Emergency Response and Public Health: Defining Common Business Processes and Information System Requirements Critical to Effectively Detect, Assess, and Respond to a Biological Incident

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Abstract
Local health departments are encouraged to organize their emergency preparedness and response activities around Incident Command System (ICS) principles. Information systems that meet incident-specific needs are critical resources for efficient public health emergency response. However, ICS and other emergency preparedness guides do not describe a common understanding of what public health information systems must do to support an effective public health emergency response. Although local health departments do essentially the same work and function in many similar ways, available information systems do not adequately meet the need for efficient response to an emergency. To overcome this hurdle, business processes and task flows necessary for responding to an emergency must be defined. Defining relevant business processes and task flows will guide definition of information systems requirements. In this study, we employ a Public Health Informatics Institute (PHII) collaborative requirements development methodology to define business processes, task flows, and information system requirements that support a local health department's ICS-based response to a biological incident. This methodology specifies three phases: business process analysis, business process redesign, and information systems requirements definition. In this poster, we present results of the business process analysis phase. Identification and prioritization of business processes were conducted with extensive consultation with emergency response personnel, resulting in nine identified business processes that are common to local public health departments and critical to a biological incident response: conduct syndrome surveillance, conduct disease investigation, assess the situation, develop an incident action plan, identify and manage personnel, assemble and manage volunteers, assemble and manage supplies and equipment, provide mass prophylaxis, and conduct risk communication activities. We present diagrams depicting anticipated information flow between business processes, detailed descriptions of each process under analysis, and a sample task flow.

Introduction
Metro-Nashville Public Health Department (MPHD) responsibilities related to public health response to a biological incident are detailed in Metro-Nashville's Comprehensive Emergency Management Plan's (CEMP) ESF 8. As with other local public health departments, MPHD faces the problems of anticipating scenarios and preparing plans for changing hazard types, a multitude of exposure scenarios, multiple plans, and the inherent limitations posed by inadequate information systems that are recognized to be of critical importance in the effectiveness of early disease detection, public health investigations and interventions. This project presents an opportunity to identify, redesign, and improve relevant business processes and to determine information systems requirements to aid MPHD's detection of and response to biological incidents. Currently, there are information systems available at the local, state and federal levels, including those at the Centers for Disease Control and Prevention (CDC).

MPHD organized its emergency preparedness and response activities around the ICS model. However, ICS does not describe or delineate a common understanding of how related business processes should be designed or what public health information systems must do to support an effective response to a public health emergency. The purpose of our study is to define business processes and information system requirements that support the information needs of MPHD's ICS-based response to a public health emergency. An expected outcome is more effective prevention, response, and recovery for public health threats with the exchange of timely, accurate, and appropriate information within MPHD and among its partners in the emergency response community. This project is conducted as part of Common Ground: Transforming Public Health Information Systems, a project sponsored by the Robert Wood Johnson Foundation (1).

Methodology
The Common Ground project utilizes a business process analysis methodology developed by the Public Health Informatics Institute (PHII) to define the requirements for public health information systems (2). A public health business process is a collection of tasks and activities undertaken by a public health agency with the intention of meeting a specific objective for their community or a client. This methodology consists of three phases: business process analysis, business process redesign, and information systems requirements definition. The current state of a business process is first described through the use of textual and graphical analytical tools. The process is then examined for redesign opportunities resulting in quality improvement. Finally, the requirements for information systems supporting the redesigned processes are defined and documented. Although similar methods have long been used in the private sector, PHII introduced the element of collaboration in order to ensure that resulting public health information systems meet both the general needs of the public health community and specific needs of individual agencies.

To help identify potential business processes, a project team developed a project scenario with the following assumptions: that the emergency is a biological public health incident originating in the jurisdiction of MPHD; that MPHD response is based on ICS principles; and that MPHD response includes mass prophylaxis. This scenario formed the basis for a table-top exercise attended by MPHD functional areas such as emergency preparedness, communicable disease investigation, and epidemiology. The results of that session, formal ICS training taken by project team members, and a review of federal, state, and local emergency response plans and frameworks resulted in a list of approximately 40 potential business processes and task sets relevant to a local public health agency response to an emergency incident.

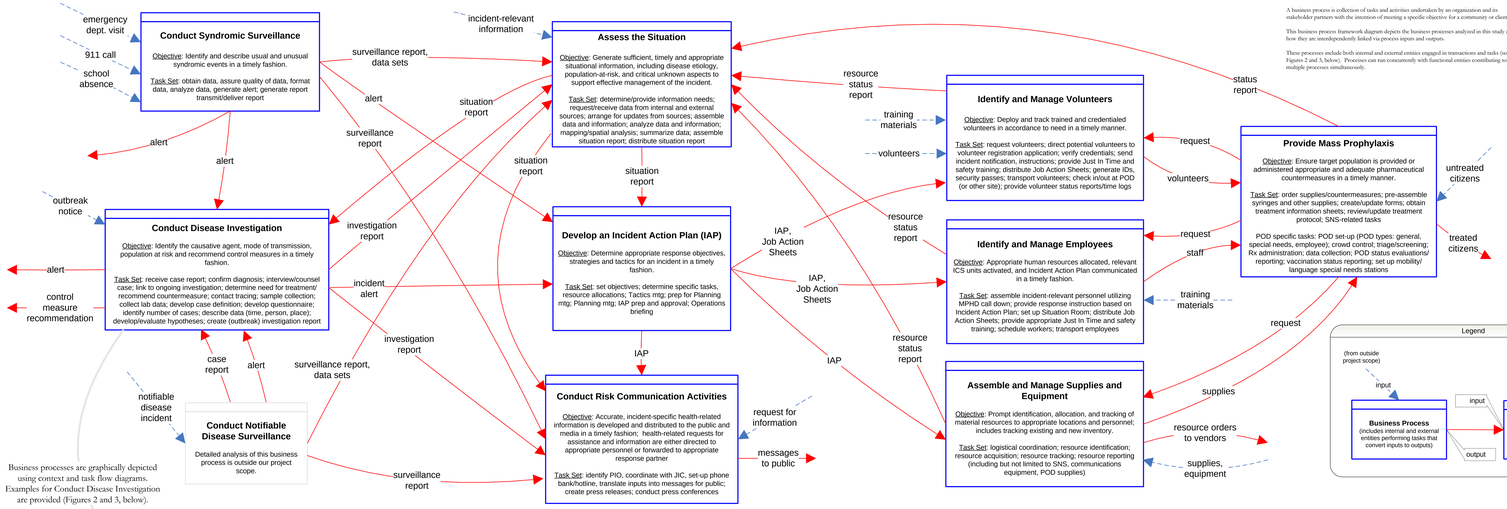
Potential business processes were then refined by a careful examination of the objective for each potential process. This resulted in a list of approximately 20 processes. In order to keep the project manageable, prioritization criteria were developed. To be considered high priority for further analysis, redesign, and information system requirements definition, business processes were to: be likely invoked given the project scenario assumptions; be information intense; be currently practiced (either in the form of a defined business process or as a collection of similar tasks and activities).

In order to develop detailed descriptions of the processes both subject matter experts (SMEs) and front-line staff were interviewed. The results of the interviews were converted by the project team to the business process analysis artifacts. These artifacts were then provided back to the interviewees for verification and feedback.

Project Objective
The objective of the Metro Public Health Department's (MPHD) Common Ground project is to define the business processes and information system requirements that support the information needs of the Metro Public Health Department Incident Command System in responding to a biological public health emergency.

Project Scenario Assumptions
- Biological public health incident originating in the jurisdiction of MPHD
- MPHD response based on Incident Command System principles
- Response includes a mass prophylaxis

Business Process Analysis Prioritization
We have identified dozens of relevant business processes (or potential processes) over the course of this project. Criteria used to prioritize processes for in-depth analysis included:
- Likelihood of the process being invoked (given scenario assumptions)
- Process is information intense
- Process (or similar activity) is currently practiced by MPHD



Business processes are graphically depicted using context and task flow diagrams. Examples for Conduct Disease Investigation are provided (Figures 2 and 3, below).

Figure 1: Business Process Framework

A business process is collection of tasks and activities undertaken by an organization and its stakeholder partners with the intention of meeting a specific objective for a community or client.

This business process framework diagram depicts the business processes analyzed in this study and how they are interdependently linked via process inputs and outputs.

These processes include both internal and external entities engaged in transactions and tasks (see Figures 2 and 3, below). Processes can run concurrently with functional entities contributing to multiple processes simultaneously.

Figure 2: Conduct Disease Investigation Context Diagram

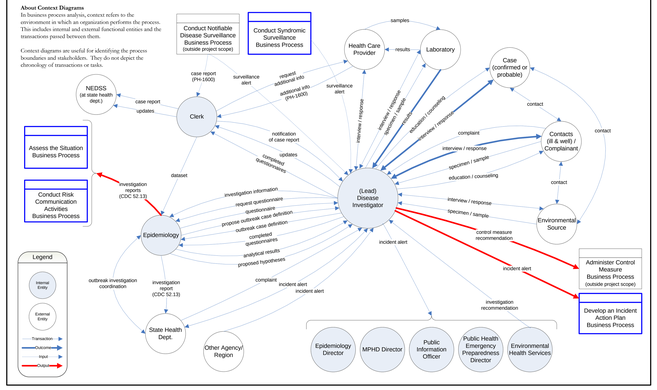
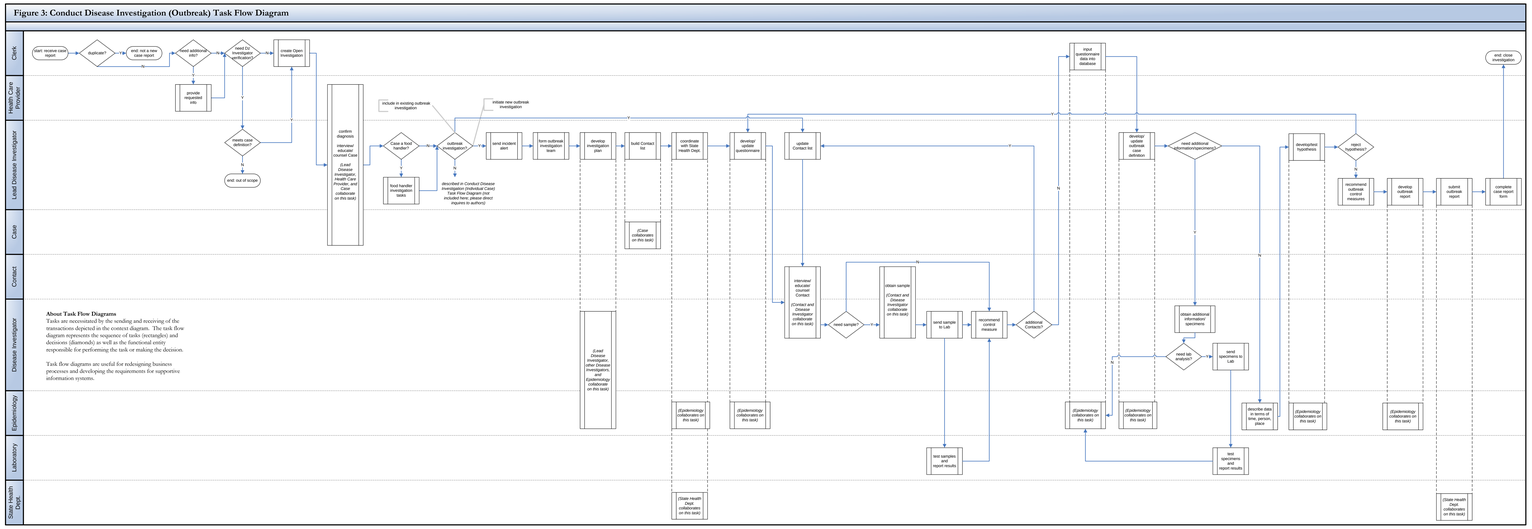


Figure 3: Conduct Disease Investigation (Outbreak) Task Flow Diagram



Results
The results presented here are for Phase 1 of the project, business process analysis. The second and third phases, business process redesign and information systems requirements definition, are ongoing and will be presented later. It is important to recognize that other important processes were also identified but are currently not prioritized for Phases 2 and 3 due to time and funding constraints.

Using the methodology described above, MPHD identified and described nine (9) business processes relevant to a public health ICS-based response to a biological incident originating in MPHD's jurisdiction. The 9 processes are: Conduct Syndromic Surveillance, Conduct Disease Investigation, Assess the Situation, Develop an Incident Action Plan, Identify and Manage Personnel, Assemble and Manage Volunteers, Assemble and Manage Supplies and Equipment, Provide Mass Prophylaxis, and Conduct Risk Communication Activities.

A graphical description of these business processes and their interdependent relationships via process inputs and outputs is presented in Figure 1. As a representation of other artifacts developed for each business process, context and task flow diagrams for the business process Conduct Disease Investigation are presented in Figures 2 and 3, respectively.

Conclusions
Public health emergency response is an extension of essential public health programs such as preventing epidemics and the spread of disease, protecting against environmental hazards, injury prevention, promotion and encouragement of healthy behaviors, assuring the quality and accessibility of health services, and assisting communities in recovering from disasters. However, with emerging risks and concerns for bioterrorism, local public health programs are required to have plans for dealing with disasters. Because there are many agents to prepare for, it is imperative that response plans have enough flexibility to adapt to different scenarios. Although this project is specific to biological agents, the business process analysis methodology employed has been very effective in organizing the wide range of public health emergency response tasks and activities into a cohesive, flexible, and extensible framework against which specific scenarios and incidents can be tested.

The next steps are to conduct business process redesign and define information system requirements. The redesign phase will involve extensive participation from local and state partners.

Acknowledgements
This study is supported in part by the Robert Wood Johnson Foundation through the Public Health Informatics Institute as part of the program Common Ground: Transforming Public Health Information Systems.

The authors will like to thank the staff of the Metro Public Health Department for all the time and thought that was provided for the identification and description of business processes. In particular, we thank Nancy Horner and Drs. Tim Van Wave (CDC) and Burns Rogers for providing assistance with both project management and technical consultation.

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