Use of region-specific human papillomavirus serotypes in improving cervical cancer prevention methods in Peru

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Why Study Cervical Cancer in Peru?

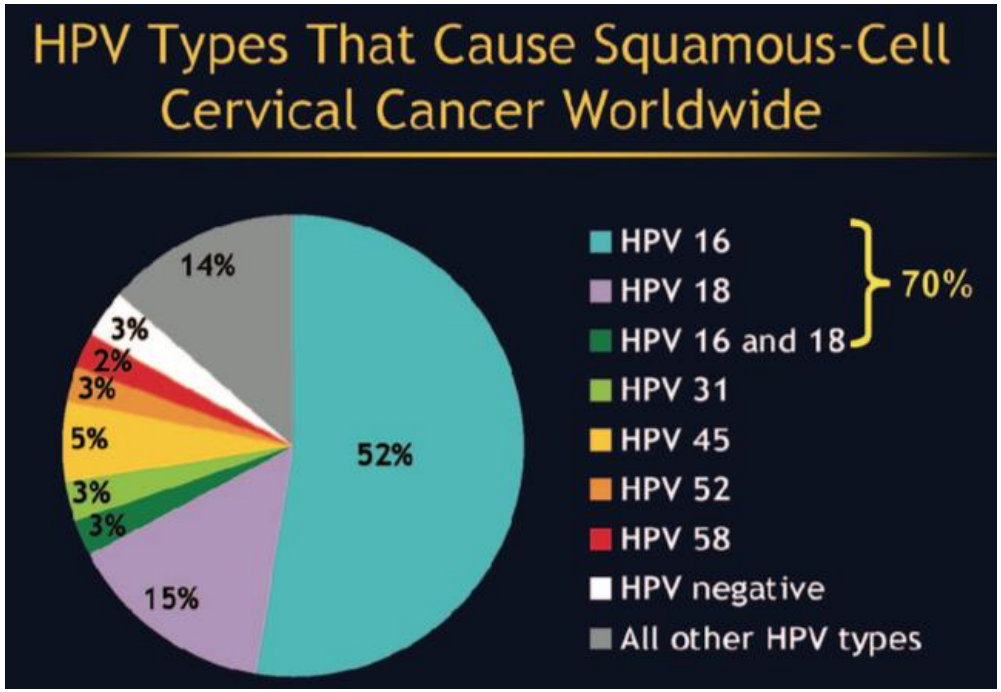
- "Cervical cancer is the second most common cancer in women worldwide, and it is the **principal cancer of women in most developing countries**, where 80 percent of cases occur."

-Muños et al. 2003

MSUCOM's Peru Service elective students and clinical faculty at the clinic in Iquitos, Peru

What Causes Cervical Cancer?

- **Human papillomavirus** (HPV) has been widely accepted as the most frequent cause of cervical cancer for nearly 40 years. (Burd et al. 2003)
- HPV accounts for over **95%** of cervical cancer cases, making it a prime target for prevention. (NIH Cancer Institute)



(Wiley D. et al. 2006; Adapted from Muñoz N, et al. 2003).

70% of cervical cancer worldwide can be attributed to serotypes 16 or 18.

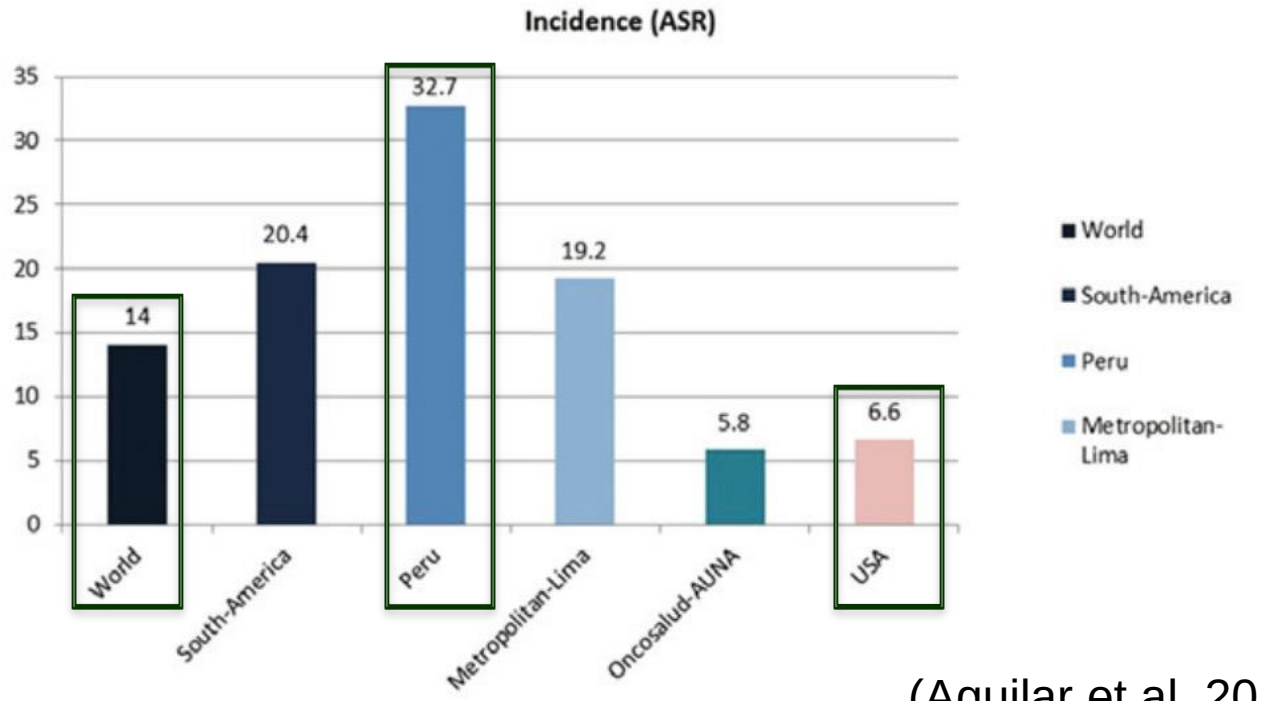
Cervical Cancer Incidence in Peru

- HPV serotypes and cervical cancer incidence varies throughout the 3 geographically distinct regions of Peru: the mountains, the coast, and the jungle. (Aguilar 2016)



- **The National Perspective**: Knowledge of endemic HPV serology within these regions may help to determine the most economic and culturally cognizant prevention practices.

Cervical Cancer Incidence Comparison

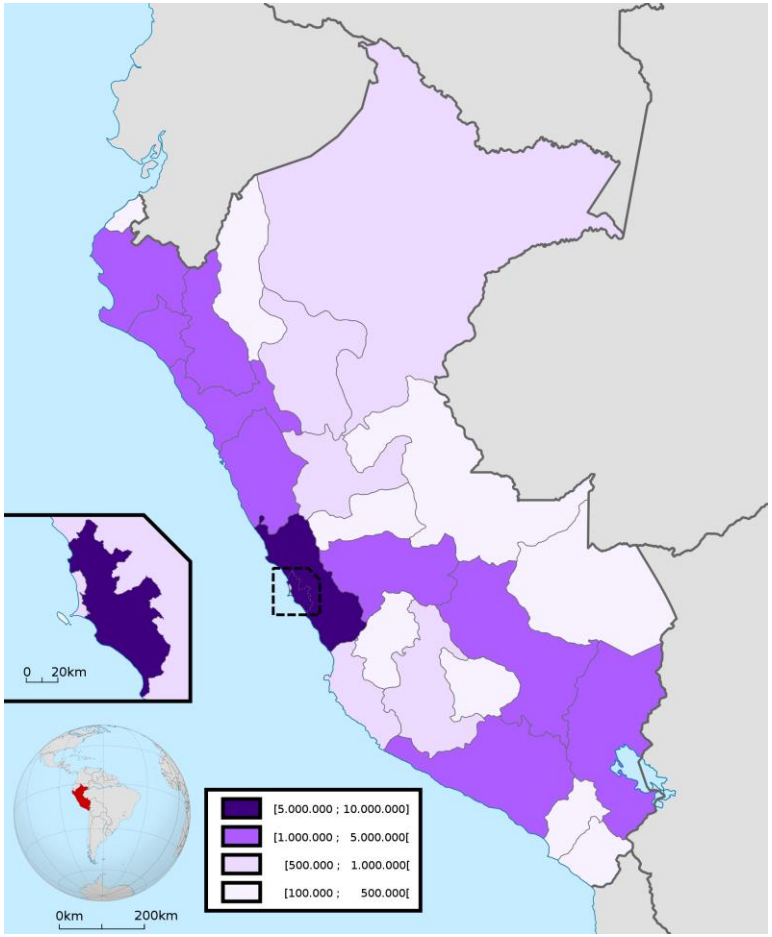


(Aguilar et al. 2016)

- Peru as a nation has one of the highest rates of cervical cancer incidence in the world, surpassing the USA, South America as a whole, and metropolitan-Lima.
- This reveals the greater problem being within the more **rural regions** of the country.

HPV Incidence in Peru

- Highest cancer burden falls on **rural** areas.
  - Cervical cancer incidence in Peru as a nation:
    - **32.7**/100,000
  - Cervical cancer incidence in **Lima, Peru**:
    - **19.2**/100,000
    - *Number is lower in high-income districts.



Lima province(dark purple) contains approx. 1/3 of Peru's population

(Aguilar et al. 2016)

Image: https://en.wikipedia.org/wiki/Demo

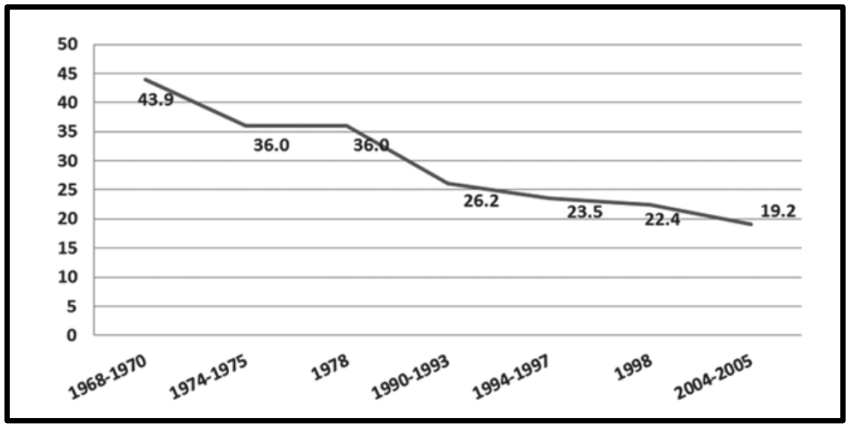
HPV Prevention Practices

- Decreased cancer incidence in Lima may be attributed to programs aimed at increasing:
  1) Vaccination
  2) Screening
- This trend was not reflected in the jungle and mountainous regions.

Why?

- Lack of medical infrastructure.
- Economical limitations.
  - Income, travel, insurance
- Cultural barriers.
  - Fear of examination

Age Standardized Rates of Cervical Cancer in Metropolitan Lima



(Aguilar et al. 2016)

HPV Vaccine

- HPV strains are classified as “Low-risk” or “high-risk” based on their likelihood of causing malignancy.
- In 2014, a 9-valent (9-V) HPV vaccine was approved by the FDA.
- The previous version was a 4-valent design covering strains 6,11,16 and 18.

The high-risk (HR) HPV genotypes covered by the current 9-V HPV vaccine: → **16, 18, 31, 33, 45, 52, 58**

HR types **not** covered by the vaccine: → **35, 39, 51, 56, 59, 68**

(Muñoz et al. 2003, Muñoz et al. 2004, Burd 2003, Wagner et al. 2015)

Our Study

2013

- Schrotenboer A, et al. “Assessment of Maternal and Reproductive Health in Women of Mala, Peru.”
  - Results indicated that there were gaps in maternal and prenatal care.

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2015

- **Jelinek K, et al. “Determining the Most Prevalent HR HPV Genotypes Among Women in Two Regions of Peru.”**
  - **2016 continued as present study.**

August 2015 and 2016:

- **MSUCOM** medical service elective in Peru partnered with physicians at **Universidad César Vallejo** to collect over 400 cervical cell samples from women in the **Loreto (Iquitos)** and **La Libertad (Trujillo**) regions of the country.

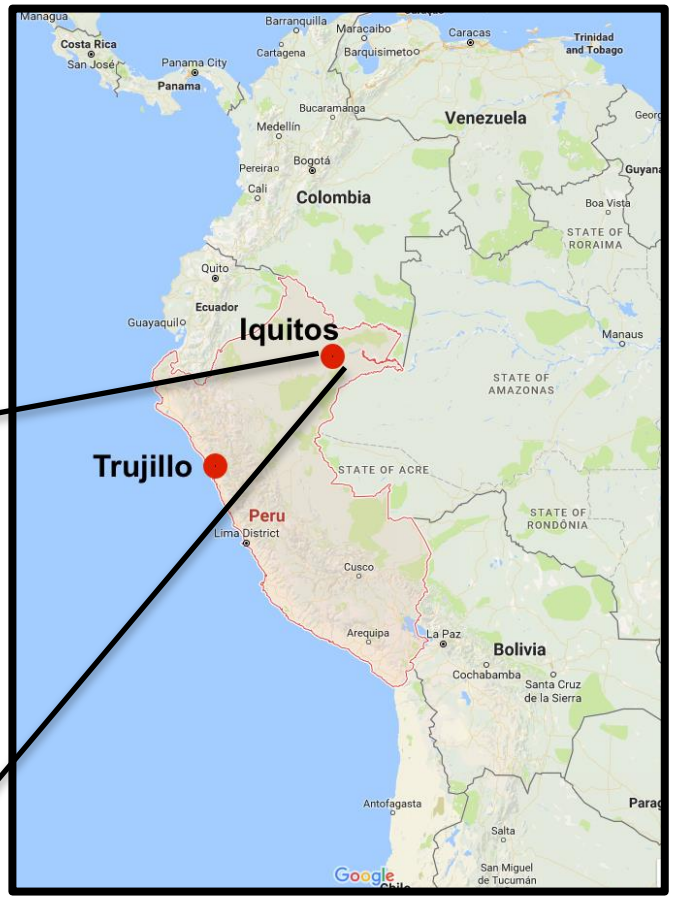

Image adapted from Google Maps

Project Goals

1. **Determine which high-risk HPV serotypes are most prevalent among Peruvian women in the regions of Loreto and La Libertad.**

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1. **Evaluate whether vaccination is the most effective method of cervical cancer prevention in these areas.**

Methods

- All women requesting a routine pelvic exam were given the option to participate in this study.
- Consenting women were asked a short series of questions, which included:
  - Age at first sexual intercourse
  - Previous pregnancies
  - Previous vaccination
  - STI history
- Vulvovaginal and cervical abnormalities were carefully documented.

Methods

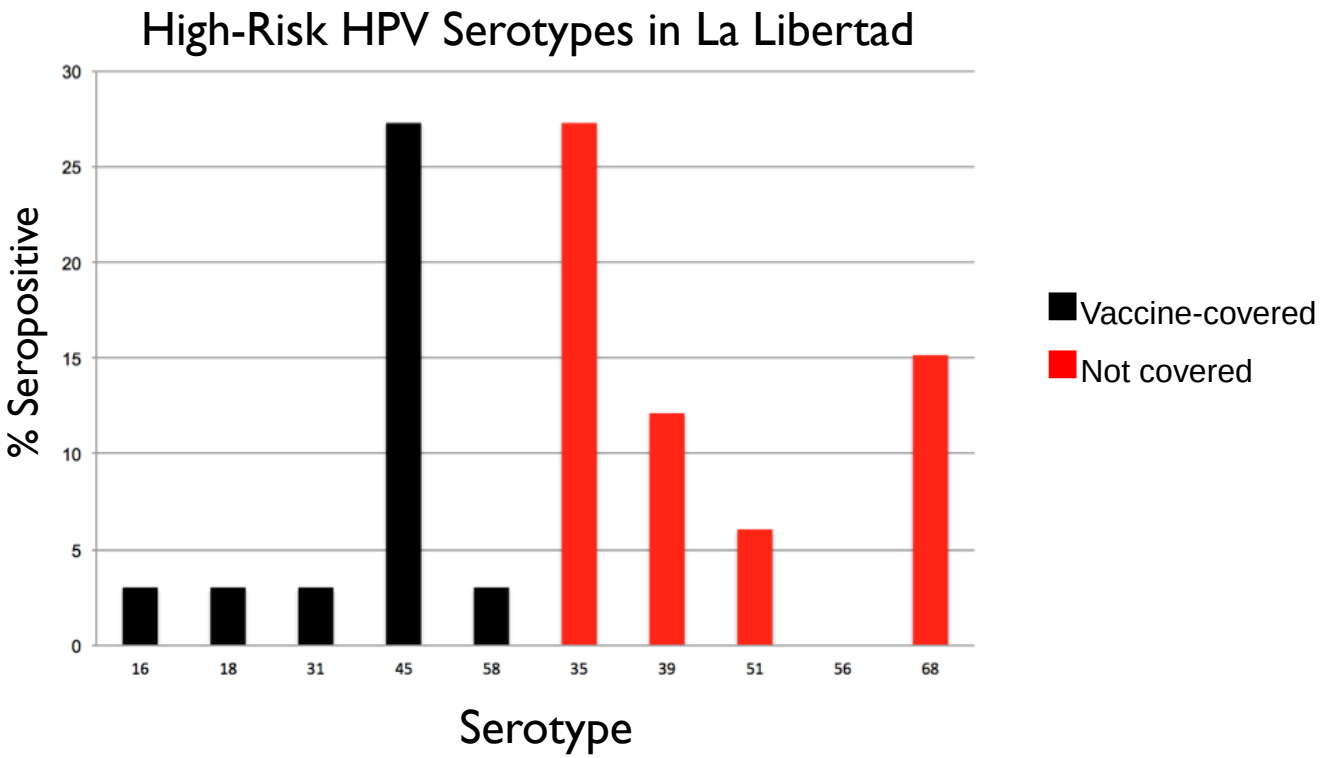
Cervical cell samples are preserved using Thinprep© Hologic PreservCyt Liquid Media kit and sent to MSU.

Viral DNA is extracted using Qiagen DNA extraction kits.

RtPCR is used to detect HPV DNA in each of the samples.

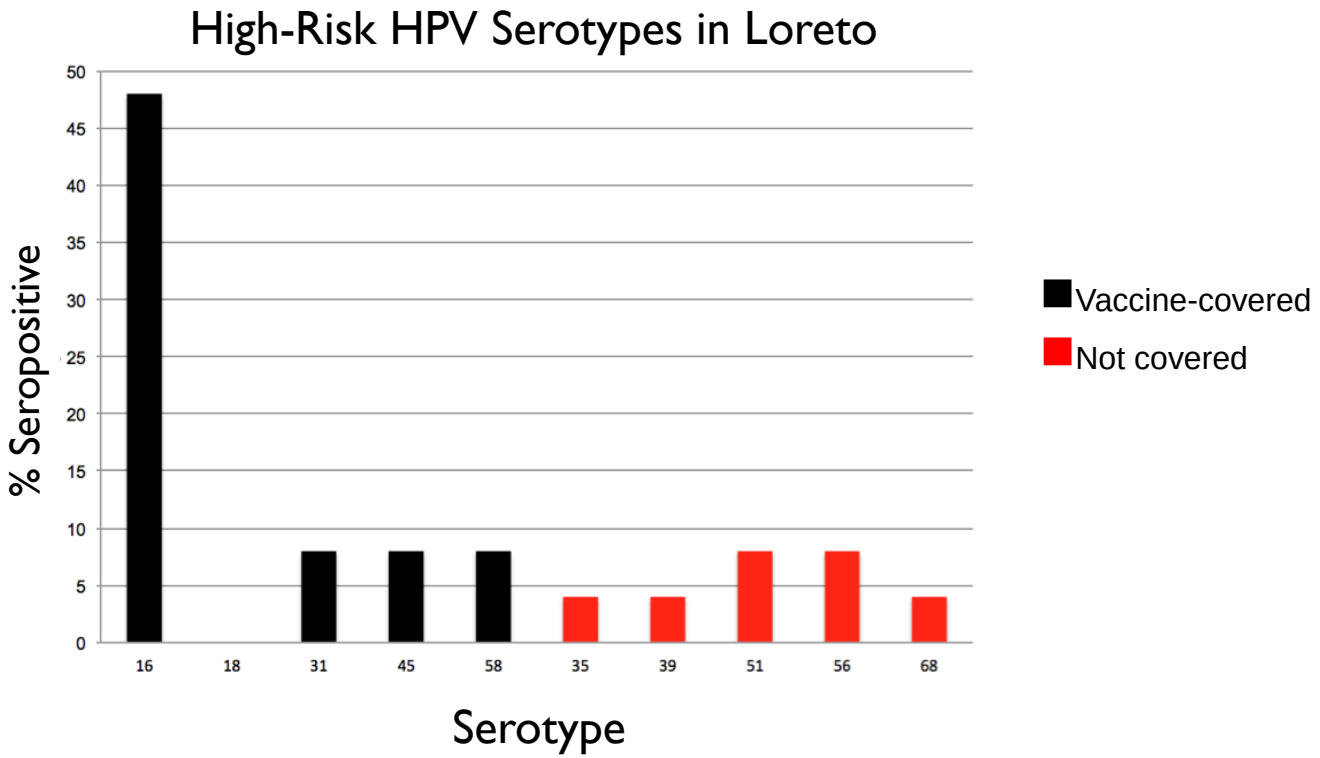
RtPCR with type-specific primers is performed on all HPV^{+} samples to determine which of the 13 high-risk serotypes are present.

Current Results: La Libertad (Trujillo)



High-risk serotype prevalence in La Libertad, Peru. Shown as the number per total HPV positive patients (La Libertad, n=111, HPV^{+}=25, 22.5% incidence) Statistical analysis showed non-random distribution ($P<0.05$) with trends towards types **45** and **35**.

Current Results: Loreto (Iquitos)



High-risk serotype prevalence in Loreto, Peru. Shown as the number per total HPV positive patients (Loreto, n=126, HPV^{+}= 33, 26.2% incidence) Statistical analysis showed non-random distribution ($P<0.01$) with trend towards type **16.**

Discussion

- The most common HPV type in Loreto was type **16**. This is consistent with the most common HPV types worldwide and is covered by the vaccine.
- The most common HPV types in La Libertad were **35** and **45**. **Type 35 is not covered by the vaccine.**
- These results suggests that in the La Libertad region of Peru, the HPV vaccine may be less effective at preventing cervical malignancy.

Patients waiting outside of the Iquitos clinic

Discussion

- In regions with atypical HPV serotype predominance, access to prevention strategies such as Papanicolaou smears, visual inspection, and HPV DNA testing are important.
- Much of the cancer burden falls on low-income regions, making it necessary to address barriers to regular screening.
- Alternative vaccination formulas and strategies may be of benefit in these regions.

Patients waiting outside of the boat clinic along the Amazon river

Next Steps

- Continue sample collection.
- Establish a laboratory base at Universidad César Vallejo to allow for testing and analysis in Peru.
- Investigate cost-efficient rapid HPV detection assays.

Thank You

Michigan State University College of Osteopathic Medicine and the Peru Global Outreach Elective!

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- Shane Sergent, DO

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- 2nd and 4th year students of the Peru Global Outreach

Assistance with statistical analysis:

- Dr. William Jackson, PhD

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