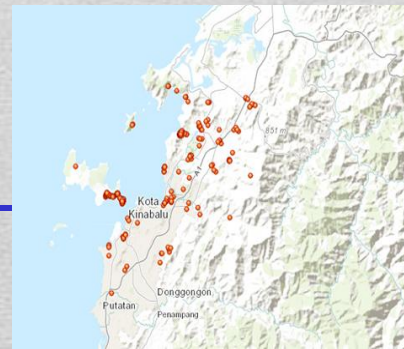


# Towards An Electronic Health & GeoHealth information System in Malaysia (e-GeoHealth): Mobile Online Geospatial Service for Sharing & Managing Disease Information in Sabah (Case Study: Cholera)

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1

- Introduction
- Problem statements
- Aim of the study
- Methodology
- Results and Applications
- Conclusion

# Contents

2

- **Electronic Health and GeoHealth Information System**  
**(E-MyGeoHealth: Electronic-Malaysian Geospatial and Health)**

**E-health** is the transfer of health resources and health care by electronic means. Consists of 3 main parts: The delivery of health information, Using the power of IT and e-commerce to improve public health services, The use of e-commerce and e-business practices in health systems management. (WHO, 2014)

E-health/Internet/Telematics /electronic health record (EHR) provide a new method for using health resources: for information dissemination, and for interaction and collaboration among institutions, health professionals, health providers and the public. (WHO,2014)

**GeoHealth-** application of location-based data /geospatial technology and analysis to public health and the healthcare industry. (GeoHealthInnovation.com, 2014)

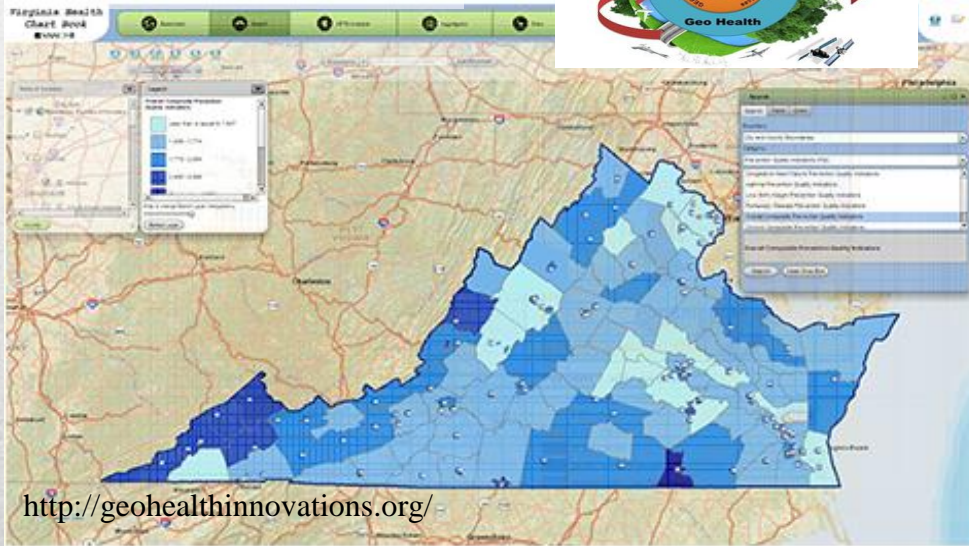
Applications: to embed geography as a variable in the analysis of disease, social determinants of health, and environmental factors, use of predictive modeling and generation of high priority target areas (HPTAs) provide clients with important decision-making tools in the implementation of public health policy and intervention.(GeoHealthInnovation.com, 2014)

# Introduction

*A methodology based on computer system for studying the association between spatial environment, health and their surrounding*

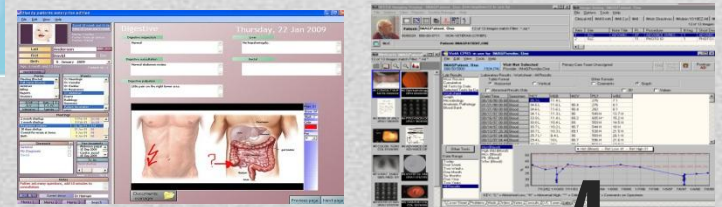
**GeoHealth Innovations**  
Changing the View on Public Health

**GeoHealth**



<http://geohealthinnovations.org/>

Electronic >>  
Health Records  
Byron Hamilton



4

[http://en.wikipedia.org/wiki/Electronic\\_health\\_record](http://en.wikipedia.org/wiki/Electronic_health_record)

*In Malaysia, there are several studies and reports on the health/disease using geospatial techniques, but they are more focusing on academic/research purposes, still in early stage of study, and using unintegrated functions of the techniques*

The lung icon was selected which represents all of the Respiratory illnesses. By clicking on the lung all the patients who had respiratory illnesses have been identified both on the patient map and in the patient table.

Patientid	ICd9	Charges	Provider
7588056	786.2	99.00000	Dr. Jones
7588098	276.5	83.00000	Dr. Jones
7588106	473.9	155.00000	Dr. Jones

Contribution of GIS and remote sensing technologies for managing foodborne diseases in Malaysia

Thursday, June 20, 2013

## Malaysia's Dengue Fever Portal and other Health GIS News

Malaysian officials are using GIS to track and hopefully quell the spread of dengue fever in the country, the *Malaysian Geospatial Health* 7(1), 2012, pp. 21-25

## Risk mapping of dengue in Selangor and Kuala Lumpur, Malaysia

Hafiz Hassan<sup>1</sup>, Shamarina Shohaimi<sup>2</sup>, Nor R. Hast

## Application of GIS in Health Management and Analysis

Dr Hj Tahir Bin Aris

Idi Azhar Mohd Hussin<sup>a</sup>, Noorizan Abdul Majid<sup>a</sup>,  
Id<sup>b</sup>, Syahrul Hisyam Baharudin<sup>a</sup>, Nik Nasruddin Mahmo

## The Application of Geographic Information System (GIS) and Remote Sensing Techniques In Mapping of Children with Malnutrition – An Introduction

# Introduction (2)

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- World Health Organization (WHO) suggests the National Infectious Disease Control Programs of particular countries **need to be applying innovative technologies to efficiently control of disease spreads.**
- However, most of the current surveillance systems in developing countries are **inadequate for the effective management and evaluation of this program complexity** (e.g. Limitation of cost and staff skill in using geospatial technologies)
- Technology is an essential tool to assist health organizations in proper controlling and preventing infectious outbreaks (e.g. Cholera). For examples; **Open Source GIS (QGIS), Esri ArcGIS Desktop and Online, Mobile GIS-Based Services, Virtual Globes (e.g. Google Earth™) and Augmented Reality (AR) etc**
- Geospatial technology can create database, map, visualize and analyze and manage of health/disease data (e.g. disease pattern analysis, health facility/care distribution, sharing and delivering data etc)

# Problem statements

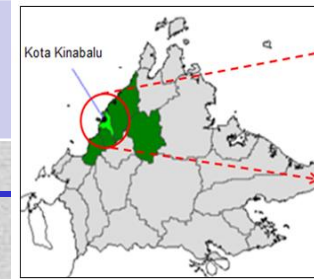
- This study **demonstrates the capabilities of Geospatial/GIS architecture applications in enhancing the current health information system of Malaysia particularly in Sabah. Mobile online geospatial service for sharing and managing disease information is proposed to be implemented in the state.**
- These integrated technologies showed the disease **database and map could be dynamically displayed in the system, and create a qualitatively / model hypothesis regarding relationship between the disease and its potential risk factors towards developing an e-GeoHealth Information System in Malaysia**

# Aim of the Study

7

- Overall steps used in this study are data/material collection, data processing, and data result and analysis

Software /Data used	Function
Google Earth, Google Map and Wikimapia	Provide information of the location and map of the cases
ArcGIS Online	a cloud-based system for mapping, searching information, storing and managing data, updating data, analysing, sharing data
ArcGIS 10.1 (ArcMap 10.1)	for creating maps, compiling geographic data, analysing mapped information, sharing etc
ArcGIS Esri for Android software /ArcGIS App Esri Software	can navigate maps, collect and report data, and perform GIS analysis using a free application downloaded from Android Market
Topographical map and cholera cases	Base map and main data



# Methodology (1)



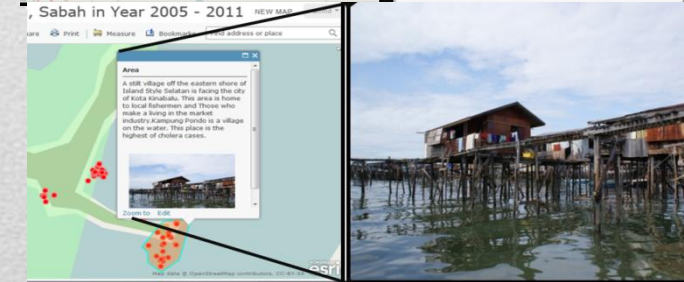
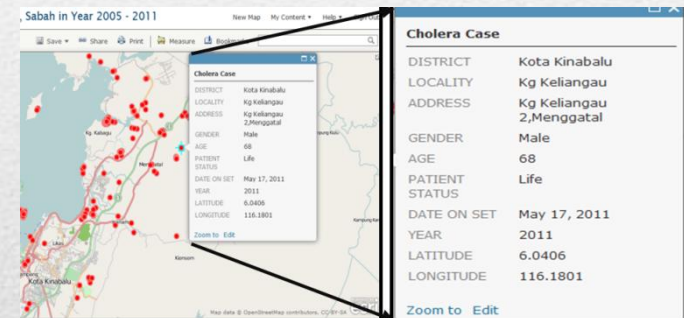
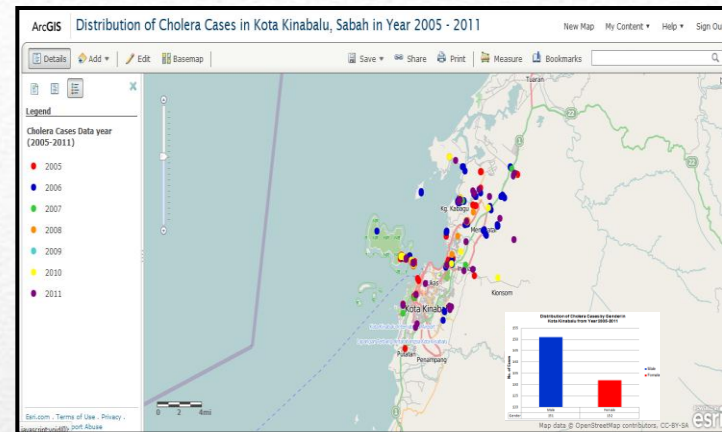
Step	explanation
Geocoding process	X,Y Information of the cases are added in the cholera cases (M.Excell), then converted into comma separated value (CSV)file format
Mapping and system development	ArcGIS.com online used to locate the position (x,y) of the cases by adding layer from CSV file. Then, the map is customizing by customizing many aspects of the map (e.g. OpenStreetMap) and its other symbology menu.
Data analysis	Data analysis of the cases (e.g. Kernel) from ArcGIS desktop are added in the ArcGIS Online for analysis and vieweing.
Sharing web map using Mobile devices	Click share and make sure the map is shared with everyone/public.

# Methodology (2)

- *Spatial Distribution of Cholera Cases Using ArcGIS Desktop and Online*
- *General Spatial Pattern Analysis of Cholera Distribution*
- *The Potential of Geospatial Applications (e.g. ArcGIS online) in Cholera Spatial Mapping, Analysis and Management*

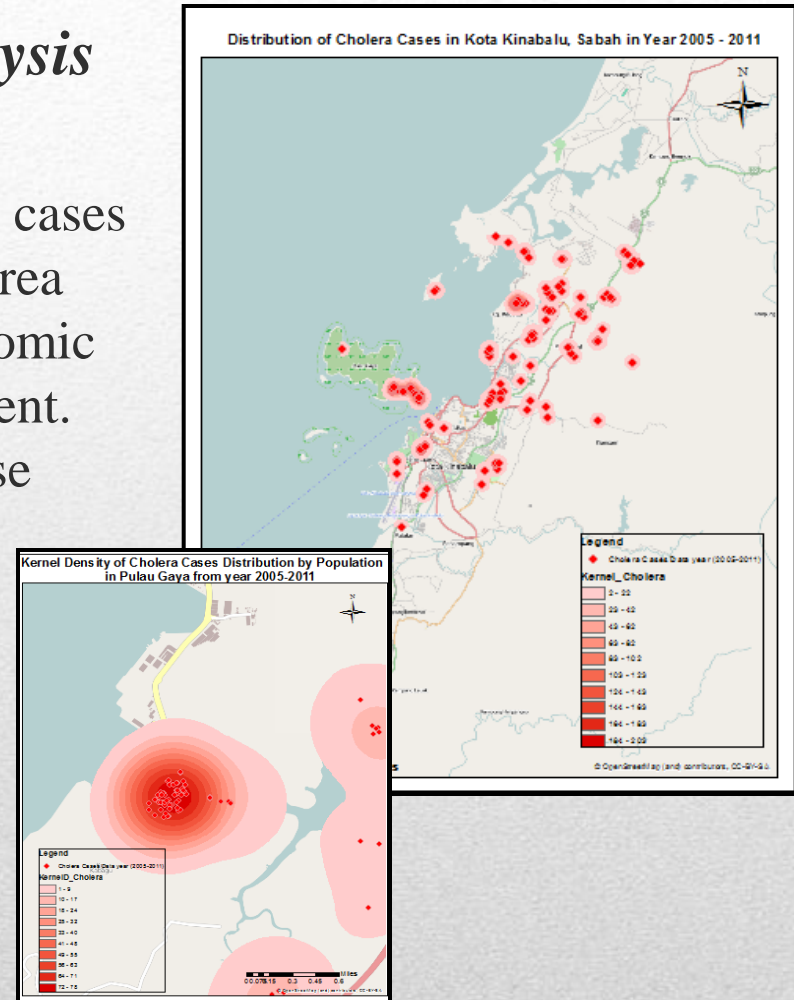
# Results and Applications 10

- *Spatial Distribution of Cholera Outbreaks*
- There are seven years of cholera cases involved in the study, from 2005 to 2011. The red color of point cholera cases represents the year 2005 which the highest number of cholera cases. The blue color of point cholera cases represents the year 2009 which the lowest number of cholera cases. It can be concluded that almost all point cases of cholera incidence located near to coastal line and river



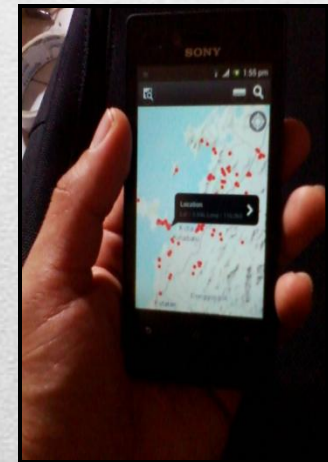
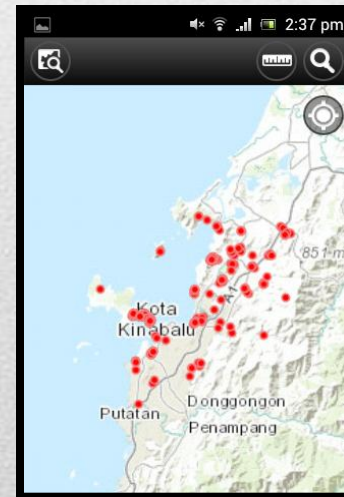
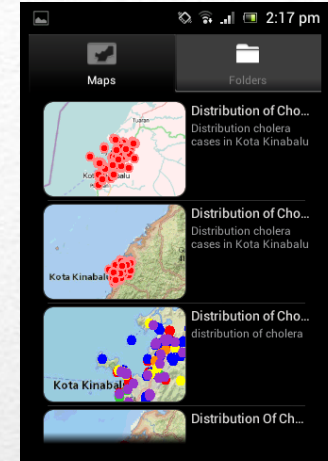
# Results and Applications(1)

- *General Spatial Pattern Analysis of Cholera Distribution*
- It is found out that the pattern of the cases is random and clustered where the area characteristics are lower socio economic groups and poor hygienic environment. These phenomena revealed that those cases could be occurred anywhere especially in unhygienic areas



# Results and Applications (2)<sub>12</sub>

- *The Potential of Geospatial Applications (e.g. ArcGIS online) in Cholera Spatial Mapping, Analysis and Management*
- It is seen that the technologies are not only used for mapping, managing and analyzing the data, but also for **sharing and displaying the data** to authorities and public applications.



# Results and Applications (3)<sub>13</sub>

- **Online mobile GIS-based services** can give a lot of benefit in term of data sharing **where the people** are able to know the information of diseases. ArcGIS Online can show the **attribute of cholera** patients such as district, locality, address, gender, age, patient status, date onset and coordinate.
- Besides that, the users can make some **simple analysis** on certain endemic areas. For example, this study elucidates the cholera distribution is close to the residential area, near the coast and rivers with dense population. Thus, it can **help awareness** for people to be more cautious in their health care. However, issues of **privacy and security** in such data need to be considered first before publishing them in particular internet or web

# Conclusion

- The authors acknowledge the invaluable guidance and datasets support from State Health Department in Sabah (JKN, Sabah), Department of Survey and Mapping Malaysia (DSMM) and UiTM.

# Thank You

15