

Real-Time Disease Surveillance using Affordable mHealth Technology

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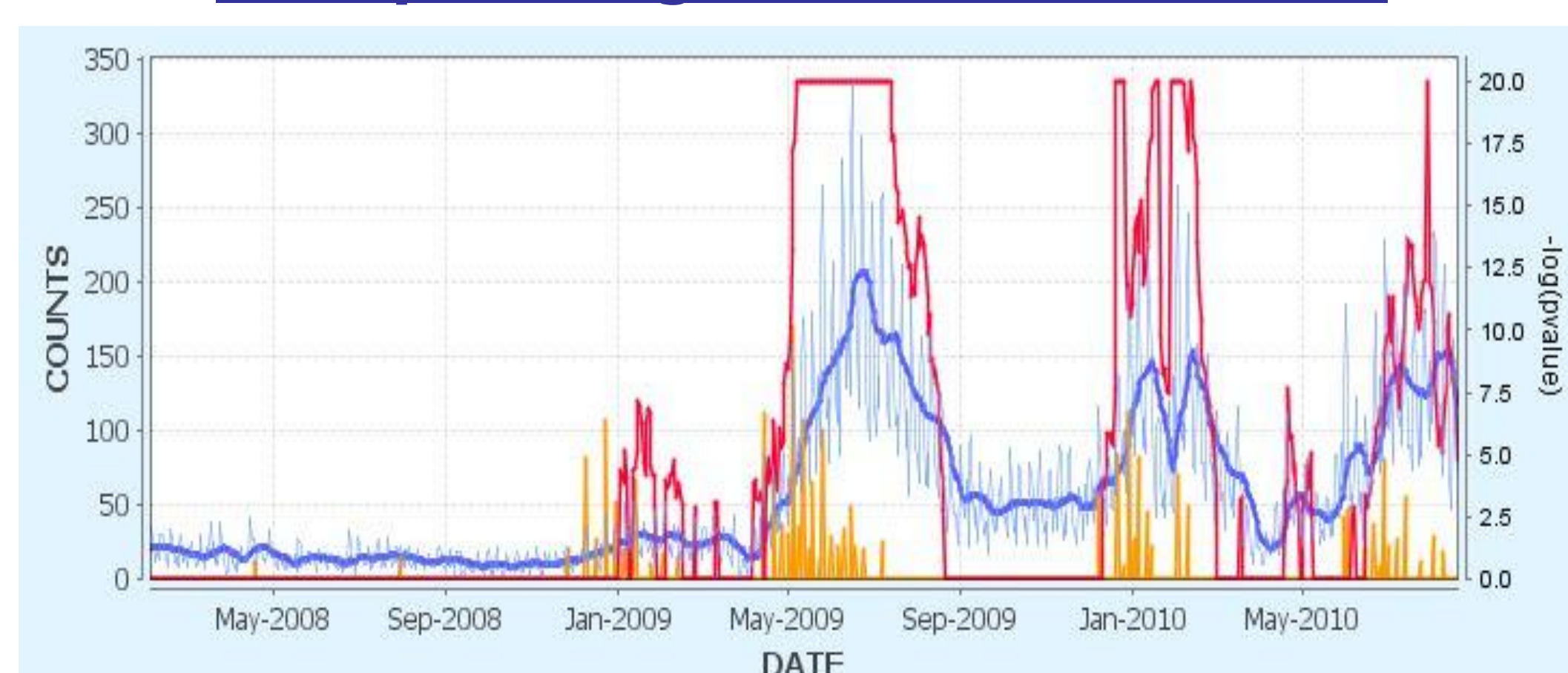
Real Time Biosurveillance Program

(1) Collect and digitize outpatient data using mobile phones (2) Detect and validate statistically significant trends using interactive analytic tool: T-Cube Web Interface (3) Mobilize response activities using automated alerting

KEY ACHIEVEMENTS

Faster detections, better situational awareness, rapid response ability

Example: Dengue Fever in Sri-Lanka



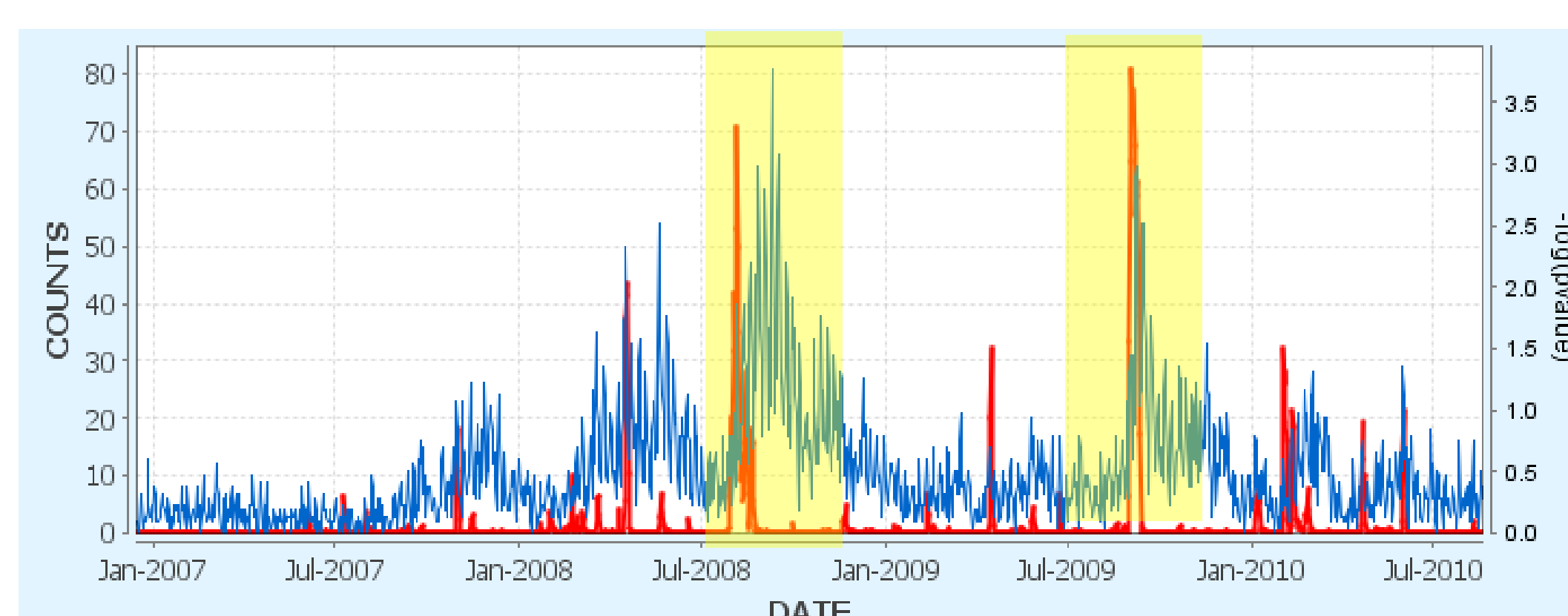
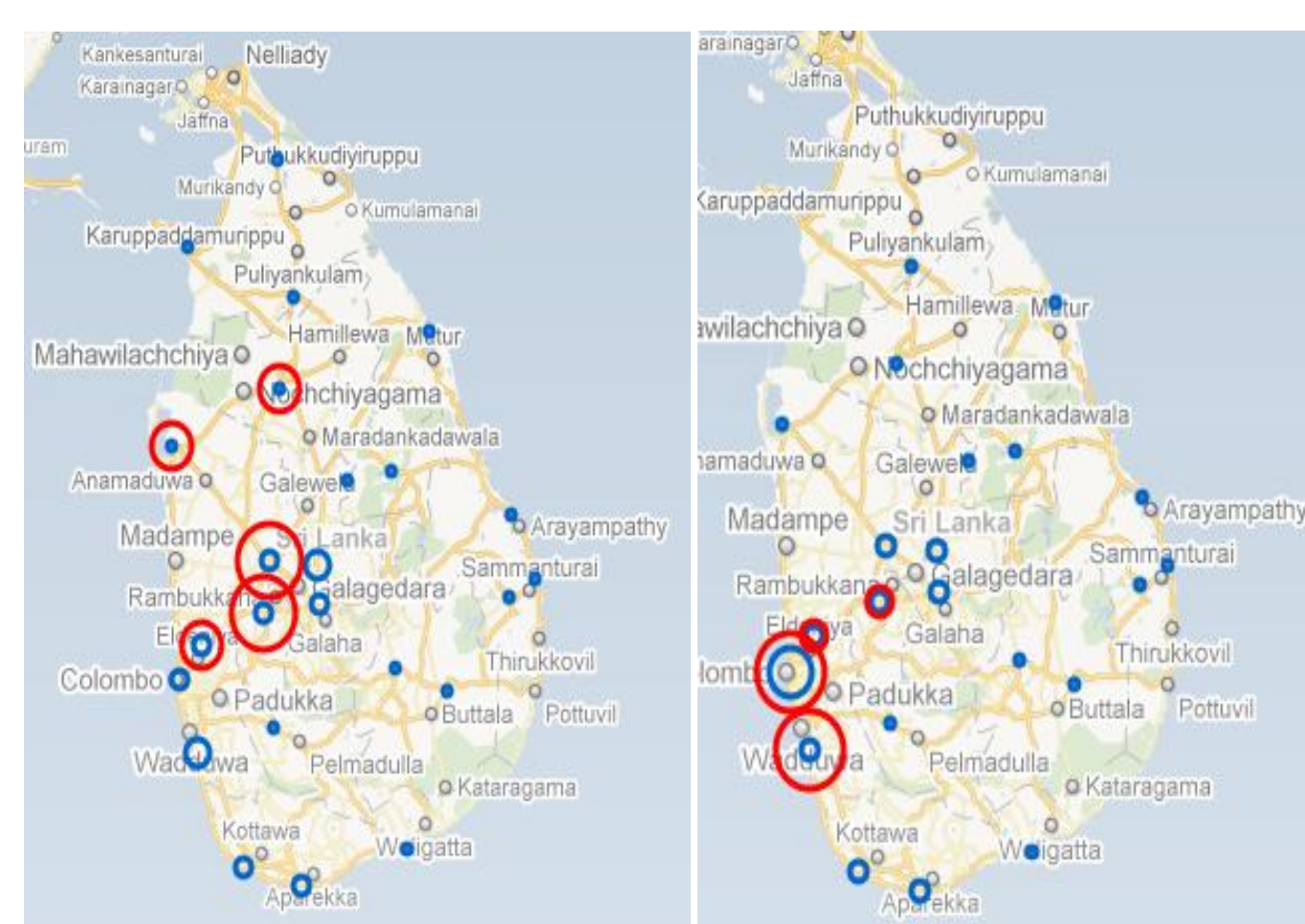
Blue: disease counts Red: temporal scan alerts Orange: CuSum alerts

- Dengue fever outbreaks in Sri-Lanka in 2009 and 2010 are thought to be the worst in history
- The one in 2009 amounted to 35,007 cases and 346 deaths
- RTBP would have issued warnings in early 2009 about that year event, when dengue cases just began to escalate, and it would have continued to issue alerts through the outbreak period. Early warning would have given health officials more time to prepare response and to mitigate consequences.

Comprehensive analyses prevent missing clues, help focus attention, enable effective actions

Example: Leptospirosis in Sri-Lanka

- Our spatial scan analysis of Leptospirosis counts in mid 2008 and late 2009 revealed spatial clusters
- This type of insight could hardly be obtained using traditional data collection and analysis methods

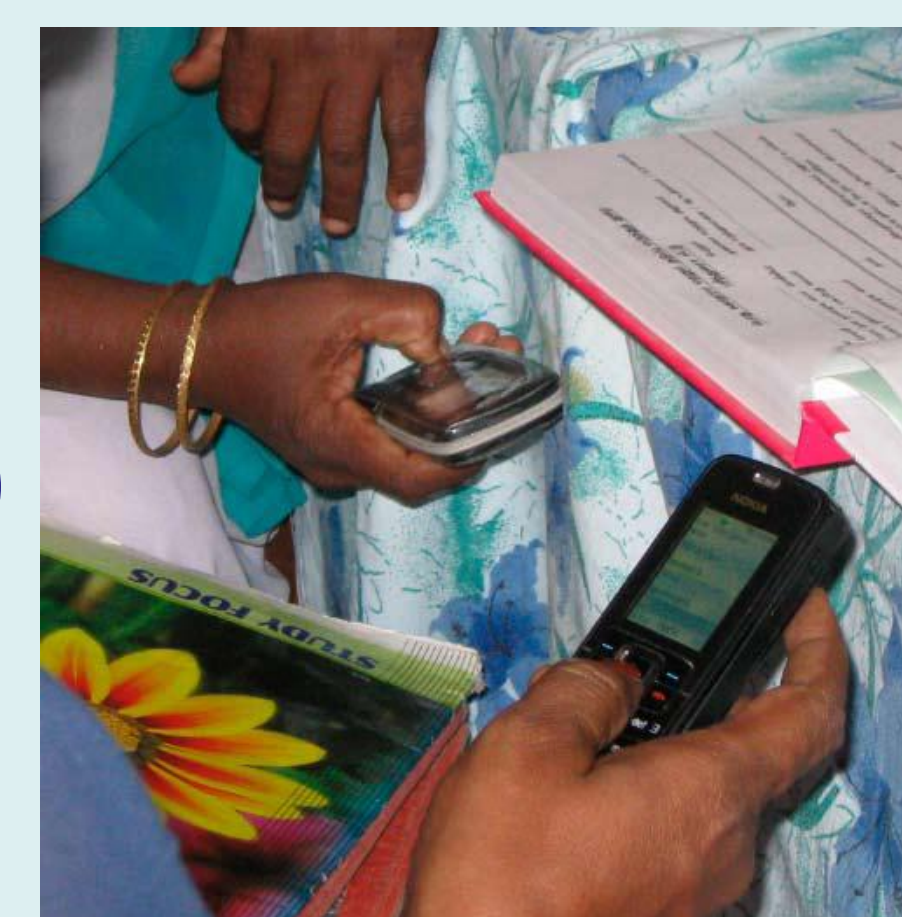


Blue: disease counts Red: Spatial Scan Alerts

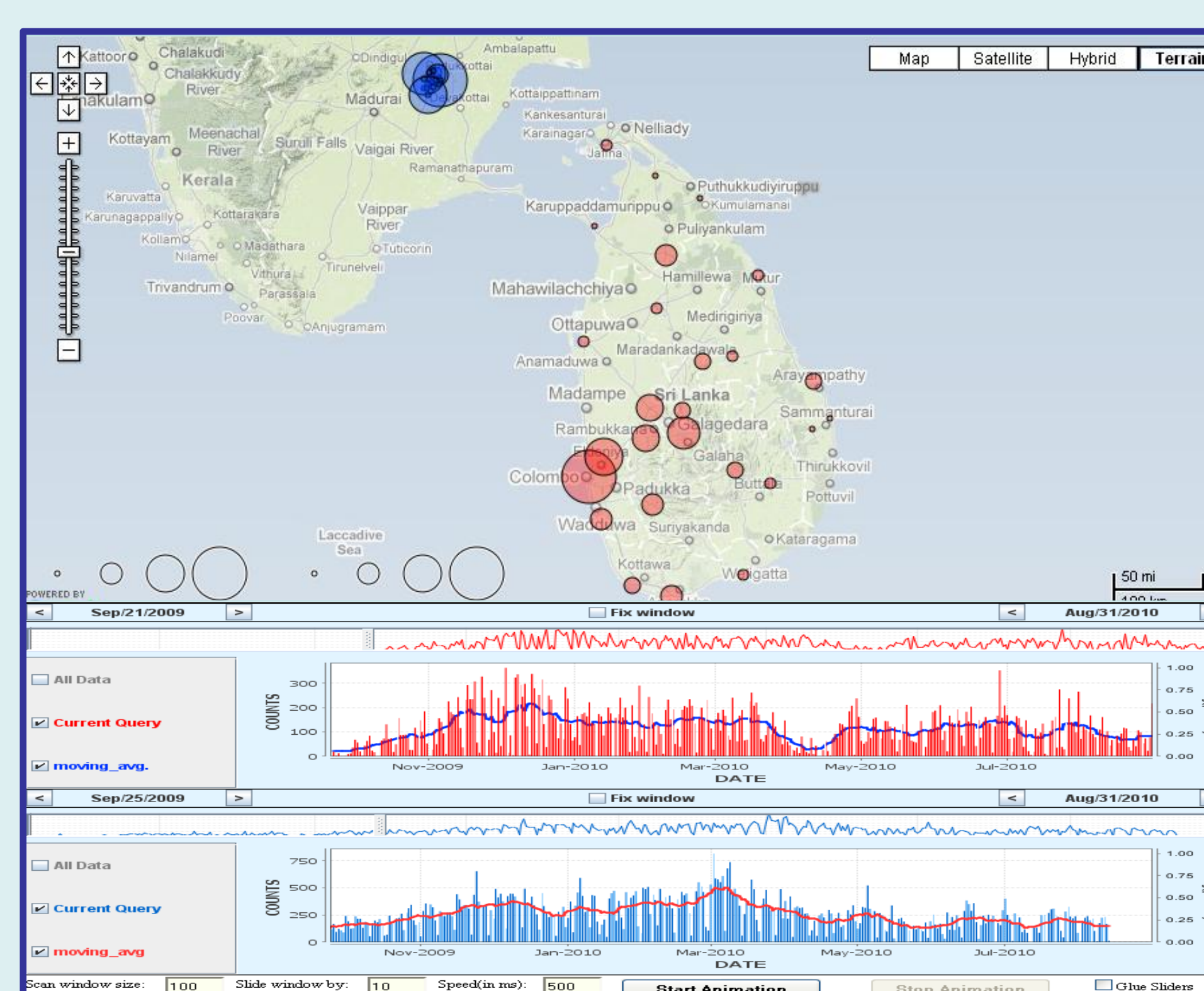
RTBP: THE SYSTEM

1. COLLECT AND DIGITIZE DATA

- Inexpensive phones with Java-based interface used to record individual patient cases (preliminary diagnoses, signs, symptoms, demographics, etc.)
- Data texted in real-time to the server
- No need to rely on computers, internet, or continuous power supply



2. SUMMARIZE AND VISUALIZE DATA 3. DETECT AND VALIDATE UNEXPECTED PATTERNS

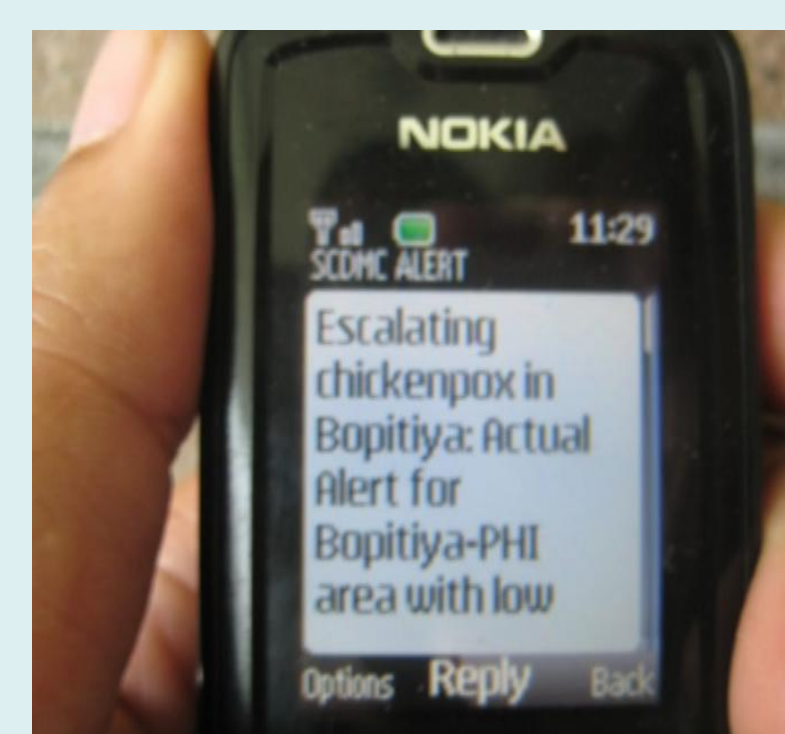


T-Cube Web Interface

- Reliable advanced statistical analytics
- Intuitive, highly interactive user interface
- Support of manual evaluations by human experts
- Automation of routine screenings

4. ALERT AND MOBILIZE RESPONSE

- Timely dissemination of alerts to designated recipients
- Rapid response and mitigation of crises



ADDITIONAL BENEFITS

Ability to monitor all diseases and syndromes

- RTBP data collection and analytic capabilities allow to monitor many more diseases than before
- Reported signs and symptoms enable syndromic surveillance
- The data collected may contribute to research of emerging, non-notifiable, as well as chronic diseases

Example: Emerging Disease

Sri Lanka kidney disease epidemic leaves doctors baffled

12 August 2008 | EN | 中文

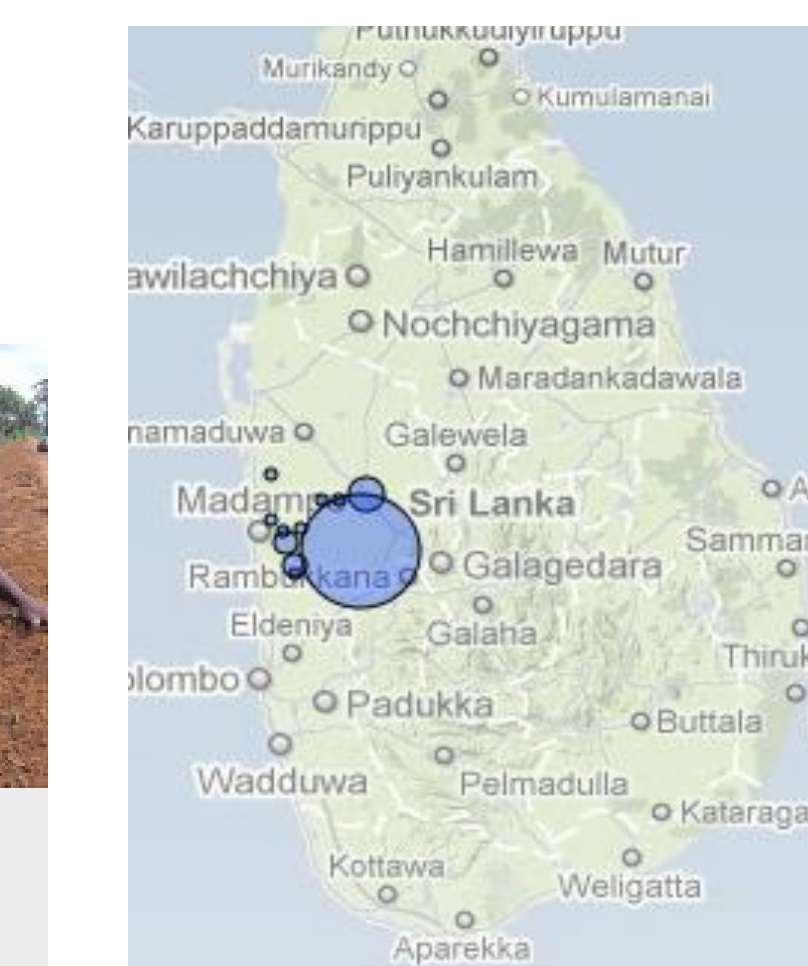


Doctors and researchers are puzzled by a sharp rise in chronic kidney disease among farming communities in the North Central province of Sri Lanka.

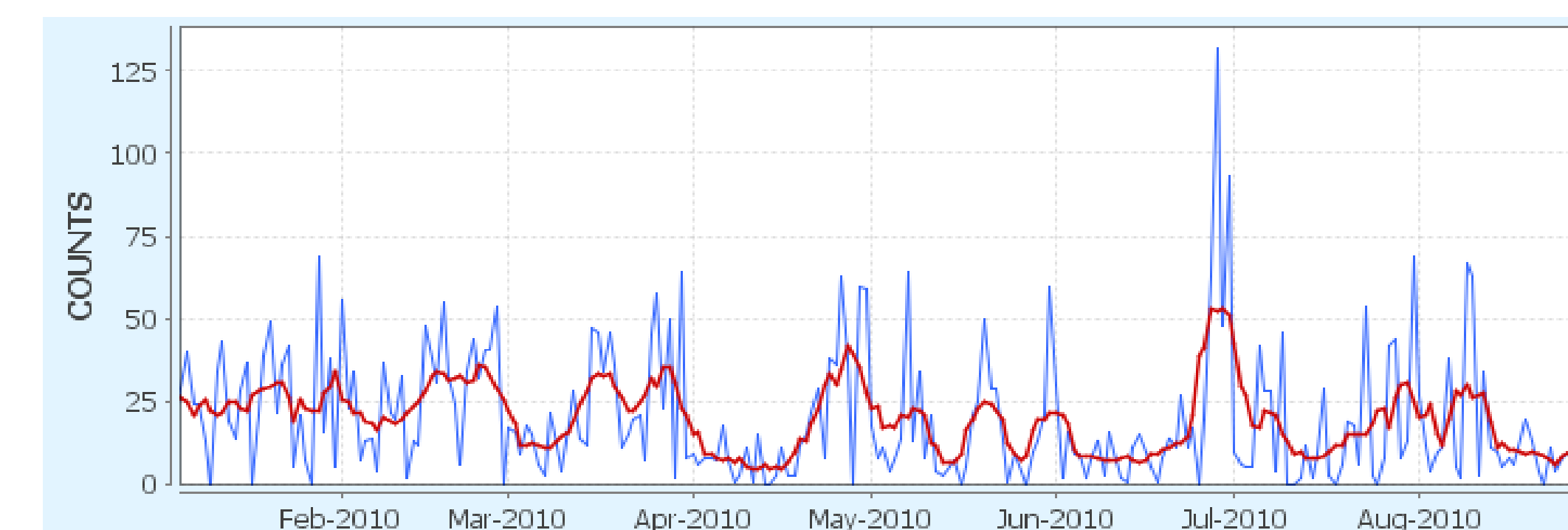
The number of cases has been steadily rising since the disease first came to light around eight years ago. Over 18,000 cases have now been reported, with cases in Eastern and Uva provinces as well as North Central.



Almost all those affected are men from farming families



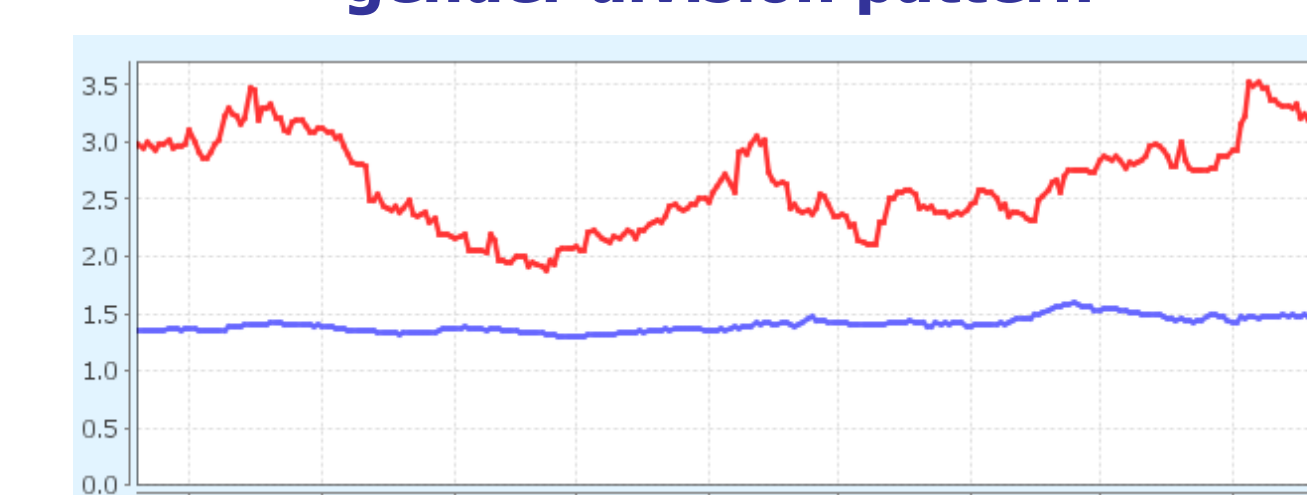
Spatial distribution of 2010 UTI cases in Sri Lanka



Time series of Urinary Track Infection cases in Sri Lanka in 2010

Example: Chronic Disease

Hypertension in Sri-Lanka gender division pattern

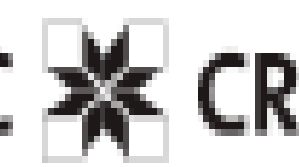
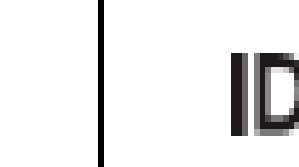
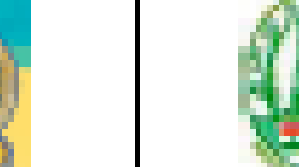
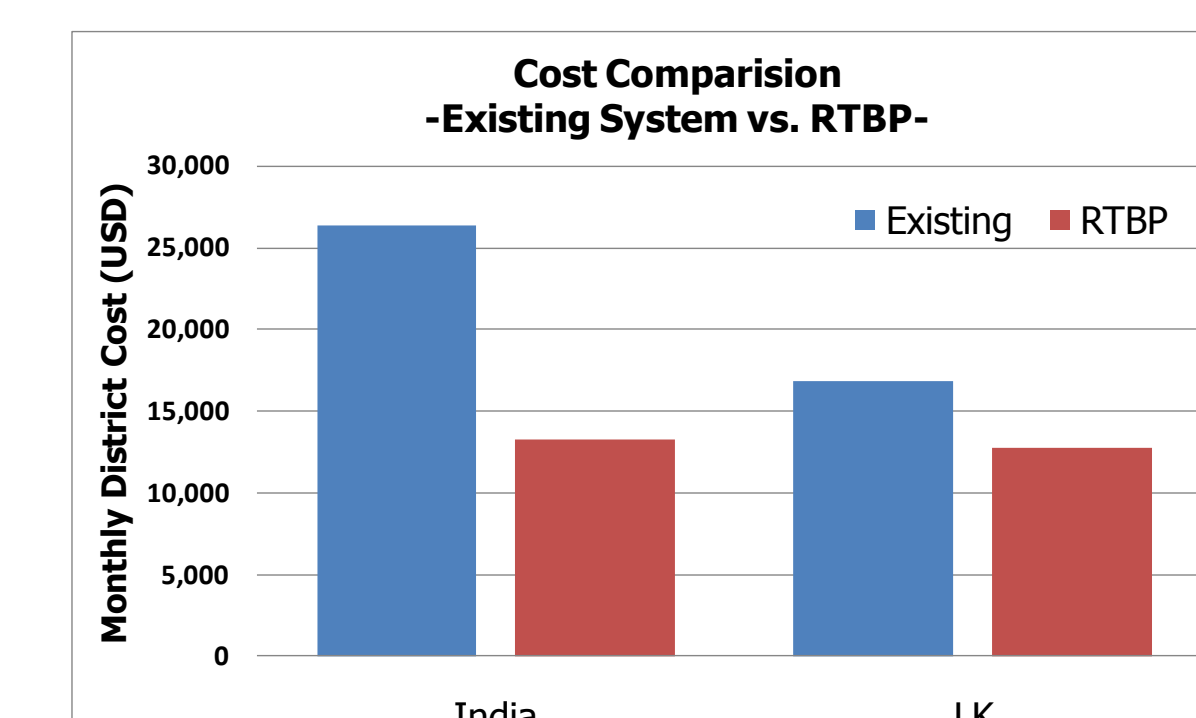


Blue: all patient visits Red: Hypertension cases Female/male ratio based on data from RTBP

- Hypertension appears to be 2-3 times more prevalent in female than in male patients
- RTBP data and statistical analysis capabilities support making such discoveries

Maintainability and cost effectiveness

- RTBP relies on widely available inexpensive mobile technology
- Service of these phones is readily available even in rural areas
- Total costs of operation are lower than with the currently used paper-based notifiable disease reporting systems
- 50% and 30% cost avoidance attainable respectively in India and Sri Lanka



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RTBP: Healthier People & Lower Costs of Public Health Management