

Project Courses with Public Impact

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Education
Collaboration

Projects
Disaster Preparedness & Response

Outreach
Debris Management

Research
Disease Modeling
Optimizing Food Distribution

Center for Health and Humanitarian Systems

MISSION

Make a positive "impact" through improved health & humanitarian systems worldwide

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Georgia Tech  **Health & Humanitarian Systems**

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Context

- Natural and manmade disasters
 - Hurricane, tsunami, flu pandemic, etc.
- Ongoing problems about health, nutrition, etc.
 - AIDS epidemic, immunization for preventable diseases, etc.
- Environments with disruptions, uncertainty, variability
- Many decision makers but often limited resources



Top 10 Problems Facing Humanity in Next 50 Years

1. Energy
2. Water
3. Food
4. Environment
5. Poverty
6. Terrorism and War
7. Disease
8. Population
9. Education
10. Democracy

Problems are global... but many are also in the US, especially for subpopulations or subregions

(Prof Richard Smalley, <http://cnst.rice.edu/content.aspx?id=246>)

ISYE 6400 – HEALTH SYSTEMS PRACTICE

ISYE 6320 – PUBLIC IMPACT APPLICATIONS OF OPERATIONS RESEARCH AND MANAGEMENT SCIENCE

Missed a vaccine? Online tool can help you catch up to prevent disease

- Personalized schedule that considers age and vaccination history
- Ensure proper coverage against vaccine preventable diseases for
 - children
 - adolescents
 - adults
- who have not followed the recommended vaccination schedule
- Partnership with CDC
- Plans for mobile app

Enter child's vaccination history:

Child's Name:

Birthdate:

Vaccine	Description	# Doses	Approximate dosage dates
HepB	Hepatitis B	1/3	Dose 1: <input type="text" value="01/27/2011"/> <input type="button" value="+ Add HepB Dose 2"/>
RV	Rotavirus	1/3	Dose 1: <input type="text" value="03/31/2011"/> <input type="button" value="+ Add RV Dose 2"/>
DTaP	Diphtheria, Tetanus, Pertussis	1/5	Dose 1: <input type="text" value="03/18/2011"/> <input type="button" value="+ Add DTaP Dose 2"/>
Hib	Haemophilus influenzae type b	0/4	<input type="button" value="+ Add Hib Dose 1"/>
PCV	Pneumococcal	0/4	<input type="button" value="+ Add PCV Dose 1"/>

Figure shows snapshot of tool

Tools have been used online or downloaded over 400,000 times
<https://vacscheduler.org>



A New Tool to Manage Your Child's Vaccine Schedule



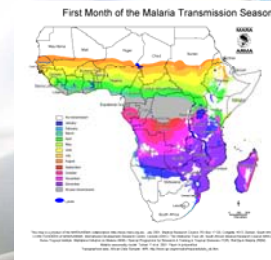
Online scheduler keeps track of missed



Tool Creates Personalized Catch-up Immunization Schedules For Missed Childhood Vaccinations

Decision-support tools for resource allocation

- Geographic assignment of healthcare workers to balance supply, demand, and preferences
 - Pilot in Mozambique, in collaboration with the Task Force for Global Health and CDC
- Systems-based approach to minimize the incidence of malaria with limited resources for indoor residual spraying
 - DC placement, zone assignment, resource deployment



Decision-support tools for informed and shared clinical decision making

- Organ transplant: Identification and allocation of increased risk encephalitis organs
 - Risk calculator
 - Estimation of survival curves and wait time considering patient condition and location
- Prenatal screening for down syndrome considering women's preferences

Infectious Encephalitis Risk Calculator

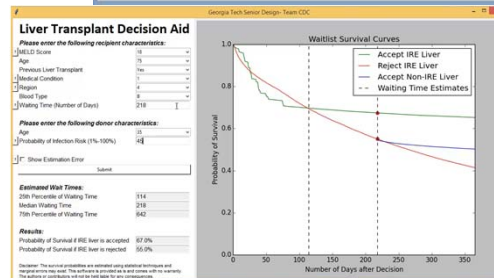
Please choose the appropriate options below*

Gender: Male Female Unknown
 Fever Seizure Headache Psychiatric Features
 Yes No Unknown Yes No Unknown Yes No Unknown

Calculate

Risk of Infection: 94.3% Risk Range: 79.8% - 98.6%

*This model was validated assuming that all five symptoms are known. Therefore, choosing unknown (if available) is not advised.
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Snapshots from transplant decision tool

Hospital/Clinic Operations Management



Strategic planning

- Design of hospital networks (how many hospitals, where?)
- Facility design and layout, capacity allocation



Tactical planning

- Quality control and management
- Capacity planning (beds, equipment, staff, supplies)



Operational planning

- Patient flow management
- Capacity allocation/resource management (scheduling of staff, operating rooms, etc.; bed assignment)

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Research Examples: Operational Flow

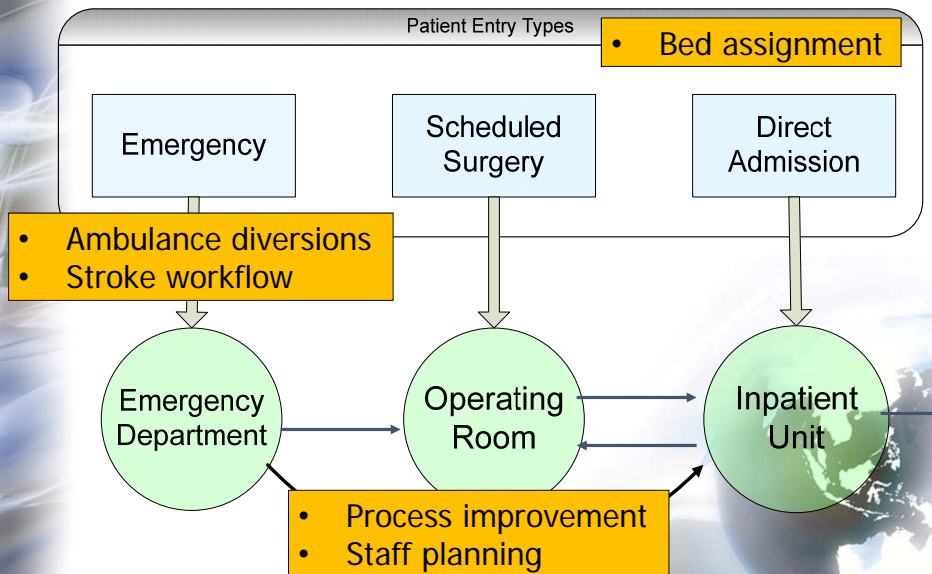
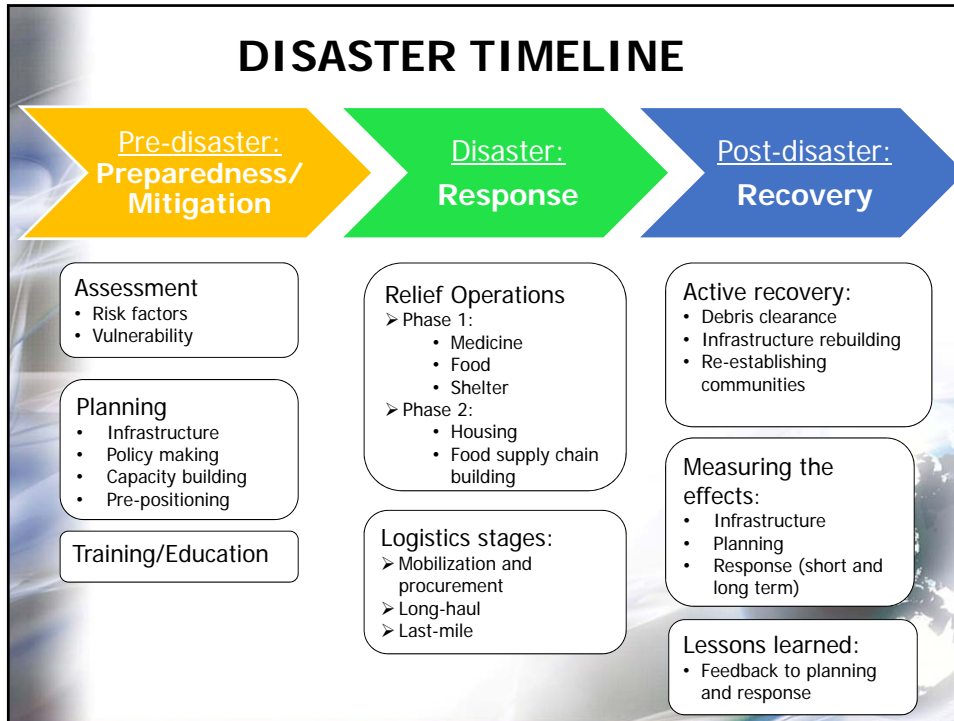


Figure created by HHS researchers

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Disaster Preparedness

- How much inventory should one pre-position globally?
 - CARE, responding to disasters world-wide
 - WFP, delivering food aid with variable donations
 - UN HCR, supplying needs of refugees with uncertain leadtimes
- Systems approach can help balance system costs, speed, quality, and performance

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CARE: Demand locations and candidate warehouses



12 potential warehouse locations and 22 demand points from a study done with CARE and Georgia Tech

Figure created by HHS researchers

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FEMA and USACE: Debris Collection Post-Disaster Response

- **Challenge:**
 - A single disaster can result in debris equal to years of normal solid waste, which impacts logistics, recovery, and environment
 - Guidelines focus on 'what' to collect but not 'how'
- **Solution:**
 - Develop tool to determine road prioritization for clearance
 - Develop tool for assigning removal teams/contractors to a region
 - Analyze the trade-offs (cost vs. speed vs. long-term impact) of different collection and disposal options and make policy recommendations

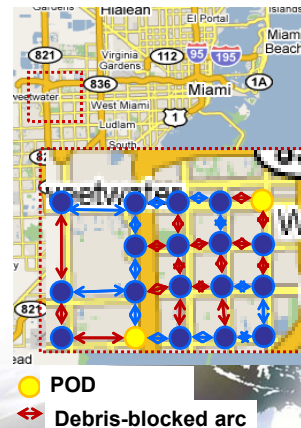


Figure created by HHS researchers

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Interdisciplinary Collaborations with Companies, Organizations, ...



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Interdisciplinary Collaborations with GT units, other universities, ...



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Questions

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