# Improving Vaccine-Preventable Disease Reporting through Health Information Exchange

Brian E. Dixon, MPA, PhD, FHIMSS UK Research Seminar October 16, 2015



RICHARD M. FAIRBANKS SCHOOL OF PUBLIC HEALTH

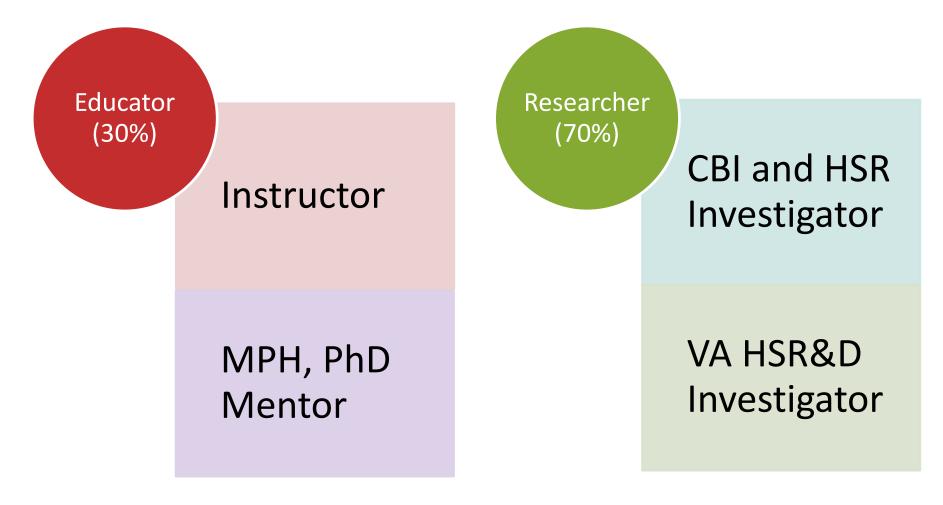
INDIANA UNIVERSITY Indianapolis



Regenstrief Center for Biomedical Informatics

Better Health Through Informatics

## IU, Regenstrief, and VA...Oh, My!







### My Research

Public Health Services and Systems Research (PHSSR); Surveillance; and Epidemiology

**Public Health** 

Health Information Exchange; and Clinical Decision Support

Health Services Research

Biomedical Informatics

Pop Health Veteran Health Usability Policy





#### Agenda

• Population Health Decision Support

• Case Reporting Then and Now

• A Pop Health Decision Support Intervention

 Preliminary Findings and Policy Recommendations

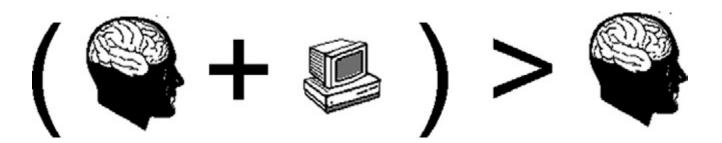




## **Clinical Decision Support**

 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

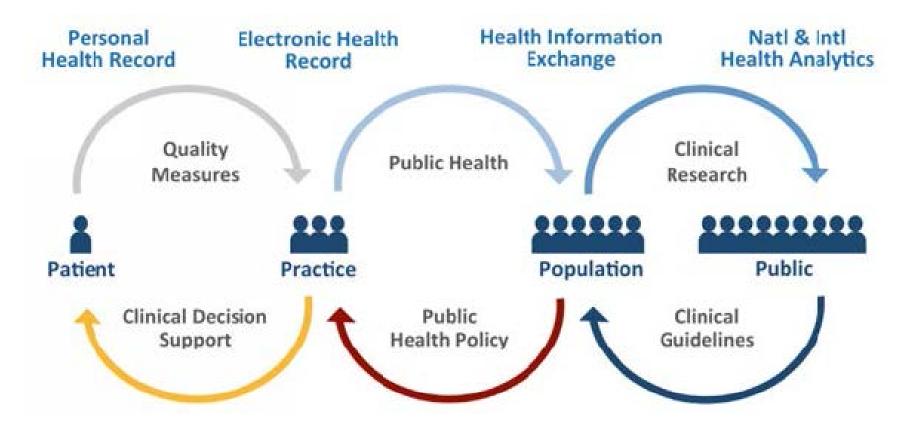


Friedman, JAMIA, 2008





#### How Does CDS 'Fit' into Public Health?



Office of the National Coordinator for Health IT, 2014





## **PH Decision Support**

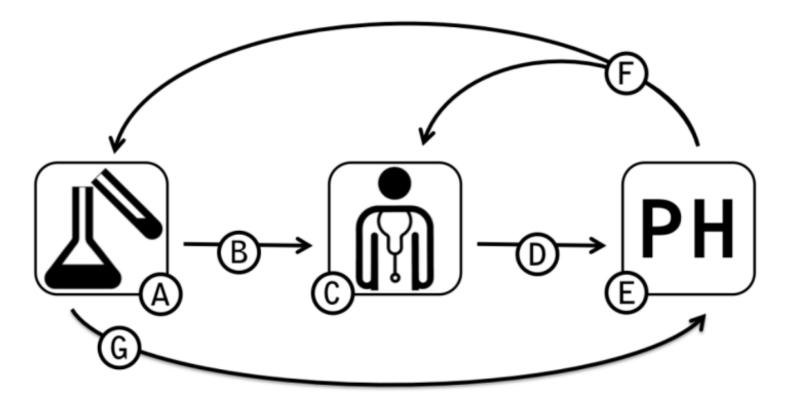
- Public health decision support (PHDS) can be defined as the use of the computer to bring *relevant knowledge* to bear on the *health* and *well-being* of a *population*.
  - Dixon, Gamache, Grannis, 2013

- Examples:
  - Vaccine forecasting report
  - Suggestion for ordering stool culture





## Traditional Case Reporting Workflow







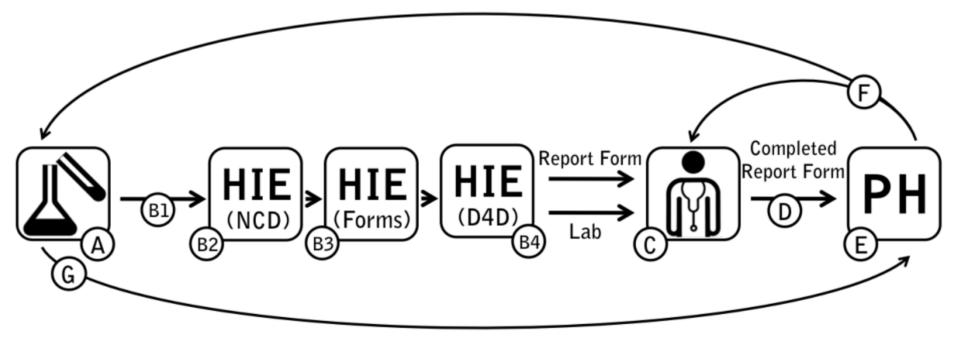
#### **Official State CDR Form**

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# Enhanced Case Reporting Workflow







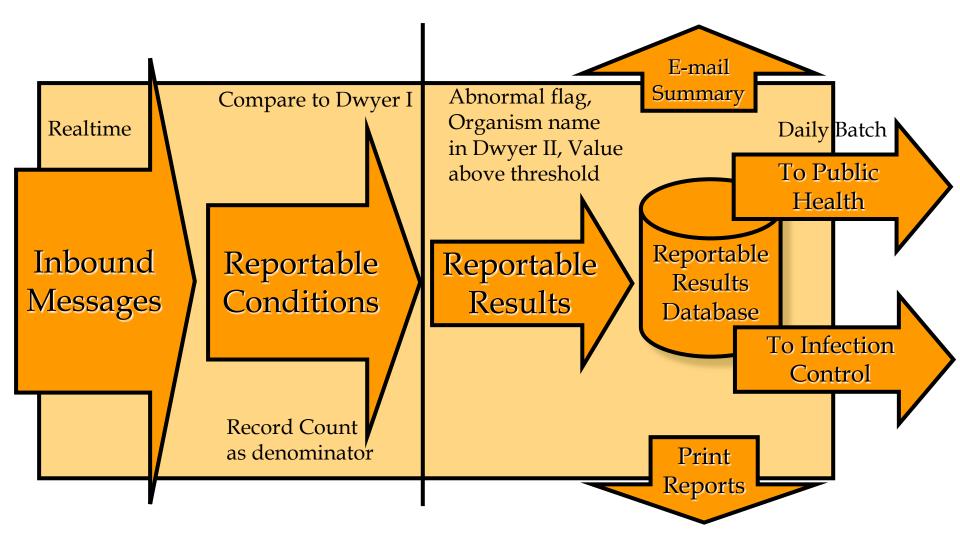
# Enhancement Builds Upon Core Infrastructure

- Automated case detection
  - Identification of cases that must be reported
- Clinical messaging\*\*
  - Getting information to its recipient in a way that is integrated into workflow
- Public health communication pathways
  - Electronic laboratory reporting\*\*
  - Fax communications





## The Notifiable Condition Detector







# **Triggers for Case Detection**

ICD-9 / ICD-10 / SNOMED CT

- Clear signal of clinical or lab confirmed diagnosis

- LOINC
  - Clear signal of test that examines PH condition
  - Yet the "result" can be hard to confirm
- Natural Language Processing

   Hard but necessary as labs "dump" results into standard messages





#### Clinical Messaging/Public Health Communication







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	Reviewed and Electronically signed by: JAMES PEARCE MD d: Sep 10 2007 12:07A		~

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## So What Happens Next?

 Today clinics must print these forms, complete them manually, and submit them to local health departments using Fax

Some use electronic fax

 In the future, we hope to work with the SHA to deliver completed forms electronically directly into the state NEDSS system





# **Conditions Addressed\***

#### Vaccine Preventable\*\*

- Hepatitis B (Acute)
- Varicella zoster virus (Chickenpox)
- Rubella
- Measles
- Mumps

Others

- Chlamydia
- Gonorrhea
- Syphilis
- Hepatitis C
- Histoplasmosis
- Salmonella





## **Project Status**

- Baseline data collection completed
  - Existing counts of disease cases, data quality, and processes within public health department
  - Finalizing baseline analysis of data\*

- Intervention Complete (Jun 2014 Jun 2015)
   Finishing entry of post-intervention data
  - Preliminary analysis of post-intervention data\*\*





## **Baseline Reports**

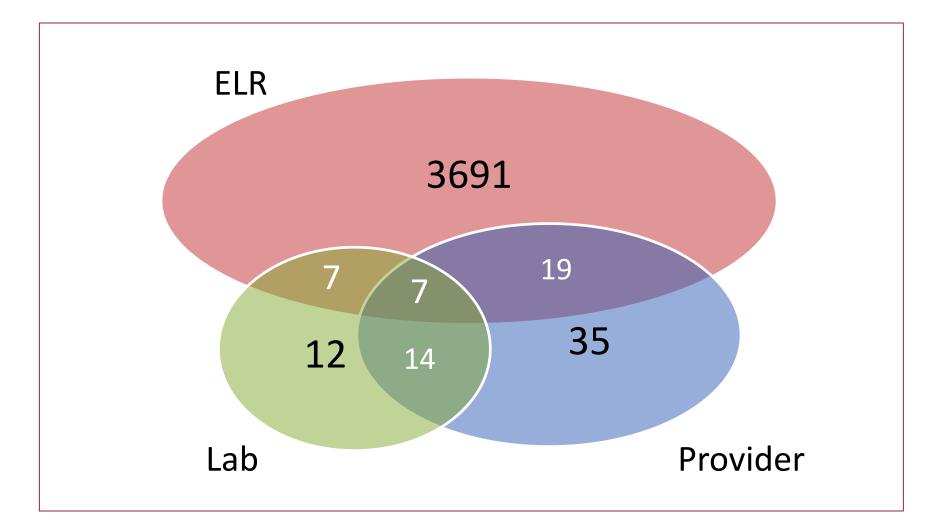
- 3,880 cases for 3,697 unique patients
  - Only the VPD conditions
  - 3,790 (97.7%) of these were HBV

- Reporting Rates
  - 24 of 3717 (.006%) of HBV inc. provider report
  - 66 of 68 (97%) of OTHER inc. provider report
  - Automated case detection provided an ELR for more than 100% of cases (duplicate results)





#### **Reporting Overlap**







## **Baseline Completeness**

- Data Completeness (Not NULL)
  - Provider: 78% mean (Range 45.3% 100%)
  - Fax-based Lab: 76% mean (Range 42% 100%)
  - ELR: 67% mean (Range 0.01% 100%)
  - ELR completeness higher for just 3 of 15 fields
    - Test name, physician last name, sex
- Providers seem to provide a report for rarer events than for more common diseases\*





## **Timeliness of VPD Reports**

• Differences btw Report Date and Test Date

- ELR: Mean = 1.4 days; Median = 0 days
- Lab: Mean = 3.1 days; Median = 2 days
- Provider: Mean = 9.3 days; Median = 3 days

• For nearly all cases, ELR is the \*first\* signal





#### Next Steps

- Complete analysis and dissemination
  - Continue to finalize and analyze post-intervention
  - Synthesize qualitative data

- Publish findings
  - Planned submission to Frontiers in PHSSR
  - Planning submissions to AJPH and JAMIA
  - Presentations at the AMIA 2015 Symposium and the HIMSS16 Conference





# **Policy Discussion**

- Utilize increasingly available e-infrastructures
  - Help identify when reporting is necessary
    - May be more advantageous for common diseases\*
  - Provide direct EHR access for PH workers
  - Aligns with CMS Meaningful Use aims/goals

Expand to other data not in ELRs
 – CPOE, eRx and Pharmacy systems





# Challenges to Using EHRs

- Available infrastructure not equal\*
  - Standard MU vs. HIE vs. NCD
  - Interoperability with Commercial EHRs
- HIPAA and State Legal Concerns

   Many PO/ISOs over-interpret regulations
- Usability/Not Easy to Find Information
   There is rarely a Google search bar





# Challenges in This Project

- Aging infrastructure/legacy systems
  - Infrastructure needs hampered intervention start
- False positives for many VPDs
  - Distinguishing btw vaccine antibodies and positive can be challenging
  - Many inappropriate tests are on the CDC list of recommended codes for ELRs
- Very few VPDs making power an issue



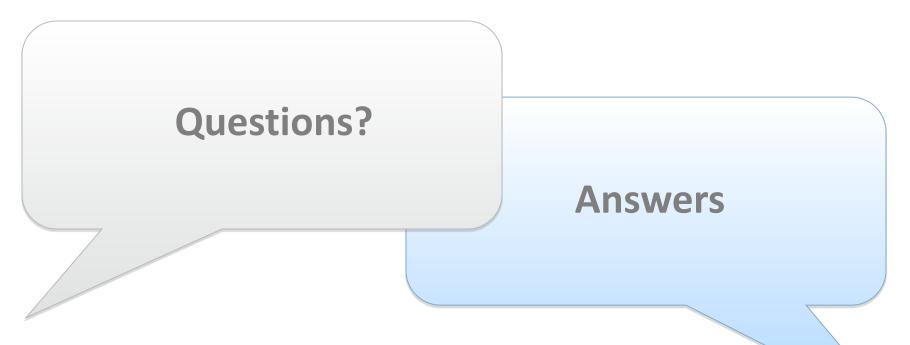


# Acknowledgements

- Key folks supporting my work
  - Shaun Grannis, MD (IUSM and Regenstrief)
  - Zuoyi Zhang, PhD (Regenstrief)
  - Jennifer Williams, MPH (Regenstrief)
  - P. Joe Gibson, PHD (Marion Co. Public Health Dept.)
  - Debra Revere and Becky Hills (U. Washington)
  - Patrick Lai, MPH (SOIC) and Uzay Kirbiyik (FSPH)
- The work presented was supported by grants from AHRQ (R01HS020209) and RWJF (71596) part of the PHSSR Portfolio.







Brian E. Dixon, MPA, PhD, FHIMSS Assistant Professor, IU Fairbanks School of Public Health; Research Scientist, Regenstrief Institute; Health Research Scientist, Department of Veterans Affairs

http://tinyurl.com/fsphbed Twitter: @dpugrad01







#### References

- Dixon BE, Grannis SJ, Revere D. Measuring the impact of a health information exchange intervention on provider-based notifiable disease reporting using mixed methods: a study protocol. BMC Medical Informatics and Decision Making 2013; 13:121.
- Revere D, Hills RA, Williams J, Grannis SJ, Dixon BE. Leveraging health information exchange to improve population health reporting processes: Lessons in using a collaborative-participatory design process. eGEMs (Generating Evidence & Methods to improve patient outcomes). 2014; 2(3):12. doi: 10.13063/2327-9214.1082



