# Surveillance of Emerging Disease in Resource-Limited Settings

Jacqueline S. Coberly, PhD[1], Richard Wojcik, MS[1], Jean-Paul Chretien, MD, PhD[2], Eric Tayag, MD[3], Marlow Niñal, MD[3], John Mark Velasco, MD[4], Agnes Tomayao, MPH[4], Sheri Lewis, MPH[1]

[1] Johns Hopkins University Applied Physics Laboratory, Laurel, MD, [2] Division of Health Sciences Informatics, Johns Hopkins University School of Medicine
[3] National Epidemiology Center, Manila, Philippines, [4] Philippines-AFRIMS Virology Research Unit, Cebu City, Philippines

The Johns Hopkins University
Applied Physics Laboratory
Laurel, Maryland
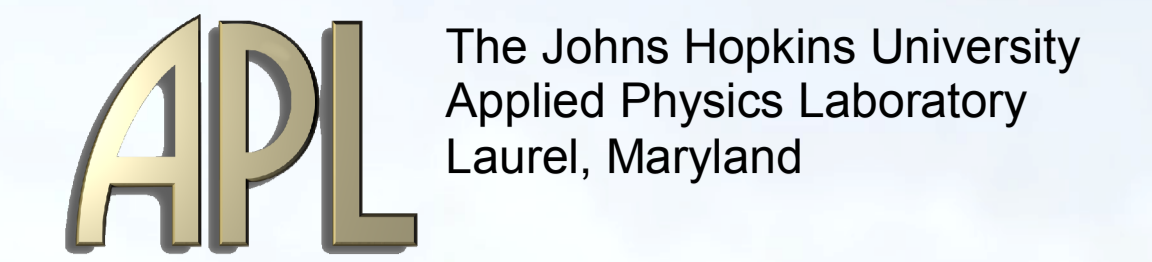
Objective

The goal of this project is to develop and pilot rapid electronic data collection tools and outbreak detection technology that will:
- Enable public health authorities in resource-limited areas to develop or enhance systems to monitor disease trends and identify disease outbreaks in accordance with the 2005 International Health Regulations (IHR 2005).
- Enable the development of infrastructure in resource-limited areas needed for national, regional surveillance networks.
- Facilitate the development of public health infrastructure needed in all countries to enable greater participation in a global surveillance and response system.

Introduction

"Inadequate surveillance & response in a single country can risk the health of its population, and also that of the world's …"

Heymann 2004[1]

- The SARS epidemic in 2003-2004 demonstrated the increasing interconnectedness of our world, and the rapidity with which disease can circumnavigate the globe. The world community needs to work together toward a global system of disease surveillance to provide optimal protection to all people.
- The revised International Health Regulations (IHR 2005) addressed this issue by requiring signatory countries to improve their ability for disease prevention, detection and response, and to report public health events of international concern (PHEIC) to the World Health Organization (WHO).
- PROBLEM
  - Traditional paper-based disease surveillance systems were designed to track long-term disease trends; not disease outbreaks and not PHEIC.
  - Electronic data collection and transmission is required for rapid outbreak detection.
  - The countries most likely to have the host, microbe, environment combination that promotes emergence or re-emergence of infectious diseases, often have limited resources to rapidly detect, respond to, and contain PHEIC.
- SOLUTION
  - Experience gained from the deployment of electronic disease surveillance systems in industrialized countries can be used to both enhance surveillance in resource-limited settings and improve the detection and response to serious disease threats.
  - This technology needs to:
    - Be electronic, to provide rapid communications.
    - Appropriate for the setting and personnel and sustainable by the organization responsible for surveillance.
    - Reach down to the patient-care level, where detection and control of disease spread is most effective.
    - Be easily integrated into existing daily work routines to facilitate uninterrupted collection and transmission of surveillance data.
    - Be coordinated within and between countries to prepare a platform that will eventually support information exchange at all levels of public health within a nation, and between public health authorities in different countries.
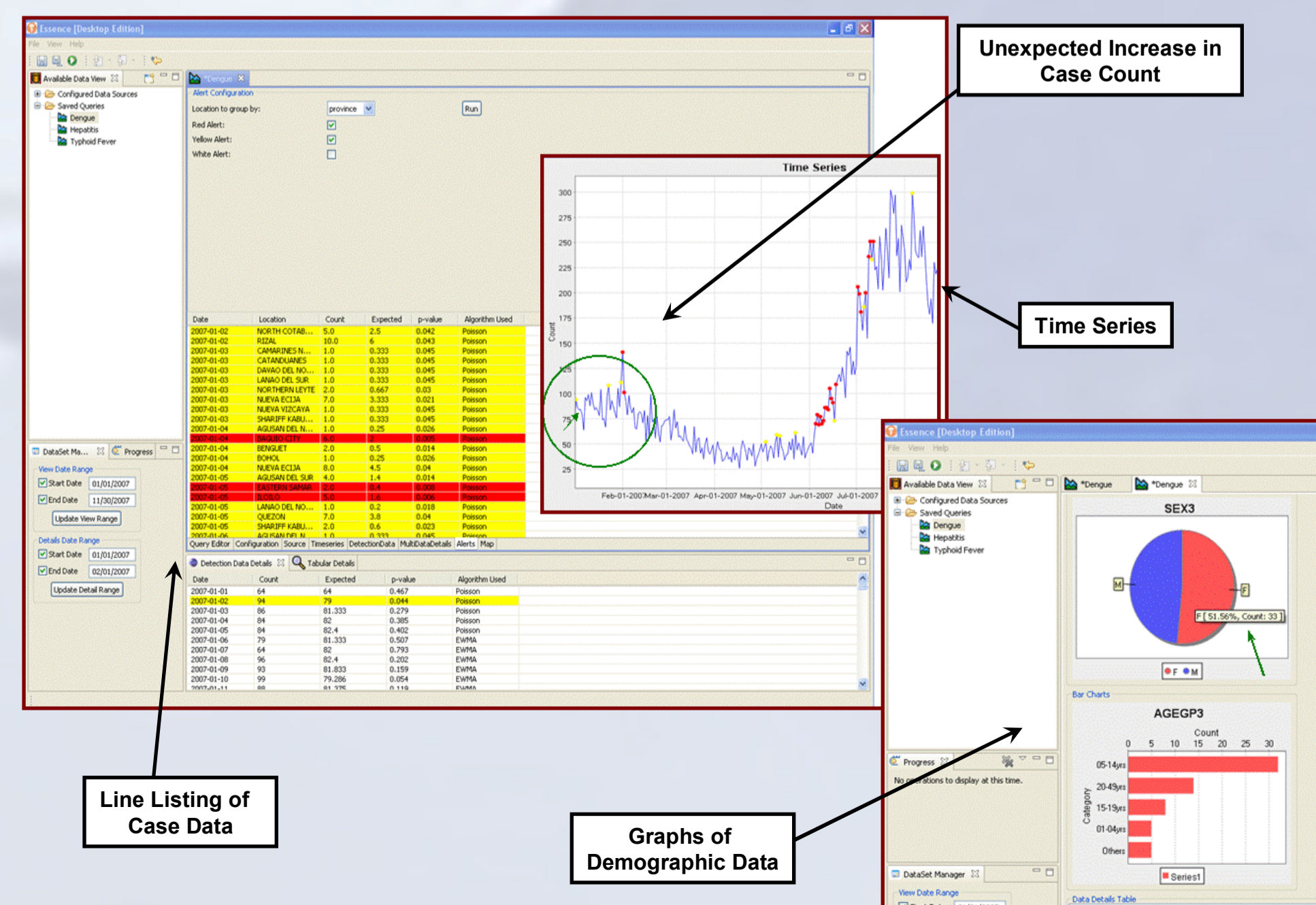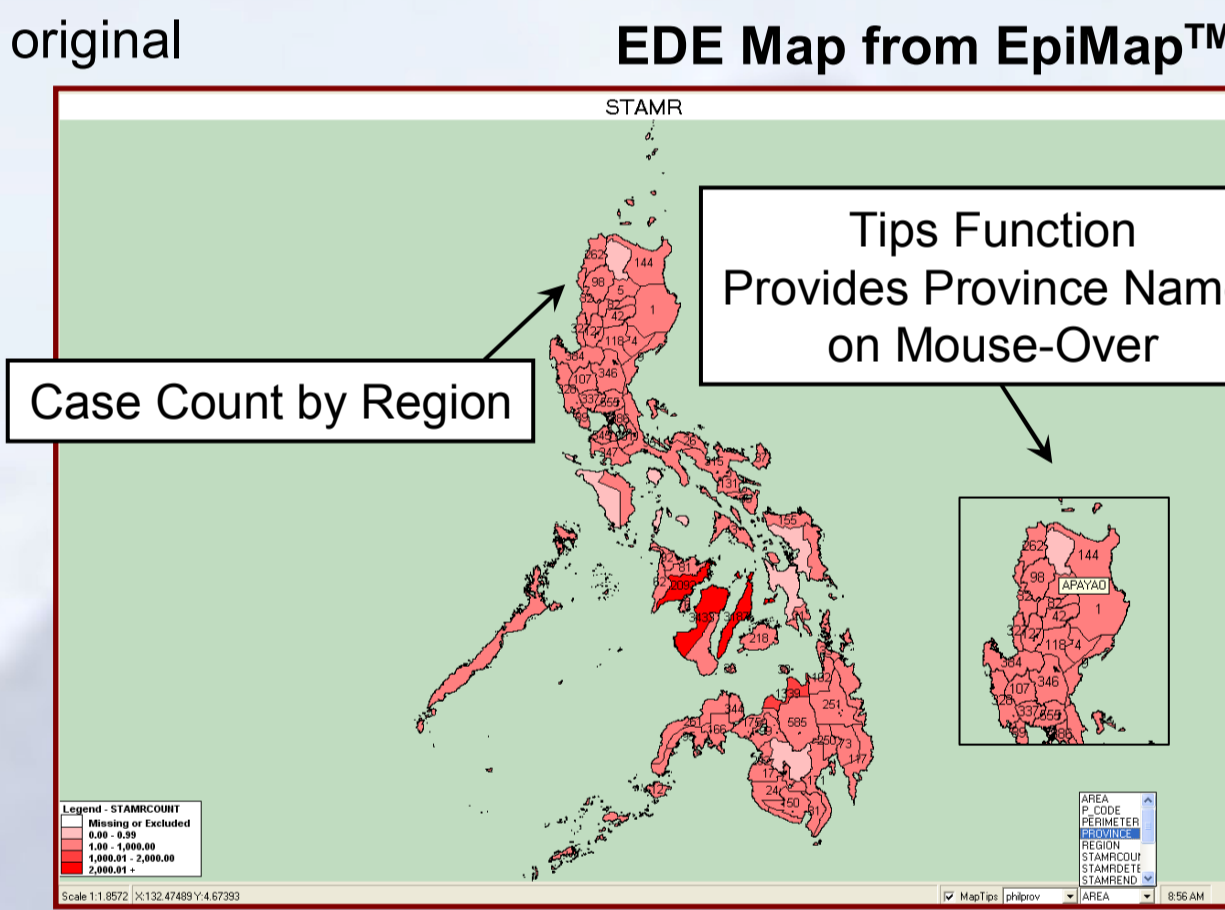
Methods

- Two independent, yet complementary, software applications were developed for this project and will be piloted in the Philippines:
  - ESSENCE Desktop Edition (EDE)
  - The Clinic Data Entry Software (CDES).
- A third complementary application is being developed to facilitate remote data capture and transmission in areas where computers and/or internet connections are unavailable.
- Our intent is to develop a suite of freely available disease surveillance software applications that can be used together or alone to implement electronic disease surveillance or enhance existing surveillance systems.

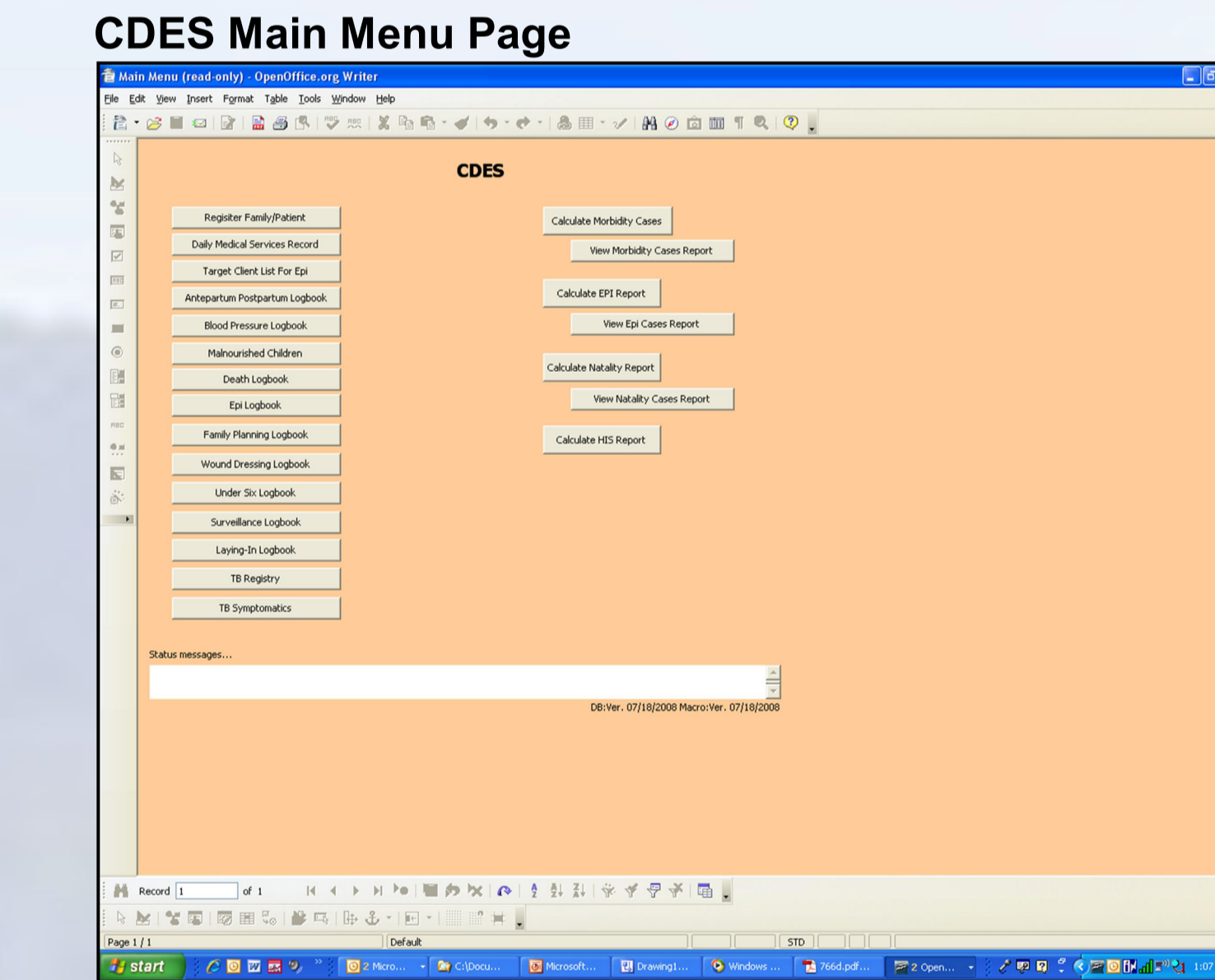**JHU/APL SAGES Tools**
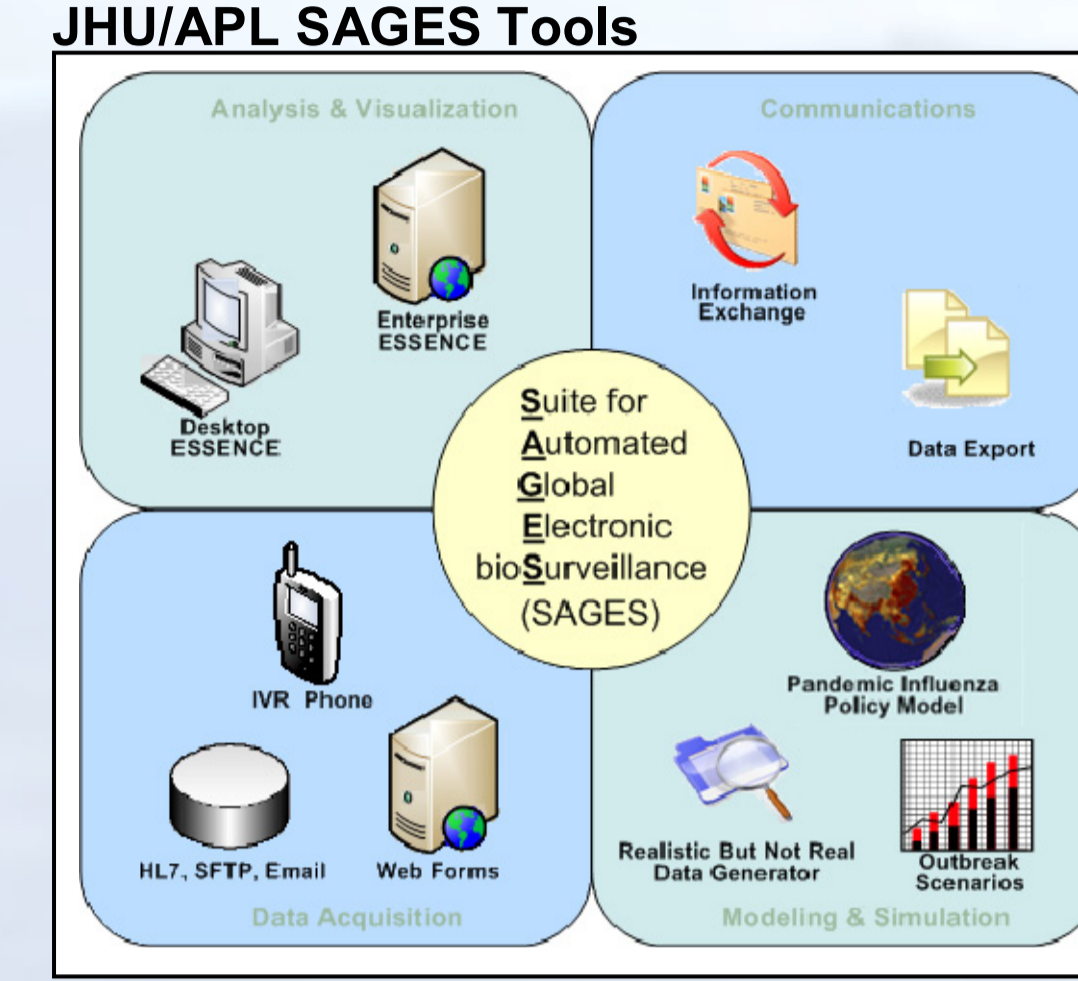
Courtesy of Sheri Lewis, MPH

ESSENCE Desktop Edition

- **EDE** is a desktop version of the ESSENCE [2] web-based disease surveillance application that mimics the flow, functionality and analytic power of the original web-based application. It:
  - Is an independent add-on application that identifies significant increases in community disease trends by analyzing longitudinal, case-level counts of disease or disease surrogate data.
  - Provides time series with unexpected increases in count data highlighted. Pie charts, bar graphs, and line listings of cases can be produced from any available clinical and demographic data.
  - Works seamlessly with EpiInfo's™ EpiMap™ to create case maps by residence, or other pertinent location.
  - Is designed to work with multiple types of systems and databases, and connect to different surveillance systems with minimal effort.

EDE Map from EpiMap™

Case Count by Region

Tips Function Provides Province Name on Mouse-Over

Unexpected Increase in Case Count

Time Series

Line Listing of Case Data

Graphs of Demographic Data

Clinic Data Entry Software

- **CDES** is a simple data entry tool created with the Open Office Base Database application that is designed to be used at the health clinic or health station level. CDES:
  - Mimics patient visit/event log books routinely used in clinics and can be used as a simple electronic medical record for each patient.
  - Creates an .odb database file or ASCII text data file that is easily transmitted via internet to regional public health authorities.
  - Creates electronic or paper copy of the periodic surveillance reports required by regional health authorities.
  - Provides a database clinic personnel can access for disease surveillance and myriad other health related questions.
  - Provides data files that can be used with EDE at the clinic or regional level to monitor local disease trends.
- EDE & CDES are being piloted in the Philippines. Initial results will be available in 2009.

Current Hand-Written Clinic Log

CDES Electronic Logbook

CDES Main Menu Page

Automated Monthly DoH Morbidity Report Generated by CDES

Conclusions

- The increasing interconnectedness of our world has transformed the traditional surveillance paradigm from a nation-based activity to a global responsibility.
- To prevent and respond to local and regional epidemics and adhere to IHR 2005, all countries need rapid outbreak detection and response capacity, particularly in resource-limited areas where the environment is ideal for development of new microbes.
- Ideally, national and regional systems will develop that can routinely share summarized disease surveillance information, eventually creating a 'virtual' global disease surveillance system.
- The project described here is developing freely available surveillance software applications that will facilitate the development or enhancement of local, regional and national disease surveillance systems in resource-limited areas of the world.

References

[1] Heymann,D. (2004). "The international response to the 2003 SARS outbreak." Philos Trans R Soc Lond B Biol Sci 359(1447): 1127-9.

[2] Lombardo, J. et al., "A Systems Overview of the Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE II)," Journal of Urban Health, Vol. 80, No. 2, Supplement 1, 2003, pp. i31–i41,
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