

Simulating Capabilities for Emergency Preparedness

1. Capabilities-Based Preparedness

- National Preparedness Goal (Department of Homeland Security) identifies 32 capabilities for emergency preparedness
- State and local governments work on increasing their capabilities
- Some of the capabilities include:
 - Fire management
 - Mass search and rescue
 - Planning

2. Motivation

- How to measure and assess capabilities?
- How does improving a capability help a community be more prepared?
- Which capabilities are most important for preparedness?

Monte Carlo simulation

- Hypothetical community of 500,000 residents
- Random disasters with different severity
- Capabilities are inputs into simulation
- Identify output metrics from simulation

3. Output Metrics

- Fatalities
- Injuries
- Business Closed
- Infrastructure Cost
- Water, Shelter, Meals Needed
- Human Relief Cost
- Roads, Bridges Closed
- Proportion Without Water, Power
- Flights Cancelled
- Houses and Commercial Buildings Damaged/Destroyed
- Days Recovery

4. Main Results

3 example capabilities

- Public Information and Warning:** Number of residents who receive information about disaster and act on information → impacts metrics related to people
- Economic Recovery:** Number of business that reopen every day after disaster → impacts metrics related to infrastructure and economy
- Vulnerability Reduction:** Number of residents who are not at risk

Vulnerability Reduction

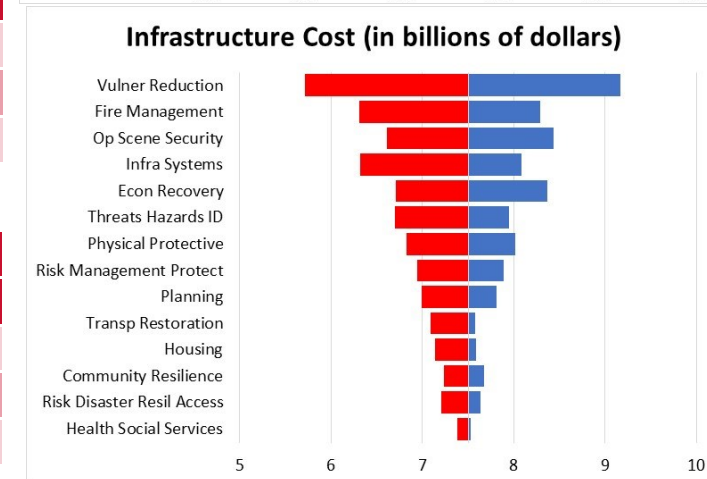
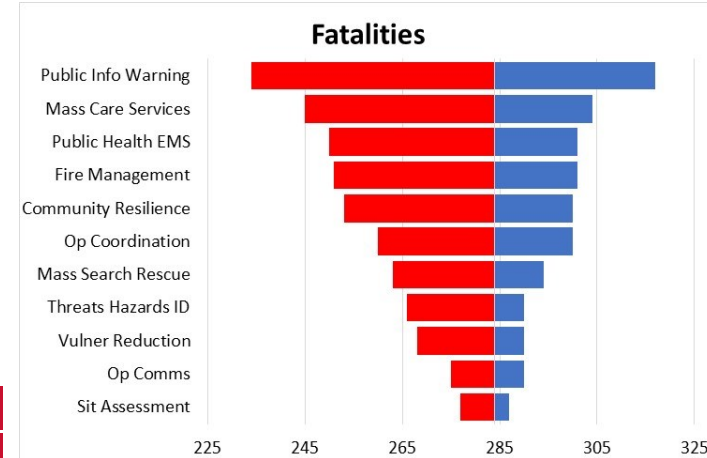
	Percentage of People Not at Risk		
	5	10	20
Mean Fatalities	290	284	268
Mean Infrastructure Cost	\$9.17 bil	\$7.49 bil	\$5.71 bil
Mean Business Closed	50,150	44,351	36,304

Public Information and Warning

	Number of People Receiving Info and Acting		
	100,000	200,000	400,000
Mean Fatalities	317	284	234
Mean Injuries	8,015	7,235	5,870
Mean Infrastructure Cost	\$7.51 bil	\$7.49 bil	\$7.48 bil

Economic Recovery

	Number of Businesses Reopened per Day		
	13	25	50
Mean Business Closed	46,685	44,248	39,977
Mean Commercial Buildings Destroyed	322	291	240
Mean Infrastructure Cost	\$7.95 bil	\$7.49 bil	\$6.71 bil



5. Conclusion

- Simulation demonstrates how capabilities can be linked to outputs (consequences) of a disaster
- Communities could use simulations to identify capabilities that are most important for their emergency preparedness
- Capabilities impact output metrics differently
 - Focus on Public Information Warning and Mass Search and Rescue to reduce fatalities
 - Focus on Vulnerability Reduction and Fire Management to reduce cost of infrastructure losses