SAND2008-7607P

Pandemic Decision Analysis Center (PanDAC):

A Health Care Surge Model for Planning and Preparedness

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November 14, 2008

Objective and Topics

- Objective: To present prototype analysis tool for health care system planning, response and policies in event of a pandemic influenza

- Topics:
  - PanDAC capabilities and application
  - Demonstration
  - Example analysis questions and results

Role Play Introduction

Sandia uses simulation-driven analysis and exercises to inform national and regional response planning, and S&T investment

San Francisco Airport, 2003

Alameda County, 2003

San Diego County, BioNet 2005

City of Anaheim, TELL 2007

PanDAC combines regional systems modeling and analysis capability (Sandia) with health care system domain expertise (Davis, Cornell).

PanDAC is an entity-level regional model

- End-user plays through a pandemic influenza scenario; selected decisions impact scenario outcomes
- Models:
  - Geographical region: Sacramento and Yolo county (currently)
  - Moving population: 1.4 million people
  - Population behavior: seek care, movement
  - Disease
  - Health care resources: hospital beds and staff, medical equipment, medication
  - Decisions: public health officials, hospital managers, responders
- Can examine health care system-level behavior as well as individual entity (hospitals, individuals) behavior
  - Provides insight on local causes of system-level behavior
- Parameters are configurable; models can be substituted
  - Assumptions can be tested and revised
  - Robustness of conclusions can be examined

Goal: to provide policy and planning guidance to health care policy-makers, public health officials, individual hospitals

Example Policy and Impact Questions

Public Health Officials and Policy-Makers

- What are impacts of interventions: social distancing, prophylaxis campaign?
- How should hospital bed space be managed across the region?
- Should triage be done within individual hospitals, or through a centralized system across regional hospitals?

Hospital Managers

- What patient loads should individual hospitals expect to see?
- What are the optimal trigger points for altering operating conditions from normal to surge?
- What is the impact of hospital staff attrition?
- What medical supplies are needed in what quantity?

PanDAC Demo

Example Policy and Impact Questions

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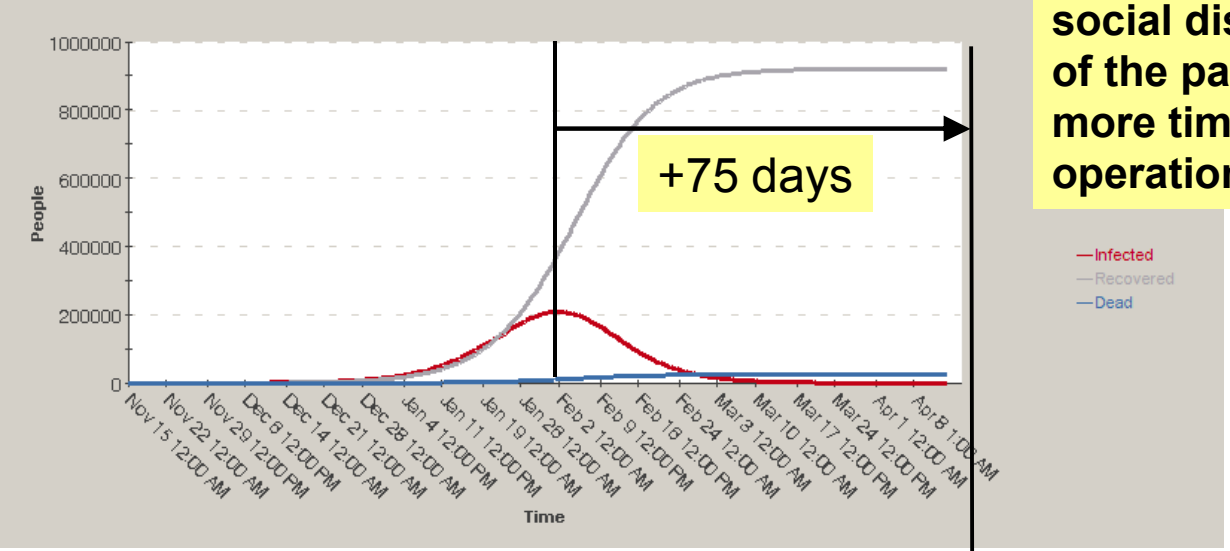
Summary Findings for Example Scenario

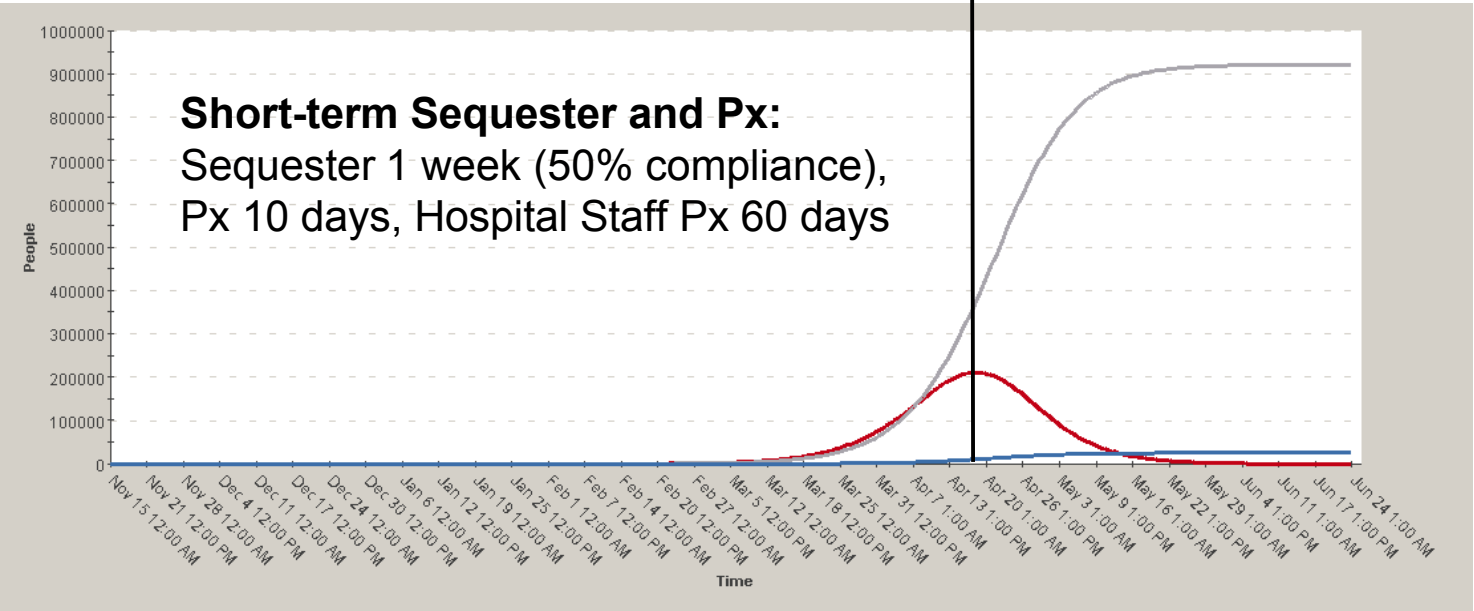
- Can reduce # dead and # affected by:
  - Preventing contagion through social distancing and prophylaxis campaigns
  - Providing effective, efficient health care services
- Prevention is the most impactful, through long-term social distancing (sequestering people in homes); even if compliance rates are low
  - If measures are short-term, second wave of infection overwhelms
  - Preventing spread of infection reduces compounding burdens downstream
  - Downstream treatment capacity is limited, so even large increases have less impact than prevention measures
- Hospital workers must be given prophylaxis before they go to work
  - Prophylaxis to hospital workers has more of an impact than to the general public because of their high rate of contact with infected patients
  - Even if sequester is short-term, if hospital workers are given prophylaxis for a long enough time, the pandemic can be prevented??
- Prophylaxis campaign and short-term social distancing buys time (delays infection peak), providing more time to ramp up surge operations
- Timing matters:
  - Trigger sequester before the pandemic begins
  - Trigger surge operations when ICU bed capacities have been reached

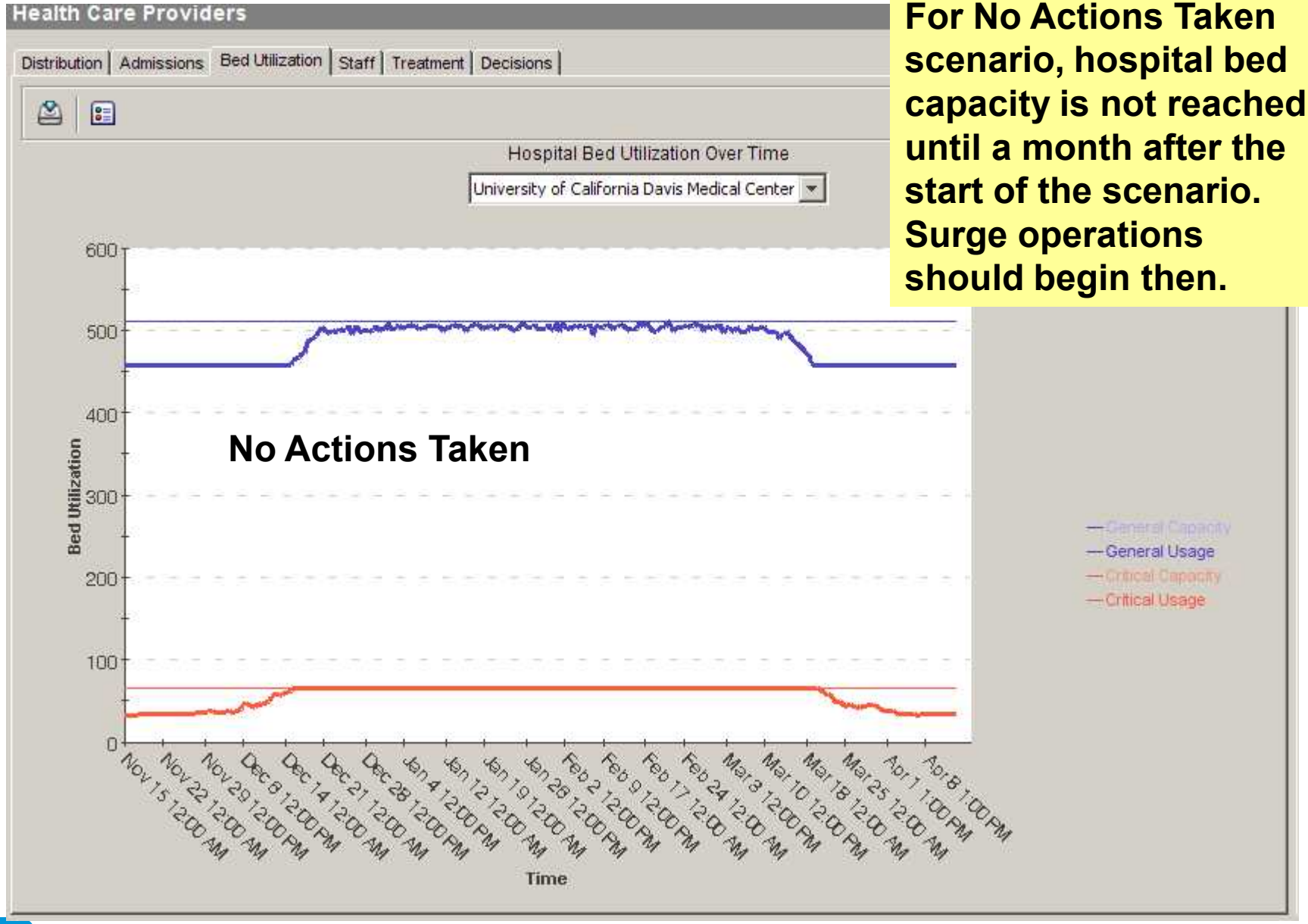
PanDAC results show impact of alternative decisions and scenario conditions

Run	Response Measures	Recovered	Dead	Day of Infection Peak	Medication needed (# pills)	Implication
1	**NO ACTIONS TAKEN**	921,000	25,100	79	2 million	946,000/1.4 million affected
2	**LONG-TERM SEQUESTER**: Don't go to work for 1 month; Sequester 1 month (50% compliance), Px 10 days, Hospital Staff Px	96	8	7	Hospitals: 970; PODS: >10 million	1 month sequester is effective, but can you control population movement for this long?
3	**SHORT-TERM SEQUESTER**: Don't go to work for 1 month; Sequester 1 week (50% compliance), Px 10 days, Hospital Staff Px	921,000	25,200	154	Hospitals: 2 million; PODS: >10 million	If don't sequester long enough, until all infecteds past contagion phase, infection curve eventually grows again. It buys time to surge.
4	**SHORT-TERM SEQUESTER + LONG-TERM PX** (60 days)	88	8	7	Hospitals: 960; PODS: >60 million	Effect of Px campaign is large-- but are these many pills available?

Prophylaxis campaign and social distancing delays onset of the pandemic, providing more time to ramp up for surge operations







For No Actions Taken scenario, hospital bed capacity is not reached until a month after the start of the scenario. Surge operations should begin then.

Path Forward

- PanDAC next steps
  - Add modeling capability for vaccination and supply chains
  - Extend geographic coverage of the model
- Discussion
  - Utilization of PanDAC
  - CA DPH access