**ALLIANCE FOR
HPV FREE COLORADO**

Using Business Intelligence to Improve HPV Up-to-Date Rates

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**LOCAL PUBLIC HEALTH
AND PARTNERS** | HPVFreeCO.org

Funding Acknowledgement

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Background

- Immunization information systems (IIS) have been widely promoted through meaningful use incentives

- Immunization information systems (IIS) have effectively increased vaccination rates through targeted point of care engagement with providers and outreach to patients

- Little public health experience using IIS to generate meaningful population health measures to drive community engagement

- **Challenge**: develop tools to leverage IIS data for county (and sub-county) population health surveillance

Objective

- To design a system that reprocesses immunization information system data to visualize trends in immunization coverage in an urban population

Use Case(s)

- Identify geographic areas where HPV up-to-date (UTD) rates could be improved,

- Produce healthcare provider level reports for practice coaches, and

- Evaluate and monitor HPV initiation and UTD rates at the county level and by demographic groups

Immunization Business Intelligence System (IBIS)

Functions:

- consume IIS data from 5 counties
- assess the validity of each vaccine
- assign each patient an up-to-date status for each vaccine, and
- visualize population and practice level UTD rates

IBIS Components

- IIS data (full history received monthly)
- Meta data driven processing engine
- Geocoder
- Immunization Calculation Engine (ICE)
- Custom application and reporting databases
- Tableau dashboards
- Lots of ETL

IBIS Assumptions

- IBIS assumes that demographic and geographic information in the most recent history is most accurate

- IBIS groups different types of HPV vaccine into one HPV vaccine group

- IBIS removes individuals from the surveillance cohort when they leave the surveillance area

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ice
Immunization Calculation Engine

IBIS Assumptions

- IBIS excludes individuals who have not had a non-flu vaccine in the past 10 years
- IBIS maintains only the current immunization rules and cannot run data through historical versions ACIP rules

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ice Immunization Calculation Engine

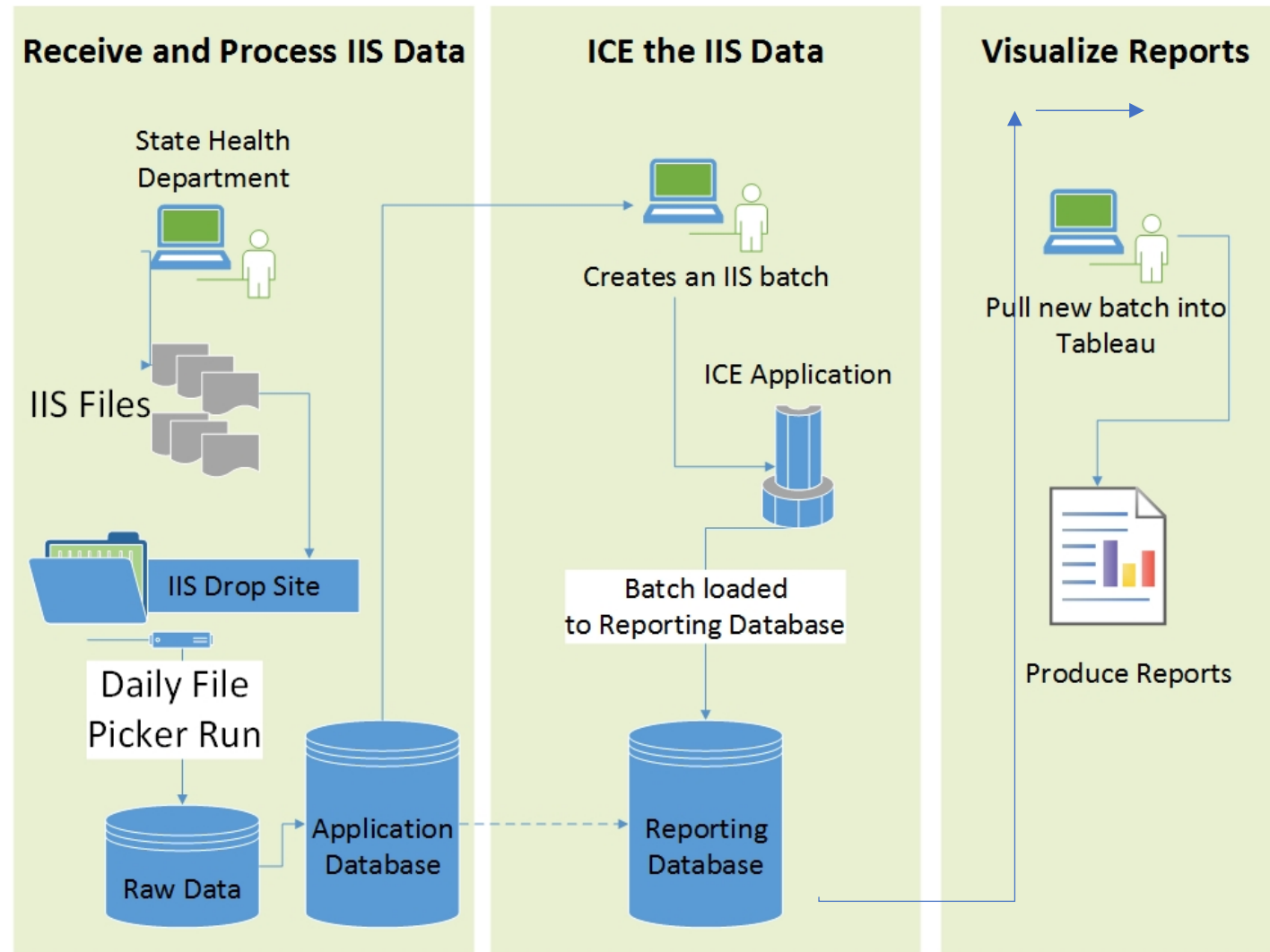# The Dynamics of Immunization Surveillance

On any given day:
- Vaccines enter the market
- ACIP modifies the vaccination scheduled
- Providers enter data into IIS
- Vaccines are given & refused
- Children are born & get older
- Children move

# of children up to date for HPV vaccine

# of children in a county who have received any vaccine in the past 10 years

HPV UTD Prevalence

Methods

Receive and Process IIS Data

State Health Department

IIS Files

IIS Drop Site

Daily File Picker Run

Raw Data

Application Database

ICE the IIS Data

Creates an IIS batch

ICE Application

Batch loaded to Reporting Database

Reporting Database

Visualize Reports

Pull new batch into Tableau

Produce Reports

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Intended Results

- How many IIS documented vaccines and patients were received from the registry?

- How many HPV vaccines were administered to how many patients?

- What percent of HPV vaccines were valid?

- What were common reasons for invalid doses?

- What percent of adolescents were UTD for HPV vaccine?

Results
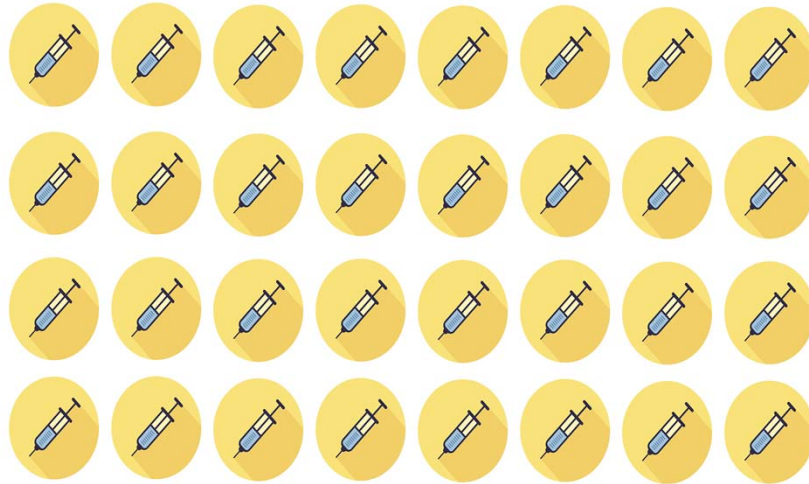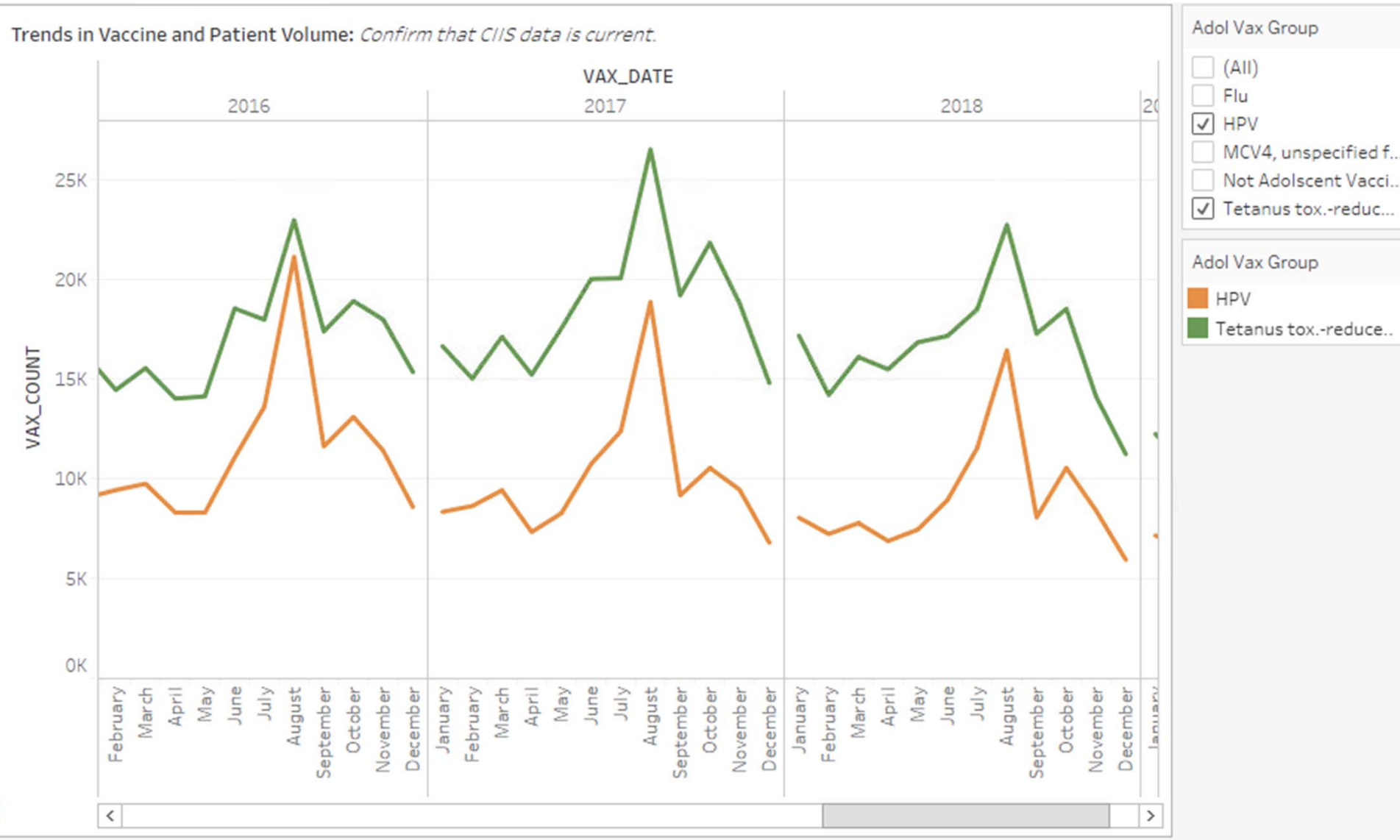

Documented vaccines: 48.4 million
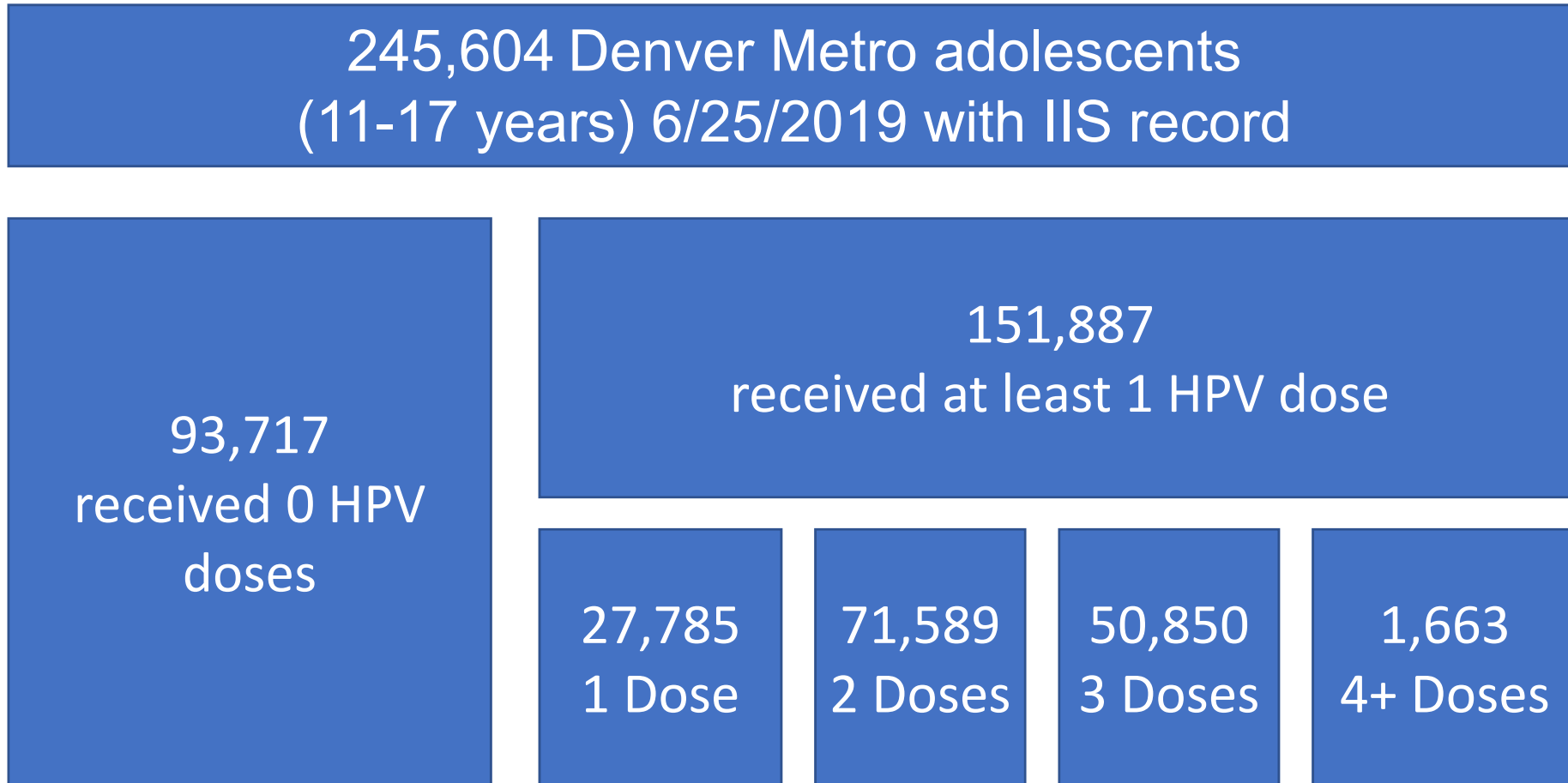
Vaccinated persons: 3.65 million

HPV vaccines: 1.28 million (≈3%).

Comparison of HPV and Tdap Vaccine Administration Trends

Results

245,604 Denver Metro adolescents
(11-17 years) 6/25/2019 with IIS record

93,717
received 0 HPV
doses

151,887
received at least 1 HPV dose
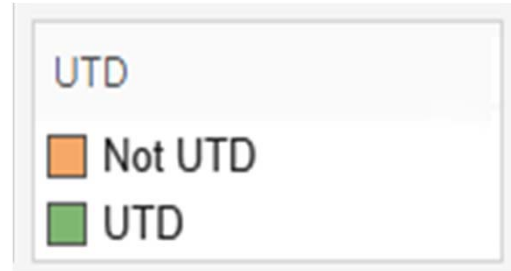
27,785
1 Dose

71,589
2 Doses

50,850
3 Doses

1,663
4+ Doses

Results

- Considering all adolescents, 49% of 11-17 year old had completed (aka Up-to-Date) the HPV vaccine series
- Among adolescents who have received at least 1 HPV vaccine, 80% have completed the HPV vaccine series

Results

HPV Up-to-date Rate by County of Residence and Age Group | Evaluated on 6/25/2019

Age In Years - Groups

Residence County Name	11-12 years		13-14 years		15-17 years		Grand Total	
Adams	17%	83%	46%	54%	58%	42%	42%	58%
Arapahoe	17%	83%	45%	55%	56%	44%	41%	59%
Denver	18%	82%	52%	48%	65%	35%	47%	53%
Douglas	14%	86%	41%	59%	49%	51%	37%	63%
Jefferson	17%	83%	47%	53%	55%	45%	42%	58%
Grand Total	17%	83%	47%	53%	57%	43%	42%	58%

Limitations

- Some providers do not currently contribute data to IIS system
- There is not a consensus definition for the denominator of population UTD rates
- Challenging to interpret historical data when new ACIP vaccine schedules are applied

Lessons Learned

- IBIS requires informatics skills to manage large data sets with multiple functional components

- Denominator difficulties make it difficult to interpret changes in UTD rates

- Costly infrastructure to implement and maintain

- Open source software successfully processed enormous database (1 billion rows)

- UTD reports challenging to interpret

- IBIS has geocoding capabilities beyond what can be done in SAS, ensuring accurate location information

Implications and Future Steps

- IBIS can enhance IIS reach to various audiences
  - Public health can use to identify intervention opportunities
  - A public-facing dashboard would allow requestors to access data themselves, takes the burden off of LPH or state IZ divisions
- Collaboration across public health entities will be important to construct a sustainable infrastructure to support IBIS functionality
- Current IBIS development includes expanding reporting to 10 additional Colorado counties and vaccines

Conclusions

- Vaccination surveillance and reporting provided important guidance for this public health program's direction

- A clinic-focused knowledge management system was successfully repurposed for population-focused HPV surveillance

- A scalable platform would allow for expansion of reporting to other vaccines, vaccine schedules, geographies and demographic groups

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Questions

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