



# National Mass Patient and Evacuee Movement, Regulating and Tracking System

2008 NDMS Conference

# Project Origin

- Problem: Need to improve our ability to transport and track very large numbers of patients and evacuees during/after a catastrophic incident (scenarios of up to 100,000 persons)
- Goals:
  - 1) Develop a model to estimate transportation needs for such an event
  - 2) Outline a proposed strategy for development of a national patient and evacuee regulating and tracking system



# Project Origin

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- Proposed by DOD (2004), Requested DHS/FEMA funding
- DHS Priority (2004); Secretary Ridge's Homeland Security Interagency Security Planning Effort
- Included patient mobilization planning for catastrophic events as a long-term initiative and identified this effort as high-priority



# Project Origin

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- Led by HHS / Agency of Healthcare Research and Quality - DOD supported the Initiative
- Funded by DHS, HHS, DOD
- Began 2005, Final Report to HSC and interagency – 2008
- Supported by DOD Evacuee/Patient Tracking Initiative (interconnecting three existing DoD patient-evacuee IT systems)



# Project Background

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## ■ Project Overview

- AHRQ Project Officer: Dr. Sally Phillips
- Project undertaken in collaboration with FEMA, DoD, and HHS
- Co-led by AHRQ and DoD
- Project steering committee

## ■ Key project staff

- Tom Rich (Abt Associates)
- Dr. Paul Biddinger (Mass General Hospital and HSPH)
- Dr. Richard Zane (Brigham and Women's Hospital)



# Project Steering Committee

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- HHS
- DOD
- FEMA
- DOT
- VA
- DHS
- HSC
- CDC
- State, Local, private industry representatives



# Key Project Goals

- Develop a web-based planning tool that estimates the time required to evacuate health care facilities
- Develop recommendations for a national system that could be used during a multi-jurisdictional mass casualty / evacuation incident to:
  - Locate and track patients and evacuees
  - Provide recommendations for regulating patients and evacuees
  - Provide decision support for patient and/or evacuee movement, regulating, resource allocation, and incident management

# The Mass Evacuation Transportation Planning Model

- Purpose of the model
  - Estimate total transportation and other assets needed to evacuate P/Es
  - Estimate required Federal assets needed to supplement State and local assets
- Inputs
  - Facilities to be evacuated
  - Patient / evacuee acuity and mobility
  - Location and capacity of receiving facilities
  - Available vehicles and staff to carry out evacuation



# The Model Considers

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- Location of evacuating and receiving facilities
- Patient transportation-medical requirements
- Availability of transport vehicles
- Surge capacity of receiving facilities
- Traffic congestion

# Web Implementation of the Model



## Mass Evacuation Transportation Planning Model

HOME | NEW SCENARIO | OPEN SCENARIO | HELP

### Scenario Input

SAVE SCENARIO | RUN SCENARIO

Scenario Name - Give this scenario a name.

Vehicles Used - Specify the fleet of vehicles that will be used for the evacuation.

TYPE	# USED	CAPACITY	PER PATIENT LOAD TIME
ALS Ambulance	10	1	20 min.
BLS Ambulance	10	1	15 min.
Wheelchair Van	40	6	5 min.
Bus	100	30	1 min.

Traffic Congestion Factor - Specify traffic congestion factor (e.g., 1 is normal speed, 0.5 is twice as fast, and 2 is twice as slow).

Overflow Receiving Facility - Specify the travel time in minutes to the overflow facility.

Minutes

Surge Capacity - Specify the surge capacity of the receiving facilities (% of normal capacity).

%

Geographic Area - Select your geographic area or the one that is closest in population density to your area.

Evacuating and Receiving Facilities - Add/remove facilities from scenario.

= Evacuating Facility   
 = Receiving Facility  
 = Delete From List   
 = Not Included in Scenario

STATUS	Name	ALS	BLS	WC VAN	Bus	CAPACITY	OCCUPANCY RATE	LONGITUDE	LATITUDE
	Facility 1	20 %	30 %	30 %	20 %	500	100 %	-70.0	43.0
	Facility 2	20 %	30 %	30 %	20 %	500	100 %	-70.1	43.1



# Web Implementation of the Model



## Mass Evacuation Transportation Planning Model

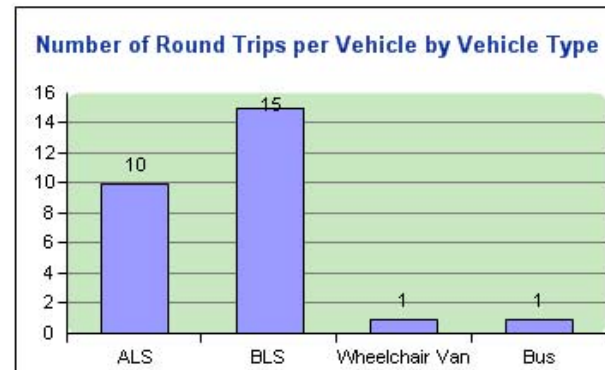
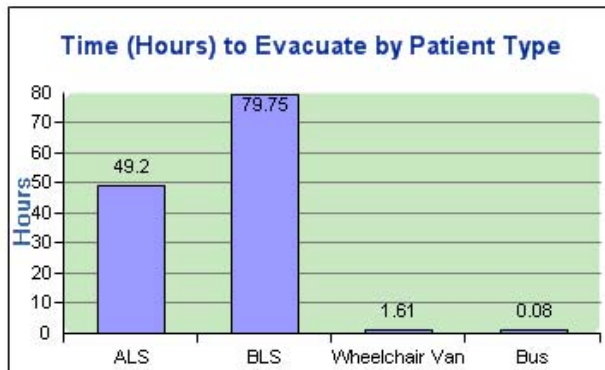
HOME | NEW SCENARIO | OPEN SCENARIO | HELP

### Scenario Results

SAVE SCENARIO | MODIFY SCENARIO

Scenario Name: Enter Scenario Name Here

Total Time (Hours) to Evacuate: 79.8



Vehicle Type	# Patients Evacuated	# Vehicles Used	Round Trips per Vehicle Used	Time to Evacuate (hours)
ALS	100	10	10	49.2
BLS	150	10	15	79.8
Wheelchair Van	150	25	1	1.6
Bus	100	3	1	0.1

# Pilot Tests of the Model

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- New York City

- NYC OEM:

- Commissioner Joseph Bruno

- (Former) Deputy Commissioner Edward Gabriel

- Los Angeles

- LA EPD:

- (Former) General Manager Ellis Stanley

- Project Leader Chris Ipsen



# Model Pilot Tests

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- New York City (April 2006)
  - Category 4 hurricane
  - Evacuation of 24 hospitals and 61 nursing homes in coastal areas (approximately 24,000 patients)
  - Planned evacuation (72 hours notice)
- Los Angeles (May 2007)
  - Major earthquake
  - Evacuation of 3 hospitals (900 patients)

# Vehicles Used

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- ALS Ambulances
- BLS Ambulances
- Wheelchair vans
- Buses

# Vehicle Capacity

	New York City	Los Angeles
ALS Ambulances	1	1
BLS Ambulances	2	2
Wheelchair vans	8 / 3 / 2	3
Buses	32 / 8	34

# Vehicle Availability (Percent of Fleet)

	New York City	Los Angeles
ALS Ambulances	40% (private sector fleet only)	5%
BLS Ambulances	40%	5%
Wheelchair vans	90% (Dept of Ed fleet)	5%
Buses	90% (Dept of Ed fleet)	5%

# Determining # of Patients to be Evacuated

## ■ New York City

- Assume all hospitals operating at 100% capacity
- No patients will self-evacuate

## ■ Los Angeles

- Single day's daily census for the 3 hospitals
- Increase by 7.5% to account for ED patients
- No patients will self-evacuate

# Determining Patient Transport Requirements

Bed ridden patients who need constant medical attention at the ALS level during transport

→ ALS  
Ambulances

Bed ridden patients requiring constant medical attention at the BLS level during transport

→ BLS  
Ambulances

Wheel chair bound patients

→ Wheelchair vans

Ambulatory patients

→ Buses

# Determining Patient Transport Requirements

## ■ New York City

- Extant study on requirements at 4 hospitals
- Census taken at 1 hospital

## ■ Los Angeles

- All patients on monitors require ALS transport
- Admitted patients not on monitors divided evenly between BLS, wheelchair van, and bus
- ED patients divided evenly between ALS, BLS, wheelchair van, and bus



# Hospitalized Patient Transport Requirements

	New York City	Los Angeles
<b>ALS Ambulances</b>	<b>14%</b>	<b>39%</b>
<b>BLS Ambulances</b>	<b>13%</b>	<b>20%</b>
<b>Wheelchair vans</b>	<b>40%</b>	<b>20%</b>
<b>Buses</b>	<b>33%</b>	<b>20%</b>



# Travel Time Assumptions

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## ■ New York City

- Based on actual patient transport times
- Average of 20 miles per hour

## ■ Los Angeles

- Used travel time model developed for this project
- Assumed travel times twice as long as the model-predicted times

# Receiving Facility Assumptions

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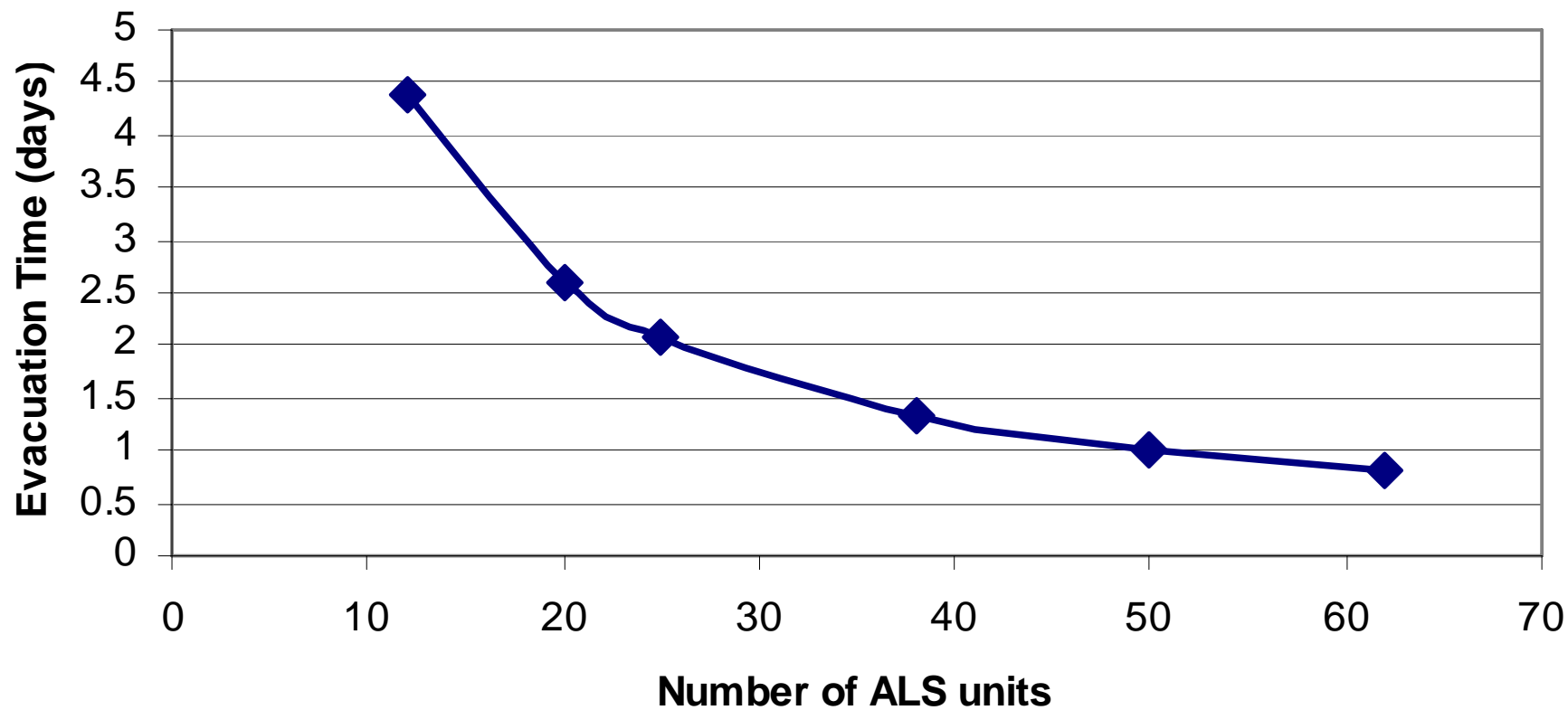
- Operating at 100% capacity
- 15% surge capacity

# Required Vehicle Roundtrips

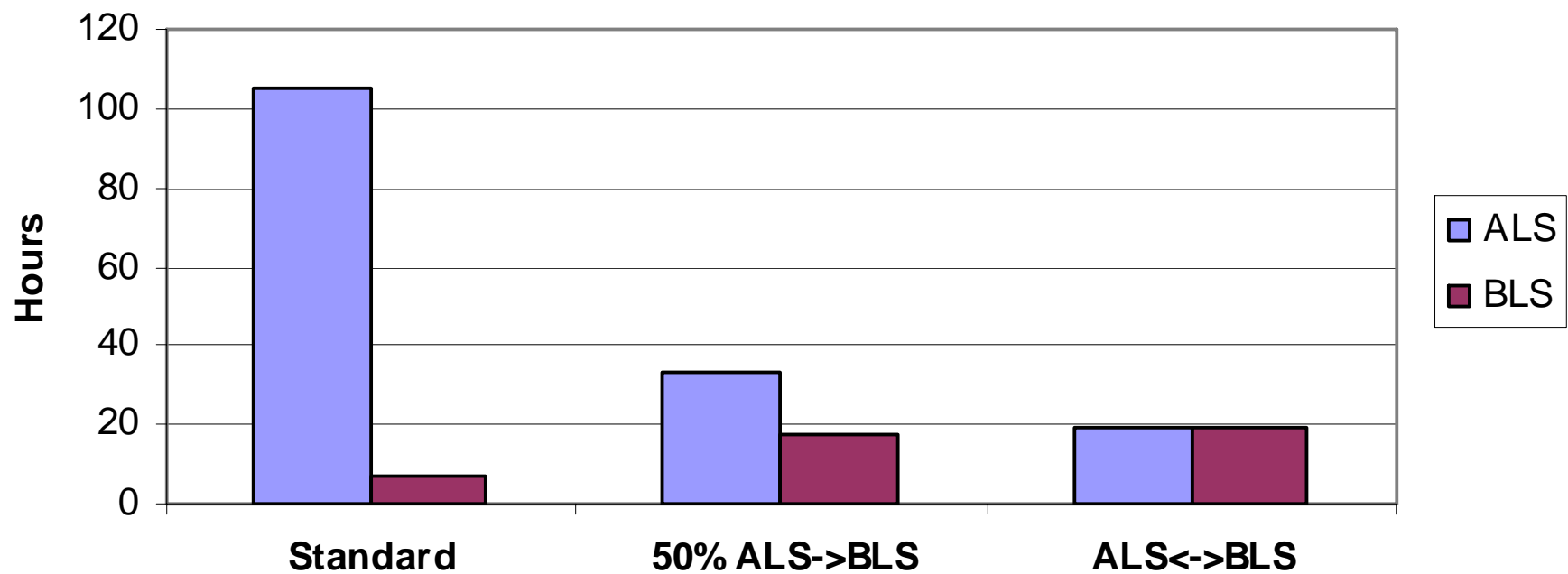
Roundtrips Required	New York City	Los Angeles
ALS Ambulances	45	32
BLS Ambulances	4	2
Wheelchair vans	6	3-4
Buses	1	1-2



# Changes to ALS Availability (Los Angeles)



# Changes to Standard of Care (Los Angeles)



# Next Steps for the Model

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- Available shortly at AHRQ Public Health Emergency Preparedness Web Site
  - [www.ahrq.gov/prep](http://www.ahrq.gov/prep)

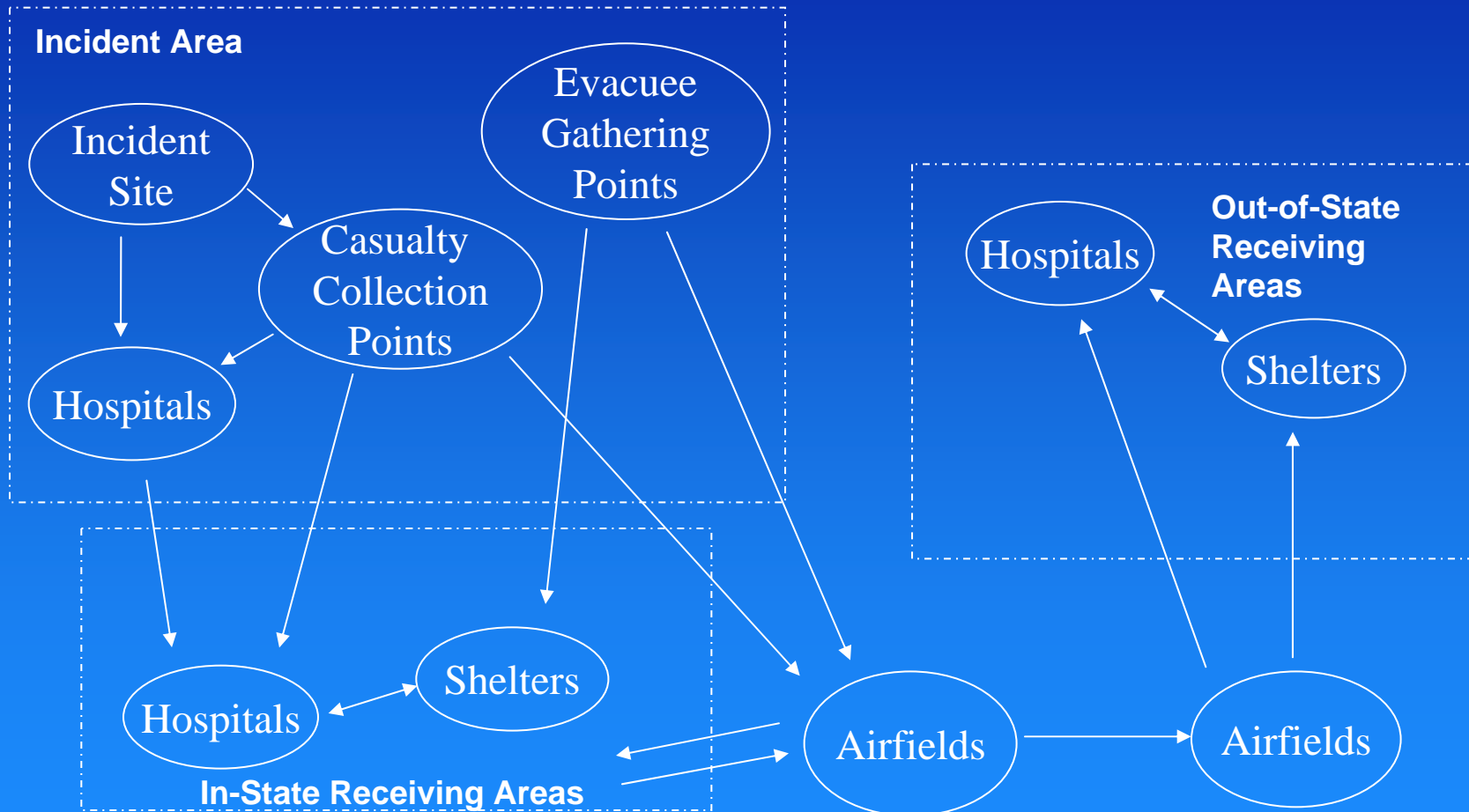


# Need for a National Tracking System

- **The Public:** Where is my loved one?
- **Incident Commanders:** How many victims are there? Where are they? Where are more response assets needed?
- **Emergency Operations Centers:** Where are the incident scenes? Where is there unused response capacity? Will I need outside assistance?
- **DOD & VA:** When will federal transportation, medical and other assets be needed to supplement local and state assets to transport patients and evacuees? Which assets?
- **Public Health Departments / Relief Organizations:** How many people are in shelters and what are their specific needs?
- **Remote Evacuation Sites:** Who exactly is coming on that plane of evacuees and patients?



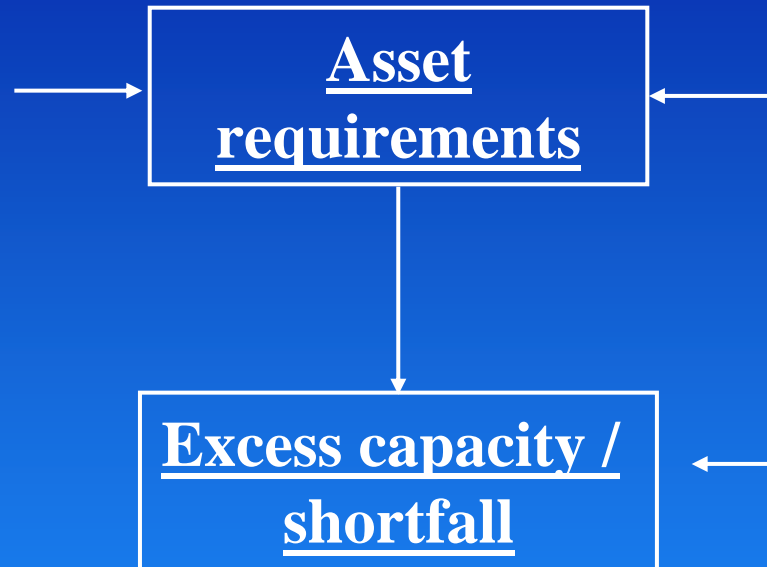
# Focus on Multi-Jurisdictional Incidents



# System Concept

## Demand

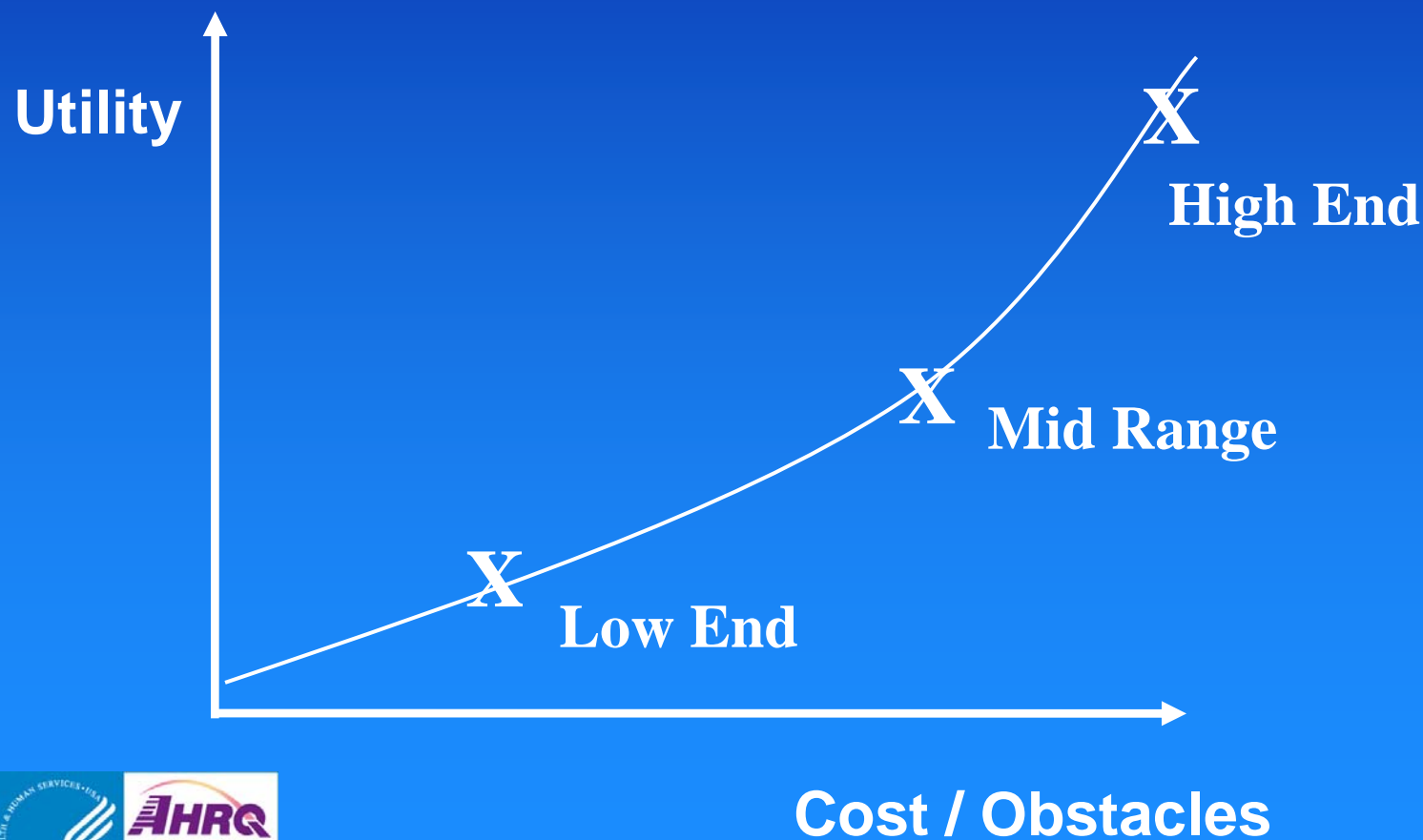
- Patient / evacuee location
- Health status
- Health needs



## Supply

- Available transportation assets
- Available medical assets

# Trade-Offs Exist With Low-End, Mid-Range, and High-End Systems



# Variables Distinguishing Low, Middle, and High-End Systems: Demand Side

- 24/ 7 vs. activated system
- Tracking vs. locating vs. aggregate location data
- Public use vs. emergency response
- Entry points
- Types of data collected
- Data collection and identification technology
- Integration with existing local systems
- Ease of use
- Levels of aggregation and access
- Technology sophistication and independence

# Existing Systems: Demand Side

- Patient Tracking Systems
  - Few jurisdictions routinely track patients between locations
  - DoD has patient tracking system for battlefield casualties and NDMS use (TRAC2ES)
- Location Systems
  - “Registration” systems (protected by firewalls and privacy restrictions) at any institution
  - “Loved ones” databases
- Pre-Evacuation Databases
  - A few jurisdictions allow citizens to register for assistance

# Project Assumptions:

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- Activated system
- Track both location and health status of each person as they encounter the system.
  - Track at “touch points”, which include overnight facilities, temporary staging areas/collection points, and (possibly) vehicles loading/unloading
  - Require minimum data elements to login or update, but build system to accept more detailed demographic and medical information
  - Build from person-level data, but accept aggregate (location-level) data

# Project Assumptions (continued)

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- System is accessible to both public and emergency responders / planners
  - Data access and reporting must be tightly controlled
- Build on existing systems as much as possible
- Build on daily-use systems as much as possible

# Minimum Data Elements

- **Unique identifier** (a universal algorithm for assigning IDs would be ideal)
- **Name, gender, DOB** (if not available, substitute age range, race and notable physical characteristics to help identify the person)
- **Health Status**
  - Red, yellow, or green triage color
  - ICU, floor, or discharge ready/not
  - Acutely ill, well with medical history (needing medical attention), healthy
- **Last updated location (ID/name/type), date, time**

# Other Important Data

- Arrival or departure (arriving at hospital vs. departing from hospital)
- Language (English, other)
- Special transportation needs: ALS/BLS ambulance, wheelchair
- Special medical needs: ventilator, oxygen, dialysis, current medications, cardiac monitor
- Contamination/radiation/contagious status
- Security/supervision needs/status (psychiatric patients, prisoners)
- Family unification code (to link family members to each other)
- Final "exit" status (dead, left with relatives, went home)
- Attached files (medical records and images)



# Key Component of the National System: An Incident-Wide Tracking Database

...	...	...	..
John Doe	10/15/06	New Orleans Hospital A	...
John Doe	10/17/06	New Orleans Shelter B	...
John Doe	10/21/06	New Orleans Airport	...
John Doe	10/21/06	Boarded FI 101 to Denver	...
John Doe	10/21/06	Denver Airport	...
John Doe	10/21/07	Denver Shelter C	...
...	...	...	...

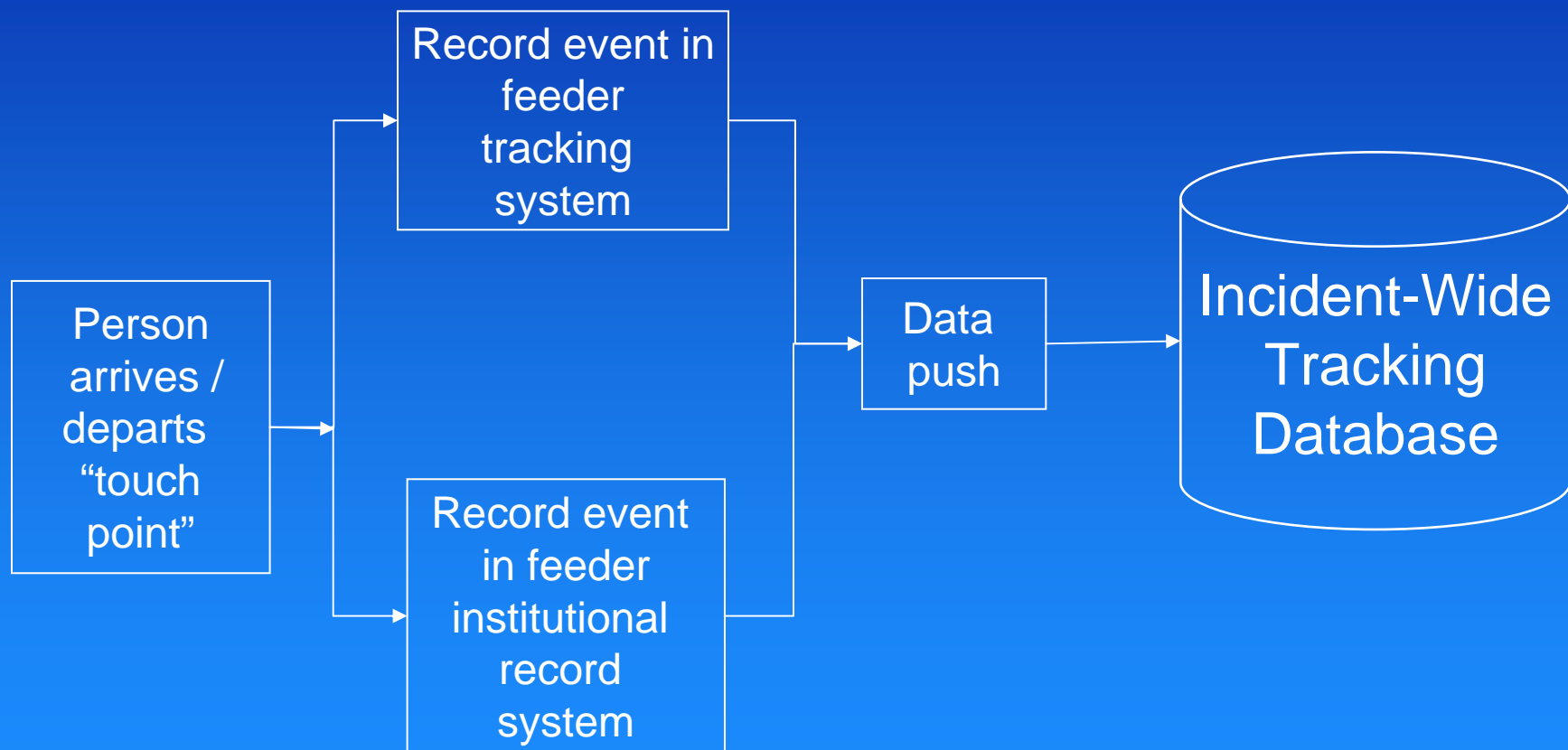
# Success Depends on Integration with Existing Systems

- Current or Planned Feeder Tracking Systems
  - Jurisdiction-specific systems (e.g., commercial systems)
  - Agency-specific systems (e.g., TRAC2ES, JPATS)

# Success Depends on Integration with Existing Systems

- Feeder Institutional Records Systems (“Check In / Check Out Systems”)
  - All facilities using a common software platform (e.g., all hospitals running Vendor X’s software)
  - All facilities within an agency (e.g., National Shelter System)
  - Single facility (e.g., a hospital with a “homegrown” system)

# Integration Between Feeder Systems and the National System



# Regulating (Matching Supply with Demand)

- Outputs of the National System should be formatted to be compatible with supply assets whenever possible
- Consider using both baseline (static inventory) and current resource availability levels
- Resource availability data on a wide range of resources (beds, transportation assets, medical personnel, and medical equipment) resources could be valuable for movement and regulating decisions
- Build on existing systems as much as possible



# Existing Resource Data and Systems

- Examples of extant baseline capacity data
  - AHA Database
  - OSCAR Nursing Home Database
  - National Shelter System
- Local or regional resource inventory / availability systems
  - Commercial
  - Non-Commercial
- National resource availability systems
  - HAvBED

# Criteria for a Resource's Role in the Implementation Plan

- Value of information for patient/evacuee movement, resource allocation, and incident management
- Has resource been typed?
- Do accurate baseline data exist?
- Do system and procedures exist (and are actually followed) for obtaining current inventory levels?

# Implementation Plan: Key Principles

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- Need phased approach with short term success (e.g., tracking a subset of patients and evacuees at a subset of touch points)
- Consider likelihood that a particular “feeder” system will be used when the National System is activated (geographic focus to implementation plan)
- Integration with existing systems would obviate need to enter additional data, but achieving this could take a long time
- Take advantage of existing large scale systems and vendors with large installed bases



# Key Recommendations

- Start with a Phase I system that is a platform for future growth
- Obtain patient / evacuee location and health status data from existing “feeder” systems
  - “Check in / check out” systems
  - Use local or agency-specific patient tracking systems
  - Begin with local and state entry, federal entry last
- Feeder systems only provide these data if the National System is “activated”

# Key Recommendations

- Track at “touch points” (e.g. evacuation centers, overnight facilities, patient collection or staging areas, vehicle loading/unloading, hospitals, etc.)
- Use Data Mining:
  - u Facilities with mandatory reporting
  - u Facilities using common software platform
  - u Facilities within an agency (e.g. VA hospitals, DOD MTFs, Indian Health, etc.)
  - u Single facility (hospital with “homegrown” system)

# Key Recommendations

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- Require minimum data elements to enter patient/evacuee data
- Build system to accept more detailed demographic and medical info
- System accessible to public and emergency responders/ planners
- Eventually include public – web based registration

# Phase I System

- For tracking, link a number of feeder systems
  - Federal tracking systems (if available)
  - Disaster shelter registration systems (voluntary)
  - Admission / discharge system for a major hospital system affiliated with large health IT vendor
- For regulating, provide baseline inventory information on a small number of key resources
  - Beds (all hospitals, nursing homes, shelters)
  - Transportation assets from major owners (ambulances, buses, airplanes, trains)

# Phase I Supply Assets

- Baseline inventories of:
  - Beds
    - Hospitals
    - Nursing homes
    - Shelters
  - Transportation assets
    - Ambulances (ground and air)
    - Buses
    - Airplanes
    - Trains

# Focus of Subsequent Phases

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- Link as many feeder systems as possible
  - Take advantage of highly concentrated health IT market
  - Focus on facilities in high risk geographic areas
- Improve quality of health care and transportation resource availability data
  - Near real-time availability, rather than baseline inventory
  - All owners, not just major owners
  - Include additional resources

# Phase II

- Interconnect existing patient & evacuee IT systems in federal-State-local jurisdictions (platform development)
- Establish national IT standards for tracking-regulating-movement
- Expand IT system to include regulating and movement
  - Match transport resources with evacuees & patients and their specific needs
    - Prospectively reserve initial and intermediate holding/ treatment locations...through final disposition.
    - Maintain tracking audit trail from incident site, or first entry into the national system, through final disposition.



# DoD Patient - Evacuee Tracking Initiative

- Supports the National Initiative
- Purpose: Establish web-based and battle-hardened, mobile system that will provide tracking information of DoD affiliated members, DoD patients, and civilian patients and/or evacuees managed by DoD.
  - DOD I 3001.02 “Personnel Accountability in Conjunction with Natural or Manmade Disasters” Aug 8, 2006: Track DoD Active Duty, Guard, Reserve, civilian employees, contractors working in DoD facilities, family members of above.
- Expand for State National Guard use; Potential use by ARC, HHS, FEMA



# DoD Patient - Evacuee Tracking Initiative

- “Interconnects” existing DoD Evacuee and HHS patient tracking systems
  - DoD Non-combatant Evacuation Tracking System (NTS)
    - Enhance NTS to Emergency Tracking Accountability System (ETAS) (evacuees)
  - HHS Joint Patient Assessment and Tracking System (JPATS)
    - Developed by DoD for HHS
  - Stream NTS/ ETAS data into HHS JPATS
  - Track evacuees, patients, and evacuees that become patients



# Federal Emphasis of National Initiative

- HSPD-21: Public Health and Medical Preparedness
  - Mass casualty care - one of four critical components
- US Policy:
  - “...to plan and enable provision for the public health and medical needs of the American people in the case of a catastrophic health event
  - ...through continual and timely flow of information during such an event
  - ... and rapid public health and medical response that marshals all available national capabilities and capacities in a rapid and coordinated manner. “



# AHRQ Next Steps

- Key to work with state and locals so that their systems can integrate with the Federal strategies as HAvBED was designed.
- Transportation support activities can be integrated into regional inventory tools to enhance access to local capabilities for evacuation and transport and identify gaps and vulnerabilities ( EPRI)
- Need to develop decision support tools for evacuation decisions (new project)

# Questions?

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