

# Leveraging Electronic Pathology Reporting in Cervical Cancer Epidemiology: Determinants of Invasive Diagnoses in Kentucky

Presented by:

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**UK**HealthCare  
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# Burden of Invasive Cervical Cancer

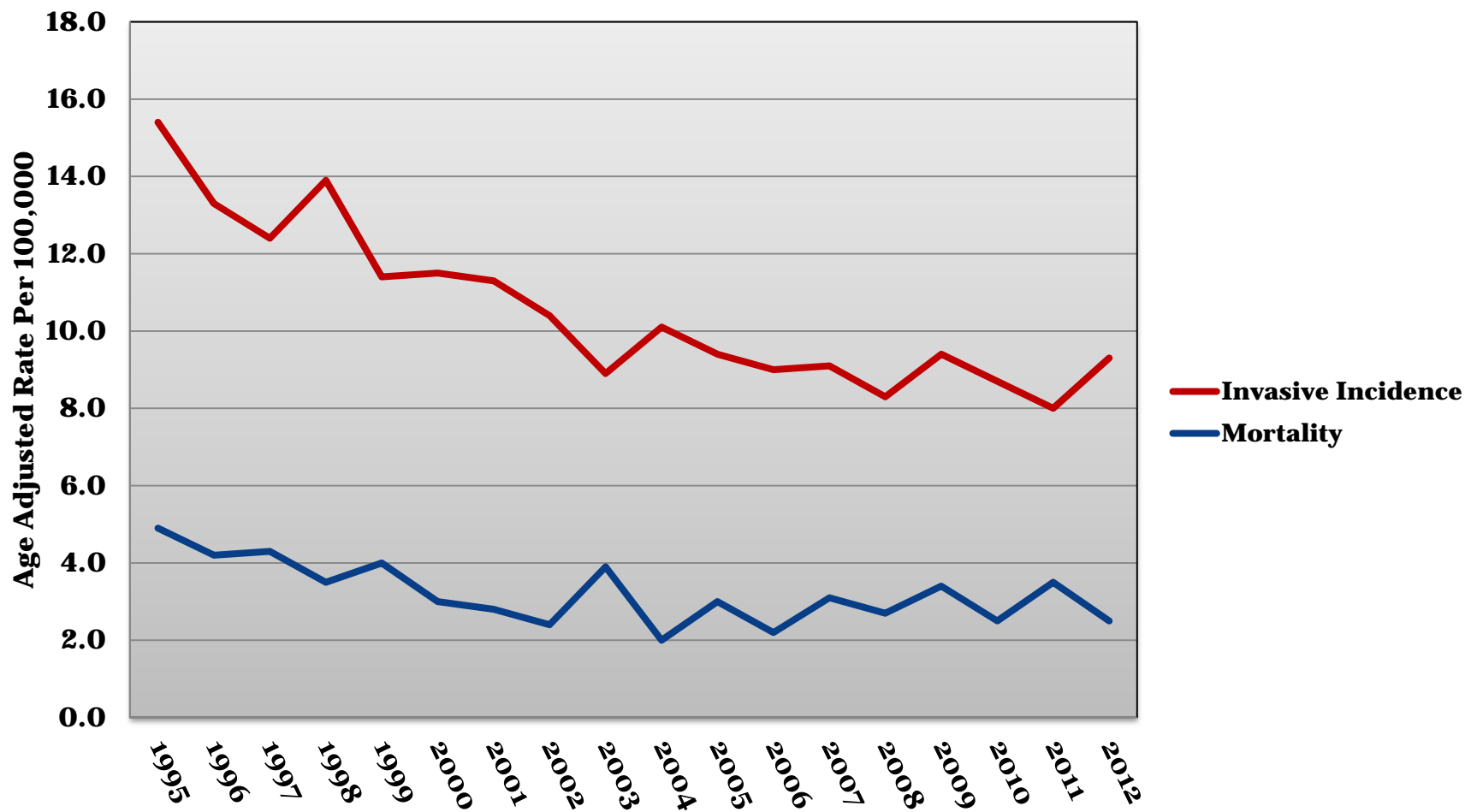
- U.S.<sup>1</sup>
  - 12,900 new cases expected in 2015
  - 4,100 deaths expected in 2015
- Kentucky
  - 10<sup>th</sup> highest incidence rate in U.S. (2007-2011) <sup>2</sup>
  - 5<sup>th</sup> highest mortality rate in U.S. (2007-2011) <sup>2</sup>
  - ~200 cases per year <sup>3</sup>
  - ~74 deaths per year <sup>3</sup>
  - Incidence and mortality highest among blacks, rural counties and in Appalachia

<sup>1</sup>American Cancer Society. Cancer Facts & Figures 2015. <http://www.cancer.org/research/cancerfactsstatistics/cancerfactsfigures2015/>

<sup>2</sup>U.S. Cancer Statistics Working Group. United States Cancer Statistics: 1999-2011 Incidence and Mortality Web-based Report. 2014. [www.cdc.gov/uscs](http://www.cdc.gov/uscs).

<sup>3</sup>Kentucky Cancer Registry. 2015. <http://cancer-rates.info/ky/>

# Kentucky Cervical Cancer Incidence and Mortality Trends 1995-2012



Source: Kentucky Cancer Registry, 2015 <http://cancer-rates.info/ky>

# Background

- Electronic pathology (ePath) reporting has become an essential data source for population-based cancer surveillance
- In 2009, the Kentucky Cancer Registry expanded ePath reporting to also include pre-invasive cervical cancers
  - Sponsored by CDC initiative to track impact of HPV immunizations



# Study Aims

1. Assess feasibility of ePath surveillance to capture population-based pre-invasive cervical cancers in Kentucky
2. Assess factors associated with invasive cervical cancer in Kentucky

# ePath Reporting in Kentucky

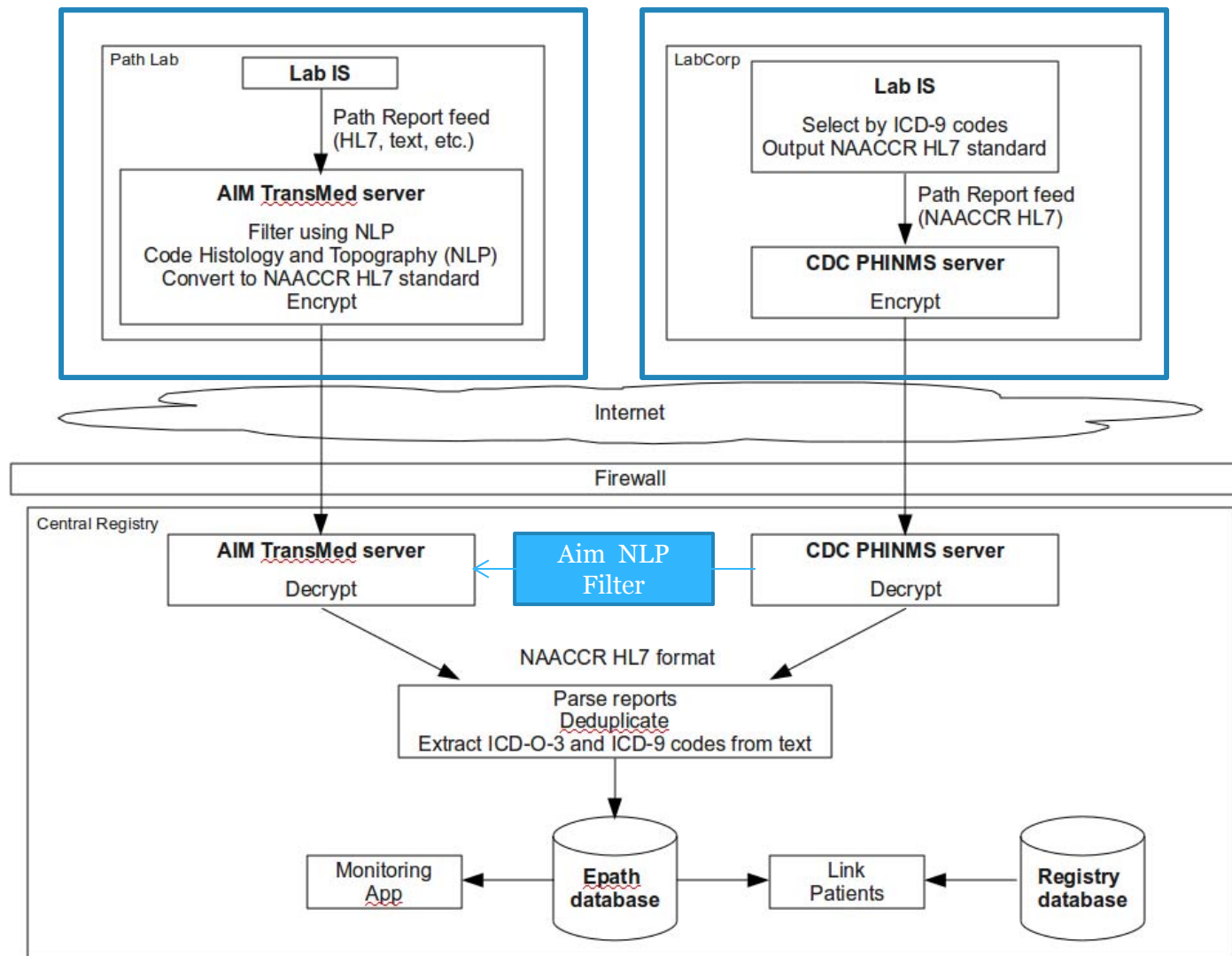
- Aggressively implementing ePath reporting since 2004
- Specifically targeted labs with high volumes of cervical specimens in 2009
- 48 laboratories reporting
  - >95% coverage of histologically confirmed cases
- Two primary methods
  - Transmed by AIM, Inc. (SEER)
  - PHIN-MS (CDC)
- 4 labs sending non-standard reports



# ePath Reporting Data Standards

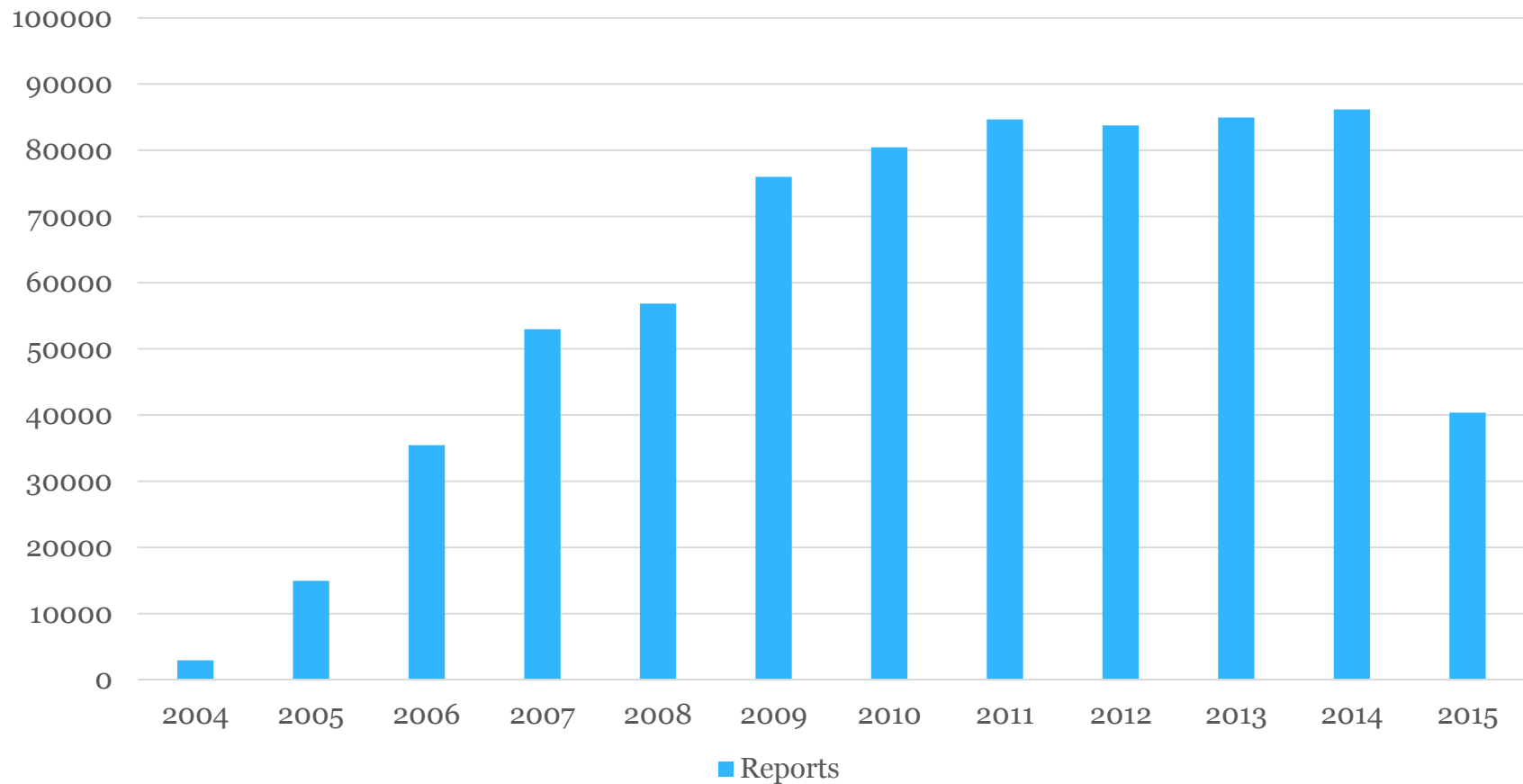
- Common data transmission standard used to transmit ePath reports
- Health Level Seven (HL7)
  - Version 2.3 or 2.5
  - Defined by NAACCR Volume V
    - Established in 2005

# E-Path Architecture





# Volume of ePath Reports Received at KCR by Year





# Population-based Surveillance of Cervical Cancer in Kentucky

- Invasive cases reported and abstracted using traditional methods
  - 1995+
- Pre-invasive cases reported primarily by ePath
  - Abstracted into custom application developed by KCR
  - 2009+

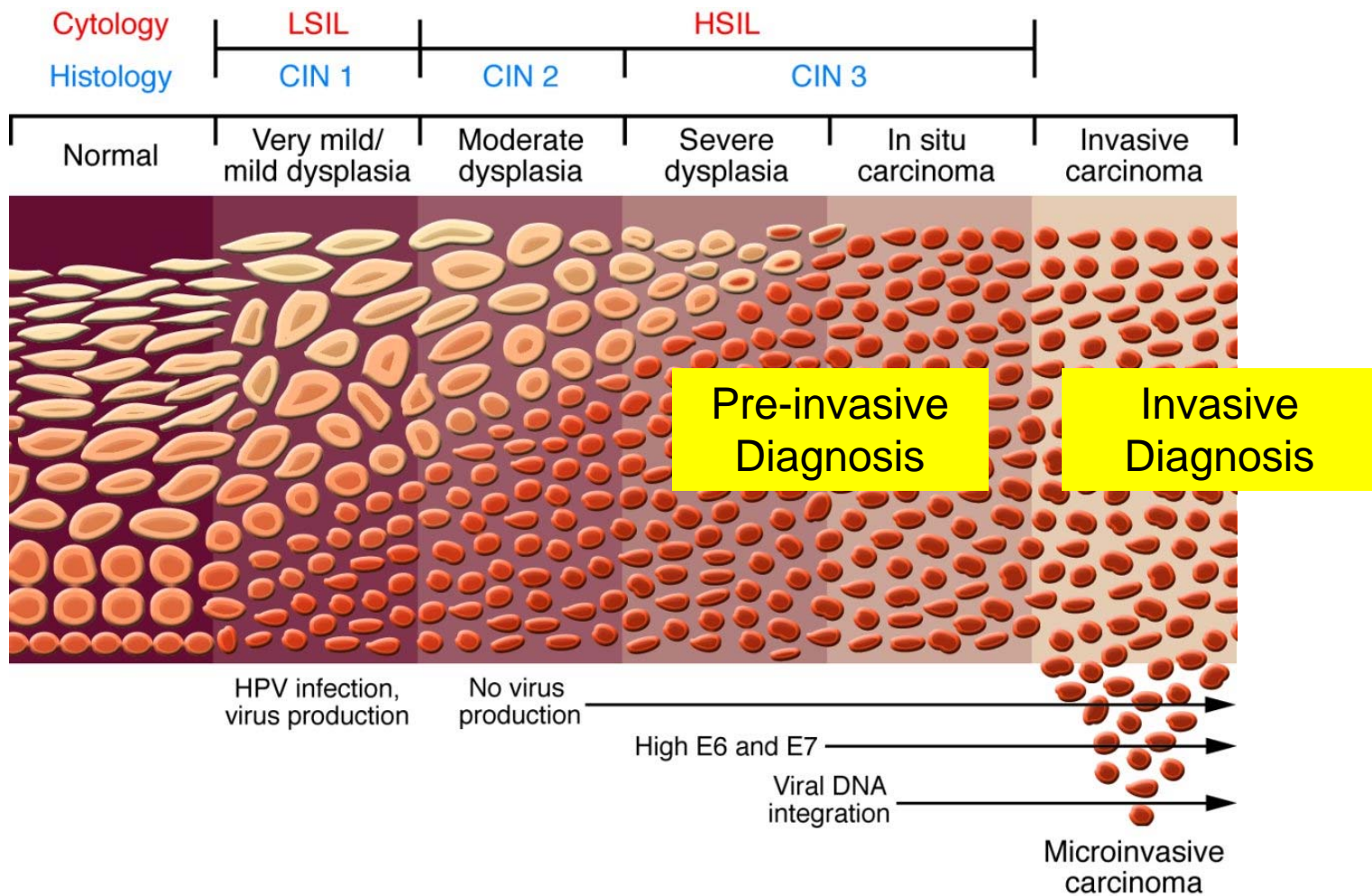
# New Cervical Cancer Research Opportunities in Kentucky Empowered by Electronic Surveillance

- Data now available to support population-based studies
- First time since registries stopped collecting pre-invasive data in 1996

# Factors Associated with Invasive Diagnoses

- Individual factors
  - Patient demographics
    - Age
    - Race
    - Appalachian residence
    - Metropolitan residence
  - Disease characteristics
    - Histologic type
- Contextual factors
  - Socioeconomic measures by county at diagnosis

# Cervical Cancer Progression



# Methods

- Cervical cancer datasets provided by KCR
- Developed multi-level multivariable logistic regression models
- Outcome of interest: Diagnosis with invasive cervical cancer

# Study Population (N=6696)

- Included all Pre-Invasive Cases
  - 2009 – August 2012
- Included all Invasive Cases
  - 2006-2012
- Excluded
  - Patients w/both pre-invasive and invasive cases (15)
  - Histologic types specific only to invasive cases
    - Adenosquamous Glassy Cell (47)
    - Small Cell (20)
    - Other Specified (5)
    - Non-carcinomas (34)
- 5414 Pre-Invasive, 1282 Invasive

# Significant Demographic Factors Associated with Invasive Disease

- Age [10 year increase]
  - OR: 2.88
  - 95%CI [2.71, 3.07]
  - Continues to be an important risk factor
  - Particularly in women age 70+
- Black Race (referent: white/other)
  - OR: 1.44
  - 95%CI [1.04, 2.01]



# Significant Individual Factors Associated with Invasive Disease

- Appalachian county not significant
- Metropolitan County
  - OR: 1.43
  - 95% CI [1.10, 1.86]
  - Unexpected
  - Inconsistent with invasive incidence data by stage
- May be result of failure of metropolitan women to follow screening guidelines?

# Significant Contextual County Factors Associated with Invasive Disease

- County education [10% increase in proportion of college educated residents]
  - OR: 0.78
  - 95% CI [0.68, 0.90]
- County poverty [10% increase in proportion of residents living in poverty] \*
  - OR: 1.20
  - 95% CI [0.96, 1.51]

\*Approaching significance

# Significant Disease Characteristics Associated with Invasive Disease: Histologic Type

- Adenocarcinoma (Referent: Squamous Cell)
  - OR: 8.20
  - 95% CI [6.39, 10.53]
  - Most important finding
- Traditional Pap screening failing to detect AIS?
- Could different HPV types be a factor?

# Limitations

- Missing race in 9.8% of all cases
- Reliance on pathology reports for the pre-invasive cases limits the covariates that can be examined
- Lack of individual measures
  - Smoking, insurance status, sexual history, screening history, BMI, income, education

# Conclusions

- Electronic pathology reporting is an effective approach for enhancing population-based cancer surveillance for certain cancers
- Association with metropolitan county may have implications for cervical cancer prevention and control strategies in Kentucky
- The strong association of Adenocarcinoma with invasive diagnoses warrants further investigation

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Thank You!

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Questions?