Distribution of HPV Types among a Population-Based Sample of Invasive Cervical Cancers across 7 U.S. States

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Factors Associated with Invasive Cervical Cancer (ICC)

• Infection with carcinogenic HPV is a necessary factor in developing cervical cancer.

• Other factors:
  – About half the cases are under age 50
  – Black and Hispanic women have higher rates
  – # Sexual partners
  – Smoking
  – Lack of screening

• About 72% squamous cell carcinoma, 19% adenocarcinoma
### ICC Age-Adjusted Incidence Rates, by State (2003-2007)*

<table>
<thead>
<tr>
<th>State</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louisiana</td>
<td>9.3</td>
</tr>
<tr>
<td>Kentucky</td>
<td>9.2</td>
</tr>
<tr>
<td>Florida</td>
<td>9.2</td>
</tr>
<tr>
<td>California</td>
<td>8.2</td>
</tr>
<tr>
<td>Hawaii</td>
<td>7.6</td>
</tr>
<tr>
<td>Michigan</td>
<td>7.5</td>
</tr>
<tr>
<td>Iowa</td>
<td>6.9</td>
</tr>
</tbody>
</table>

*http://apps.nccd.cdc.gov/uscs/cancersbystateandregion.aspx*
Study Design

• CDC funded study, coordinated by Battelle
• The purpose of this pilot study was to develop an infrastructure for the systematic monitoring of HPV types in ICC (and other HPV-related cancers), test the feasibility, and obtain a baseline measurement of HPV types.
• Cancer registries included:
  Initially:
  – Kentucky, Louisiana, Michigan, and Florida (3 counties); years 2004-2005
  Residual Tissue Repositories added later:
  – Hawaii; years 2000-2004
  – Iowa and Los Angeles; years 1994-1995
Study Design (cont)

- Each registry followed a common study protocol for selecting cases and submitting tumor tissue samples (embedded in paraffin) to CDC for HPV typing.

- 779 samples for females diagnosed with ICC from all seven states were successfully submitted and typed.
Study Variables

• Selected variables from the cancer registries were linked with the HPV typing results from CDC.

• Variables from the cancer registries included:
  – Demographics: age, race/ethnicity, state and county of residence, urban/rural location
  – Clinical: stage, histology, grade, survival status
Study Variables
Hierarchical HPV types from CDC

HPV-16

If not HPV-16, then HPV-18

If not HPV-18, then positive for types 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68

If not, then positive for other HPV types

HPV negative
Demographics by State
Race

% White, non-Hispanic
% Black, non-Hispanic
% Hispanic
% Asian, Pac Isl
% All other

FL
KY
LA
MI
HI
IA
L.A.

L.A. = Los Angeles
Demographics by State
Age Groups

% <50  % 50+

IA  KY  LA  MI  FL  HI  L.A.

L.A. = Los Angeles
Distribution by HPV Types
All States

- HPV-16 POS: 50.7%
- HPV-18 POS & HPV-16 NEG: 20.8%
- NEG for HPV-16/18, POS for other carcinogenic types: 15.7%
- NEG carcinogenic HPV, POS non-carcinogenic types: 9.6%
- PCR negative: 3.2%
Distribution by HPV Types

FL, KY, LA, MI (n=526)
- 9.7%
- 19.8%
- 16.0%
- 51.7%

HI, IA, Los Angeles (n=253)
- 9.5%
- 9.7%
- 15.0%
- 48.6%
- 4.0%
- 22.9%
HPV Types by State

- % HPV-16 POS
- % HPV-18 POS & HPV-16 NEG
- % POS for other carcinogenic
- % NEG for carcinogenic

L.A. = Los Angeles
HPV Types by Race

Other races = 22 cases (2.8%)
HPV Types by Stage

- % HPV-16 POS
- % HPV-18 POS & HPV-16 NEG
- % POS for other carcinogenic
- % NEG for carcinogenic

Unknown = 90 cases (12%)

Local: 368, 47%
Regional: 247, 32%
Distant: 74, 9%
HPV Types by Grade

- **Grade I**: 66, 8%
- **Grade II**: 238, 31%
- **Grade III**: 253, 32%
- **Grade IV**: 12, 2%
- **Unknown**: 210, 27%
HPV Types by Histology

- **Squamous**
  - % HPV-16 POS: 571, 73%
  - % POS for other carcinogenic

- **Adenocarcinoma**
  - % HPV-18 POS & HPV-16 NEG: 180, 23%
  - % NEG for carcinogenic

All other types = 28 cases (4%)
A Different Grouping of HPV Type

- HPV-16 only: 44.5%
- HPV-18 only: 15.1%
- HPV-16 & HPV-18: 12.8%
- Other carcinogenic HPV: 20.8%
- HPV 16/18 & other carcinogenic HPV: 1.3%
- Negative for carcinogenic HPV: 15.1%
Conclusions

• Overall, our study population followed expected HPV distributions, with 71% being HPV 16 and/or 18, 21% other carcinogenic types combined, and about 13% negative.

• Variations were observed across age and race; women over 50 were more likely to be carcinogenic for other types or negative; White-non-Hispanics having the lowest proportion of other carcinogenic types, and Asian/Pacific Islanders the lowest proportion of HPV-16.

• Variations were observed across stage and grade.

• Greatest variations observed across histology, with adenocarcinomas having lower HPV 16, higher HPV 18 and higher negatives.
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