake indicates that continued education about HPV would be beneficial prior to, or as part of, any HPV immunization programs. Proper condom use for prevention of pregnancy and HIV, which may provide some protection against HPV, should be included as part of HPV education. However, in the absence of condom use, HPV vaccination may take on greater importance for cervical cancer prevention. Educational programs administered by local or regional healthcare providers and respected community leaders should help increase women's knowledge and awareness of the prevention of cervical cancer.

The prevalence of HPV infection in the study population (16%) was similar to that reported for the overall female population in Honduras (14.7%) [5]. However, our study population in this rural region had a 3% prevalence of HPV 16/18, which was lower than reported for an urban center in Honduras (7% for HPV 16, 9% for HPV 18) [10], although such data from Honduras are scant.

Epidemiologic differences, along with access, knowledge, and perceptions may vary widely, even within Honduras; thus, a tailored approach to screening and prevention by region and/or population is indicated. Collection of descriptive information, such as the data obtained in this study, across populations and settings will help to inform national and regional cervical cancer screening and prevention strategies.

## Conclusions

Honduran women of the Locomapa region who participated in this study were found to be at increased risk for cervical cancer with 39% having had their first birth before age 18, 71% had 3 or more children, 43% reported having had more than one sexual partner, and 3% tested positive for high risk HPV genotypes 16 and 18. Most women (84%) had heard about cervical cancer screening, however, for women with no prior past test (30%), 43% had not heard of screening. Thirty four percent of women agreed that access to a Pap test was a barrier.

Knowledge of HPV was much lower than cervical cancer screening, with nearly half having not heard of HPV prior to attending the Jornada. Even though only half of the women had heard of HPV,

90% of all women reported that they would want themselves and/or their daughters to be vaccinated against HPV if given the opportunity.

Programs and health fairs conducted by local or regional healthcare providers and respected community leaders in rural regions could improve cancer control in Honduras. These services should help provide better access to cervical cancer screening and increase women's knowledge and awareness of the prevention of cervical cancer.

## Competing Interests

The authors declare that they have no competing interests.

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## Appendix A

Health questionnaire administered to participants (Spanish and English versions).

## References

1. Muñoz N, Castellsagué X, de González AB, Gissmann L (2006) Chapter 1: HPV in the etiology of human cancer. *Vaccine* 24: S1-S10.
2. Muñoz N, Bravo LE (2012) Epidemiology of cervical cancer in Colombia. *Colomb Med* 43: 298-304.
3. Clifford G, Franceschi S, Diaz M, Muñoz N, Villa LL (2006) Chapter 3: HPV type-distribution in women with and without cervical neoplastic diseases. *Vaccine* 24: S26-S34.
4. (2016) Cancer facts & figures 2016. American Cancer Society, Atlanta.
5. <http://www.hpvcentre.net/statistics/reports/XMX.pdf>.
6. <https://www.cia.gov/library/publications/the-world-factbook/geos/ho.html>.
7. <http://globocan.iarc.fr>.
8. World Health Organization (2007) Early detection. In: *Cancer control: knowledge into action*. (module 3), WHO guide for effective programmes, Geneva.
9. Ferrera A, Velema JP, Figueroa M, Bulnes R, Toro LA, et al. (1999) Human papillomavirus infection, cervical dysplasia and invasive cervical cancer in Honduras: a case-control study. *Int J Cancer* 82: 799-803.
10. Tábora N, Zelaya A, Bakkers J, Melchers WJG, Ferrera A (2005) Chlamydia trachomatis and genital human papillomavirus infections in female university students in Honduras. *Am J Trop Med Hyg* 73: 50-53.
11. [http://www.hpvcentre.net/statistics/reports/HND\\_FS.pdf](http://www.hpvcentre.net/statistics/reports/HND_FS.pdf).
12. Garrett JJ, Barrington C (2013) "We do the impossible": women overcoming barriers to cervical cancer screening in rural Honduras - a positive deviance analysis. *Cult Health Sex* 15: 637-651.
13. Castellsagué X, Diaz M, de Sanjose S, Munoz N, Herrero R, et al. (2006) Worldwide human papillomavirus etiology of cervical adenocarcinoma and its cofactors: implications for screening and prevention. *JNCI* 98: 303-315.
14. International Collaboration of Epidemiological Studies of Cervical Cancer (2006) Cervical carcinoma and reproductive factors: collaborative reanalysis of individual data on 16,563 women with cervical carcinoma and 33,542 women without cervical carcinoma from 25 epidemiological studies. *Int J Cancer* 119: 1108-1124.
15. Tábora N, Bulnes R, Toro LA, Claros JM, Massuger LFAG, et al. (2011) Human papillomavirus infection in Honduran women with cervical intraepithelial neoplasia or cervical cancer. *J Low Genit Tract Dis* 15: 48-53.