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Enhanced Public Health Reporting Using an HIE Network

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Conflict of Interest

Brian E. Dixon, PhD, FACMI, FHIMSS

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Has no real or apparent conflicts of interest to report.

NOTE:

Dr. Dixon is part-time VA employee. Comments are personal and should not be attributed to the Department of Veterans Affairs or the Federal Government.



Agenda

- Case Reporting for Notifiable Disease
 - Historical perspective
 - Significance for clinical and public health practice
- Controlled Before-and-after Trial of HIE-based Intervention
 - Indiana Health Information Exchange
 - Study Design and Methods
 - Results
 - Discussion
- Conclusions



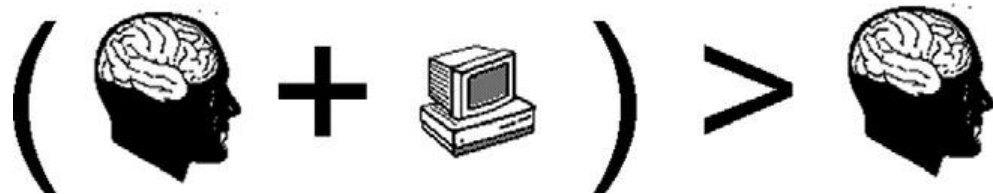
Learning Objectives

- Describe the barriers to timely, complete reporting of notifiable diseases to public health authorities
- Discuss the policies and requirements for reporting information to public health agencies
- Define the concept of electronic case reporting in support of public health
- Explain how a health information exchange network can facilitate electronic case reporting



Clinical Decision Support

- Computer-based clinical decision support (CDS) can be defined as the use of the computer to bring relevant knowledge to bear on the health care and well being of a patient.
 - Greenes, 2007



Friedman, JAMIA, 2008

Public Health Decision Support

- Public health decision support (PHDS) can be defined as the use of the computer to bring relevant knowledge to bear on the health and well-being of a population.
 - Dixon, Gamache & Grannis, 2013
 - doi.org/10.1136/amiajnl-2012-001514
- Examples:
 - Vaccine forecasting report
 - Suggestion for ordering stool culture



Public Health Case Reporting



Notifiable Diseases

- “for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease” McNabb, et al., 2008
- Examples of notifiable diseases
 - HIV / AIDS
 - Sexually transmitted infections (e.g., Chlamydia)
 - Enteric diseases, including *E. coli*, Salmonella
 - Lead poisoning
 - Zika virus
 - Lyme disease

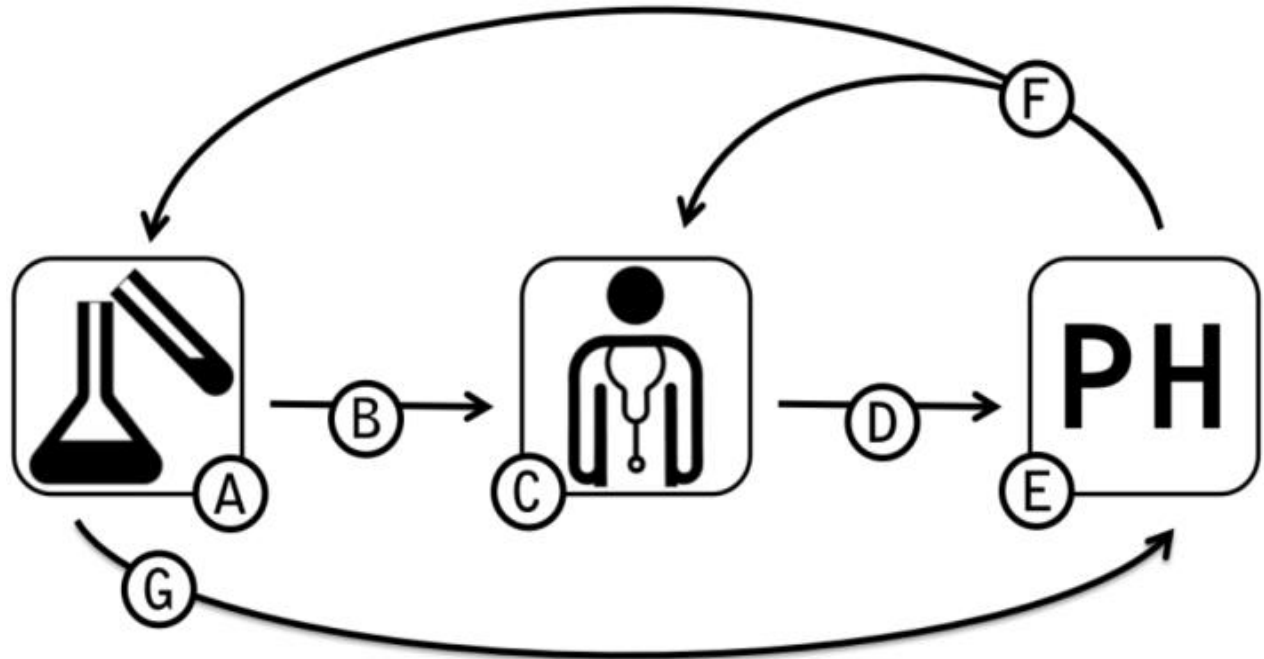


Notifiable Disease Case Reporting

- Most states require reporting of notifiable diseases
 - State law varies with respect to disease, requirements
- Notifiable disease reporting often uses manual, spontaneous reporting processes
 - Paper, Phone, Fax
 - Relies on providers, labs to Identify and Report
- Varied workflow at health department based on disease
 - Routine (e.g., chlamydia)
 - Intense (e.g., HIV)
 - Dixon et al. 2014, [10.5210/ojphi.v5i3.4939](https://doi.org/10.5210/ojphi.v5i3.4939)



Traditional Case Reporting Workflow



Problem: Provider Underreporting

- Between 9% and 99% cases reported (high variance)
 - Most diseases less than 20% cases
 - Doyle et al., 2012, Am J Epidemiol
- Why care about disease reporting to public health?
 - Accurate reporting of disease burden (epidemiology)
 - Timely control and response
 - Cost of care for rising incidence (\$\$\$)
 - Antibiotic resistance



PH Reporting: Provider's View

- In pre-intervention survey, 60.7% of clinic staff (N=29) said they had previously reported to PH
- I need to report that to public health?
 - Lack of awareness (28%)
- I don't know to whom or how to report that...
 - Lack of understanding of process (21%)
- No one's fined me for not reporting that...
 - Lack of sufficient rewards/penalties



How can we improve provider reporting rates?

- Leverage health information technology (IT) components available in our ecosystem
- Implement a solution that minimizes burden on clinics while maximizes yield for public health organizations
- Utilizes available standards in support of interoperability



Official State Case Report Form



CONFIDENTIAL REPORT OF COMMUNICABLE DISEASES

State Form 43823 (R2 / 11-96)
THIS FORM CONTAINS CONFIDENTIAL INFORMATION PER 410 IAC 3.1-2-18.

DISEASE

patient Information

- Name
- Address
- Phone#
- DOB
- Gender
- Race/ethnicity

Name (last, first, m.i.)		Telephone number () () () () () ()	
If minor, name of parent (last, first, m.i.)		(Not Required For STD's) Check all that apply:	
Address (number and street)		<input type="checkbox"/> Health Care Worker	
City, ZIP code		<input type="checkbox"/> Food Service	
County		<input type="checkbox"/> School (student / staff)	
Date of birth (month, day, year)		<input type="checkbox"/> Day Care (attende / staff)	
Age	RACE	ETHNICITY	
<input type="checkbox"/> Male	<input type="checkbox"/> White	<input type="checkbox"/> Hispanic	
<input type="checkbox"/> Female	<input type="checkbox"/> Black	<input type="checkbox"/> Non-Hispanic	
Pregnant?	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Other	Name of school / day care?	
<input type="checkbox"/> Unknown	<input type="checkbox"/> Multi-Race	Part of an outbreak?	
Etiologic agent		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
Date of diagnosis (month, day, year)		Site of infection	
Symptoms associated with infection?		Stage (syphilis only)	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		(Not Required for STD's) Onset date (month, day, year)	
IF YES		Died? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Pertinent symptoms, signs:			
Lab test(s) and result(s)		Date(s)	
Treatment (name of antibiotic)		Dosage	
Antibiotic resistance? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> UNKNOWN		Date initiated	
		If Yes, what antibiotic?	

lab Information

- Etiologic agent
- Test name
- Test date
- Treatment initiation date
- Treatment (drugs)

provider Information

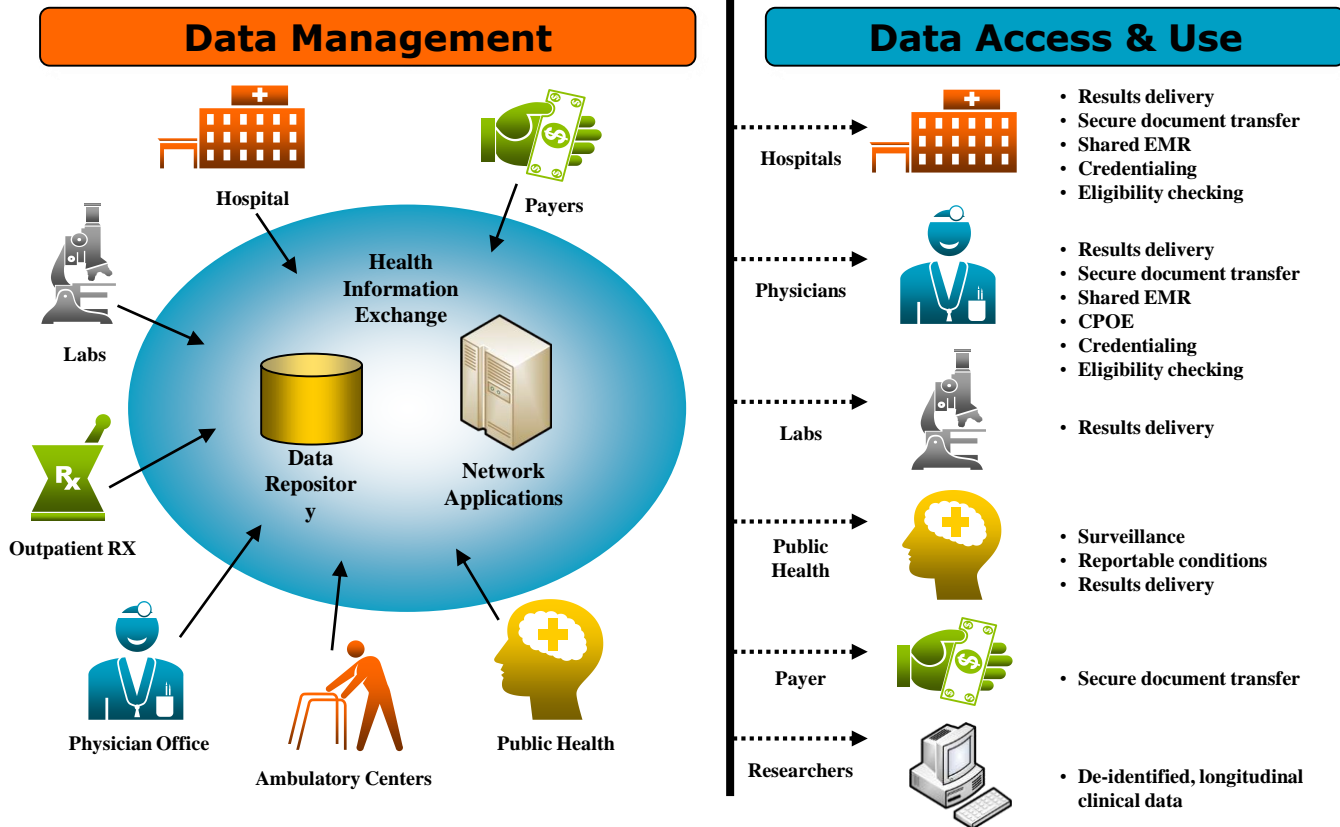
- Physician name
- Physician address
- Phone#
- Reported by
- Report date

Reported by (name and address)	If hospital, name of hospital
Name of physician and address	Record number
Telephone number	Person reporting (other than physician)
Date of report	Telephone number () () () () () ()
	Check here if you need a copy of this report <input type="checkbox"/>

LOCAL HEALTH DEPARTMENT USE ONLY	
Date received (month, day, year)	Follow-up initiated? <input type="checkbox"/> Yes <input type="checkbox"/> No
Name of investigator	



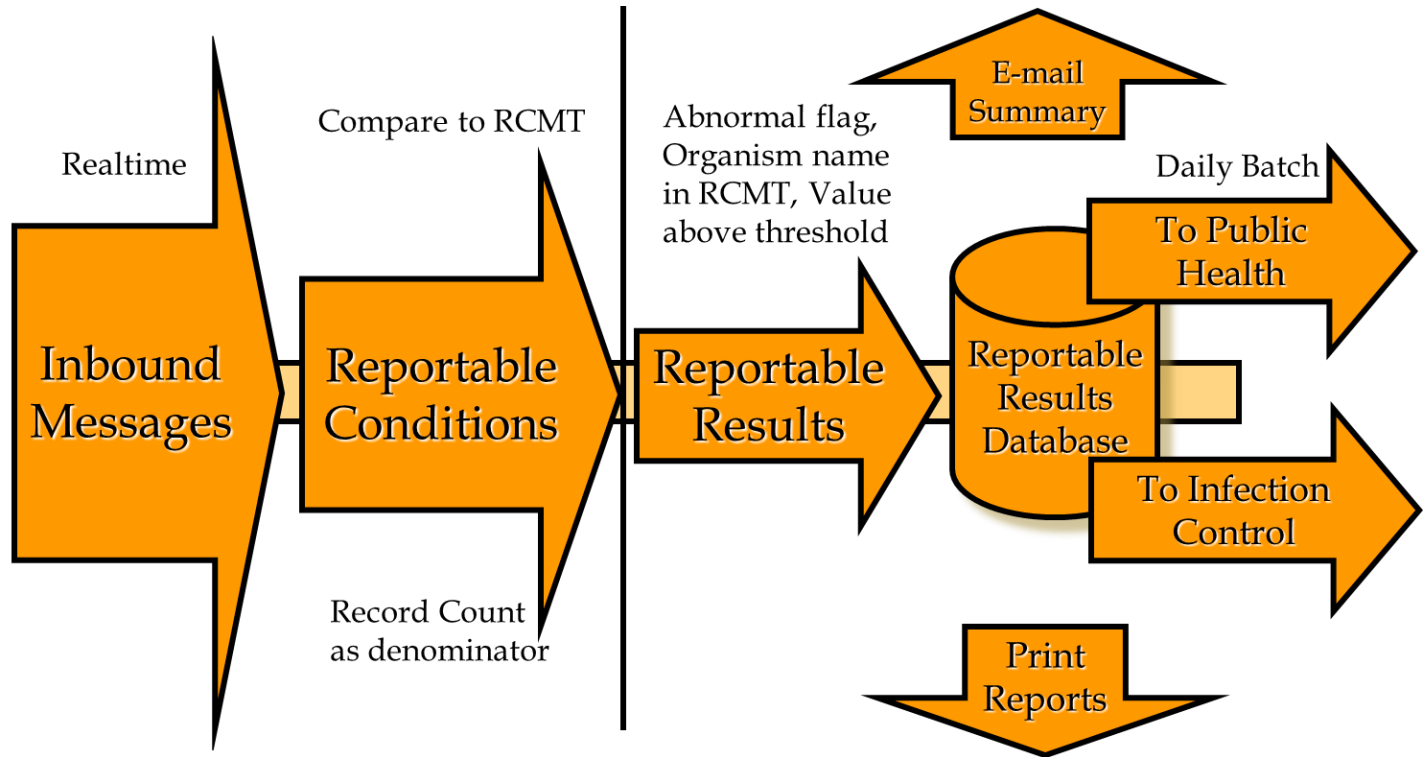
The Indiana Network for Patient Care



Quick Stats on the INPC

- 117 hospitals, representing 38 health systems
- Over 16,000 practices with over 45,000 providers
- Over 14 million patients
- Nearing 12 billion pieces of clinical data
 - Doubled in the past 2 years!

The Notifiable Condition Detector



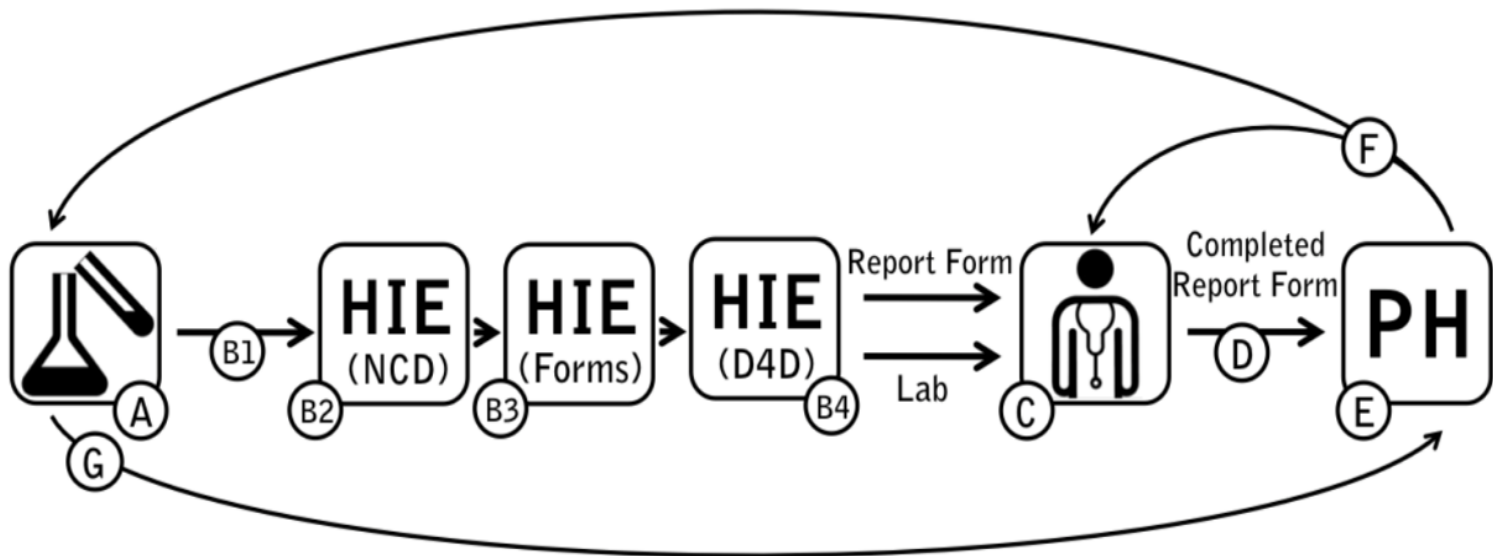
Fidahussein M, Friedlin J, Grannis S. Practical Challenges in the Secondary Use of Real-World Data: The Notifiable Condition Detector. AMIA Annu Symp Proc. 2011:402-8.

Leveraging Robust Infrastructure

- Existing HIE communication pathways
 - Electronic laboratory reporting (ELR)
- Automated case detection
 - Identification of cases that should be reported to PH
 - Classification of disease using LOINC / SNOMED CT
- Clinical messaging (aka DOCS4DOCS @IHIE)
 - Getting information to its recipient in a way that is integrated into workflow



Enhanced Case Reporting Workflow



Pre-Populated Notifiable Report

DOCS4DOCS®
Grannis, Shaun J.
SERVICE - Reportable Conditions
DOCUMENT INBOX»INBOX REVIEW

General

- Inbox
- Inbox History
- Report Search
- System Messages
- Dead Ltr Summary
- Document Track
- Delivery Status
- Message Status
- Help
- Logout

DOCS4DOCS® HELPDESK
helpdesk@ihle.com
1-317-644-1752
1-877-HELP D4D
1-877-435-7343


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INBOX Review

Navigation:

Actions:

Copy for: UNKNOWN (NPI_ALL_PP_MASTER: 000000001) Pt: [REDACTED]



**CONFIDENTIAL REPORT OF
COMMUNICABLE DISEASES**
State Form 43823 (R2 / 11-96)
THIS FORM CONTAINS CONFIDENTIAL
INFORMATION PER 410 IAC 3.1-2-18.

DISEASE
HEPATITIS C

Name (last, first, m.i.)		
If child, name of parent (last, first, m.i.)		
Address (number and street)		Telephone number
City, ZIP code		<p>(Not Required For STD's) Check all that apply:</p> <input type="checkbox"/> Health Care Worker <input type="checkbox"/> Food Service <input type="checkbox"/> School (student / staff) <input type="checkbox"/> Day Care (attendee / staff)
County		
Date of birth (month, day, year)	Age	
SEX	RACE	ETHNICITY
<input checked="" type="checkbox"/> Male	<input checked="" type="checkbox"/> White	<input type="checkbox"/> Hispanic
<input type="checkbox"/> Female	<input type="checkbox"/> Black	<input type="checkbox"/> Non-Hispanic
Pregnant?	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown
Name of school / day care?		



Study Design and Methodology

- Controlled Before-and-After Study
 - Intervention clinics (N=7) were not randomized, but there were concurrent controls (N=312)
 - All clinics were connected to INPC via D4D
- Timeframe: 2013-2016; Setting: Indianapolis, Indiana
- Difference-in-difference analysis to detect Δ
 - Focus is Δ between intervention and control sites
 - Binomial GLM with logit link function and NLEstimate macro



Data and Sources

- Source of Data: Case files from the Marion County Public Health Department
 - All cases for 7 representative diseases: CT, GC, HBV, HCV, Histoplasmosis, Salmonella, Syphilis
 - Case records include lab, HIE, and provider reports
- A report is a fax, paper report, or e-report
 - We looked at reports as well as the fields within the report, such as patient name, address, lab test, etc.
- Goal: Comprehensive review of all reports for each case as well as the information in each report

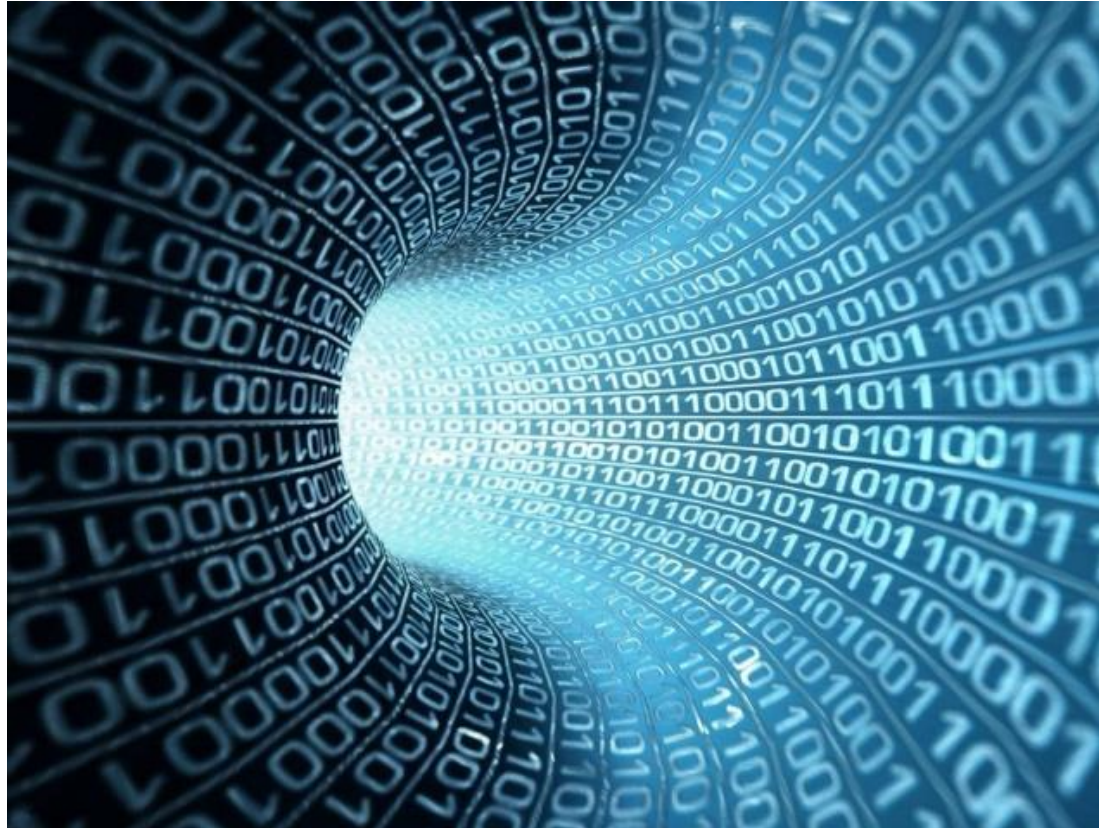


Outcome Measures

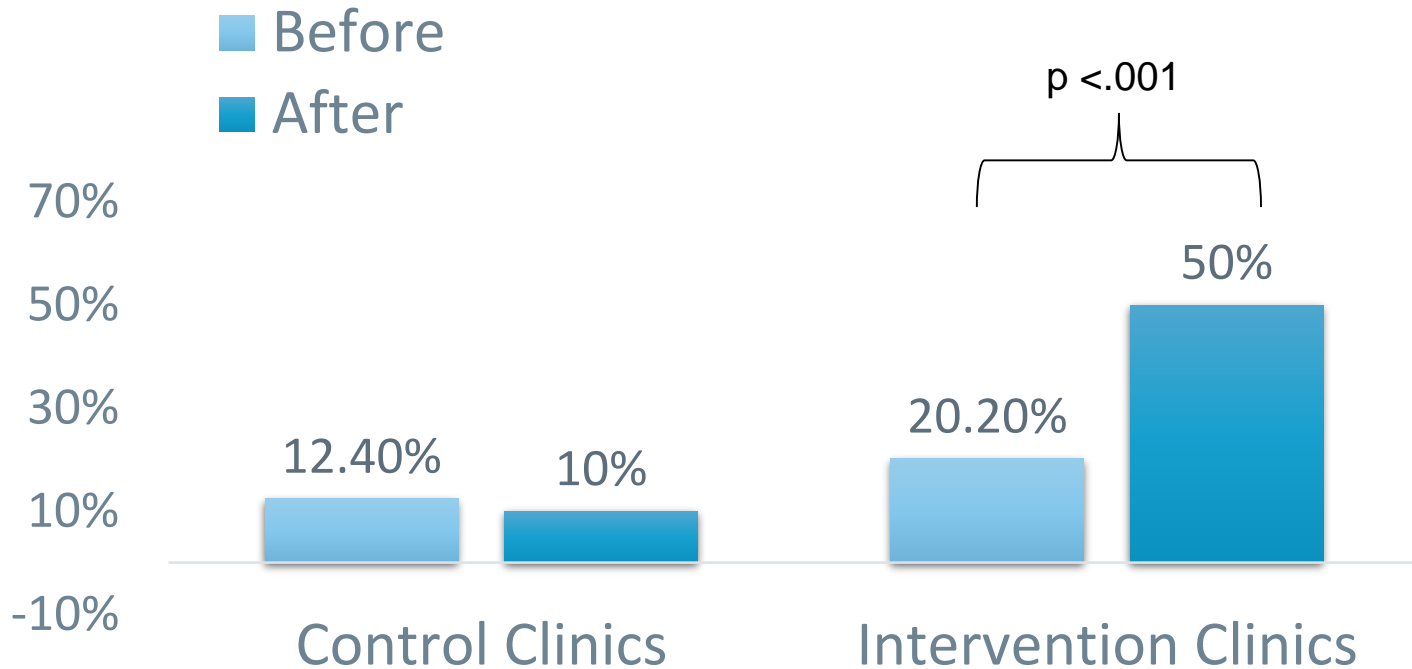
- Primary Outcome
 - Provider Reporting Rate: the proportion of cases where there is at least one report from a provider (clinic or hospital)
 - Remember that the lab can also submit reports
- Secondary Outcomes
 - Completeness of key fields used by disease investigators: the proportion of non-null values received by MCPHD
 - Timeliness of reports: Difference in # days between lab result and when report submitted to MCPHD



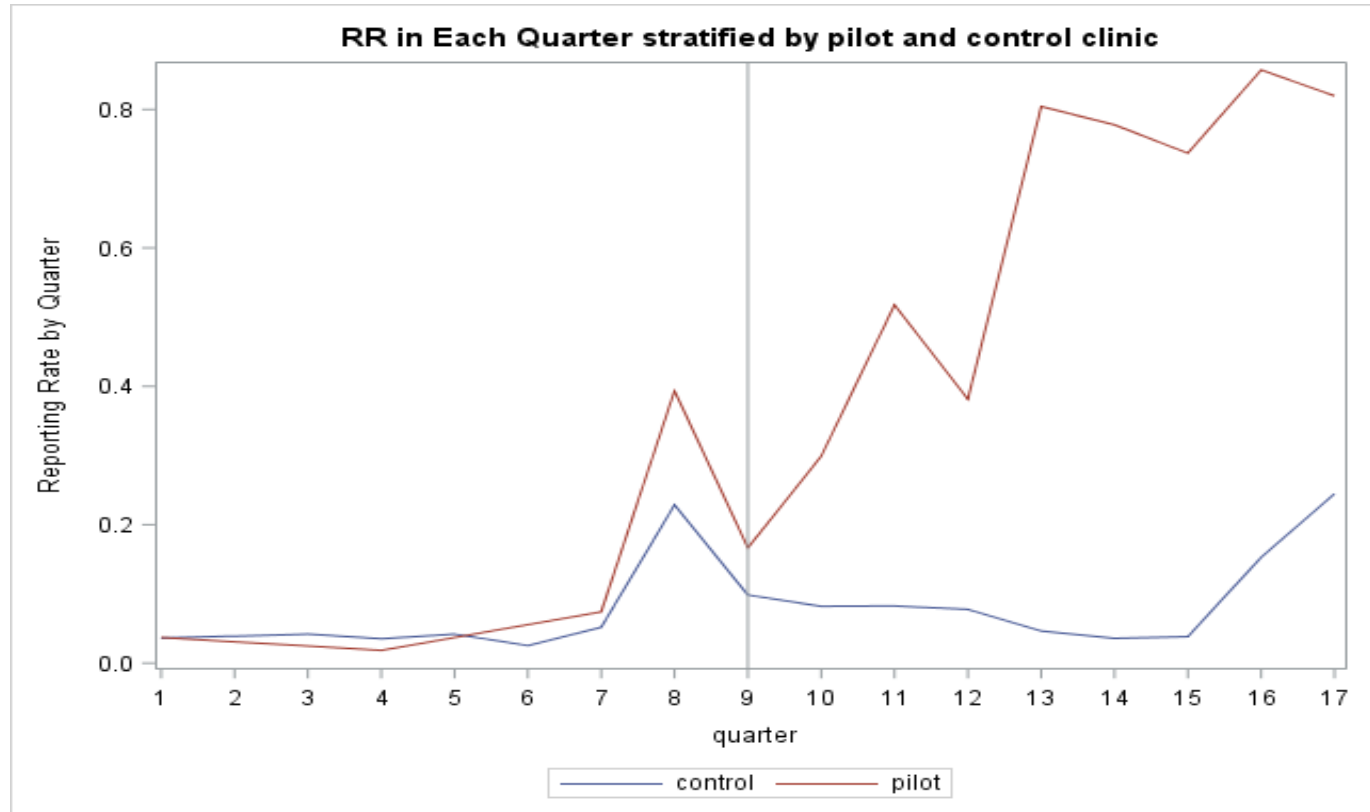
Results of Evaluation



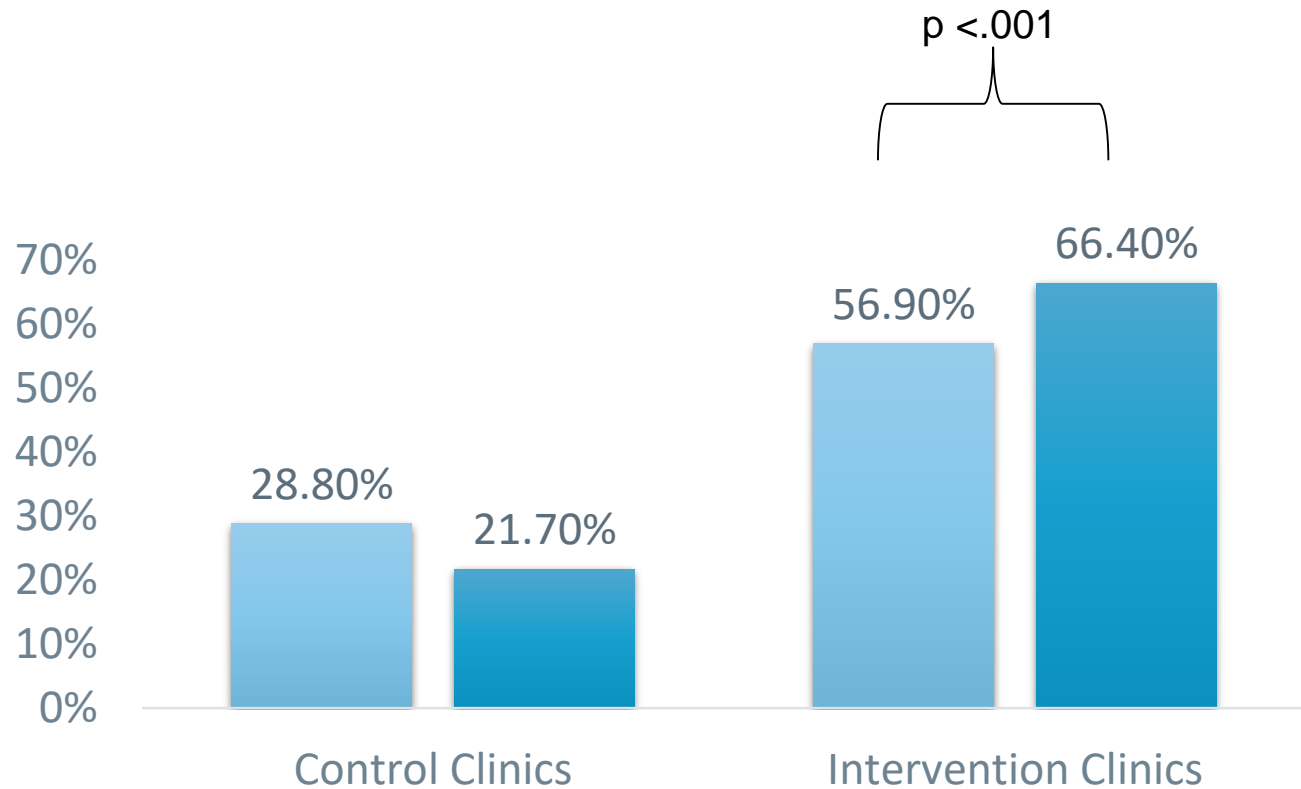
Provider Reporting Rates



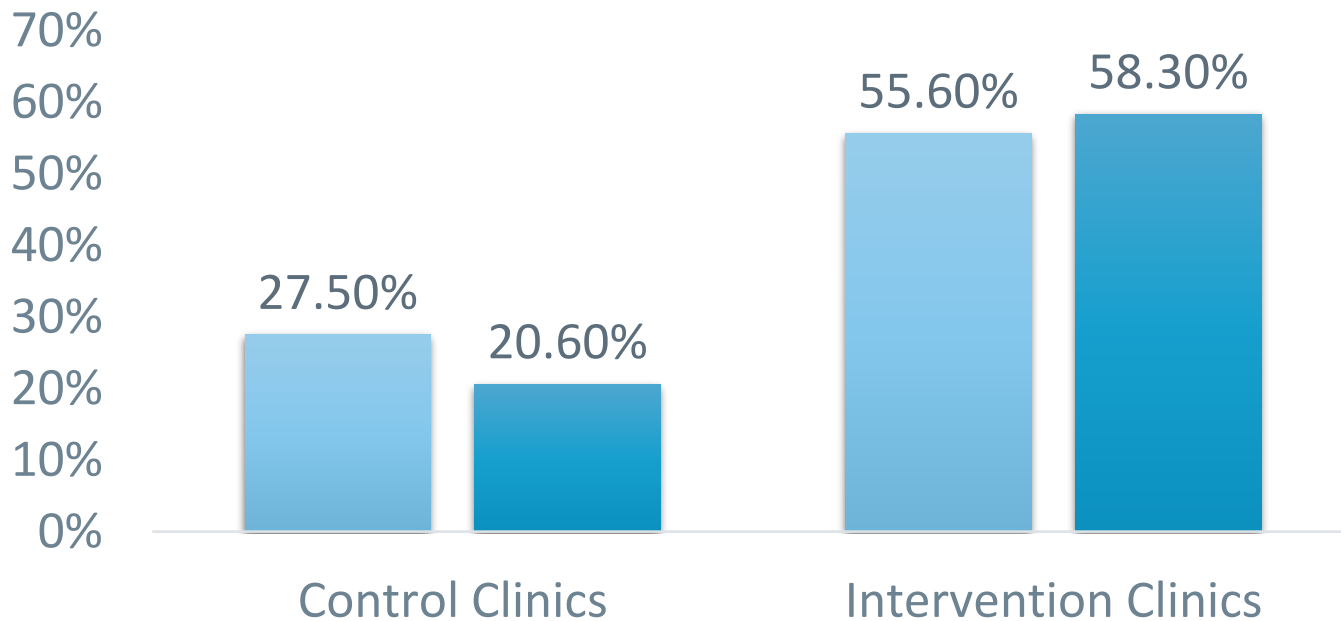
Reporting Rates Over Time



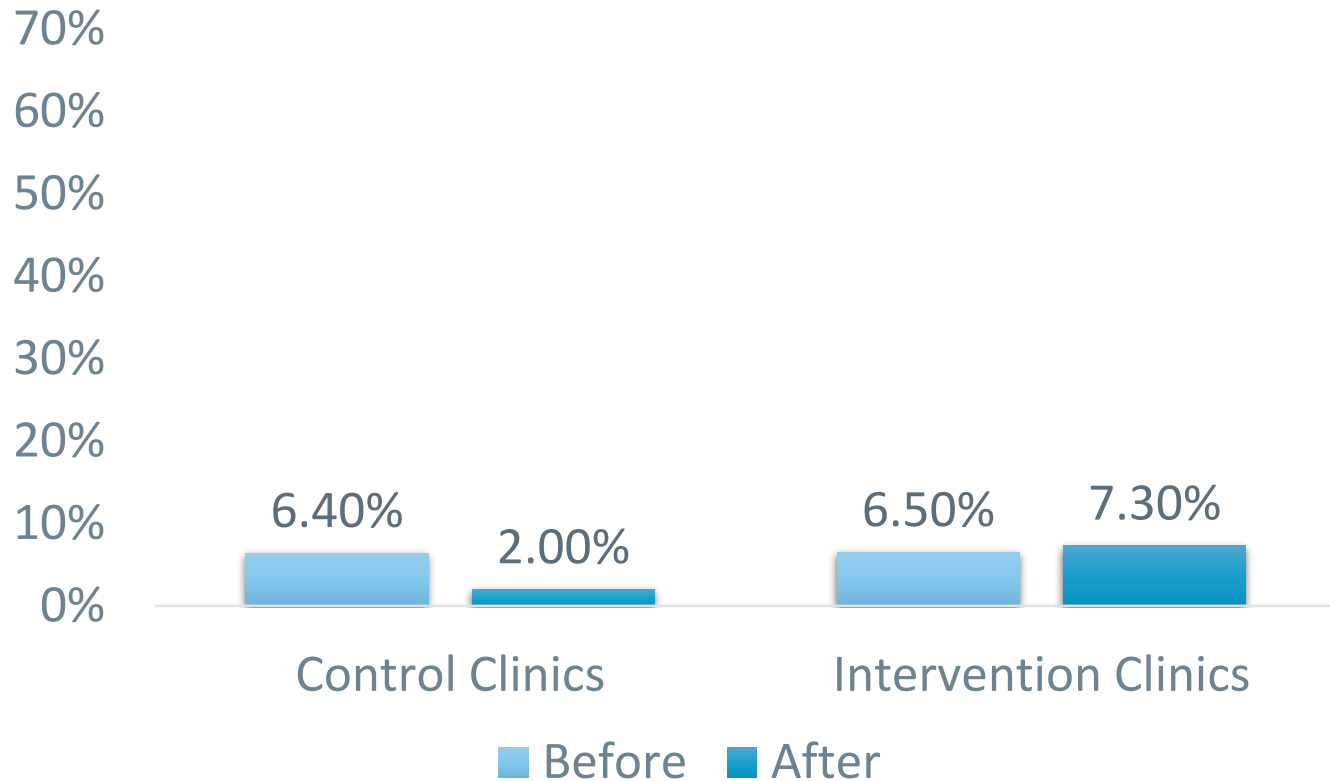
Provider Reporting Rates (Chlamydia)



Provider Reporting Rates (Gonorrhea)



Provider Reporting Rates (Hepatitis C)

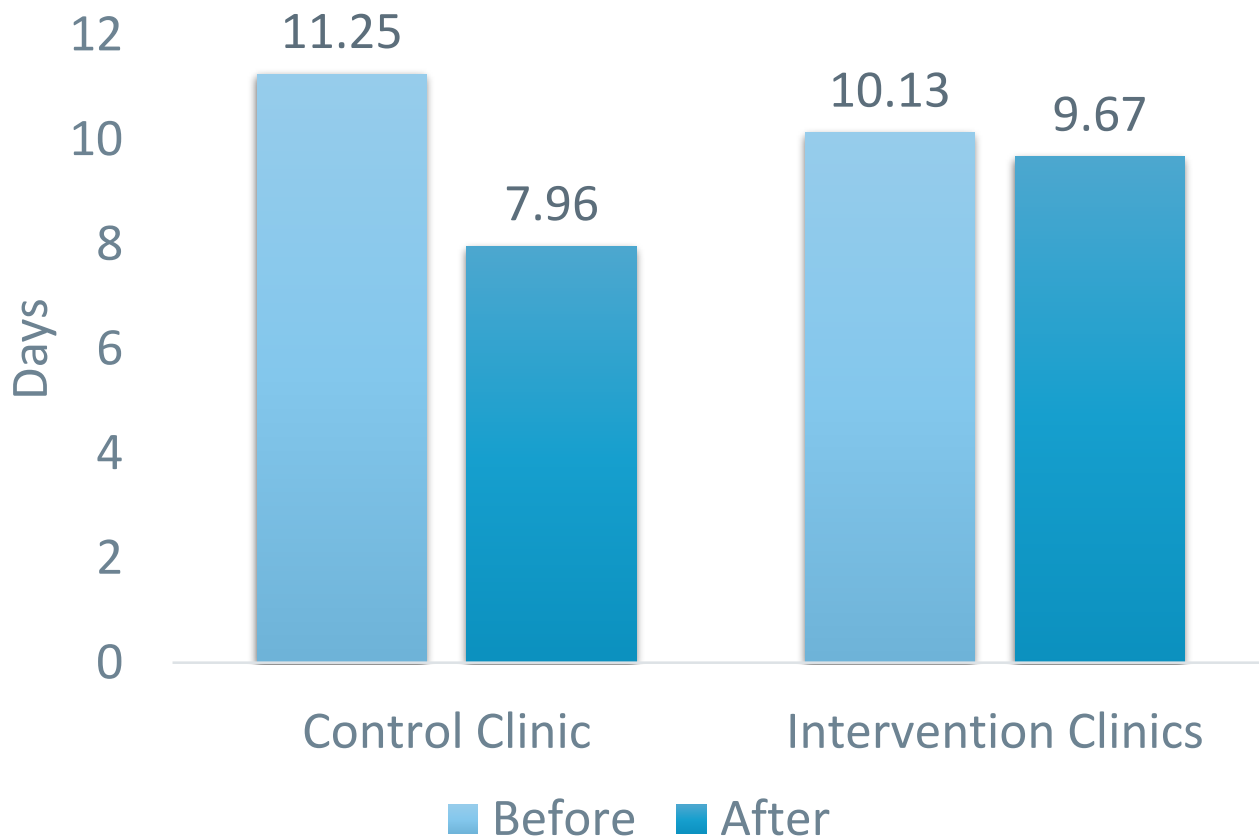


Completeness of Data in Reports

- 4 of 15 Fields Significantly Improved ($p < 0.001$)
 - Physician First Name, Last Name
 - Physician Address, Zip Code
- 9 of 11 Remaining Fields Improved**
 - Patient Information, Lab Test Performed
 - Completeness from control clinics also improved
- Patient First and Last Name Remained 100%



Timeliness of Provider Reporting



Trial Conclusions

- Alerting clinics to new cases of notifiable disease is feasible and effective at improving reporting rates
 - Clinics responded to alerts with submissions to the LHD and provided more complete reports*
- The intervention effects were not uniform
 - Timeliness of reporting did NOT change
 - Chlamydia benefited the most
 - Other diseases did not improve significantly**



Lessons and Discussion

- Leverage existing standards and pathways where possible
 - Use of LOINC and SNOMED CT in ELR messages
 - Utilize eCR C-CDAs and FHIR APIs where they exist
- Public health services part of an HIE network are not always revenue generating
 - Policy or other drivers might be necessary to drive adoption
- Solutions should fit into clinic workflow
 - Current solutions for “outside” information not optimal
 - EHR systems should assume coordination with external entities such as public health departments



Implications of Trial

- Electronic case reporting (eCR) is a public health option specified in Stage 3 meaningful use
 - Also MIPS Public Health Reporting criterion
- If we can alert providers to cases that should be reported and enabled electronic submission of reports, we should see reporting rates increase across diseases
 - PH Decision Support combined with MU functions
- Do not focus solely on MDs / physicians
 - Clinic “reporters” are nurses, MAs, others
 - Revere et al., 2017. doi.org/10.1186/s12889-017-4156-4



Implications of Trial

Digital Bridge is a forum for discussing the challenges of interoperability and collaboration on solving them

Our Vision



The vision of the Digital Bridge is to ensure our nation's health through a bidirectional information flow between health care and public health.

Digital Bridge is currently piloting electronic case reporting (eCR) as its first use case

<https://digitalbridge.us/infoex/about/>

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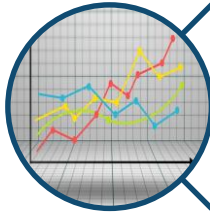


Public Health Informatics Program @Regenstrief Institute



Support and Improve the Business of Public Health

- Automating reporting of cases (ELR, ECR) to PH agencies
- Leveraging EHR data for chronic disease prevalence



Assess and Improve the Health of Populations

- Improving vaccination rates and population immunity
- Reduce the proportion of children who are overweight



Educate and Train the Next Generation

- Provide high quality informatics education to MPH, MD, etc.
- Train the future leaders of public health informatics



Questions and Discussion

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