



# Humanitarian Assistance/ Disaster Response (HA/DR) Information Technologies

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# IT & HA/DR: Computational analytics

1. Automated events data analytics
2. Agent-based modeling of refugee camps

# I. Automated events data analytics (AEDA)

- Early warning (EW) and preparedness: “Seeing it coming”
- AEDA is a computational methodology that has matured over a 40-year period (WEIS, COPDAB, now GDELT)
- Selected methods from AEDA have actionable value and transition potential
- Advanced AEDA uses algorithms to extract and analyze latent dynamic drivers of disaster incident-events distributed in space and time
- Onset, location, extent, duration, and other features are dimensions of HA/DR incident-events
- Each dimension has computable generative functions and statistics that can add value as actionable EW intelligence and risk assessments to improve preparedness
- Current data standard: GDELT (Global Database of Events, Language, and Tone): 1–1.5 x 10<sup>5</sup> events/day by 0400 CTZ = 1000 GMT/UTC

# GDELT Oct 7, 2013



## 2. Agent-based modeling (ABM) of refugee camps

- Modeling and simulation (M&S) of real-world refugee camps with high-fidelity local scale and individual persons
- Dadaab Refugee Camp Complex, Kenya
- Population  $0.5 \pm 0.1$  million
- Validation using empirical data from the field (UNHCR, AID, ICRC, among others) and multiple standard validation tests for M&S
- What-if scenario analyses for discovery and improving preparedness

# Dadaab Refugee Camps Complex

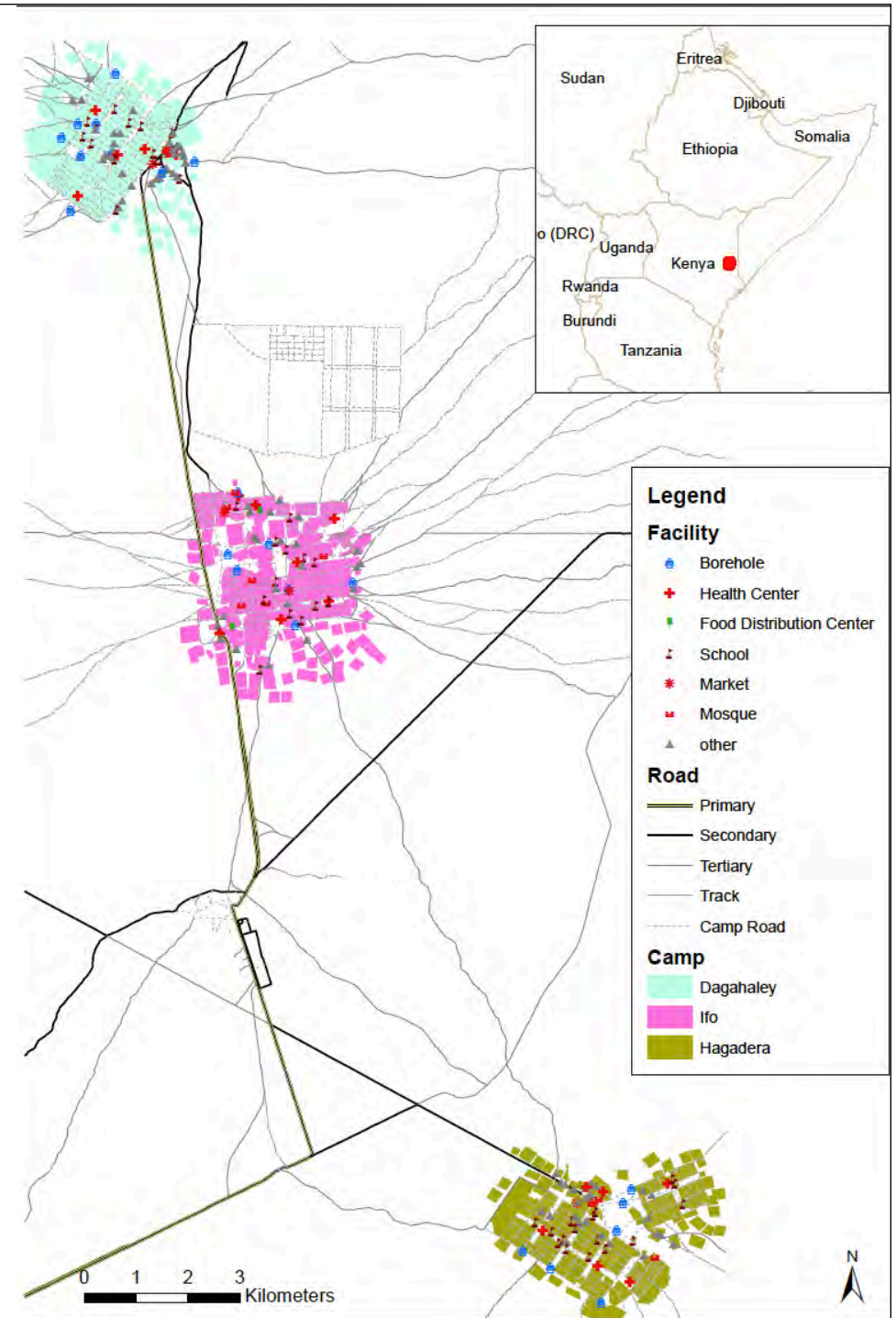
Kenya-Somalia border

Approximately 500,000 refugees live in three camps

Frequent influx of new refugees mainly from Somalia

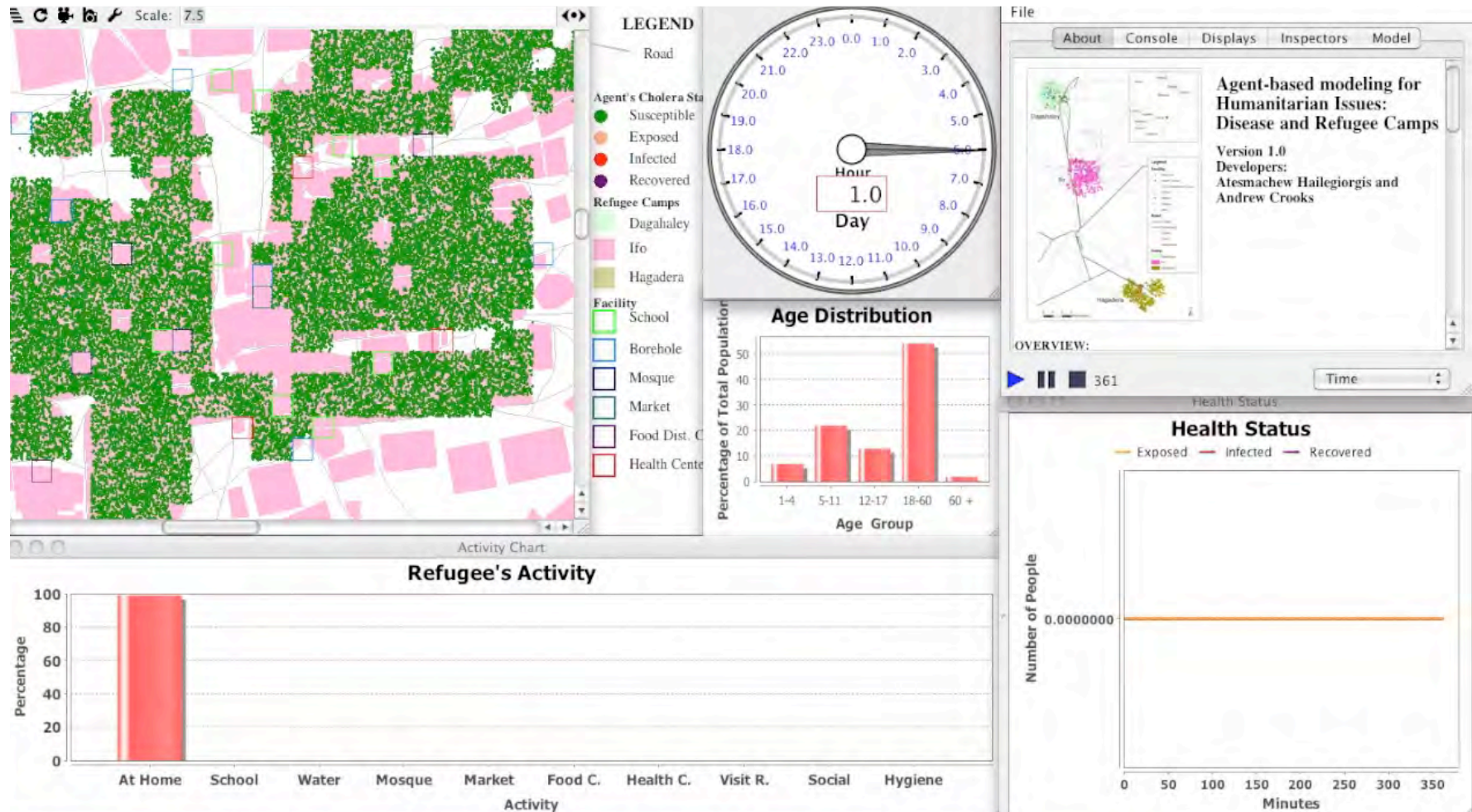
Insecurity severely hampers health and nutrition service delivery

Issues of cholera, measles, and other pathogens





# Dadaab Model: Dashboard



# IT & HA/DR: Computational analytics CONCLUSIONS

## 1. Automated events data analytics:

*Computational methods applied to GDELT or other global HA/DR incident data provide new capabilities for “seeing it coming.” Data are not enough; mathematical models are critical for replicating and understanding observed patterns.*

## 2. Agent-based modeling of refugee camps

*Computational methods for agent-based M&S provide new capabilities for analyzing real-world “what-if” scenarios for improving preparedness. Multi-scale models are also viable and valuable. Climate change models are the next frontier in HA/DR analytics via agent-based models (IPCC 2013 Special Report on Managing Risks of Extreme Events and Disasters).*





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