Impact of the US HPV vaccination program on HPV-associated outcomes

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June 22, 2022
Monitoring Impact of HPV Vaccination

- HPV prevalence in several populations
  - National Health and Nutrition Examination Survey (NHANES), women undergoing cervical cancer screening, men who have sex with men

- Anogenital warts
  - Claims data

- Juvenile onset recurrent respiratory papillomatosis (JORRP)
  - Network of pediatric otolaryngologists

- Cervical precancers
  - Population-based surveillance and administrative data, state-based data

- HPV-associated cancers
  - State-based cancer registries
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HPV Prevalence Monitoring in Genital Specimens: National Health and Nutrition Examination Survey (NHANES)

- **HPV DNA testing**
  - Self-collected vaginal swabs ongoing since 2003
  - Self-collected genital swabs in males since 2013
  - Linked to demographic, limited behavioral data, self/parent-reported HPV vaccination history
Prevalence of Vaccine-type HPV (HPV 6,11,16,18) in Females, 2007–2010 Compared to Pre-vaccine Era

Markowitz et al. J Infect Dis 2013
NHANES: National Health and Nutritional Examination Survey
Prevalence of Vaccine-type HPV (HPV 6,11,16,18) in Females, 2015–2018 Compared to Pre-vaccine Era

- 14–19 years*
  - Pre-vaccine era, 2003–2006: 11.5%
  - 2007–2010: 18.5%
  - 2011–2014: 11.8%
  - 2015–2018: 9.5%
- 20–24 years*
  - Pre-vaccine era, 2003–2006: 3.3%
  - 2007–2010: 7.2%
  - 2011–2014: 3.3%
  - 2015–2018: 9.1%
- 25–29 years
  - Pre-vaccine era, 2003–2006: 1.1%
  - 2007–2010: 8.8%
  - 2011–2014: 8.9%
  - 2015–2018: 7.1%
- 30–34 years
  - Pre-vaccine era, 2003–2006: 3.3%
  - 2007–2010: 7.2%
  - 2011–2014: 9.1%
  - 2015–2018: 6.2%

Markowitz et al. J Infect Dis 2013; Oliver et al. J Infect Dis 2017; Rosenblum et al. MMWR 2021

NHANES: National Health and Nutritional Examination Survey
Vaccine Impact among Vaccinated* and Unvaccinated Sexually Experienced Females

* Reported receipt of ≥1 HPV vaccine dose.

Rosenblum et al. *MMWR* 2022

NHANES: National Health and Nutritional Examination Survey
Prevalence of Vaccine-type HPV (HPV 6,11,16,18) in 14–19 Year-old Females, 2013–2016 Compared to Pre-vaccine Era, by Race/Ethnicity

- **non-Hispanic white**: 11.3% lower
  - aPR 0.14 (0.06-0.29)

- **non-Hispanic black**: 74% lower
  - aPR 0.26 (0.12-0.54)

- **Mexican American**: 10.0% lower
  - aPR 0.13 (0.03-0.53)

McClung et al. *J Adolesc Health* 2019
JORRP Case-Patients and Incidence by Birth Year

JORRP, Juvenile onset recurrent respiratory papillomatosis
Meites et al, Clin Infect Dis 2021
Evaluation of HPV Vaccine Impact on Cervical Precancers in the United States

- Population-based surveillance in locations in 5 states (HPV-IMPACT)
- Administrative claims data in privately insured women
- CIN3 surveillance through cancer registries
- Monitoring challenging due to changes in cervical cancer screening recommendations

Show decreases in cervical precancers in young women consistent with vaccine impact

- CIN2+ rates decreased significantly in screened women aged 18–20 and 21–24 years
- CIN2+ rates increases in screened women in older age groups
- Could be attributable to:
  - Longer screening intervals and/or
  - Increased sensitivity of screening or diagnostic tests

CIN2+, Precancerous lesions called “cervical intraepithelial neoplasia, grade 2 or worse; or adenocarcinoma in situ”
Precancer Declines Specific to Vaccine Types, Ages 18-39 Years

- Applied HPV type-specific proportions to actual number of reported CIN2+ cases
- Estimated proportion and numbers of vaccine-type CIN2+ cases have declined
- Estimated numbers of other CIN2+ cases approximately constant

<table>
<thead>
<tr>
<th>Vaccine type CIN2+</th>
<th>Other CIN2+</th>
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<tbody>
<tr>
<td>1235 (52.7%)</td>
<td>1163 (50.8%)</td>
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<tr>
<td>561 (23.9%)</td>
<td>577 (25.2%)</td>
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<tr>
<td>369 (15.8%)</td>
<td>331 (14.5%)</td>
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<tr>
<td>179 (7.6%)</td>
<td>219 (9.8%)</td>
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</tbody>
</table>

CIN2+, cervical intraepithelial neoplasia, grade 2 or worse or adenocarcinoma in situ
McClung et al. Cancer Epidemiology, Biomarkers and Prevention 2019
Cervical Cancer Trends, United States Cancer Statistics

Age 21-24 years

 SCC, squamous cell carcinoma
Mix et al, *Cancer Epidemiol Biomarks Prev* 2020
Summary

- Genital 4vHPV (6/11/16/18) prevalence has declined markedly among both vaccinated and unvaccinated young females.
- Declines in HPV6/11 prevalence have resulted in a reduced incidence of JORRP.
- Declines in HPV16/18 prevalence have translated into declines in cervical precancer incidence in young women.
- Early impact on invasive cancer might be occurring.
- Monitoring will continue to assess the impact of vaccination, including impact of 9vHPV vaccine.
Acknowledgements

- Lauri Markowitz
- Rayleen Lewis
- Elissa Meites
- Hannah Rosenblum
- Nancy McClung
- Harrell Chesson
- Mona Saraiya
- Jacqueline Mix
- Troy Querec
- Beth Unger
- JORRP collaborators
- HPV-IMPACT collaborators/ EIP sites in CA, CT, NY, OR, TN
- National Center for Health Statistics/DHANES