

Reduction in HPV-Associated High Grade Cervical Lesion Incidence in Connecticut, 2008-14: Evidence for Herd Immunity

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NE Epi Conference
October 2, 2015

Background

- Annually responsible for ~12,000 cases/yr of cervical cancer and >200,000 cases of high grade cervical cancer precursor lesions (CIN2+)
- CIN2+ (and cervical cancer) became vaccine preventable in 2006
 - HPV vaccine recommended for girls 11-12 yrs in 3-dose series
 - Catch-up for women up to 26 yrs
 - >95% effective in preventing CIN2+ (**cervical interepithelial neoplasia grades 2 and higher, adenocarcinoma in situ**)

Surveillance – HPV IMPACT

- In 2008, CDC STD staff and five EIP sites (CA, CT, OR, TN, NY) established active, population-based surveillance for CIN2+
 - Pathology-laboratories
 - In CT, CIN 2+ made reportable statewide

Study Objectives

- Determine trends in CIN 2+ incidence in Connecticut, 2008 through 2014
- Compare observed to expected changes in incidence in 21-24 year olds

Methods 1

- Use deduplicated cases assigned to the year in which their initial diagnosis occurred
- Determine age & age-group specific incidence rates using annual population estimates (US Census)
- Compared observed to maximum expected decrease through 2014 in 21-24 year olds
 - 21 is youngest age for routine PAP screening
 - 21-24 year olds in 2014 were 13-16 years old in 2006, group most likely to be HPV-infection naïve when vaccinated.

Maximum Expected Decrease 21-24 yo, CT

[max. % of CIN2+ that are vaccine-preventable]
x [est. max. percentage vaccinated in age group]

- % CIN2+ vaccine-preventable = [100% types 16/18 + 21% other HPV types] = 54.3%* + 9.6%** = 63.9%
- % vaccinated = 66%***

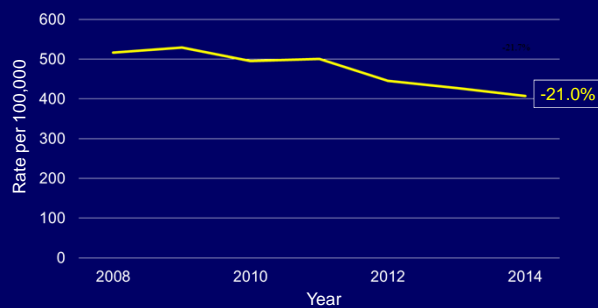
Max expected decrease = 42.2%

* Hariri. Cancer Epidemiol Biomarkers Prev 2015;24:393-399

** Wheeler. Lancet Oncol 2012;13:100-10

*** NIS Teen 2008-2011.

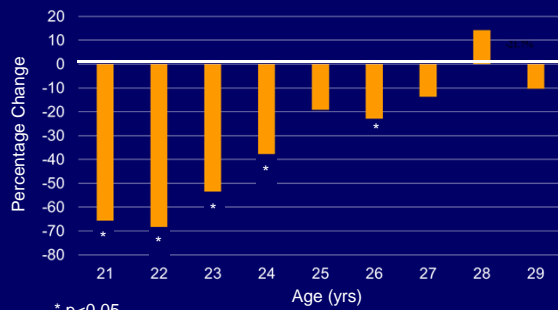
Rates of CIN2+ in Women 21-39 y.o. CT, 2008-2014



Rates of CIN2+ by Age Group Women 21-39 y.o., CT, 2008-2014



Percentage Decrease in CIN2+ 2008 to 2014 by Age, 21-29 yrs, CT



Observed vs. Maximum Expected Decrease in CIN2+ in 21-24 year olds

[max. % cases potentially preventable: 63.9%] x
[max % vaccinated: 66%] = 42.2% (314 cases*)

Actual decrease = 57.1% (425 cases*), p=0.00004

Relative actual to expected decrease:
1.36 [95% CI 1.17-1.57]

* Using 2008 denominator and baseline 744 cases

Hypotheses

- Cross-protection for non-vaccine strains
- Under-reporting in 2014 relative to 2008
- Reduced rates of detection of CIN2+ due to changes in PAP screening recommendations in 2012
- **Herd immunity**

Conclusions

- There has been a progressive decrease in CIN2+ diagnoses, mostly since 2011.
- Vaccination rates may be high enough in those who were 13-16 years (now 21-24) when vaccine licensed to reduce the probability of HPV exposure in the unvaccinated, leading to herd immunity.

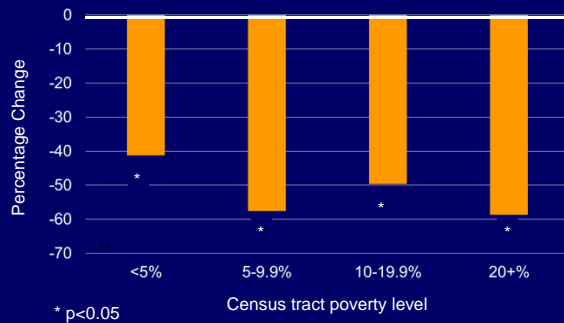
Acknowledgements

- CT EIP co-authors
 - Yale
 - Kyle Higgins
 - Pamela Julian
 - James Meek
 - Linda Niccolai
 - CT DPH
 - Lynn Sosa
- Pathology laboratories in CT
- CDC HPV staff

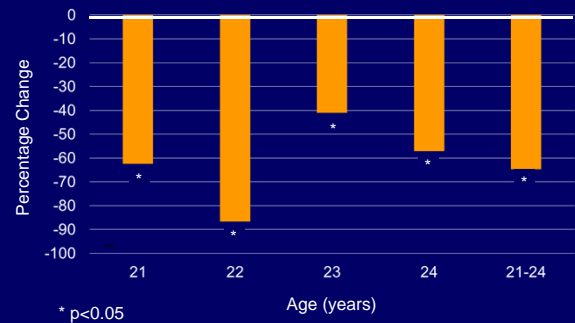
Limitations

- Don't know what HPV types responsible for the changes observed – changes in behavior could account for some of the decrease.
- Percentage of CIN2+ prevented in 21-22 yo already at estimated maximum – suggests some parameters could be off.
- Estimate of % of CIN+ that are vaccine types were from EIP data collected 2008-2012 – possible underestimate of % CIN2+ preventable.

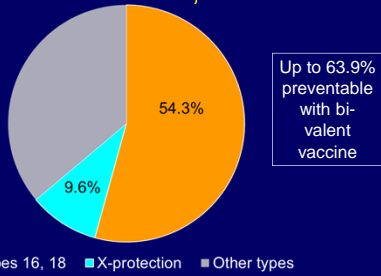
Percentage Decrease in CIN2+ in 21-24 year olds by poverty level, 2008 to 2014, CT



Percentage Decrease in CIN3+ in 21-24 year olds, 2008 to 2014



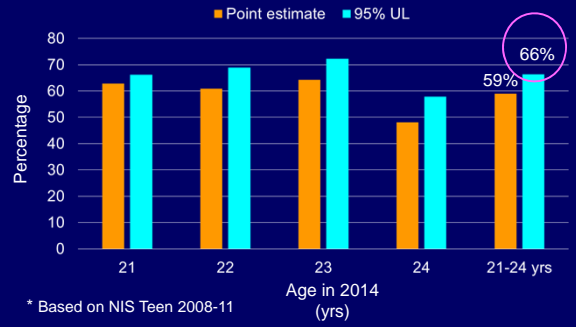
Percentages of CIN2+ in 21-24 yo unvaccinated women that are Types 16 /18 and Types with Possible Cross-protection, 5 HPV IMPACT sites, 2008-11*



■ Types 16, 18 ■ X-protection ■ Other types

* Hariri. Cancer Epidemiol Biomarkers Prev 2015;24:393-399.

Percentage of 21-24 y.o. vaccinated* with ≥ 1 HPV dose by age 17 years, CT



* Based on NIS Teen 2008-11