

Automated Immunization Surveillance: Using Business Intelligence to Improve Up-to-Date Rates

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HPV FREE COLORADO**

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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) TM
- Custom application and reporting databases
- Tableau dashboards
- Lots of ETL



The Dynamics of Immunization Surveillance

On any given day:

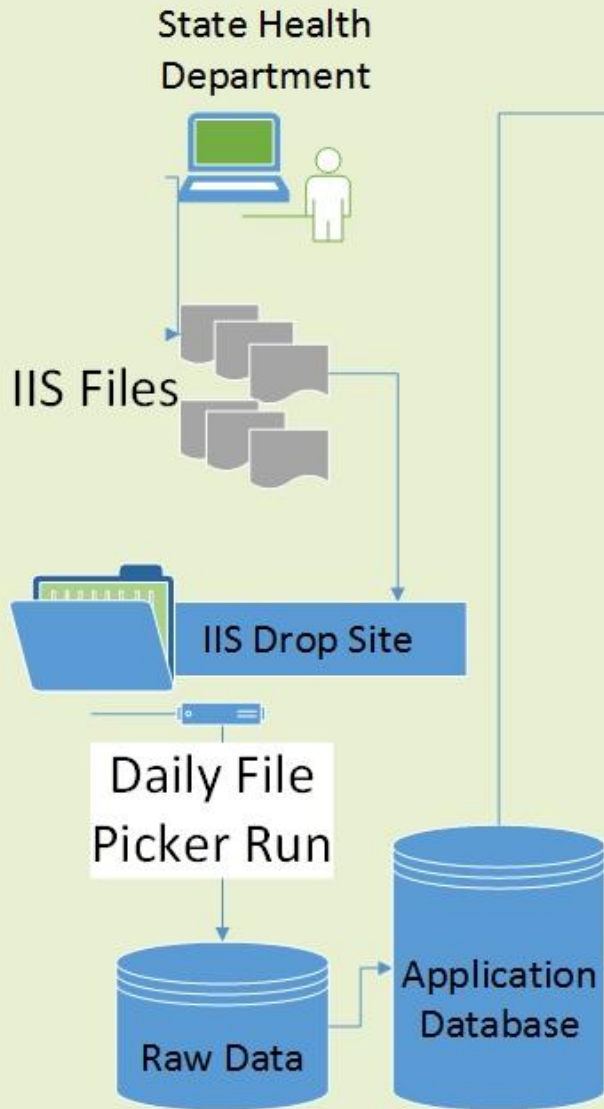
- Vaccines enter the market
- ACIP modifies the vaccination scheduled
- Providers enter data into IIS
- Vaccines are given & refused
- Children are born & get older
- Children move

of children up to date for HPV vaccine

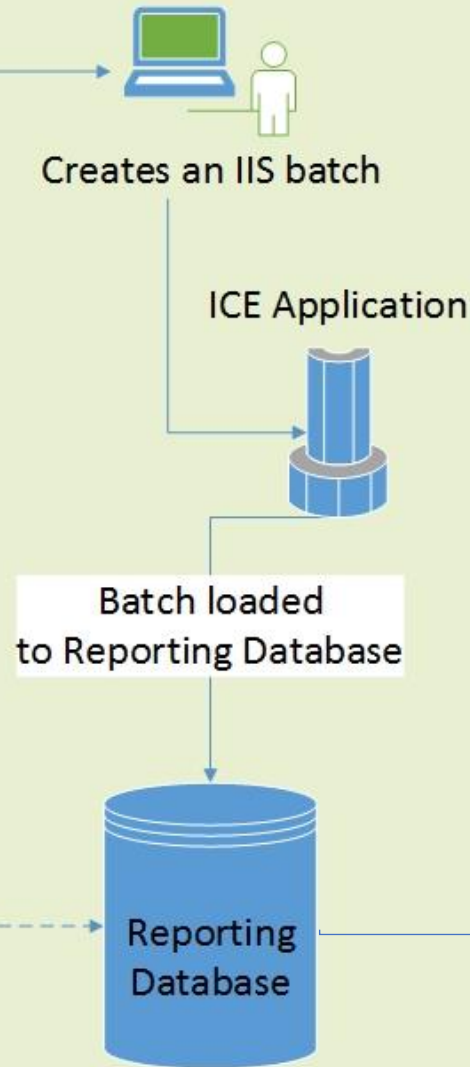
of children in a county who have received any vaccine in the past 10 years

HPV UTD Prevalence

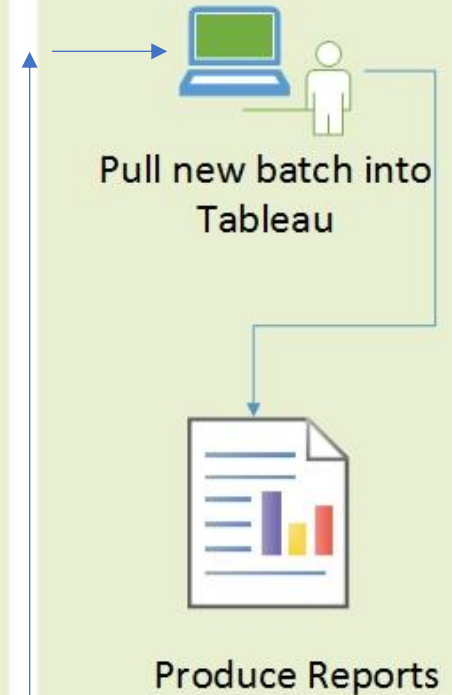
Receive and Process IIS Data



ICE the IIS Data



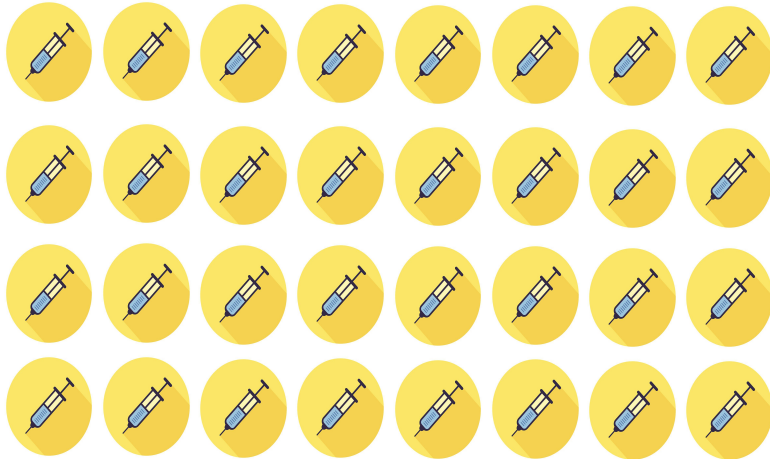
Visualize Reports



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:

Vaccinated persons:

HPV vaccines:

33 million

2.45 million

1.94 million ($\approx 6\%$).

Results

In 2015-2017, IBIS had evidence of:



295,046 HPV
vaccines



administered to
181,905 patients



at 869 unique
clinical locations

Results

273,718 Denver Metro adolescents
(11-17 years) 12/31/2017 with IIS record

123,316
received 0 HPV
doses

150,402
received at least 1 HPV dose

51,301
1 Dose

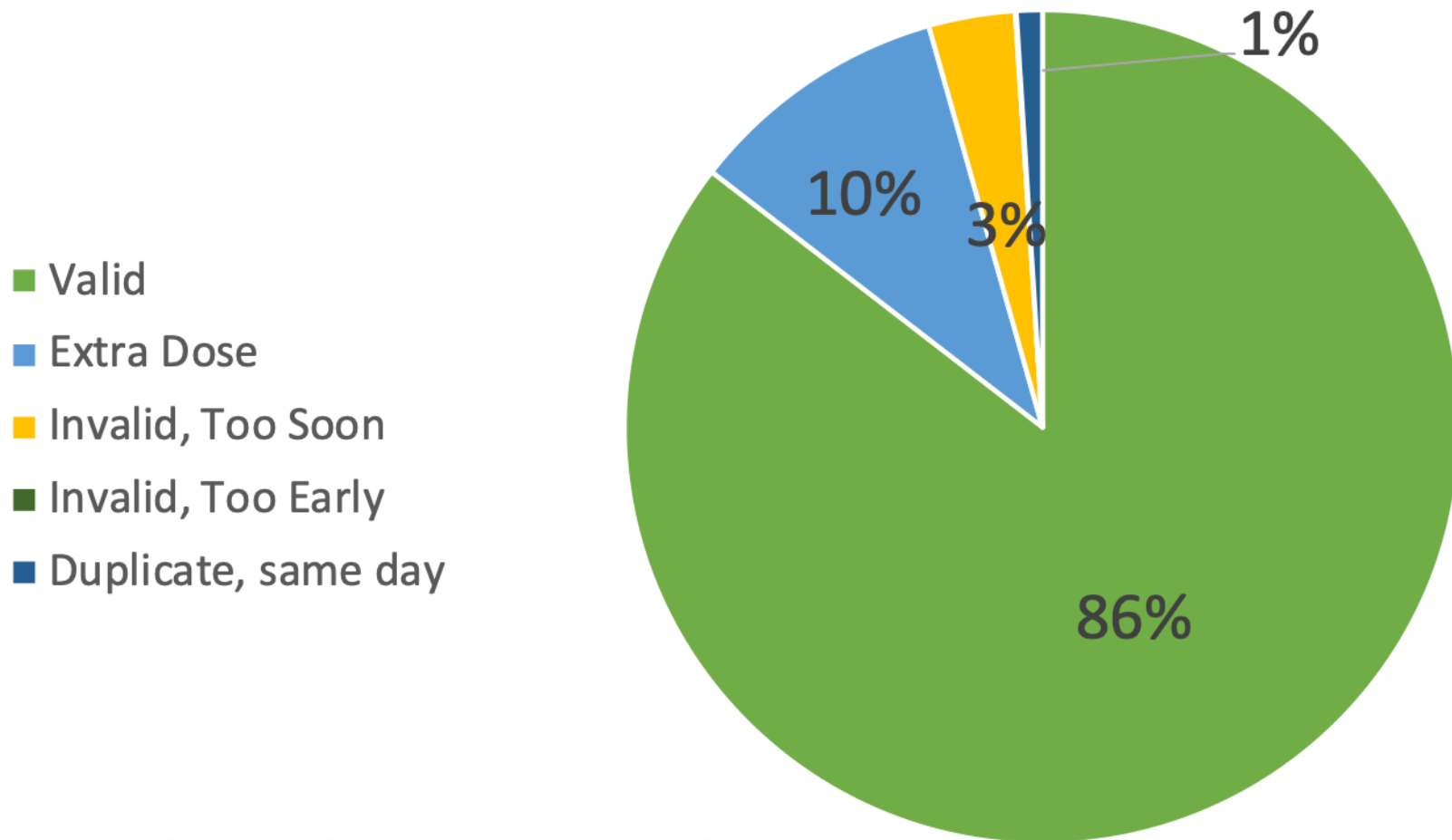
37,190
2 Doses

58,943
3 Doses

2,692
4+ Doses

Results

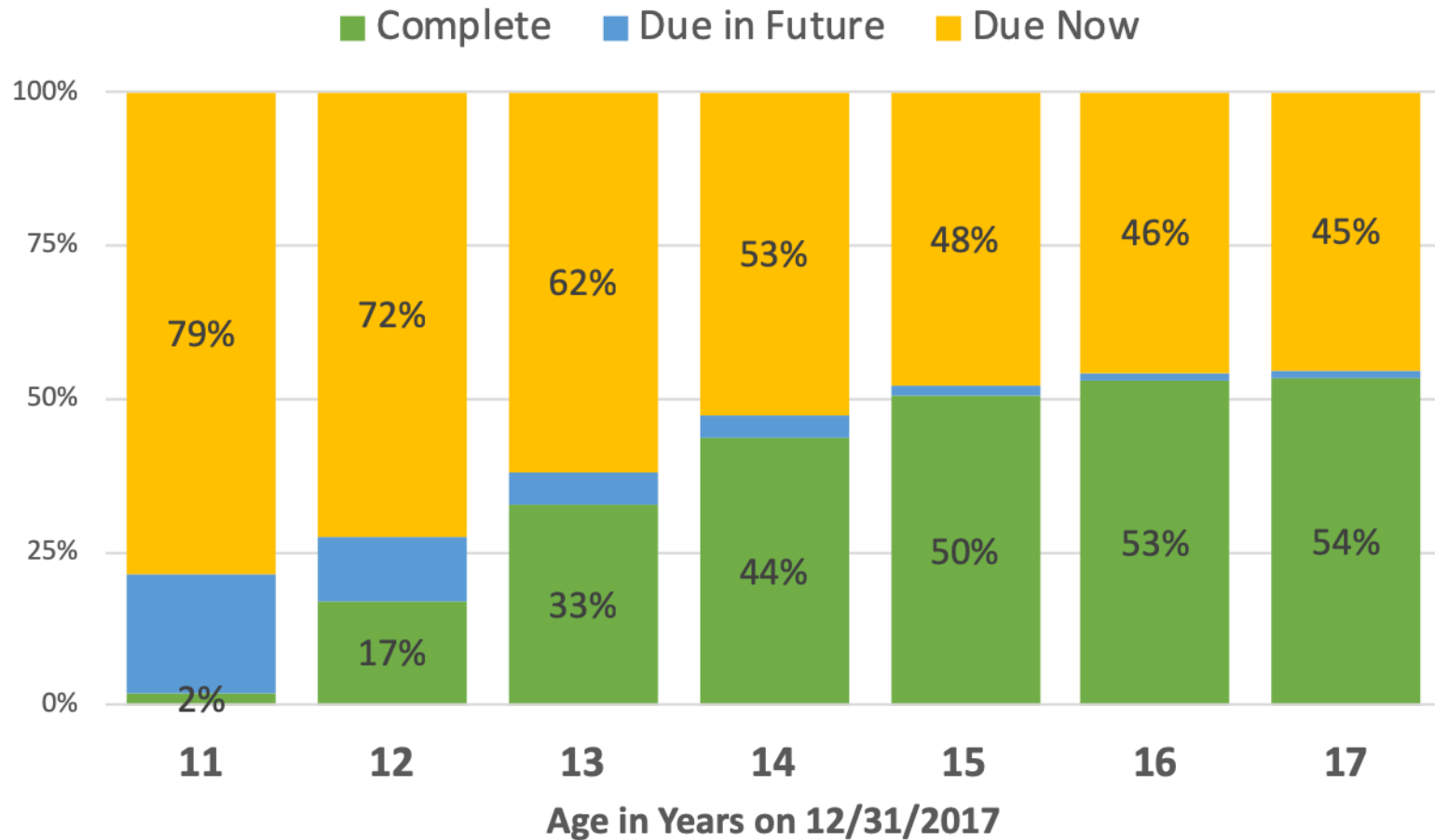
HPV Vaccine Validity, 2015-2017



Results

- Considering all adolescents, 35% of 11-17 year old had completed the HPV vaccine series
- Among adolescents who have received at least 1 HPV vaccine, 64% have completed the HPV vaccine series

HPV Vaccine Completion* By Age



*Evaluated based on data received for vaccines through 12/31/2017

Results

Tableau reports displayed age and specific HPV initiation and completion rates for a practice and tracked trends over time

Evaluation date: 4/30/2017

Adolescents at XXXXXXXXX

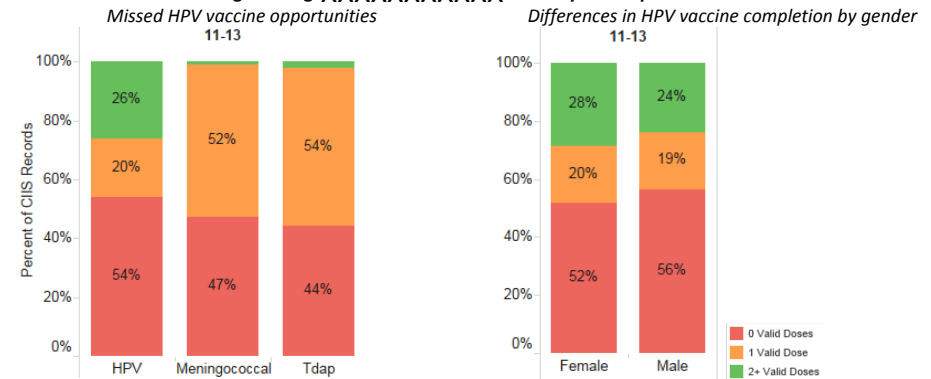
	Total active patients	Active female patients	Active male patients
11-12 years of age	151	67	84
13-14 years of age	102	52	50
15-17 years of age	111	55	56

XXXXXXXXXXXX compared to other Denver metro area counties

Overall, 11-12 year old patients living in Denver and Adams county have the highest HPV vaccine initiation rates (percent with 1+ doses). Adams and Arapahoe county have the highest HPV vaccine completion (percent with 3+ doses). HPV vaccine initiation and completion among 11-12 year old patients at XXXXXXXXXXXX; are higher than in the surrounding five counties.

	Initiation (% with 1+ HPV vaccine)	Completion (% with 2+ HPV vaccine)
Adams	36.5%	15.2%
Arapahoe	33.1%	13.4%
Denver	37.7%	14.2%
Douglas	26.0%	10.2%
Jefferson	32.1%	13.6%
	42.4%	17.2%

Adolescent vaccine coverage among XXXXXXXXXXXX 11-13 year old patients



Opportunities

Patients at XXXXXXXXXXXX have higher HPV vaccine initiation and completion than in the surrounding counties but the percent of all ages that have started the vaccine lags behind the percent who have had at least one Meningococcal or Tdap vaccine. Initiation and completion have decreased slightly since 2/28/17; this is a trend that we have seen throughout the Denver metro area but that can be countered at the practice level. By gender, male 11-12 year olds continue to have higher HPV vaccine initiation and completion than female patients, while more females than males aged 13-14 and 15-17 have started and completed the series.

Limitations

- Some providers do not currently contribute data to IIS system
- There is not one best denominator for 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)
- Practices found UTD reports challenging to interpret

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

Conclusions

- Collaboration across public health entities will be important to construct a sustainable infrastructure to support IBIS functionality
- Future development of IBIS includes expanding reporting to 10 additional Colorado counties and vaccines in 2019

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Questions

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