Section A: Identifiers

1. Submitter: Janet J. Hamilton, MPH, Surveillance and Reporting Section Manager
2. Public health organization name: Florida Department of Health
3. Public health information system name: Electronic Surveillance System for the Early Notification of Community-based Epidemics, Florida (ESSENCE-FL)
4. Mailing address: 4052 Bald Cypress Way, Bin A-12; Tallahassee, FL 32399
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6. Submitter's e-mail address and the organization's Web site:

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7. Description of community(ies) or population(s) served.

The Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE-FL) serves the state of Florida population, 18 million residents as well as all visitors (80.3 million annually) to the state. For additional information see Section B.

8. Number of full-time employees:
   a. In entire organization (list by staff category).

   Florida Department of Health staff: 16,985.25 FTE (not including part-time or contracted staff). Of this number, 1,743.50 FTE are central office program staff geographically located in Tallahassee; Division of Disease Control: 411.5 FTE; Bureau of Epidemiology: 40 FTE; Acute Disease Epidemiology Section: 14 FTE

   b. Number of staff directly involved in the project: 4
9. Description of public health program(s) directly affected by the public health information system described in this application.

The Florida Department of Health (FDOH), Division of Disease Control, Bureau of Epidemiology (BOE), Acute Disease Epidemiology Section (ADES) manages the ESSENCE-FL system. The system is valued, trusted and relied upon daily by state and county level

epidemiologists across FDOH program areas (epidemiology, immunizations, environmental health- chemical, vectorborne, waterborne and foodborne disease programs) to detect outbreaks and unusual cases, monitor morbidity and mortality and provide situational awareness including after events such as hurricanes, wildfires, earthquakes, pandemic influenza, Gulf oil spill, etc.

10. The names and titles of the members of the Electronic Public Health Information Team (considered authors of the application). Aaron Kite-Powell, MS, Surveillance Epidemiologist; Janet Hamilton, MPH, Surveillance and Reporting Section Manager; Richard S. Hopkins, MD, MSPH, State Epidemiologist, Acting

Section B:

The Organization

Florida has a population of over 18 million residents and an additional 80.3 million tourists visit the state annually. Florida's population almost doubled in the last 20 years. The state is extremely diverse, with large immigrant populations, mostly from the Caribbean and Central America, and many retirees. Florida has 67 counties: 23 urban and suburban counties have about 85% of the resident population. The most populous county, Miami-Dade, has 2.5 million residents, while several rural counties have fewer than 10,000 residents.

FDOH's mission is to promote and protect the health and safety of all people in Florida through the delivery of quality public health services and promotion of health care standards. FDOH comprises: a state health office (central office), with statewide responsibilities, 67 county health departments (CHD), five public health laboratories, and A.G. Holley State TB Hospital. The Division of Disease Control compromises six Bureaus: Epidemiology, Tuberculosis and Refugee Health, Immunizations, HIV/AIDS, AG Holley Hospital, and Sexually Transmitted Diseases and Prevention. Florida has a unitary public health system. All employees working at CHDs are employees of FDOH. CHD epidemiology programs conduct case and outbreak

investigations and disease surveillance activities. The size and sophistication of CHD epidemiology services are roughly proportional to the populations of the counties.

BOE and the Bureau of Environmental Public Health Medicine set policy, and provide technical assistance, training, and field assistance to CHD epidemiology units. BOE leads statewide surveillance activities including: operating Merlin, the statewide web-based reportable disease surveillance application; operating the statewide ESSENCE-FL system; and detecting outbreaks. BOE also operates EpiCom, a secure, moderated, threaded bulletin board and alerting system for epidemiologic investigations, outbreaks, and other hazards.

Management

Objectives:

ESSENCE-FL was implemented to meet a diverse set of public health challenges. Due to varying technical skills of CHD epidemiology staff, the system needed to be intuitive. Goals of the system were to: 1) improve internal public health efficiencies by reducing the time spent accessing data and creating reports; 2) improve decision-making related to disease control efforts through enhanced access to critical data sources formerly siloed in separate systems or not accessible to public health; 3) improve communication by closing the public health data sharing surveillance loop within public health and with our partners in the clinical community; 4) reduce the need for specialized and costly trainings in various data management, statistical and mapping software packages; 5) provide an intuitive environment for epidemiologists to conduct analyses for outbreak detection, routine descriptive epidemiologic analysis, and monitor morbidity and mortality trends over time, geography, and across multiple data sources. The system design needed to be flexible to incorporate new data streams as they became available (i.e. environmental data sources, vital statistics) and to be able to quickly adapt and update definitions of syndromes and other conditions under surveillance.

The state's emergency preparedness leadership desired a single system that could be used to work with many different types of health data. We intended for ESSENCE-FL to evolve from its initial implementation as a syndromic surveillance system for an early event detection (based on emergency department [ED] chief complaints) to a multifaceted surveillance system supporting routine descriptive epidemiologic analysis, data visualization, and reporting across many data sources, using and building on tools originally developed for syndromic surveillance.

Project Organization:

BOE oversees the management of the statewide ESSENCE-FL system. Enhancements are developed through collaboration between BOE and the Johns Hopkins University (JHU) Applied Physics Laboratory. A statewide surveillance epidemiologist is responsible for day-to-day oversight of the system and ensuring project goals are met. In addition, this position oversees technical components including data transmission, processing, and data quality controls. The position facilitates communication and coordination among data providers (hospitals, Vital Statistics, Poison Centers etc.) and users about current observations and about system design, functionality and reporting tools. The surveillance epidemiologist communicates FDOH's business needs directly to JHU staff and completes final user acceptance testing. JHU staff support database and user interface design, administration and programming. Roles and responsibilities have evolved since implementation, reducing the need for JHU staff to support individual hospital connections. System hosting, redundancy and disaster recovery services are provided by Information Systems of Florida (ISF).

System training is provided by a statewide surveillance epidemiologist. Training is provided through web-based recorded trainings, interactive WebX trainings and site-visits at hospitals or CHDs for one-on-one or classroom based training. A user manual was also recently written and is posted on BOE's website.

Implementation

Public Health Organization – Segments Involved:

ESSENCE-FL is used daily by state-level surveillance epidemiologists in BOE, Bureau of Environmental Public Health Medicine (Food and Waterborne, Vectorborne, and Chemical Disease Surveillance Programs), and the Bureau of Immunizations, CHD epidemiology staff, and hospital staff. Types of system use include:

- *Outbreak detection:* Each data source (particularly ED, poison control, and reportable disease data) is monitored closely for unusual changes in syndrome or disease activity. Recently, a novel approach to detecting small outbreaks based on the time patients arrive at the ED has been developed in ESSENCE-FL, tested and proven successful. To our knowledge this is the first implementation of this detection method in any system. (See Value & Appendix, Figure 3)
- *Situational awareness and monitoring trends:* Diverse data visualization schemes and data dashboards simplify monitoring large sets of data. Users are able to characterize current trends, whether these are influenza-like illness in ED visits or case reports of salmonellosis from our reportable disease database, in part by overlaying time series graphs of similar outcomes from different data sources on one graph for comparison purposes (Appendix, Figure 6). The intuitive environment is used for routine descriptive epidemiologic analysis, to monitor morbidity and mortality trends over time, geography, and across multiple data sources, and thereby to provide information that can assist with making decisions on how to improve population health.
- *Closing the public health surveillance loop:* Graphics and summary statistic tables can be exported from ESSENCE-FL and are included in routine (daily, weekly, monthly, etc) mortality and morbidity reports. These reports are shared with public health and clinical communities to provide insight on community health and disease trends. One third of the CHDs that produce a regular newsletter used ESSENCE-FL data and visualizations in their most recent edition.

- Weekly Reportable Disease Data Review: Each week state-level epidemiologists across FDOH meet via WebX conference to review and discuss current trends in the reportable disease data using ESSENCE-FL. This is a dynamic interactive session where epidemiologists run ESSENCE-FL reports together, often drilling down on the fly to answer questions or gather information to communicate to CHD epidemiology staff for follow up.

Scope:

ESSENCE-FL is a multi-tier, secure, web-based application with role-based access levels. All public health users have access to all data sources immediately on log-in. Hospital staffs have access to their own hospital(s) data, as well as an aggregate view of the FDOH reportable disease data. The system structure can be sub-divided into five areas: data ingestion database, detection database, web database, detection algorithms, and web application. All processes occur in the background *without* manual intervention. (Appendix, Figure 1).

Free text chief complaints from hospital ED records are parsed into syndromes and sub-syndromes by a version of a natural language processing developed by JHU that can also correct for common misspellings and medical short-hand. The data are then processed through the detection database and results are transferred to the web database where the users can access the data visualizations and alert lists. A unique feature of this system is that ad hoc queries from users can be completed and the detection algorithms will run dynamically on these user specified queries and time series graphs. As a result, presentations of statistical results are not limited to static alert list table views, but can be dynamically generated for any data source.

System Implementation:

Florida began moving toward an integrated surveillance system of systems in 2006. A variety of incompatible systems had presented Florida with challenges related to data exchange, analysis and visualization. Where systems were already operational, concerns arose regarding

abandoning legacy systems: perceptions of failed projects, system adoption fatigue and user re-training. To gain consensus among stakeholders, the State Working Group Committee on Syndromic Surveillance was convened. The group was a diverse set of stakeholders (internal: epidemiology, environmental health, laboratory and CHD; external: hospital infection preventionists and Florida Hospital Association). The Committee completed a surveillance systems standards document and then voted to establish a statewide unified surveillance system. Existing operational systems were assessed to determine if they met the new standards.

BOE explored the feasibility of implementing a statewide infrastructure of syndromic surveillance through a research project carried out by JHU. This exploration included evaluating whether the latest version of the JHU-ESSENCE system could be adapted to meet Florida's specific interests with regard to system interface and functionality.

The statewide ESSENCE-FL system was implemented in a phased approach. Initially, data from existing regionally based systems were incorporated. As these regional system contracts expired and users became comfortable and familiar with ESSENCE-FL the regional legacy systems were retired. Hospitals not currently participating in a syndromic surveillance system were asked to voluntarily contribute data to the system. CHD directors and administrators were provided recruitment letter templates and system fact sheets to facilitate recruitment efforts. CHDs leveraged existing relationships to convene in person hospital recruitment sessions. Large hospital chains were contacted directly by the State Health Office, and the Florida Hospital Association encouraged facilities to participate. During the initial implementation phase, JHU assisted with hospital data transfer configurations and set up.

In 2008, records from Florida's reportable disease surveillance system, Merlin, were incorporated. Florida Poison Information Center Network (FPICN) data was incorporated in 2008, and finally Office of Vital Statistics death records were incorporated in early 2010. The

four different data sources in ESSENCE-FL have separate modules within the system. The number of *active* users has grown from an average of 6 unique log-ins in 2007 to 57 per week in 2011. Over 5,500 unique ESSENCE-FL webpage views are generated per week in 2011.

Current State:

System Usage: The ESSENCE-FL system includes four different data sources, described briefly below. (Appendix, Table 1)

1) *Data Source-Emergency Department and Urgent Care Center:* De-identified ED data from 156 hospitals and 19 urgent care centers, sent once daily. Reports from these facilities capture approximately 85% of all Florida ED visits. The system receives records for 20,000-25,000 ED visits daily. Data includes: patient age, sex, chief complaint, date of visit, time of visit, race/ethnicity, discharge disposition, discharge diagnosis, patient resident zip code, a unique identifier for the patient and visit, and hospital name. Automated parsing of the free text chief complaints places data into 13 syndromes, >100 more specific sub-syndromes, and allows for flexible impromptu ad hoc queries. Daily alerts populated in "alert list tables" are stratified by county, hospital, age group, syndrome and sub-syndrome to highlight where the observed count exceeds the expected count. Users can then "drill down" into the data from the alert lists to further characterize the anomaly and determine if it may be of public health significance.

2) Data Source-State Reportable Disease System, Merlin: De-identified data, sent once per hour. Florida has about 100 reportable diseases/conditions. Merlin is the state reportable diseases and conditions surveillance system used by all 67 CHDs. Over 45,000 cases are reported annually, not including tuberculosis, sexually transmitted diseases or HIV/AIDS. The variables from Merlin include five dates associated with the reported case, unique case ID, disease name, disease code, sex, race, ethnicity, age, zip code of residence, county of residence, outbreak status, diagnosis status, reporting status, whether the case works in a sensitive occupation or not (i.e.

food handler, etc), whether the case was imported from another region or not, whether the case was classified as the primary case or secondary case, follow-up status, final known outcome of the case, whether the case was hospitalized, and the jurisdiction of the case. ESSENCE-FL also calculates additional variables based on available date fields to create measures of reporting timeliness (e.g. date reported to CHD minus date of onset, etc). This information is used by CHDs to ensure they are able to meet statewide Epidemiology Quality Improvement measures. Users create customizable alert lists by any chosen stratification which are automatically populated when observed counts exceed expected counts.

3) Data Source-Florida Poison Information Center Network (FPCIN): De-identified, updated every 20 minutes, and includes all calls. Over 113,500 calls were received in 2010. A large number of variables are sent, including demographic data to orient the data by time, person, and place, as well as information on substance, substance categories, clinical effects, information on the exposure, and how it was managed clinically. ESSENCE-FL uses FPCIN industry standard existing substance categories. Users create customizable alert lists by any chosen stratification which are automatically populated when observed counts exceed expected counts.

4) Data Source-Office of Vital Statistics Mortality Data: De-identified mortality data, updated once daily, and includes all deaths that occur in Florida. The variables included with these data are demographics, place of death, county of residence, zip code of residence, pregnancy status, five free text cause of death statements assigned by the individual completing the death certificate, ICD-10 codes for underlying and contributing causes of death, ACME codes 1-20, and three nationally standardized underlying cause of death groups, which are labeled as annual, monthly, and infant). A version of the ED visit free-text parser can be used to lump death records into categories (including “pneumonia and influenza”) before ICD-10 codes or underlying cause are assigned. (Appendix, Figure 8)

Exchange and Interoperability Levels:

Technical system integration and interoperability with other information systems is on-going. Without established national standards, ED syndromic surveillance standards have varied widely between systems. Recently the International Society for Disease Surveillance (ISDS), in close collaboration with the Centers for Disease Control and Prevention (CDC), developed syndromic surveillance standards and guidelines to clarify the public health syndromic surveillance requirements to meet Meaningful Use. FDOH actively participated with ISDS in the development of these standards. Design work has begun in order to receive HL7 messages for ESSENCE-FL ED data to ensure the system is compliant with the final Meaningful Use rule.

FDOH, through ESSENCE-FL, participates in data exchange projects outside of the state. ESSENCE-FL sends an automated daily data extract of influenza-like illness to the national Distribute (Distributed Surveillance Taskforce for Real-time Influenza Burden Tracking and Evaluation) project sponsored by ISDS. Data exchange between ESSENCE-FL and the Merlin reportable disease surveillance system complies with early versions of the CDC Public Health Information Network (PHIN) message mapping guides for content. Other data exchanges (FPCIN and Office of Vital Statistics) meet industry standards.

Privacy Protection:

Privacy and data are protected through a number of security steps (Appendix, Figure 1). Data received by ESSENCE-FL in all four modules is de-identified. Unique record-level identifiers are produced by the data sender (hospitals, Merlin, FPCIN, vital statistics) and associated with every record. Transfer, storage and output of data are secured including: secure transfer methods (sftp, VPN, public/private keys), web server using SSL encryption, role based user access levels (assigned at the time of account creation) by user ID and password and secure (https) web-based application.

Data Quality:

Data quality is assessed in multiple ways. ESSENCE-FL includes web pages that show the date and time it last received files from each data source. The system manager has access to additional web pages that show where files are in the data ingestion process and highlights when errors occur. De-duplication occurs as part of the standard data ingestion process. File content data quality concerns are monitored by running comparative analysis against the content of the original data source. For instance, once a month counts of reportable disease data in ESSENCE-FL are compared to the counts in the Merlin system. If errors are found they are documented and resolved by coordination among system administrators. Data quality issues are shared with the users of the data via email distribution lists and other communications.

Value

Impact on Population Health and Public Health Practice:

The disparate data sources collected in ESSENCE-FL support a process that takes thousands of individual data points, categorizes and aggregates them, and translates them into "information for action." Users are able to easily interact with the data, improving speed and efficiency. The following examples highlight uses of ESSENCE-FL that have positively impacted public health practice and outcomes and population health.

- *Post-disaster surveillance Hurricane Wilma*: On 10/24/2005 Hurricane Wilma made landfall in SW Florida. There was extensive damage to infrastructure, including displacing thousands of residents and causing power outages for up to 2 weeks. After the storm public health officials enhanced surveillance activities. A number of ad hoc queries were run in ESSENCE-FL ED to look at chronic diseases, infectious diseases, injuries, motor vehicle accidents, and animal bites. These analyses showed the most significant increase occurred in patients requesting dialysis treatments (proportional morbidity ratio (PMR) = 24.74; 95% confidence interval (CI) = 14.37-

42.58), and patients requesting medication refills, presumably to treat existing chronic illnesses (PMR=3.67; 95% CI=2.91-4.62), (Appendix, Figures 4 and 5). These results guided the development of policies related to special needs populations, and public health messaging reminding people to have enough medications on-hand in the event pharmacies and physician's offices are closed. We expect these plans will reduce morbidity during the next hurricane.

- *Gastrointestinal illness outbreak example*: A county user of ESSENCE-FL detected a cluster of four patients who presented to an ED in a short interval of time with chief complaints mentioning vomiting and diarrhea, and one with food poisoning (Appendix, Figure 3). The CHD followed up with the hospital to gain clinical presentation information, and interviewed the patients. All had purchased and eaten food from the same grocery store deli. An inspection of the deli found food heating lamps were not working, and food temperatures were below the hot holding recommended temperature. The deli was required to replace the faulty heating lamps, and discard temperature abused food. In this situation, no illness had been reported to public health yet the source of illness was found, quickly remedied, and further illness prevented.
- *Shigellosis outbreaks*: Routine monitoring of reportable disease data in ESSENCE-FL in late 2010 and early 2011 noted a sharp rise in case reports of shigellosis in younger children across multiple counties (Appendix, Figure 5). The observations were shared in BOE's weekly ESSENCE-FL data review, which led to a conference call with the affected counties so that best practices on information dissemination to the community and specific disease control interventions could be discussed. Routine review of these data using ESSENCE-FL enhanced local and statewide situational awareness, provided improved characterization of the data through ease of access to analytic and data visualization tools, and facilitated dissemination of reports internally and to the community. So far, this year's shigellosis outbreak is not as large as the last two outbreaks 2 and 5 years ago.

- *Immediately after the Haiti earthquake and cholera epidemic:* "Ad hoc" queries allow users to form their own "syndromes" has proven useful for tracking and identifying emerging diseases or known events. This feature is currently used to identify imported cholera cases due to the current outbreak in Haiti that were previously not reported to public health. Florida has the largest population of Haitians in the United States, and is a central hub of travel to and from Haiti. Shortly after reports of cholera becoming epidemic in Haiti in October 2010, BOE enhanced surveillance for imported cases so that the potential for local spread of disease from imported cases could be minimized. We requested that hospital EDs add the word "Haiti" to patient chief complaints if the patient had recently returned from travel to Haiti. Epidemiologists conducted queries for the word "Haiti," and ascertained whether the remaining chief complaint included possible symptoms of cholera. A similar request was made immediately following the Haiti earthquake to monitor and quantify the number of displaced persons accessing the healthcare system in FL. Following the earthquake, cases of diseases of public health concern were identified in displaced persons (lead poisoning, malaria, and giardiasis). This information was useful for planning, resource allocation and public messaging.
- *Childhood Drowning Prevention Education:* CHD health education specialists responsible for monitoring the occurrence of pediatric drowning or near drowning events are using ESSENCE-FL to enhance data collection for their program. Specialized free text queries of the ED and mortality data were created. Results of these queries are automatically presented daily in a customized alert list under designated user accounts. Prior to ESSENCE-FL the program relied primarily the health care community to manually fax reports. System use has provided additional data, and more timely reports to support programmatic activities designed to reduce drowning. More accurate data is used to drive decision making and public health messaging.

Costs and Benefits Offsetting Costs:

Funding has been exclusively through the CDC's Public Health Emergency Preparedness cooperative agreement and H1N1 federal dollars. The system was implemented in the 2007-08 grant year. Since implementation, FDOH has spent $1.15 million dollars on the ESSENCE-FL system including FTEs and indirect costs. The majority of this cost, approximately 70% has been used for enhancements focusing on data source integration and analysis. Dollars spent on implementation and enhancements are as follows: $112,500 (or >0.01 cent per FL resident) was spent for the initial state system go-live supporting only the ED module; in grant year 2008-09, system costs were approximately $200,000 (>0.01 cent per FL resident), and in 2009-10 costs were $500,000 (<0.03 cents per FL resident). Maintenance costs for the system currently are $60,000 per year, including hosting costs, a prorated share of equipment costs, etc. The value or return on investment of a surveillance information system like ESSENCE-FL cannot be expressed simply in dollar terms. It is very hard to be certain how many cases of disease, or how many deaths, were prevented as a result of actions taken on the basis of information from this system. Costs may also be avoided when a system like ESSENCE-FL provides information that allows response decision-makers to NOT devote further resources to a particular hazard, exposure, population, or situation. The basic model for the impact of surveillance is: high-quality, appropriately timely surveillance data, analyzed and turned into recommendations, can allow those in charge of organizing public health efforts (whether for ongoing health problems or emergencies) to make more focused and more effective allocations of the correct public health resources, and obtain better health outcomes at a lower cost than would otherwise be possible.

During the 2009 H1N1 influenza A epidemic, analyses of ESSENCE-FL ED data for influenza-like illness visits was the best source of information to support timely, accurate public health messaging. Daily ESSENCE-FL ED visit numbers gave a distinct signal within days of a rapid upswing of community disease due to the novel virus in early September, 2009 (Appendix,

Figure 9). These data supported an increase in messaging to public health and medical partners: 1) that influenza was epidemic; 2) almost all influenza was due to the 2009 H1N1 virus, which was susceptible to antivirals; and, 3) that appropriate recognition, treatment, and isolation of ill persons were of paramount importance. ESSENCE-FL analyses supported the anecdotal clinical information that most persons seeking care were children and adolescents, and the urgency of implementing vaccine clinics for those age groups as soon as vaccine became available. Conversely, the analyses of pneumonia and influenza mortality data, supported by ESSENCE-FL visualizations, indicated that overall mortality, and mortality in the elderly, were only slightly increased, so we did not need to plan for an overwhelming demand for ICU beds and ventilators. Reported cases of hospitalized or fatal 2009 H1N1 influenza, visualized in ESSENCE-FL, were analyzed to indicate that most cases requiring hospital or ICU care, and most deaths, were in adults aged 45 to 64 years, with underlying medical conditions. These data were used to reinforce messaging to clinicians to be vigorous about early antiviral treatment of people with influenza who had underlying medical conditions.

Did our advice save hospitalizations, ICU admissions, or lives? We can't be sure. What we do know is that our advice to clinicians was heavily dependent on data obtained and visualized through ESSENCE-FL.

Lessons Learned/Critical Success Factors:

Success is attributed to leadership understanding the importance of public health informatics, a flexible and adaptive design team, and establishing stakeholder buy in early. Daily management of the system should be led by a surveillance epidemiologist who is very familiar with the end user business needs, who is directly involved in communications with data source IT contacts, and is familiar with the more technical interactions with on-boarding new data sources. Flexible and timely access to system servers by all members of the support and

development team is essential for efficient troubleshooting when problems arise or updates need to be applied. The system should be easy and intuitive to use and ensure that processes for daily review and monitoring are not labor intensive. Data contributors to the system should be given some flexibility in their participation options. When working with non-public health stakeholders, the system implementation should be invisible to daily operations.

Dissemination:

ESSENCE-FL system users are actively presenting and publishing their work. The statewide managing epidemiologist of ESSENCE-FL has presented seven times at the Annual International Society for Disease Surveillance Conference since 2006. Presentations have been made at the annual conferences of the American Public Health Association, the Council of State and Territorial Epidemiologists, and the Southeastern Center for Emerging Biologic Threats. CHDs and epidemiologists from other Bureaus have also presented their ESSENCE-FL work at national conferences. Published manuscripts and conference abstracts are available in peer-reviewed journals. During the influenza season a large component of the weekly influenza report is composed of data from the ESSENCE-FL system. CHDs use ESSENCE-FL to produce routine reports and newsletters distributed to community partners.

Transportability:

ESSENCE-FL has been developed on industry standard information architecture. The ESSENCE-FL reportable disease module incorporates some system specific data elements, but the majority of the functionality is transferable to others. The ESSENCE-FL FPCIN module is already in operation in other locations around the nation. General system enhancements to the ESSENCE-FL platform that are added per Florida-specific design requests can be implemented in other existing ESSENCE systems. Syndrome definitions and symptom classification tables in the ESSENCE-FL ED module are shared with other jurisdictions.

Appendix

Figure 1. Diagram of the ESSENCE-FL Implementation

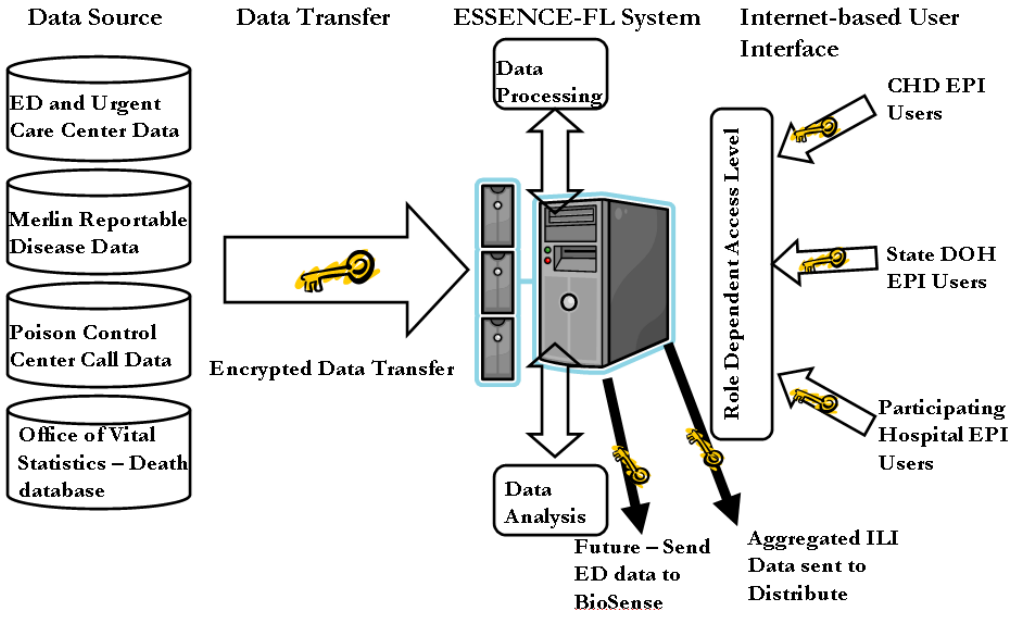

Table 1. Data source characteristics in the ESSENCE-FL Implementation

Data Source	Timeliness of Data Transmission	Volume	Primary Units of Analysis
Emergency Department/Urgent Care Data	1 file each day	Total: ~25 million records	Syndromes, sub-syndromes, free text queries, and stratified by various demographic variables
Merlin-Reportable Diseases/Conditions	1 file each hour	Total: ~350,000 case reports	Reportable disease cases, and stratified by various demographic variables
Florida Poison Information Center Network (FPCIN)-Call Data	1 file every 20 minutes	Total: ~1.5 million calls	Major substance, minor substance, individual substance, clinical effects and stratified by various demographic variables
Florida Office of Vital Statistics – Mortality Data	1 file per day	Total: ~2.1 million deaths	NCHS cause of death groups, flexible ICD-10 and free text queries, and stratified by various demographic variables

Figure 3. ESSENCE-FL: Number of emergency department visits for nausea, vomiting, and diarrhea by patient time of arrival, aggregated as counts per hour in a 24-hour period, Hospital A

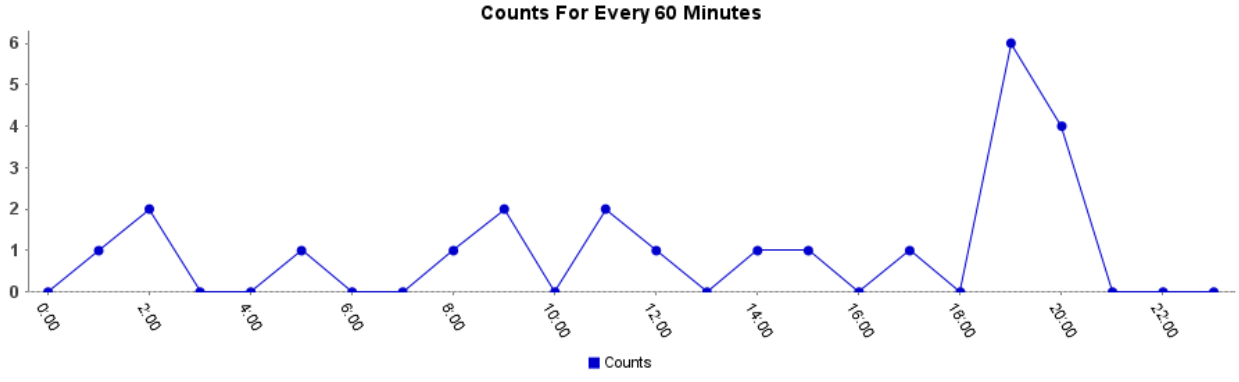

Figure 4. ESSENCE-FL: Emergency department visits of patients seeking dialysis at area hospitals post Hurricane Wilma, Broward County, FL, July-October 2005

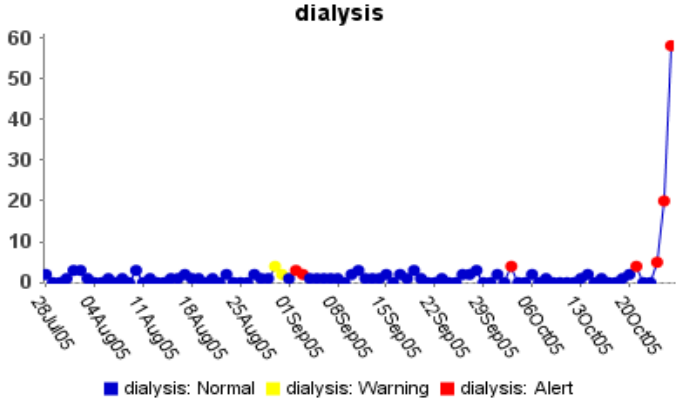

Figure 5. ESSENCE-FL: Emergency department visits of patients seeking medication-refills at area hospitals post Hurricane Wilma, Broward County, FL, August-October 2005

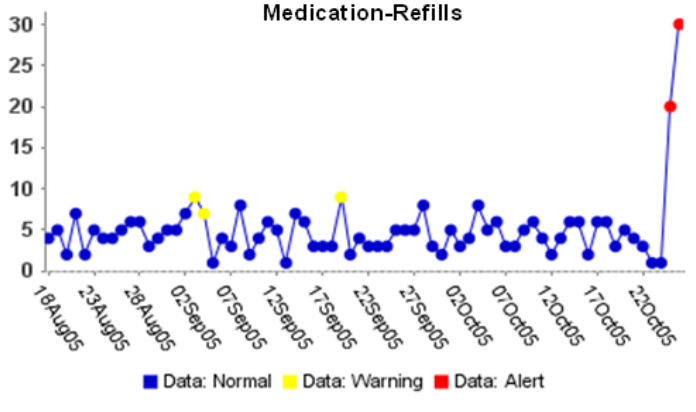

Figure 6. ESSENCE-FL: The initial statistical alerts associated with a shigellosis outbreak in a particular county (reportable disease data), Florida 2008-2010

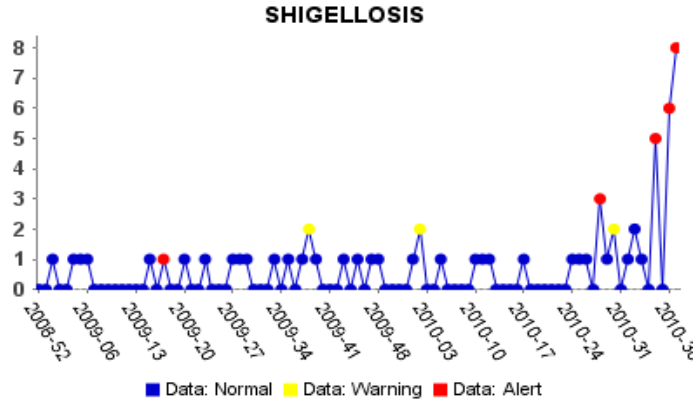

Figure 7. ESSENCE-FL: Comparing monthly counts of emergency department data where drowning was mentioned in the chief complaint and mortality data (vital statistics data) that included drowning as a cause of death, <1-4 yr old age group, Florida 2008-2011

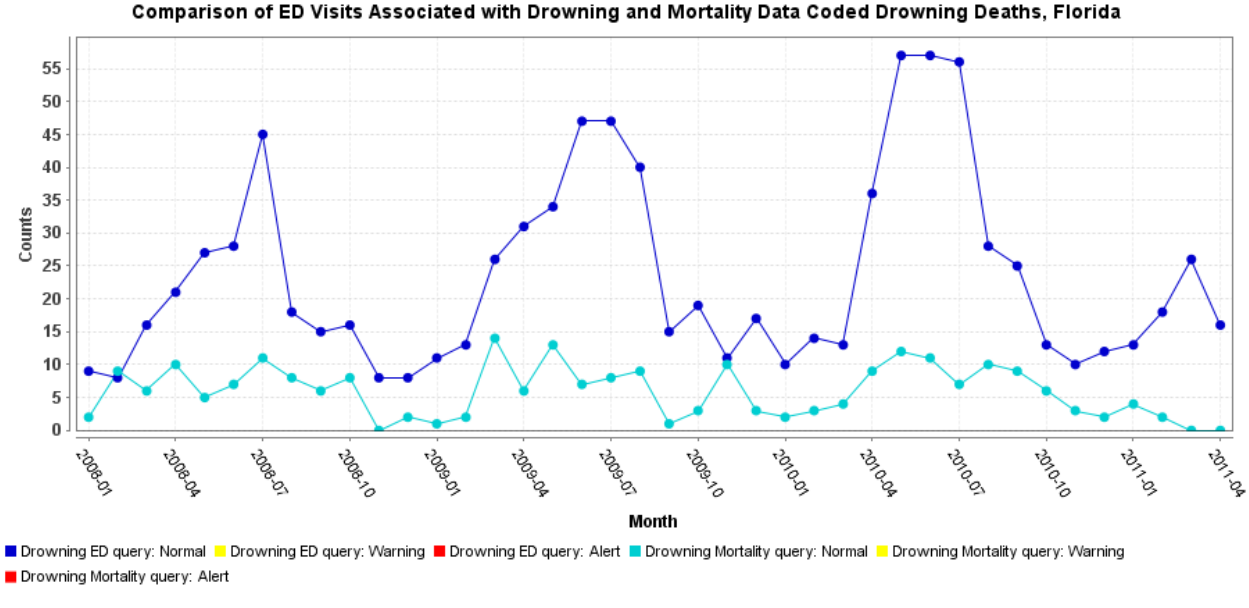

Figure 8. ESSENCE-FL: Pneumonia and influenza mortality data from the Office of Vital Statistics, Florida 2003-2010. Mortality due to the 2009 H1N1 virus was only slightly increased, however the increases were seen unusually early in the year

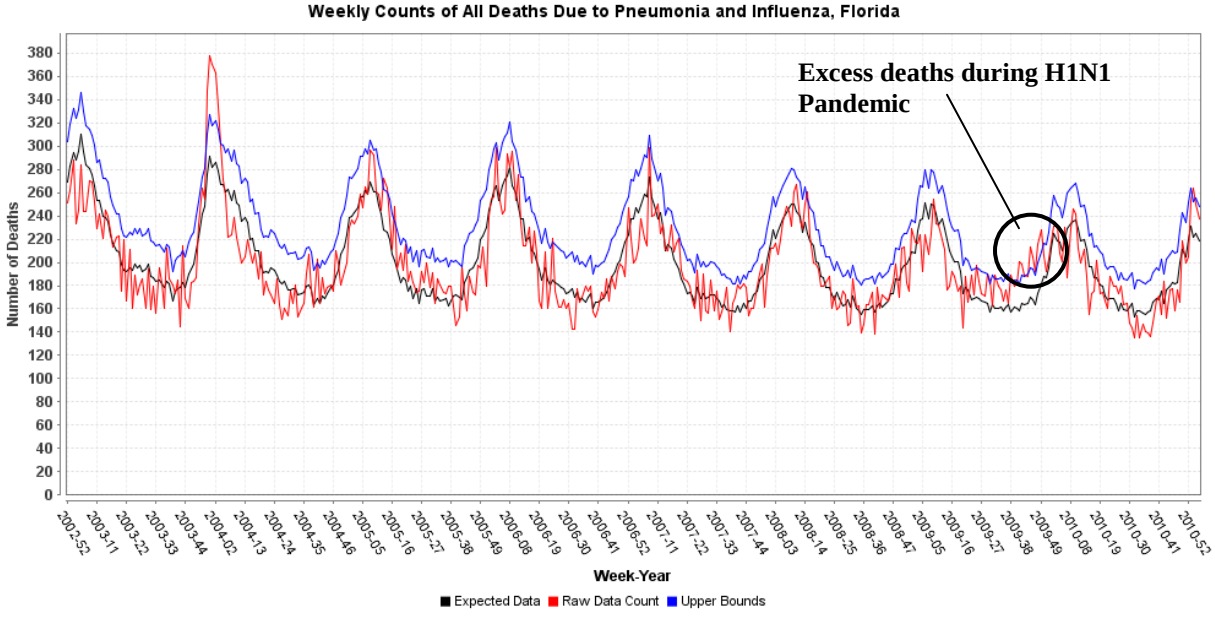

Figure 9. ESSENCE-FL: Weekly percent of emergency department visits categorized as influenza-like illness, Florida 2007-2010