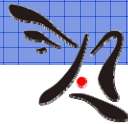


T-Cube Web Interface for Real-time Biosurveillance in Sri Lanka

Maheshkumar Sabhnani¹, [Artur Dubrawski](#)¹ and Nuwan Waidyanatha²

¹ The Auton Lab
Carnegie Mellon University

² LIRNEasia
Colombo, Sri Lanka



LIRNEasia
Learning Initiatives and Programs for Network Enhancement

Carnegie Mellon **Auton Lab**

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

Objective:

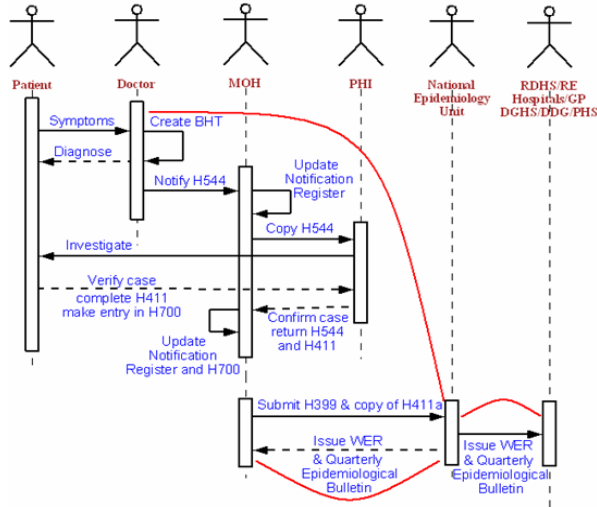
To present an on-going effort to establish a system
for real-time disease surveillance
in a developing country

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



Black arrows represent the current manual paper/postal system for health data collection and reporting

- It can take up to 10 days for Epidemiology Unit to receive data
- It only records cases of a few reportable diseases and no syndrome or diagnosis information
- No direct alerting capability; alerts distributed by phone throughout organizational hierarchy (Epi Unit → Regional Epis → Medical Officers of Health → Hospitals, Providers, etc)

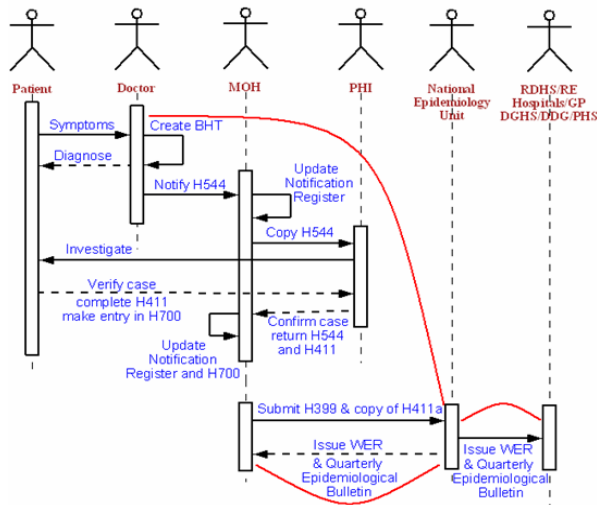


Slide 3 of 14

Copyright © 2009 Carnegie Mellon University and LIRNEasia



SL Disease Notification: Opportunity for Improvement



Red lines: RTBP mobile phone communication system for health data collection and reporting

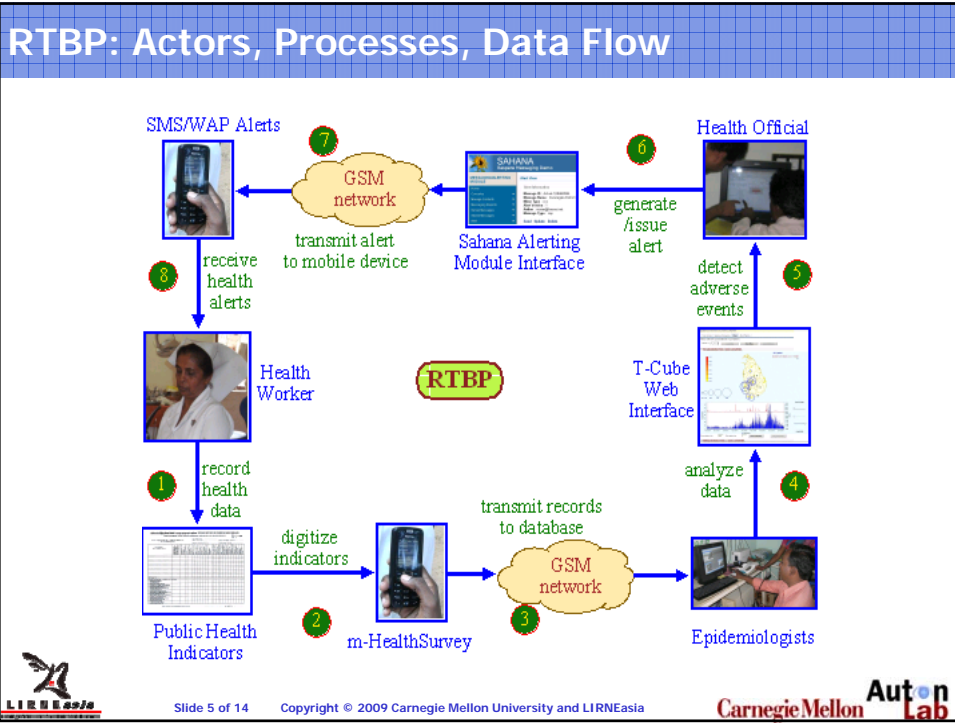
- Many developing countries, including Sri Lanka, have pretty good cell phone coverage
- RTPB leverages that to mitigate reporting latencies
- RTPB adds automated alerting and advanced analytic capabilities
- It also aims at deepening and widening the scope of what is being reported



Slide 4 of 14

Copyright © 2009 Carnegie Mellon University and LIRNEasia





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	Bingriya	Dysentery
	Bopitiya	Encephalitis
	Dambadeniya	Enteric_fever
	Dunakadeniya	Food_poisoning
	Hettipola	Human_rabies
	Horathapola	Leptospirosis
	Kandanegedara	Typhus_fever
	Kattimahana	Viral_Hepatitis
	Katupotha	
	Koshena	
	Kuliyapitiya	
	Minuwangatte	
	Minumaldeniya	
	Narammala	
	Sandalankawa	
	Wariyapola	

RTBP:

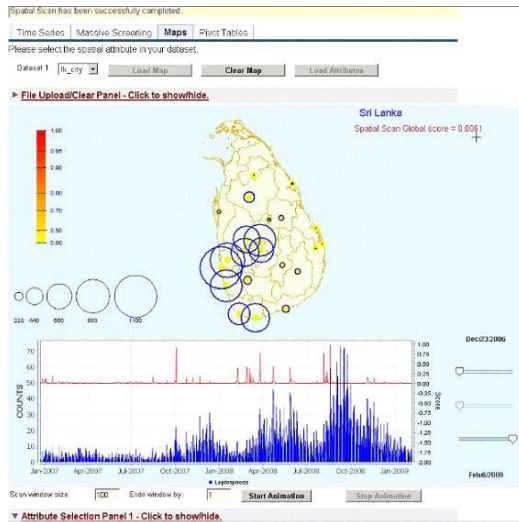
- More dimensions
- More values per dimension
- Not just reportable diseases
- Daily resolution and collection cycles
- Finer spatial resolution

New

distinct value count	33	140	3	10	36	31
possible choices	single	single	single	single	multiple	multiple
case date	location	disease	gender	age group	sign	symptom
Min 2009-09-03	Ammanamulla	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
	Havenegegedara	Acute Gastroenteritis		25-29	Chest pain	Deviation of the tongue
	Horathapola	Allergy		30-34	Cold	Difficulty in breathing
	Horombawa	Anemia		35-39	Constipation	Heart murmur
	Kadapathwehara	Angina		40-45	Cough	Increase of respiratory rate
	Kandanegedara	Anxiety		Above_45	Deviation of the tongue	Low Blood pressure

Slide 6 of 14 Copyright © 2009 Carnegie Mellon University and LIRNEasia

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



Slide 7 of 14

Copyright © 2009 Carnegie Mellon University and LIRNEasia



Video: Demo of the RTBP T-Cube Web Interface

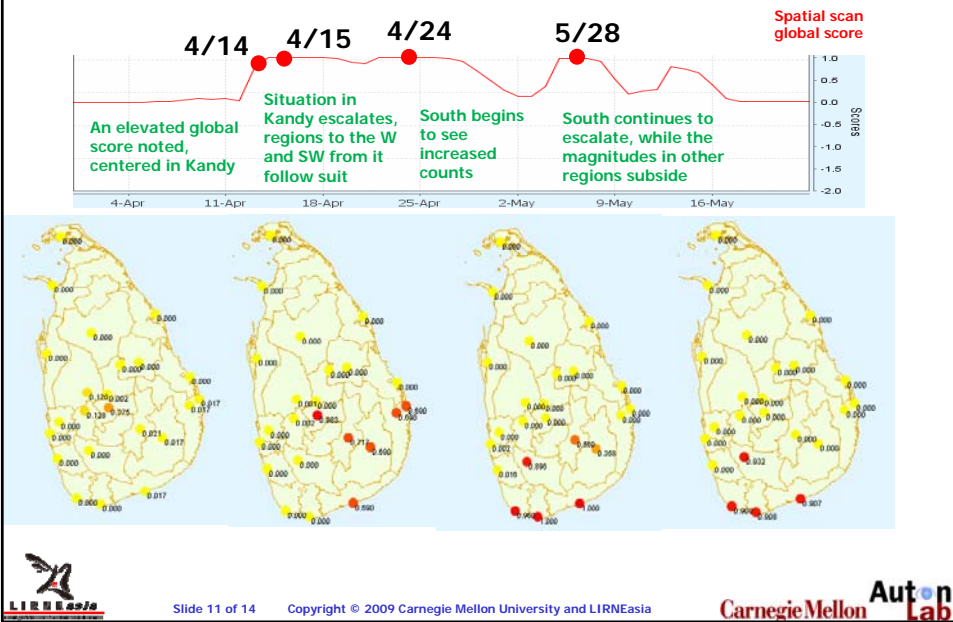


Slide 8 of 14

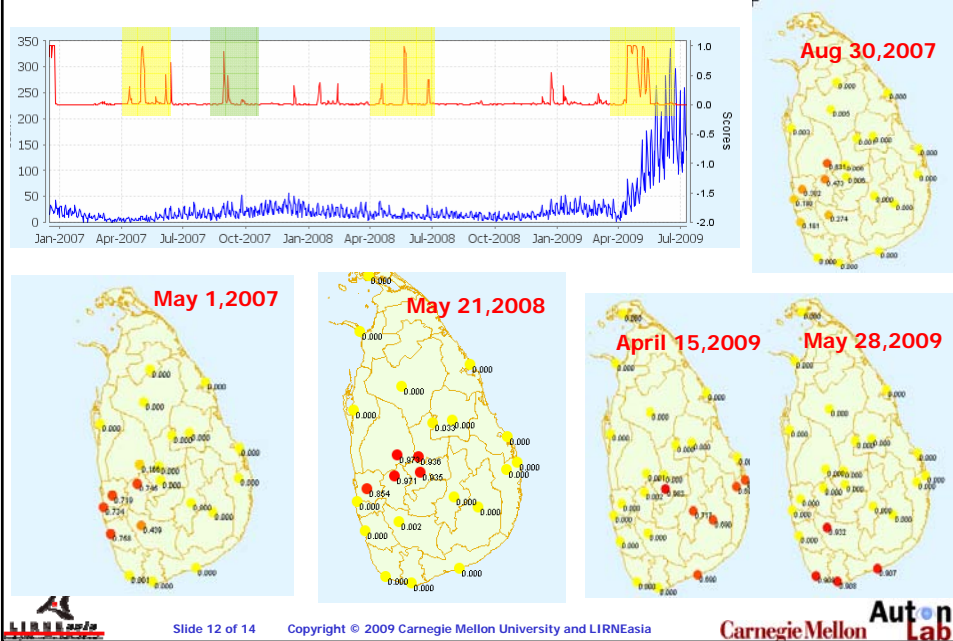
Copyright © 2009 Carnegie Mellon University and LIRNEasia



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.



Slide 13 of 14

Copyright © 2009 Carnegie Mellon University and LIRNEasia



Acknowledgements

This work has been supported in part by the International Development Research Centre of Canada (105130), and by CDC (R01-PH000028) and NSF (IIS-0911032).



We have also received support from numerous collaborators not specifically named here!



Partners in RTBP:

- LIRNEasia
- Indian Institute of Technology Madras, India
- National Center for Biological Sciences, India
- Sarvodaya Shramadana Society, Sri Lanka
- Respere Lanka (Private) Limited, Sri Lanka
- University of Alberta, Canada
- Carnegie Mellon University Auton Lab, USA



Slide 14 of 14

Copyright © 2009 Carnegie Mellon University and LIRNEasia

