

T-Cube Web Interface for Real-time Biosurveillance in Sri Lanka

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T-Cube Web Interface for Real-time Biosurveillance in Sri Lanka

Objective:

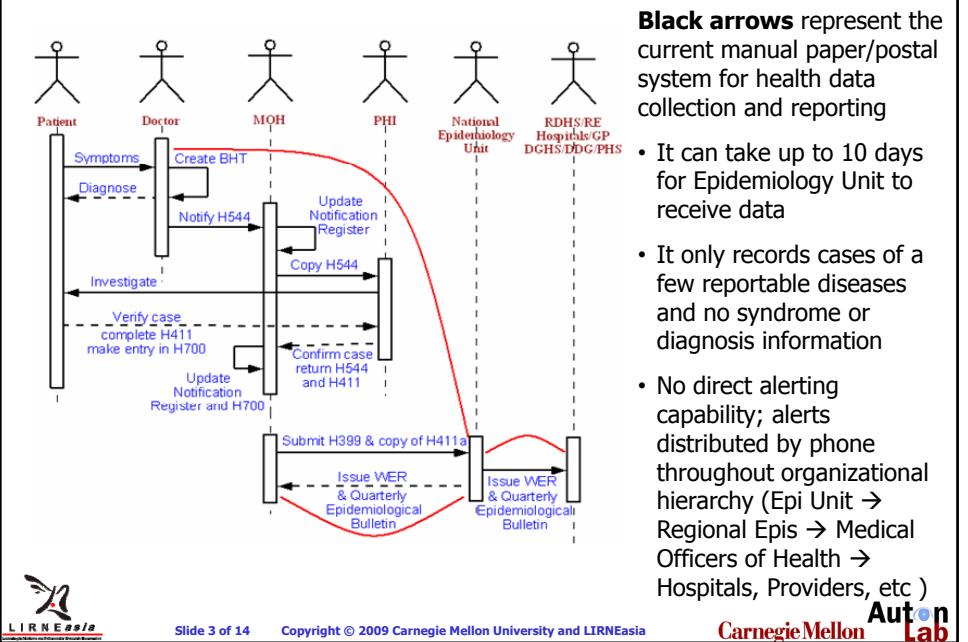
To present an on-going effort to establish a system
for real-time disease surveillance
in a developing country

Agenda:

1. Current disease reporting system in Sri Lanka
2. Concept of the Real-Time Biosurveillance Program
3. TCWI: An interactive surveillance component of RTBP
 - a. Short demo (video)
 - b. Examples of evaluations performed so far
4. Conclusion



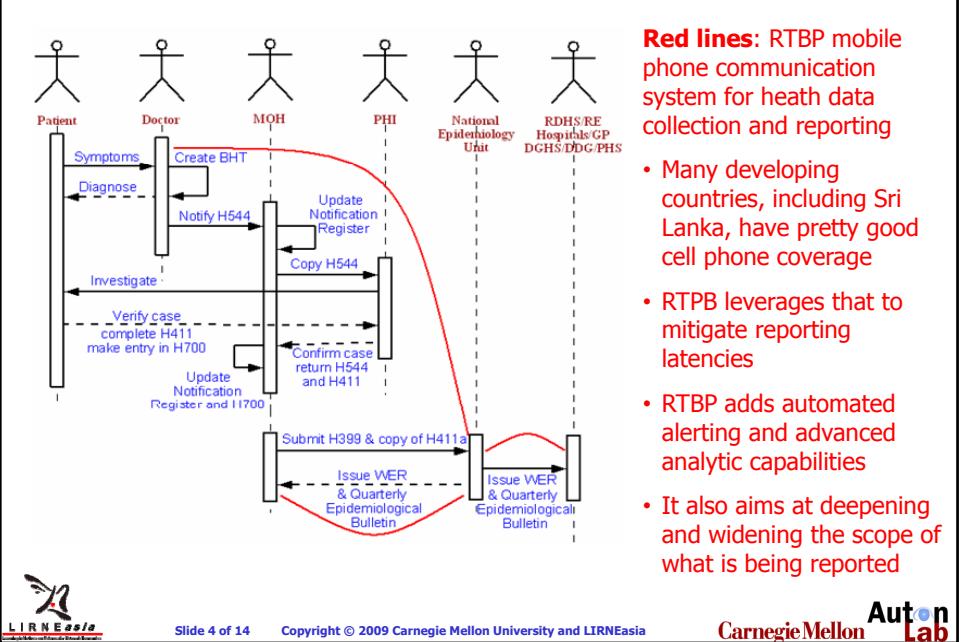
Sri Lanka Disease Notification: Current System



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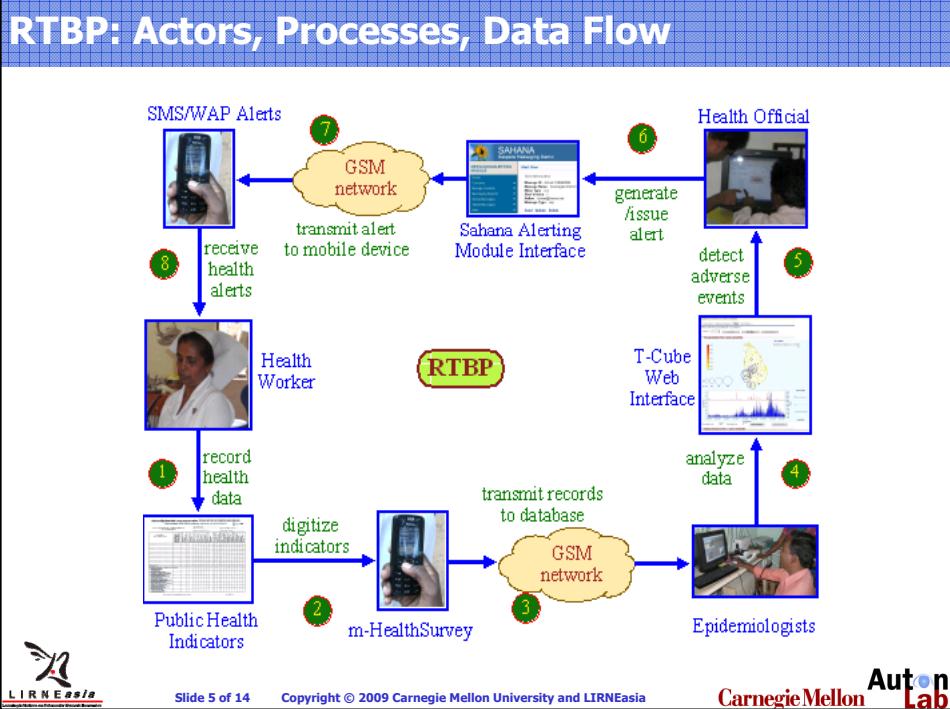
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SL Disease Notification: Opportunity for Improvement



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Improved Detail and Resolution of Data

Current	distinct value count 17	9	
	case date	location	disease
	Min 2009-12-16	Bihalpola	Dengue fever
	Max 2009-07-10	Bingiriya	Dysentery
		Bopitiya	Encephalitis
		Dambadeniya	Enteric fever
		Dunakadeniya	Food_poisoning
		Hettipola	Human rabies
		Horathapola	Leptospirosis
		Kandanegedara	Typhus fever
		Kattimahana	Viral Hepatitis
		Katupotha	
		Koshena	
		Kuliyapitiya	
		Minuwangatte	
		Munamaldeniya	
		Narammala	
		Sandalankawa	
		Wariyapola	

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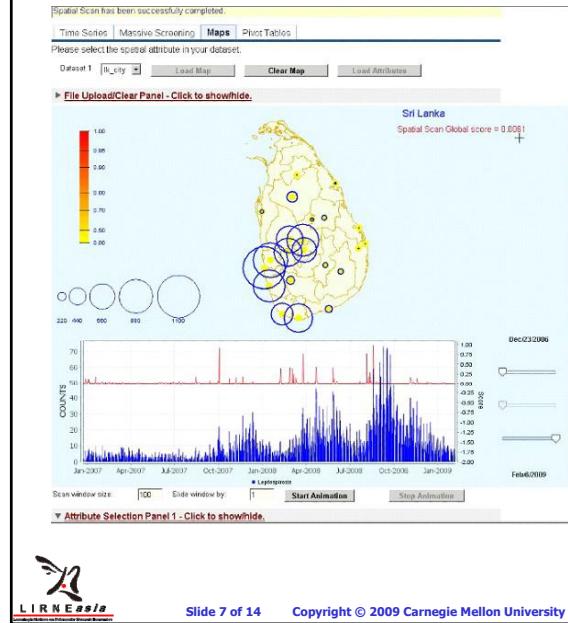
New	distinct value count 33	140	3	10	36	31	
	possible choices	single	single	single	multiple	multiple	
	case date	location	disease	gender	age group	sign	symptom
	Min 2009-09-03	Armanamulla	Abdominal pain	Female	0-1	Abdominal Pain	Coated tongue
	Max 2009-11-30	Bogahapitiya	Abscesses	Male	1-5	Anal itching	Crepitation
		Bopitiya	Accident	Unknown	6-14	Backache	Cyanosis
		Deegalla	Acne	15-19	Body ache	Dehydration	
		Dunakadeniya	Acute Diarrheal Disease	20-24	Burning sensation in the stomach	Delirium	
		Havenegedara	Acute Gastroenteritis	25-29	Chest pain	Deviation of the tongue	
		Horathapola	Allergy	30-34	Cold	Difficulty in breathing	
		Homombawa	Anemia	35-39	Constipation	Heart murmur	
		Kadapathwehera	Angina	40-45	Cough	Increase of respiratory rate	
		Kandanegedara	Anxiety	Above 45	Deviation of the tongue	Low Blood pressure	
	

RTBP:

- More dimensions
- More values per dimension
- Not just reportable diseases
- Daily resolution and collection cycles
- Finer spatial resolution

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T-Cube Web Interface in RTBP



- Efficient representation of data substantially speeds-up analyses and user interactions
- Implements statistical event detection techniques
- Enables data visualization along temporal and spatial dimensions at interactive speeds
- Automates alerts



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Video: Demo of the RTBP T-Cube Web Interface



RTBP: TCWI Evaluations Performed So Far

17 Hospitals/Central Dispensaries
16 Sarvodaya Suwadana Centers
Kurunegala District, North
Western Province, Sri Lanka

24 Health Sub
Centers;
4 Public Health
Centers Thirupathur
block, Sivaganga
District, state of Tamil
Nadu, India

- Data is being collected under the new schema only for a few months now
- Its amount & consistency do not warrant objective evaluations just yet
- Therefore, so far, evaluations rely on semi-synthetic data:
 - Use actual historically reported counts per region and per reportable disease
 - Other attributes in RTBP schema are then probabilistically synthesized
 - We test the **ability to detect known events**, the **usability in tracking of emerging events** and in **revealing systematic patterns** of events.



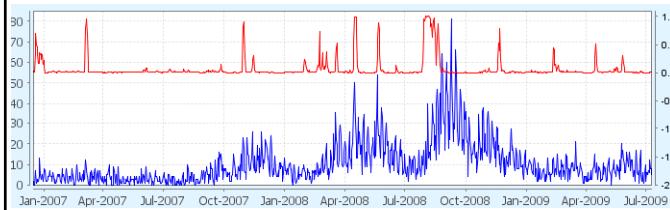
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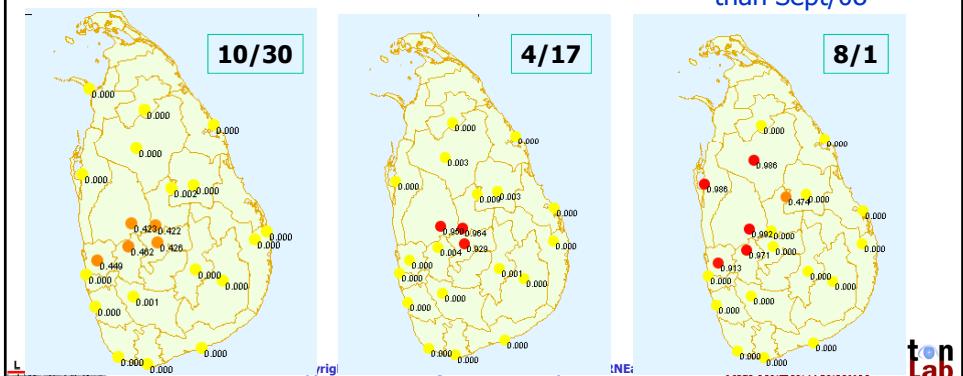
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Example Evaluation: Leptospirosis: Deadly Pile-up during Q4 2008--Q1 2009

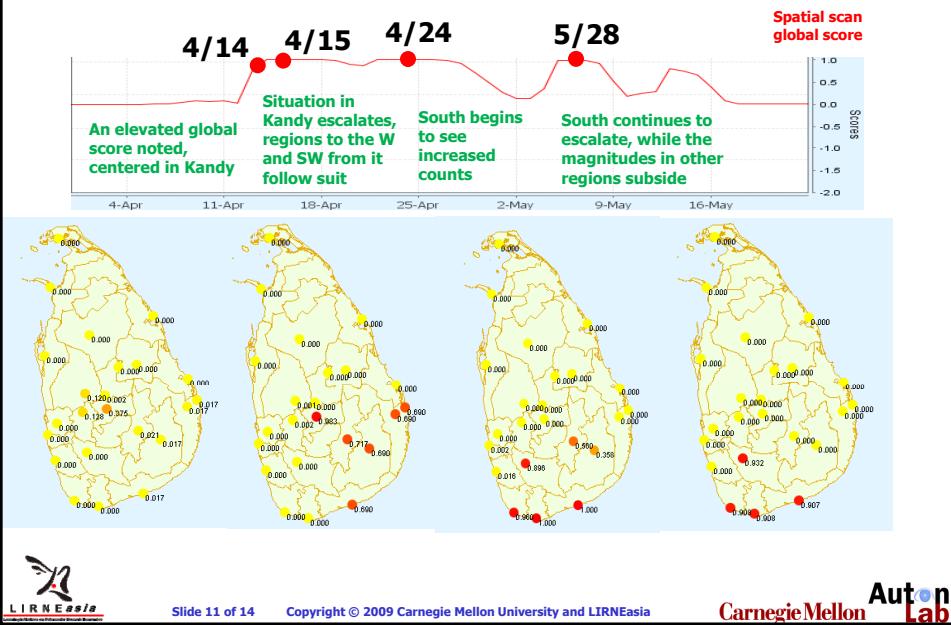
10/30 4/17 8/1



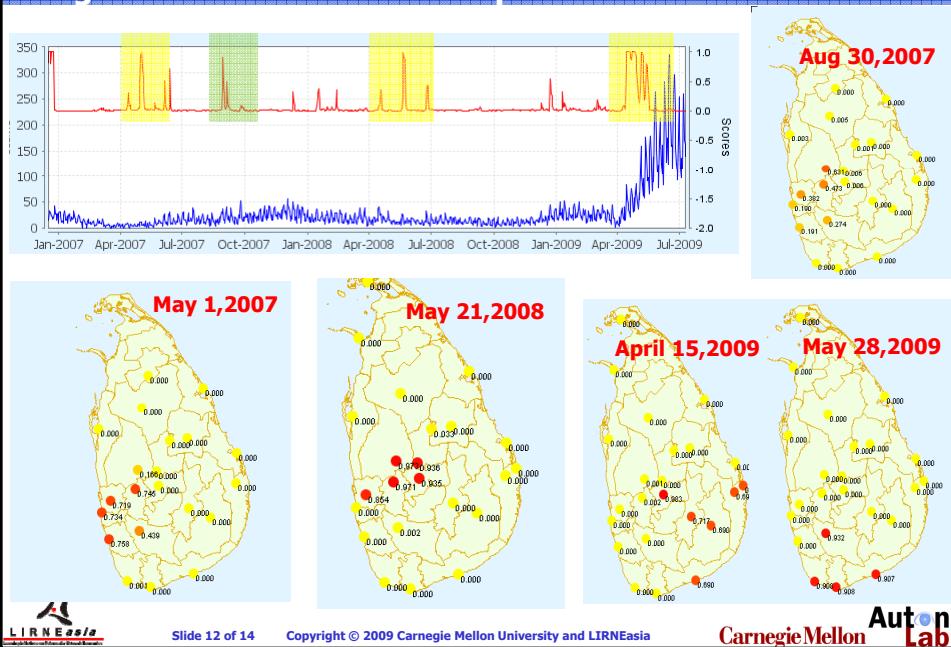
- Over 360 deaths
- Peak in Sept/08 originally noticed much later later
- RTBP would have picked up leading waves much earlier than Sept/08



Example Evaluation: Progression of Dengue Fever Outbreak (Spring 2009)



Example Evaluation: Dengue Fever: Seasonal and Spatial Patterns



Summary and Conclusion

1. RTBP **deepens and widens coverage** of reported health data while significantly **reducing latency of reporting**
2. T-Cube Web Interface (TCWI) supports RTBP by enabling:
 - a. **Automated comprehensive searches for events of interest through large collections of data**
 - b. **Interactive data navigation and visualization**
 - c. Automated explanation of detected patterns
3. A fielded RTBP-like system can **qualitatively** yet **affordably** improve ability to detect and mitigate bio-medical threats in countries with limited resources and infrastructure
4. The pilot studies are ongoing in Sri Lanka and India, but we are on the outlook for additional challenges.



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- Carnegie Mellon University Auton Lab, USA

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