WBD: Cholera Early Warning System

Linking GEO, Health and post Millennium Development Goals agenda

Tokyo, Japan

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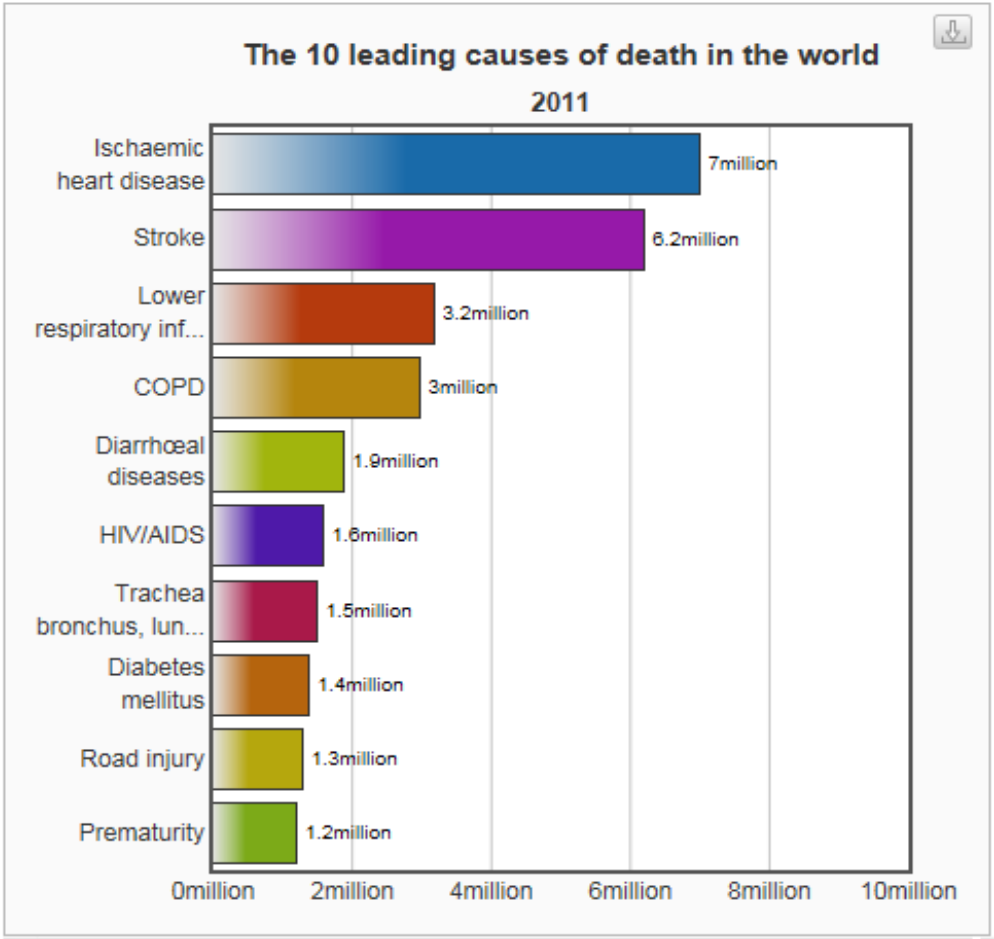
Diarrhoea disease: leading cause, cholera a menace

3-5 million cases of cholera and 120,000 deaths each year



http://www.who.int/mediacentre/factsheets/fs310/en/index.html

MDG target met 2010···people are still dying!

MDG 7 Target 7c:

- Halve, by 2015, the proportion of people without sustainable access to ***safe drinking water*** and basic sanitation

Indicator to monitor (proxy for access to safe drinking-water):

- Proportion of the population that uses an ***improved*** drinking-water source (urban + rural)

An improved drinking water source is:

"a source that by the nature of its construction adequately protects the source from outside contamination in particular with fecal matter"

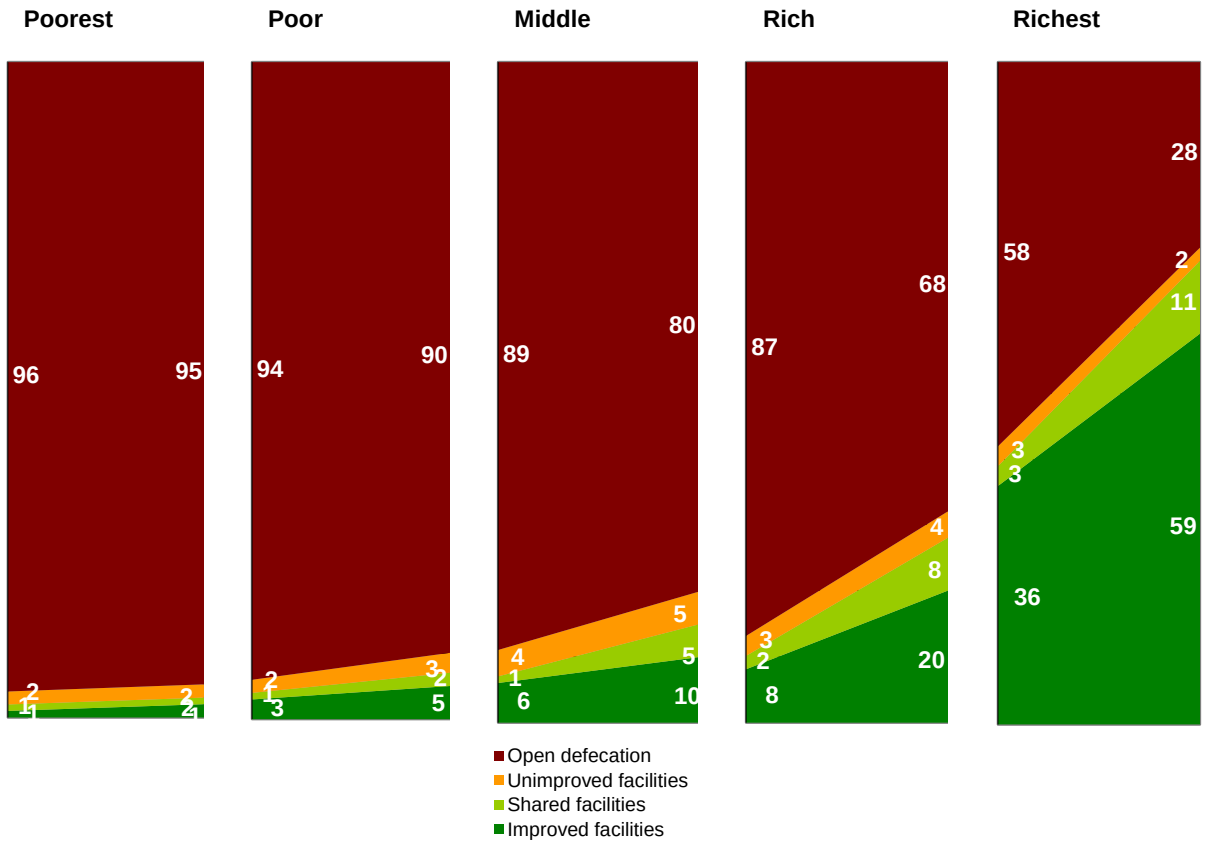
Current UN stats (WHO and UNICEF)

- 748 million without potable water,
- Billions without safe water
- 2.5 billion without proper sanitation,
- 1.0 million defecate in open
- Diarrhoea kills 1,800 children every day…
- Worse under changing climate scenarios…but how much?

For more info on MDG WASH and stats: www.wssinfo.org

Little progress for the lowest 40%

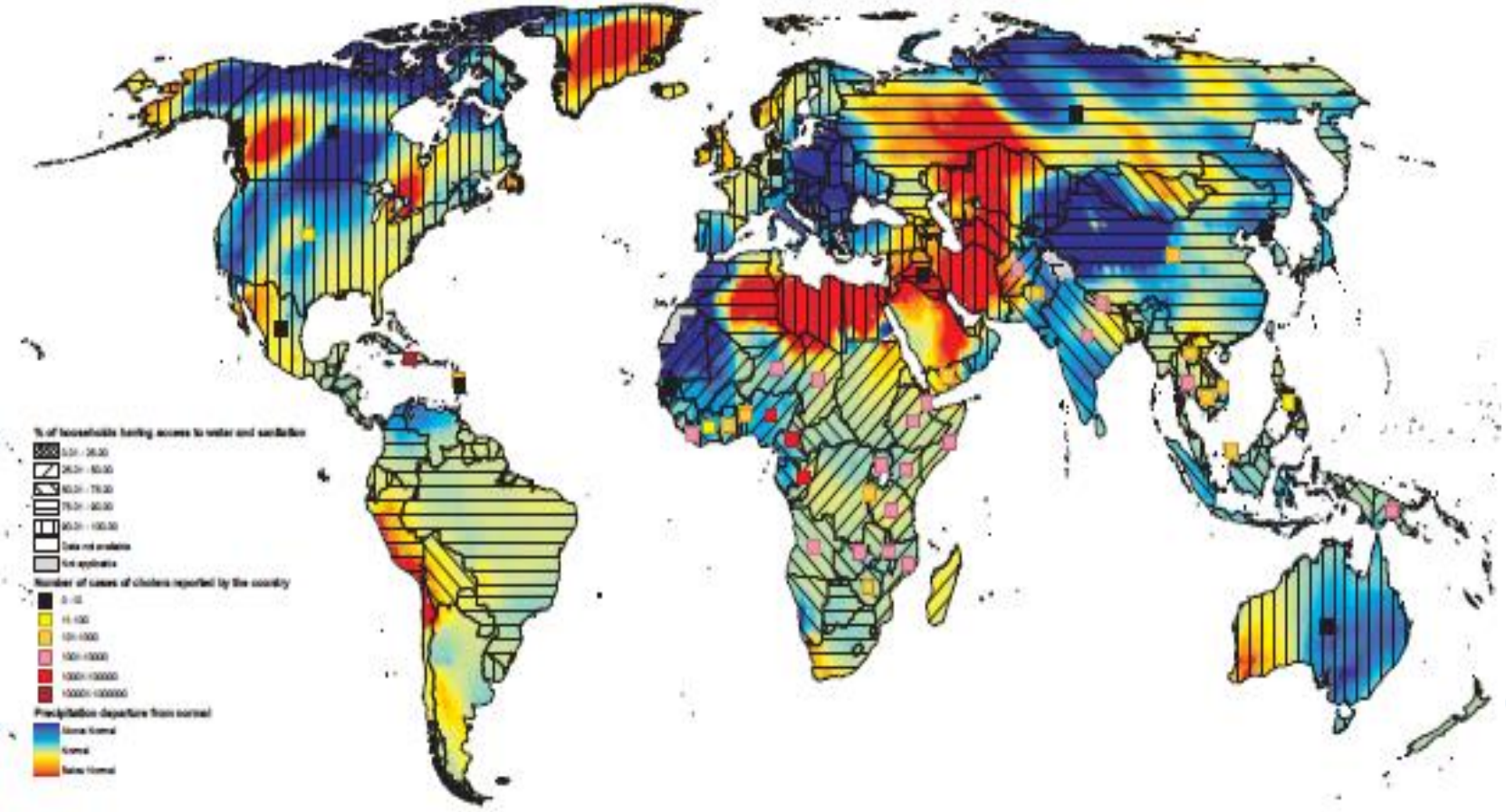
INDIA - Rural sanitation coverage



Rich-poorest 40% gap increased 1995-2008: **36% pt to 65% pt**

Global risk assessment: GEO, GFCS etc.

http://www.who.int/globalchange/publications/atlas/report/en/index.html

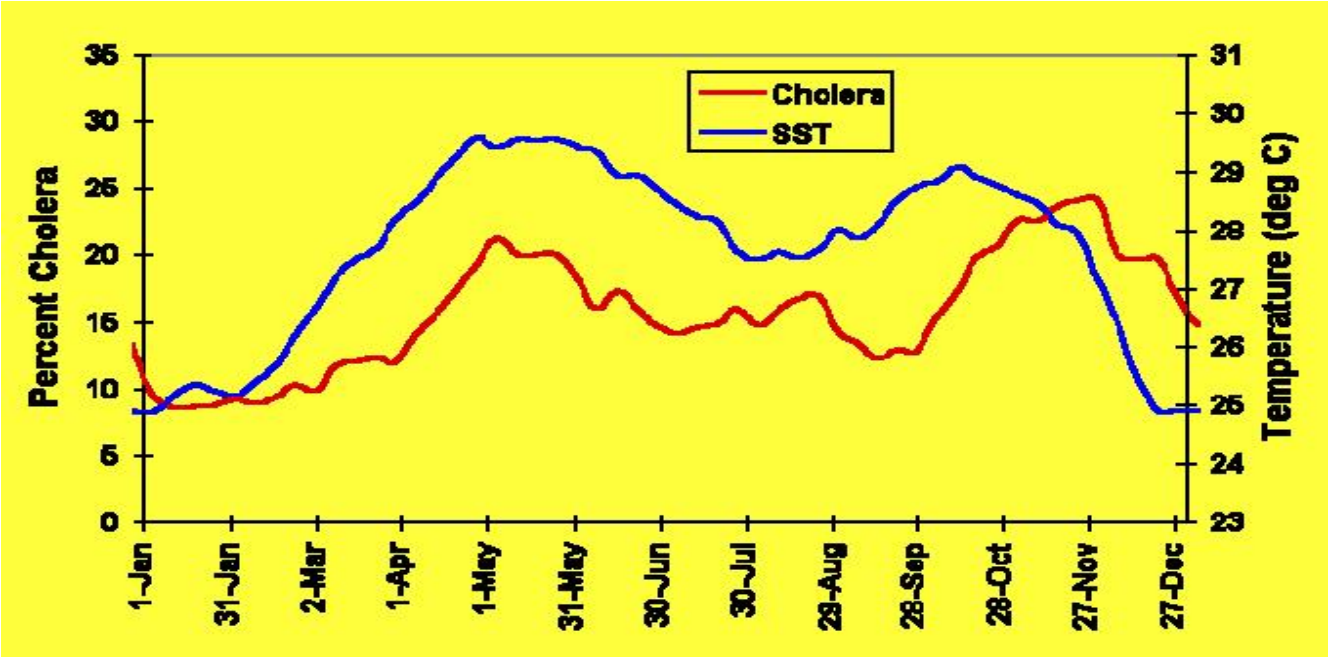


Cholera outbreaks in areas where WASH coverage is poor, and more likely with higher precipitation anomalies

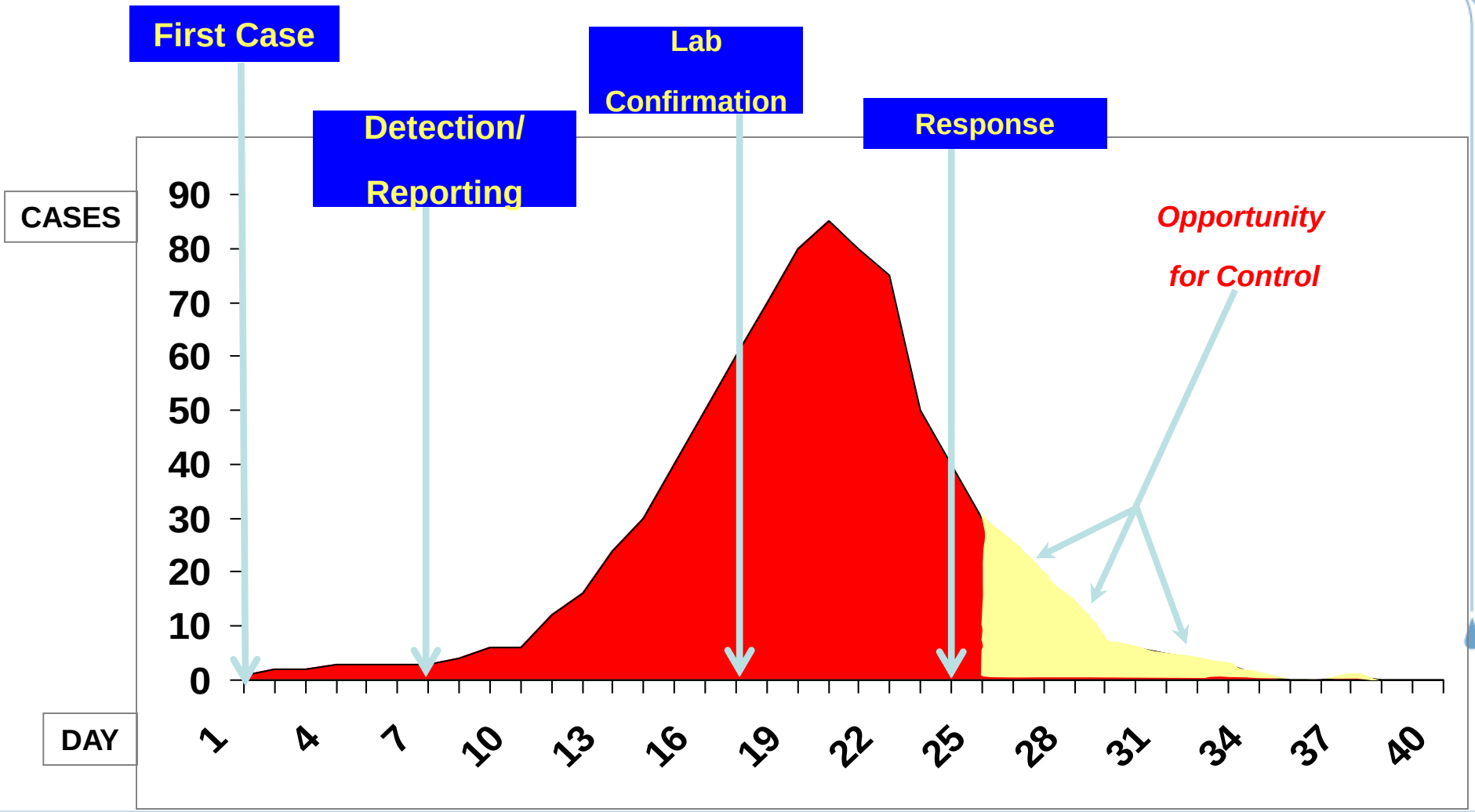
What are the environmental drivers?

- Sea Surface Temperature
- Salinity
- Chlorophyll
- Temperature

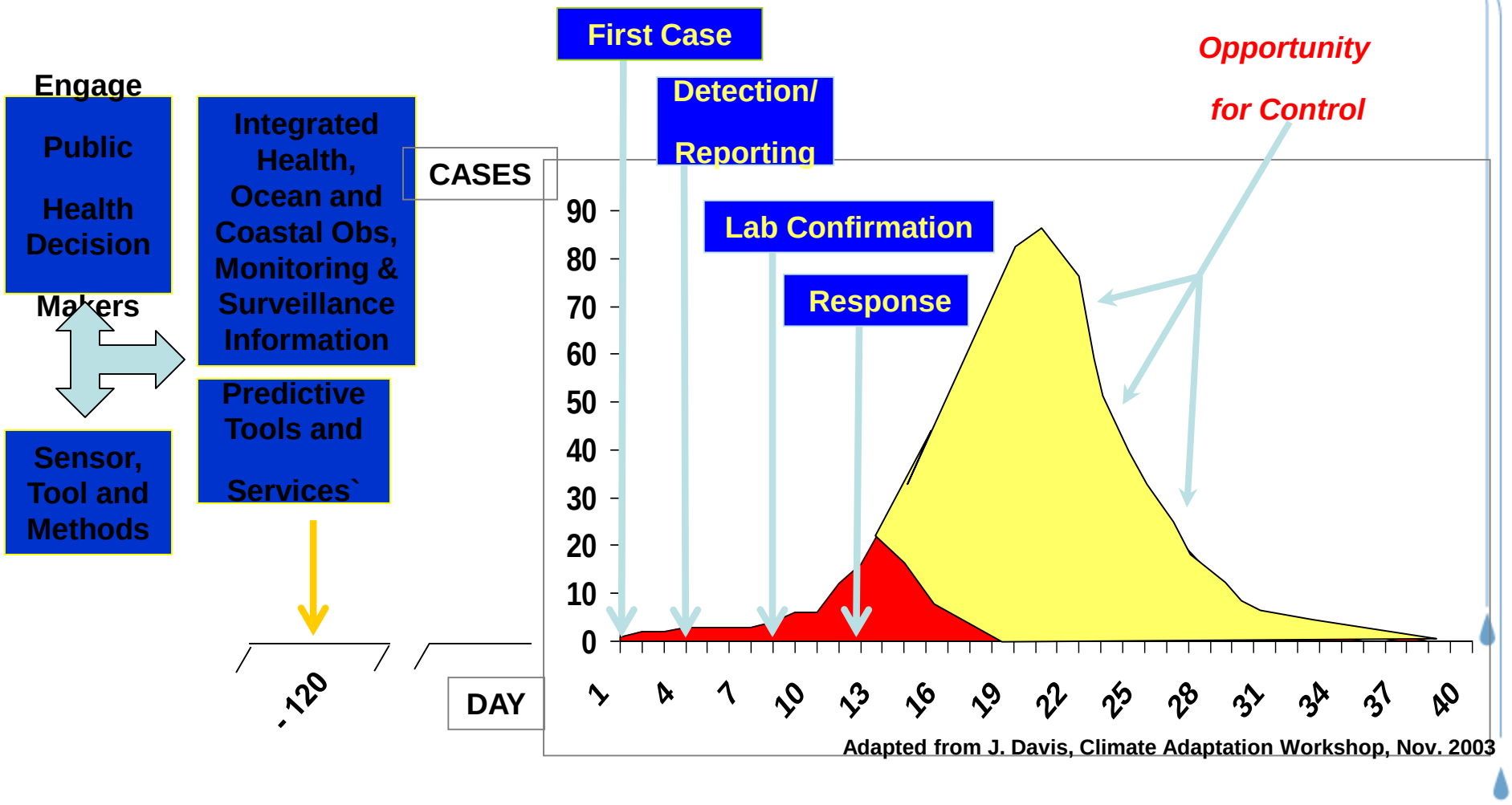
- Soil Moisture
- Precipitation
- Soil Type



Current Epidemic Detection and Response Curve



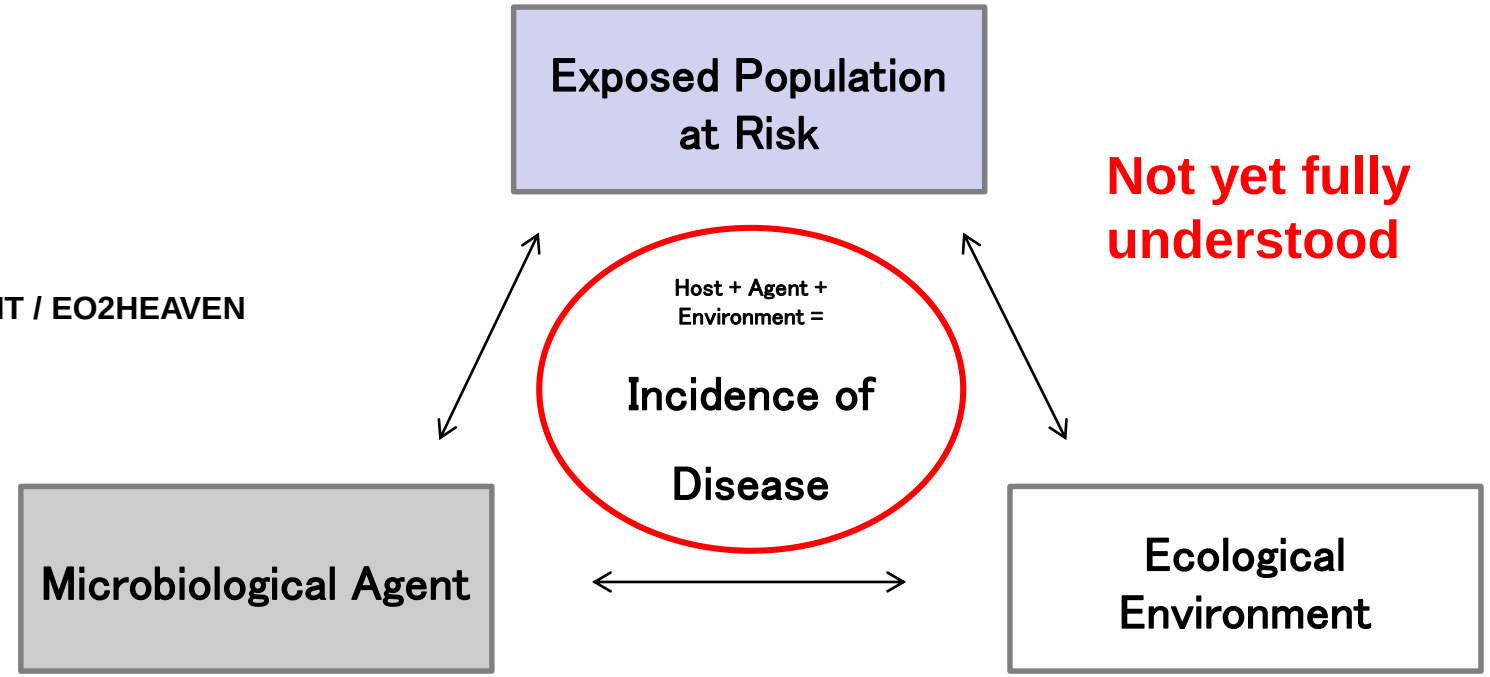
Getting ahead of Curve: Integrate information



Adapted from J. Davis, Climate Adaptation Workshop, Nov. 2003

One Health Aspects for cholera

- Climate–water–health nexus
- Water–microbiology–food–health chain
- Outbreaks depend on socio–economic factors



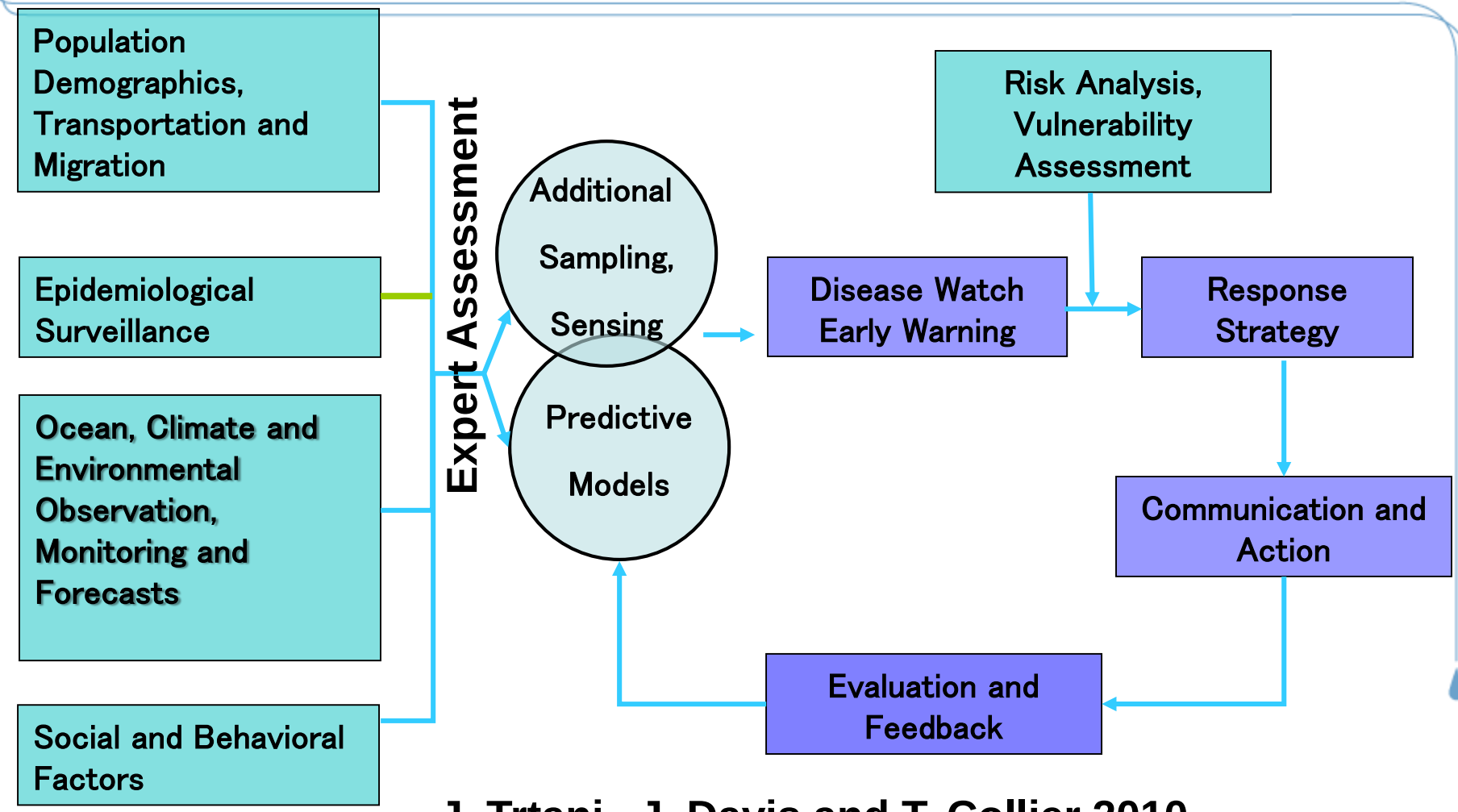
Not yet fully understood

Figure: KIT / EO2HEAVEN

Lessons learnt Cholera Case Study Uganda

- Patterns in case and environmental data only appear at coarser spatial and temporal scales
- Models based only on environmental factors do not capture the underlying dynamics of outbreaks
- Difficult to find cause–effect mechanisms;
  - fresh water cholera case differs from coastal case
- For prediction models: need to track case development in neighboring areas as well as environmental conditions in the larger area
  - road distance, population density important
- Implies need for
  - flexible framework to integrate data and models for scientific analysis
  - better case surveillance

Components of a Cholera Early Warning System



J. Trtanj., J. Davis and T. Collier 2010

Cholera Early Warning System Framework

Cholera Outbreak Forecasting
Tool for early warning and preparedness
Cholera risk identification:
where, when and in what magnitude

VI. Build Early warning system
1. Real time integration
2. Dissemination to public health system

Outbreak Hindcasting, Risk analysis, vulnerability assessment

V. Develop predictive model
1. Data integration, risk analysis
2. Vulnerability assessment
3. Prediction tool of outbreaks
4. Disease watch early warning

Model based analysis, model calibration & validation

Integrating data & models

Climate Data linked to NOAA data

Disease Incidence and Epidemiological Data

Cholera Pathogen Data

WASH and socio-economic data

I. Climate and Environment Risk Research
1. Climatic factors
2. Topographic /Geological
3. Hydrology -water systems and water quality
4. (Waste water networks)

II. Epidemiological Risk Research
1. Clinical prevalence and description of person, time and place
2. Surveillance system

III. Microbiological research
1. Strain identification
2. Bacterial prevalence and epidemic potential

IV. Population and Socio-Economic Risk Research
1. Demographics and migration
2. Socio-economic data
3. Access to water and sanitation services (GIMS)
4. Personal risk factor identification
5. Waste disposal (GIMS)

Multidisciplinary Team for cholera EWS

- **Building on**
  - **WHO GIMS, NOAA Ecological Forecasting and Data Services, and Fraunhofer ICT system skills**
  - **EO2HEAVEN results and NOAA work in US coastal regions**
  - **Cholera research of Berg-en-Dal group**
- **Seeking funding to build sustainable, operational Early Warning System for any interested country**