

# Public Response: Causes, Consequences and Mitigation

**William J. Burns**  
**Decision Research**  
**CREATE**  
**CSUSM**

**August 11, 2009**

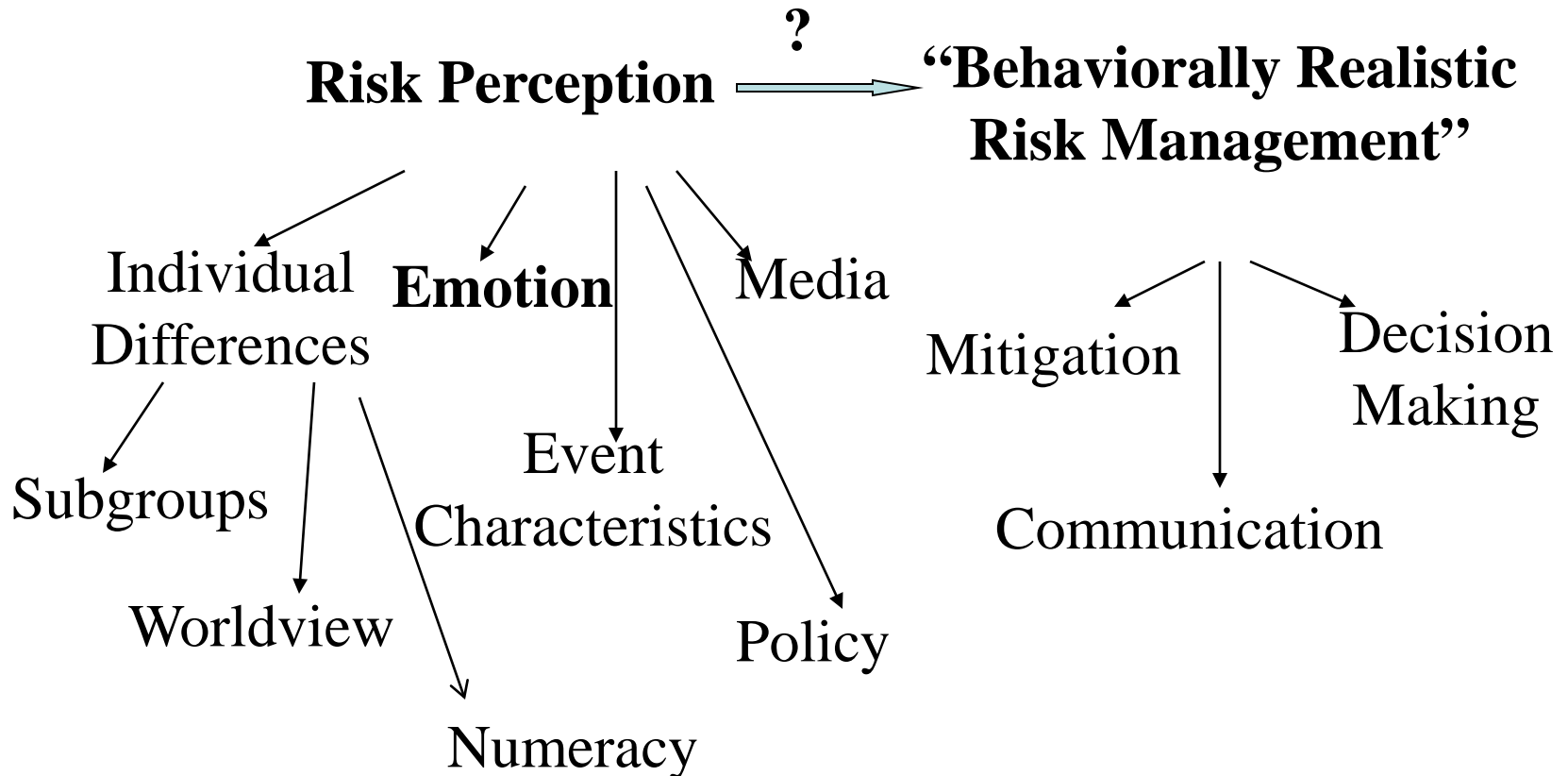
This research was supported by the National Science Foundation under grant numbers SES-0728934 and SES-0901036. It was also supported by the U. S. Department of Homeland Security through the Center for Risk and Economic Analysis of Terrorism Events (CREATE) under grant number N00014-05-1-0630. However, any opinions, findings, conclusions, and recommendations in this document are those of the author and do not necessarily reflect views of the National Science Foundation or the U. S. Department of Homeland Security.



## Objectives

- **Research Findings Emerging from the Literature and Research Forums**
- **Three-Dimensional Taxonomy of Modeling Approaches**
- **Potential Consequences**

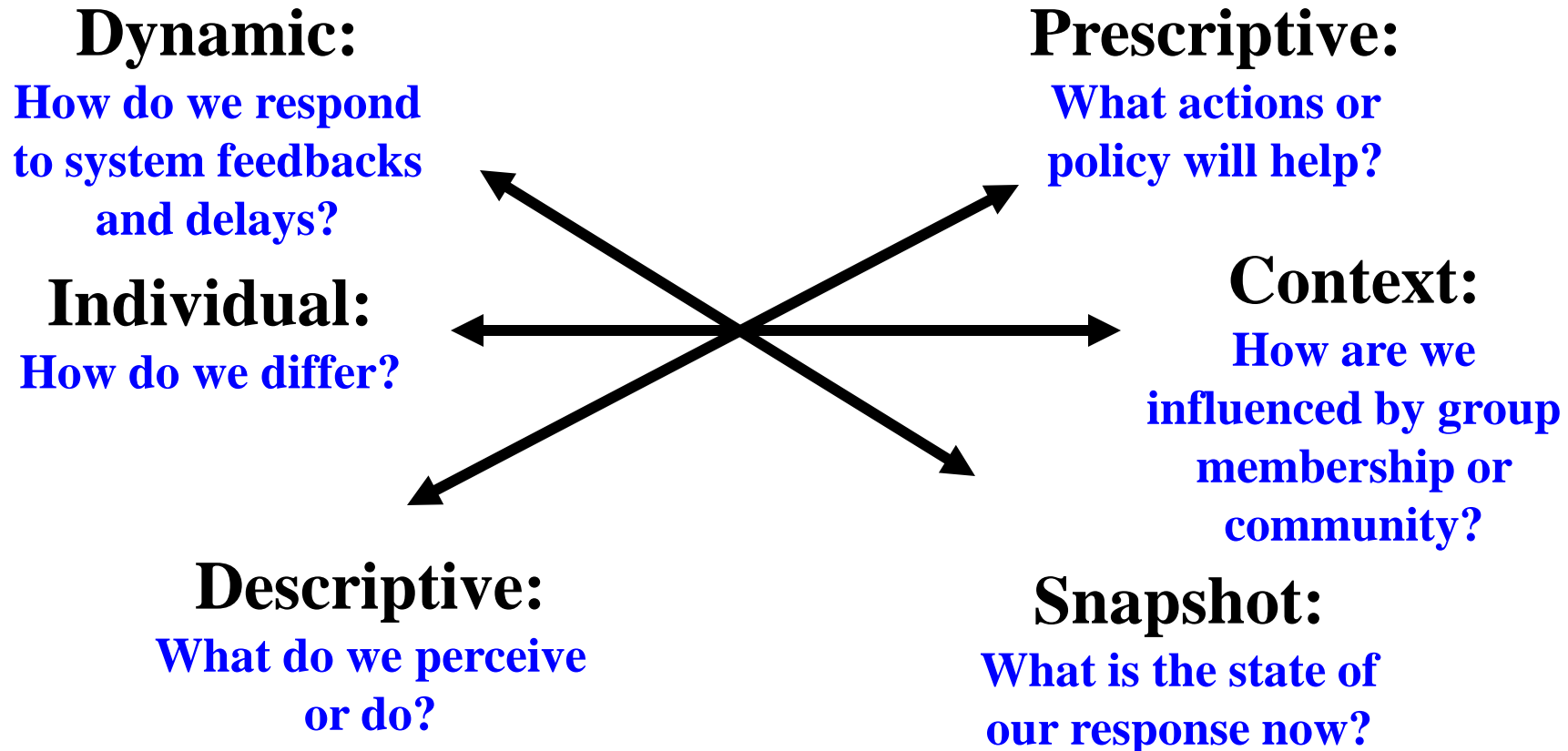
# Summary Findings: Risk Literature, National Surveys & Risk Perception Workshop



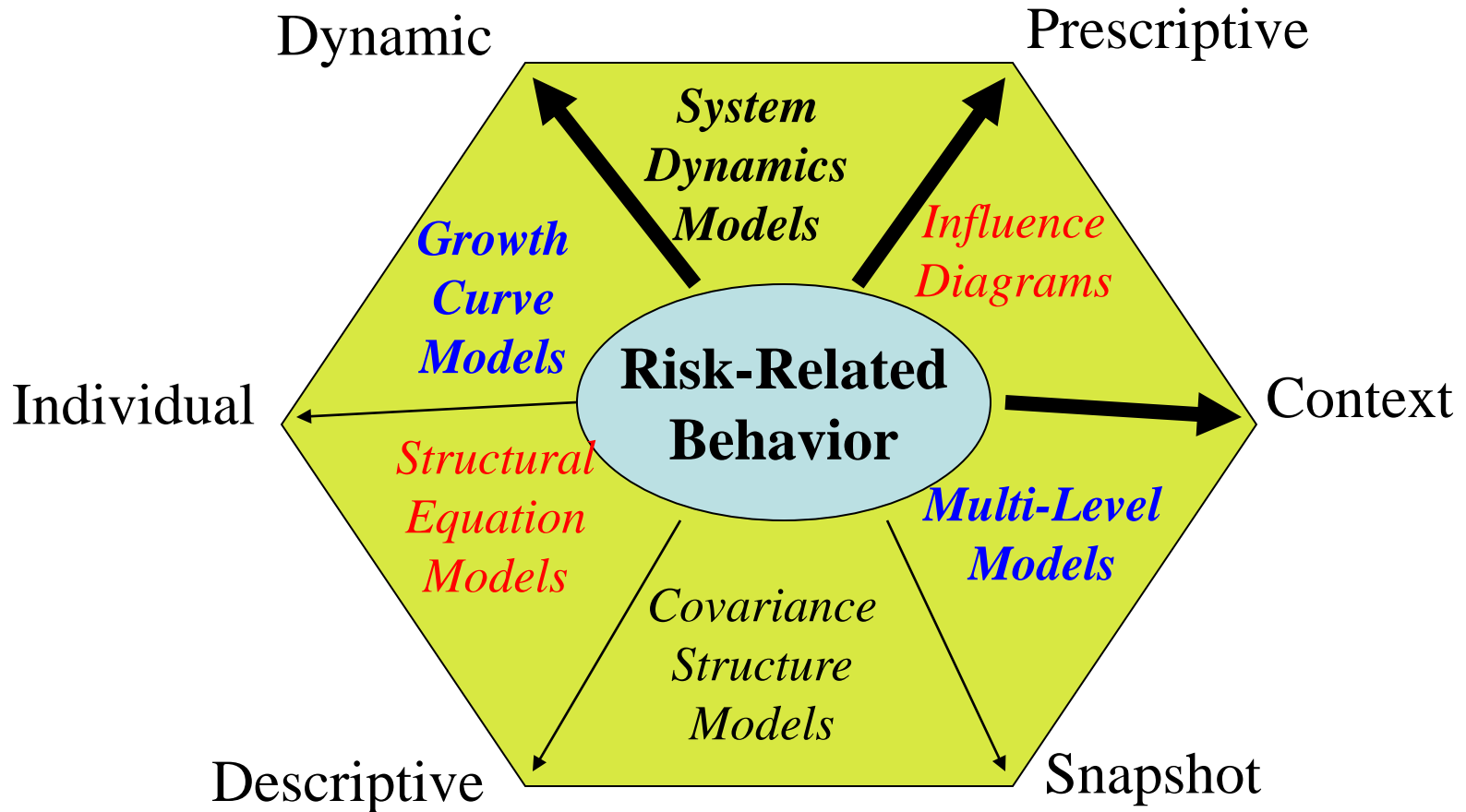
## Some Observations

- **Currently:** Descriptively Rich Portrayal of People's Perception of Risk.
- **Limitations:** High Resolution Snapshots Still Unable to Provide Insight into Dynamic Processes Driving Community Preparedness and Response
- **Consequences:** Difficult to Estimate the Ripple Effects (*social, political, economic*).
- **Approach:** More Focus on Context-Rich, Dynamic and Prescriptively-Informative Modeling

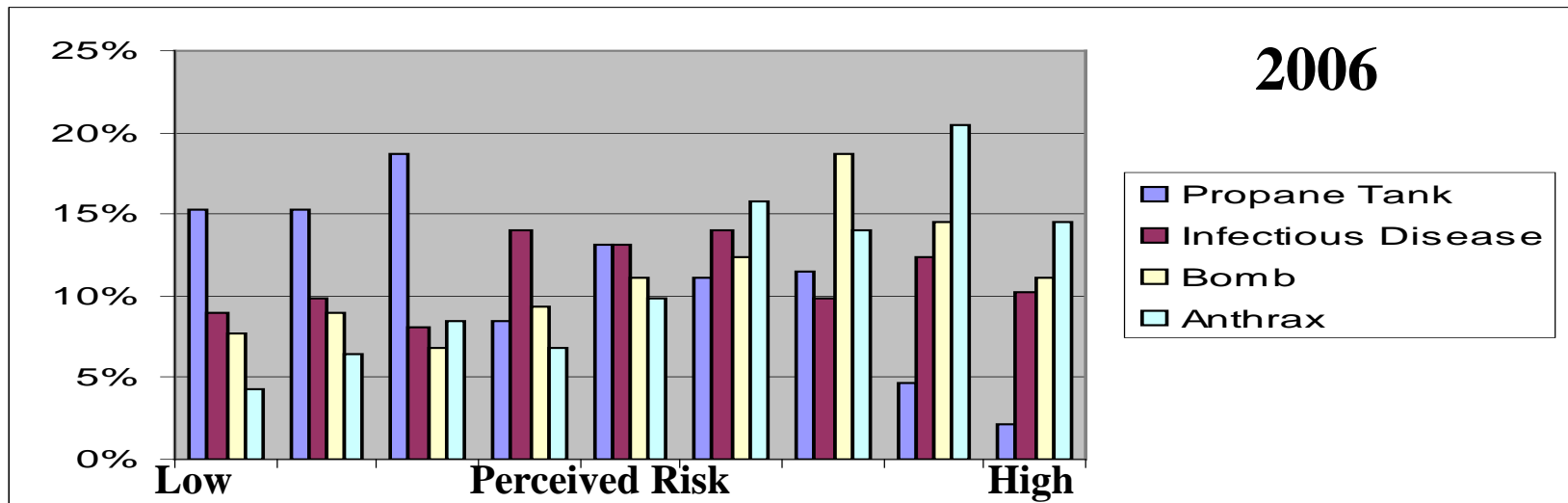
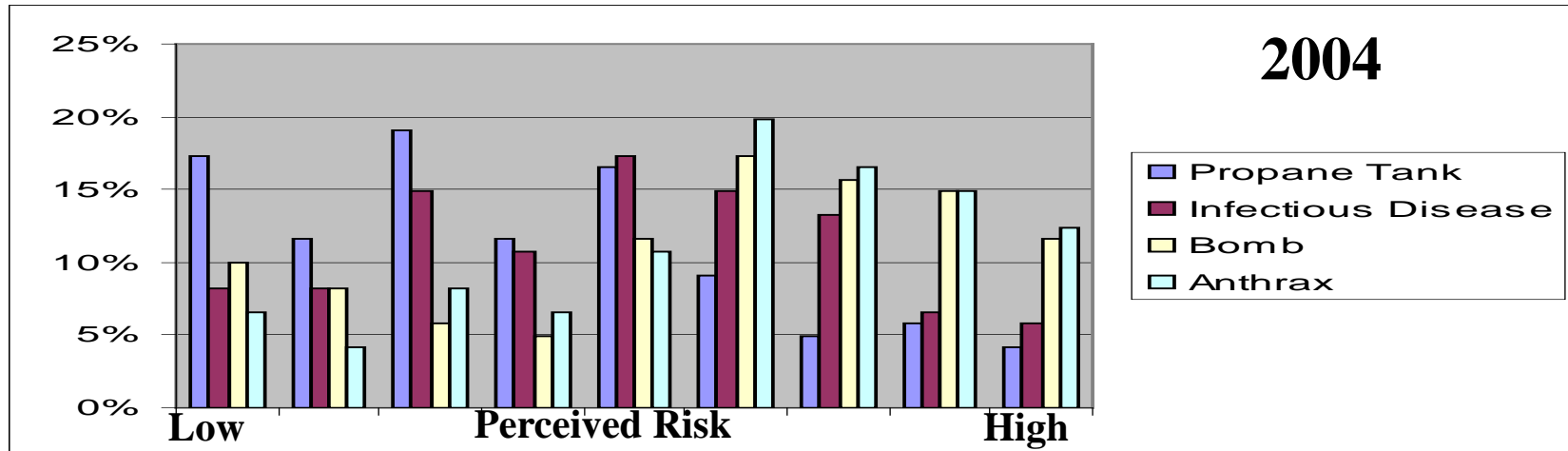
# Modeling Risk-Related Behavior Along Three Dimensions



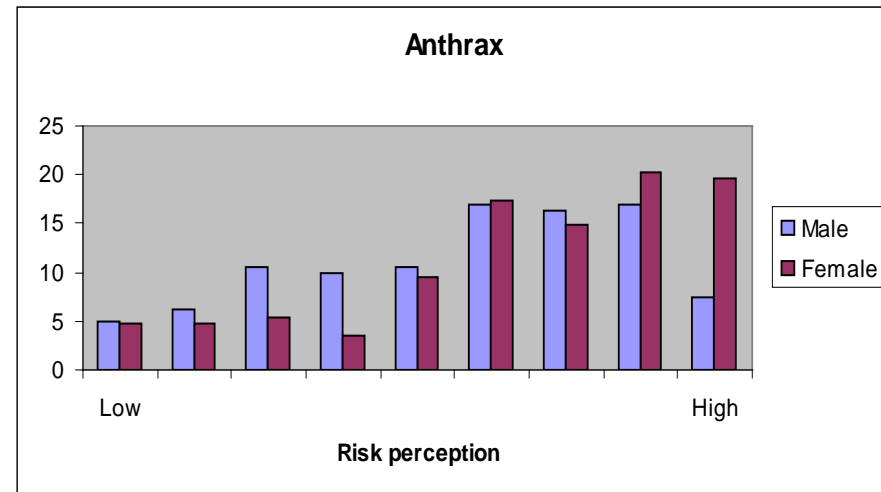
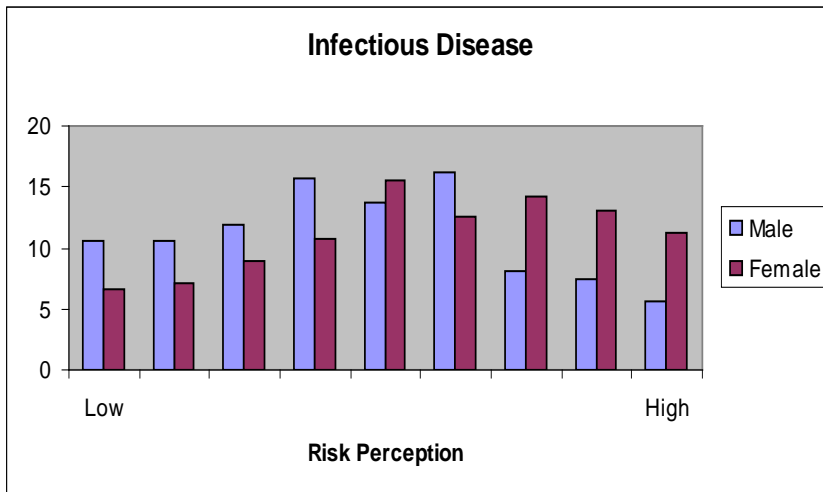
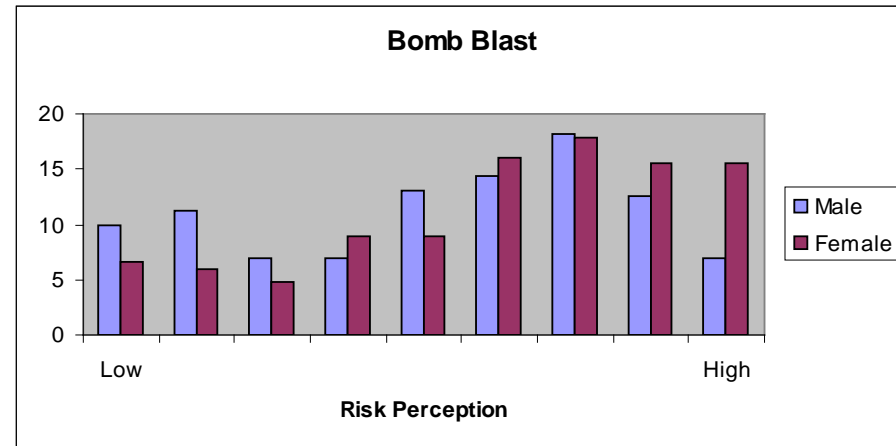
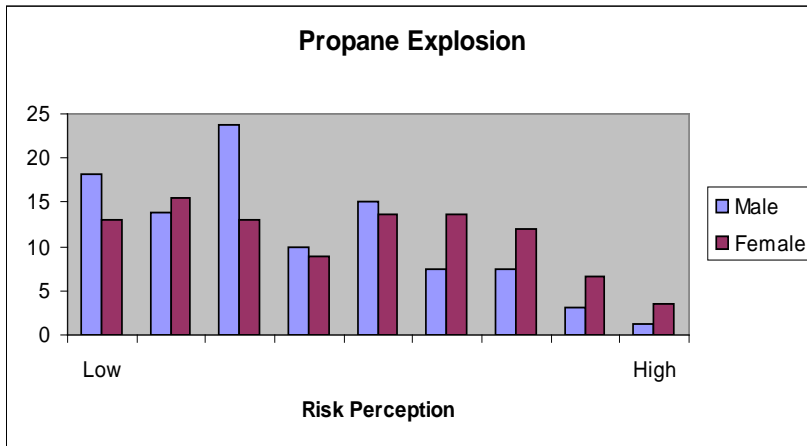
# Modeling Risk-Related Behavior Along Three Dimensions



# Descriptive Snapshot: Perceived Risk by Event Type 2004 vs. 2006



# Risk Perception: Males vs. Females





# What Factors Are Likely to Cause the Greatest Fears?

Natural Disasters → Industrial Accidents → **Terrorism**

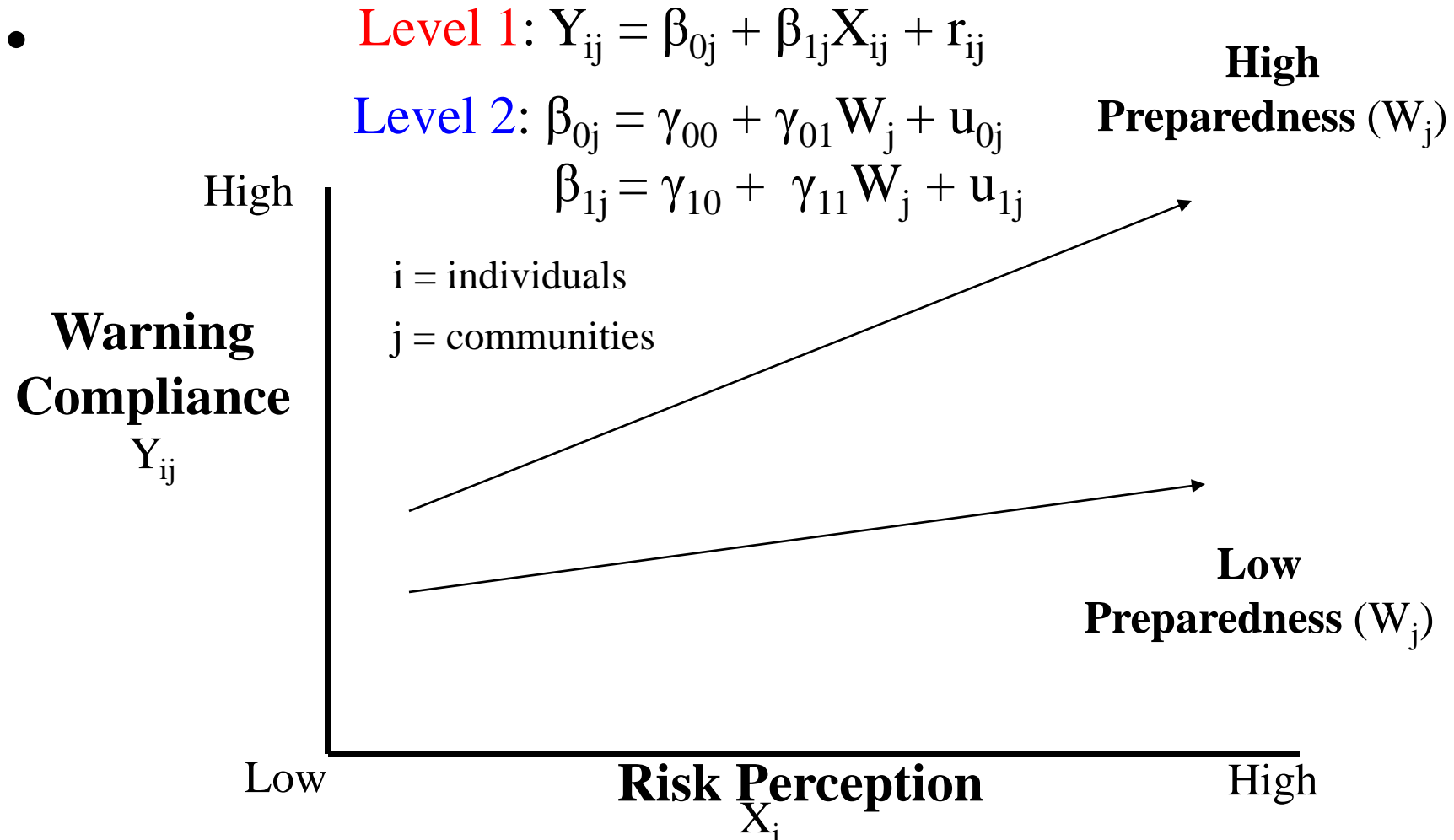
Explosions → **Biological/Radiological**

Competence → **Negligence**

Military/First Responders → Citizens → **Children**

Distant → **Near**

# Context: Risk Perception vs. Compliance for Different Levels of Preparedness



## Context: Risk Perception Over Time for Different Levels of Preparedness (*illustration*)

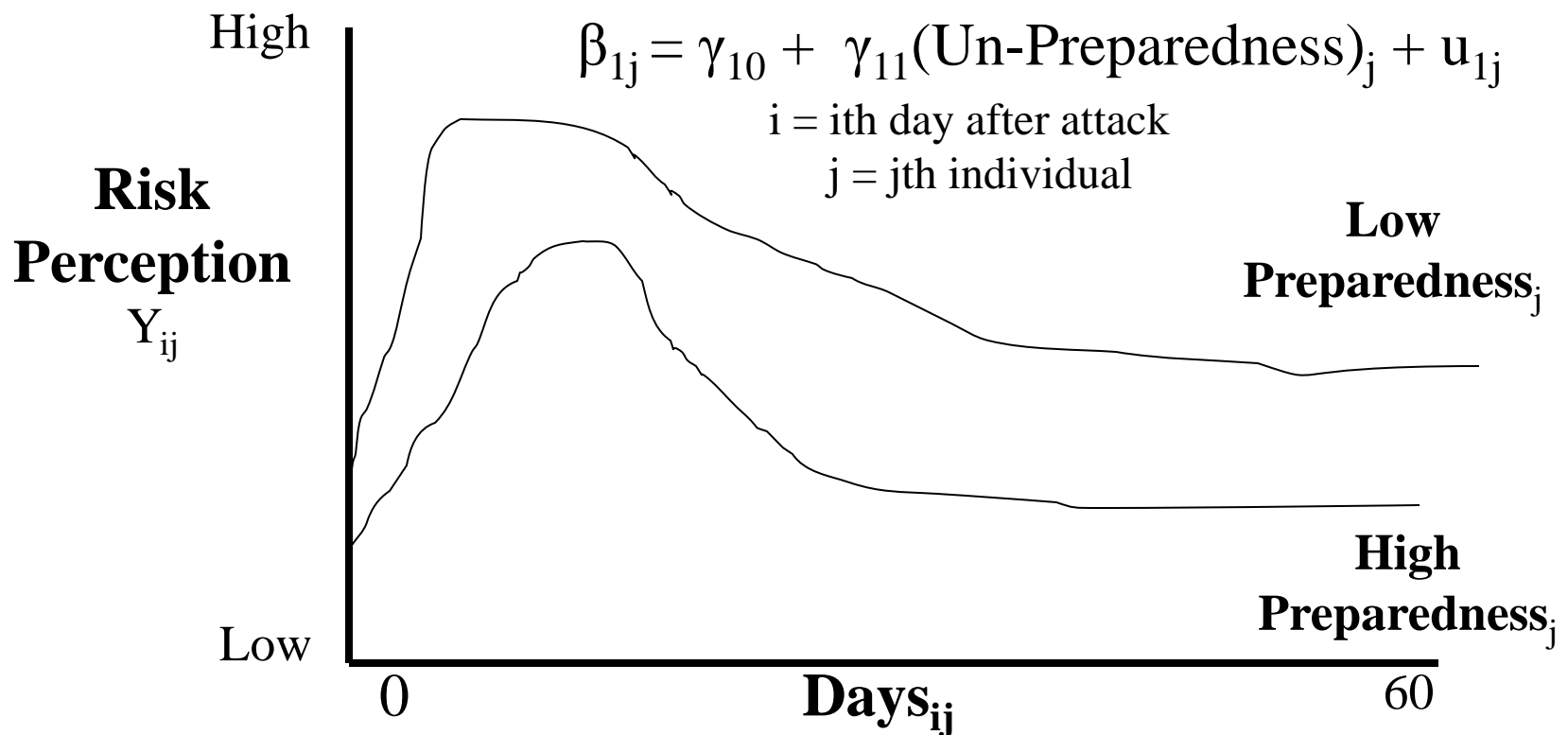
- Level 1:**  $Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Days})_{ij} - \gamma_{20}\text{Days}^2_{ij} + r_{ij}$

- Level 2:**  $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Un-Preparedness})_j + u_{0j}$

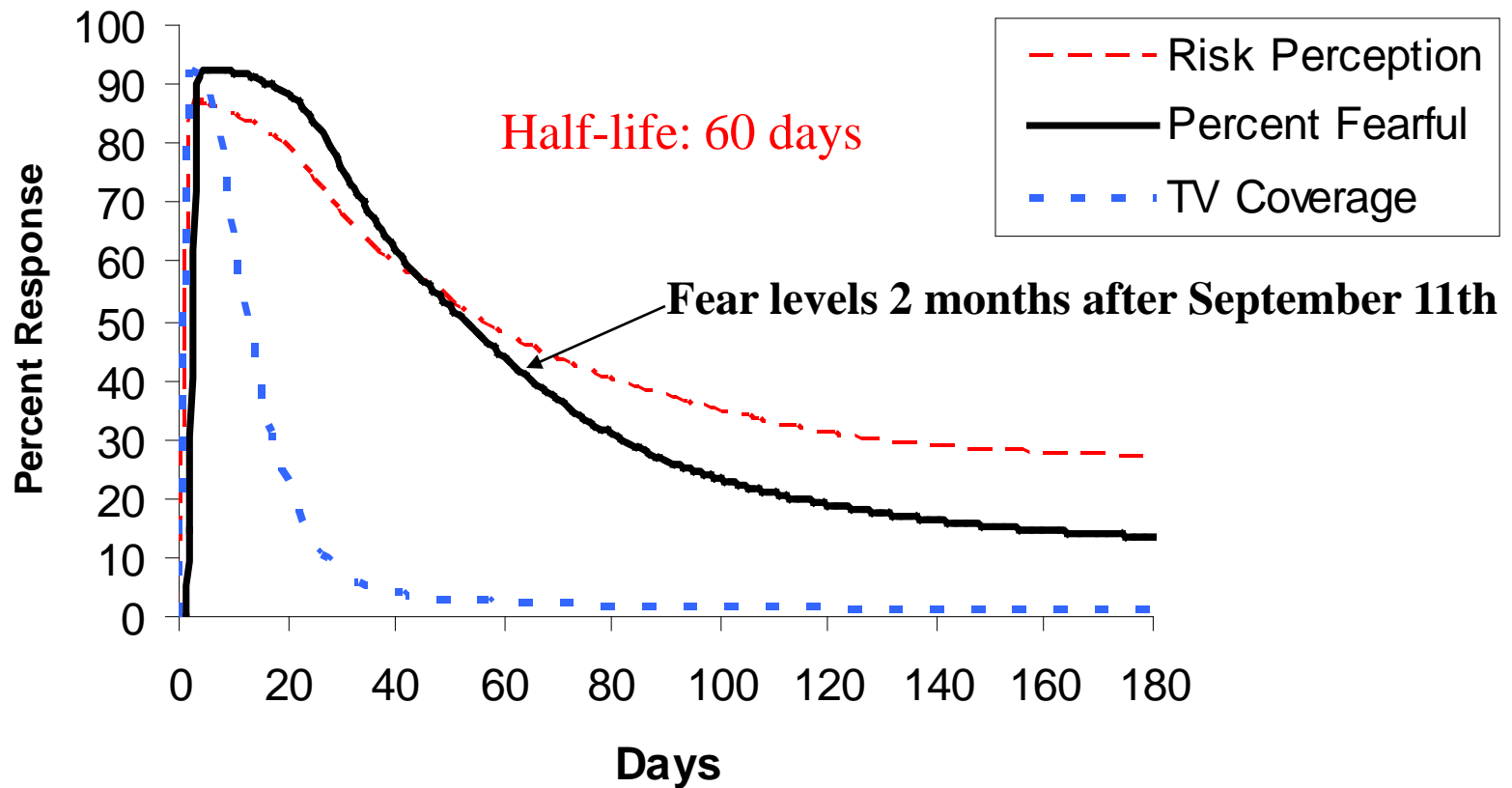
- $\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Un-Preparedness})_j + u_{1j}$

$i = i$ th day after attack

$j = j$ th individual

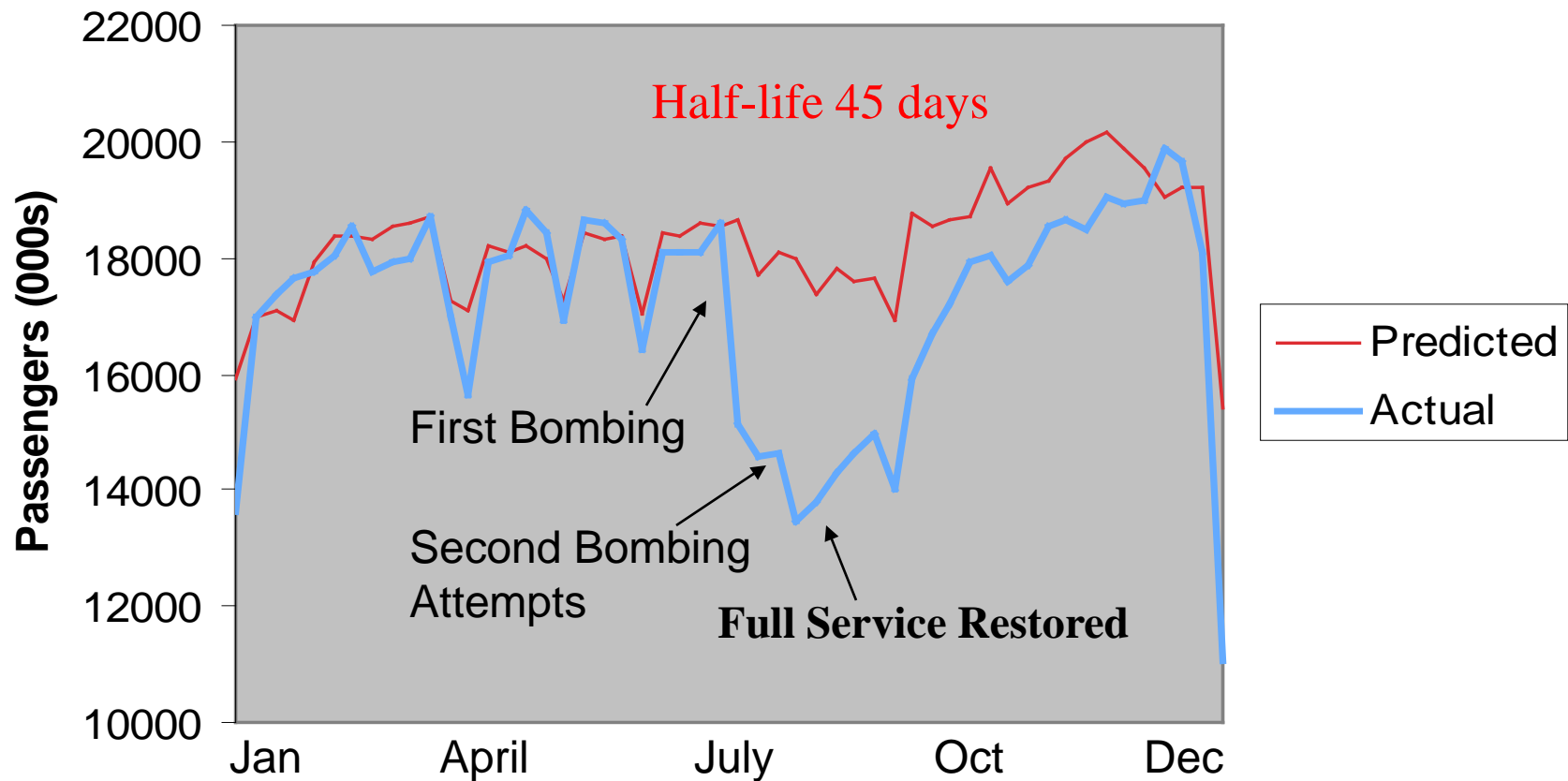


# Community Response to Anthrax Release (Based on System Dynamics Simulation Model)



# London Train Bombings: Predicted vs. Actual Passengers

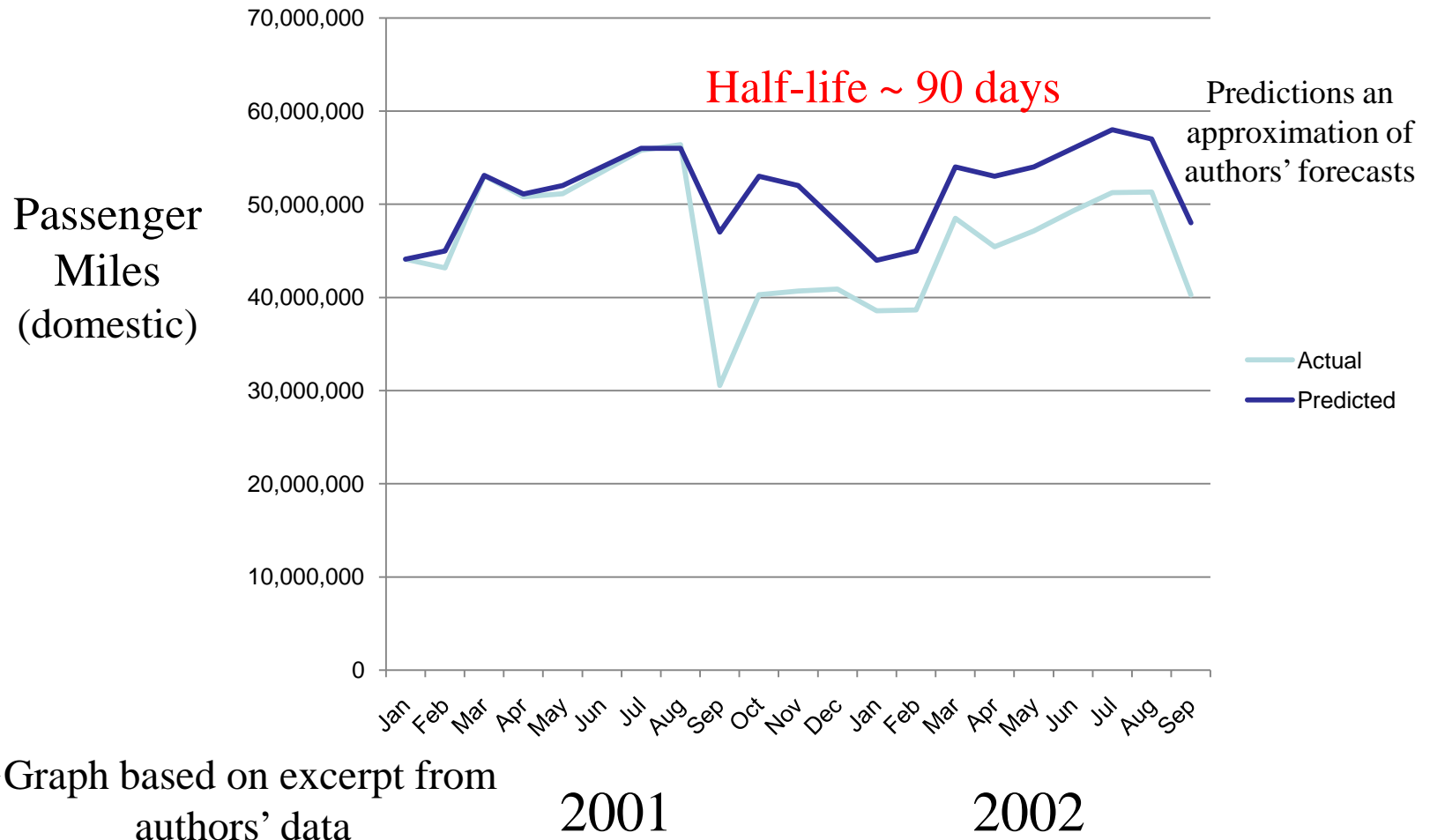
(Prager, Asay, Lee & von Winterfeldt)



2005

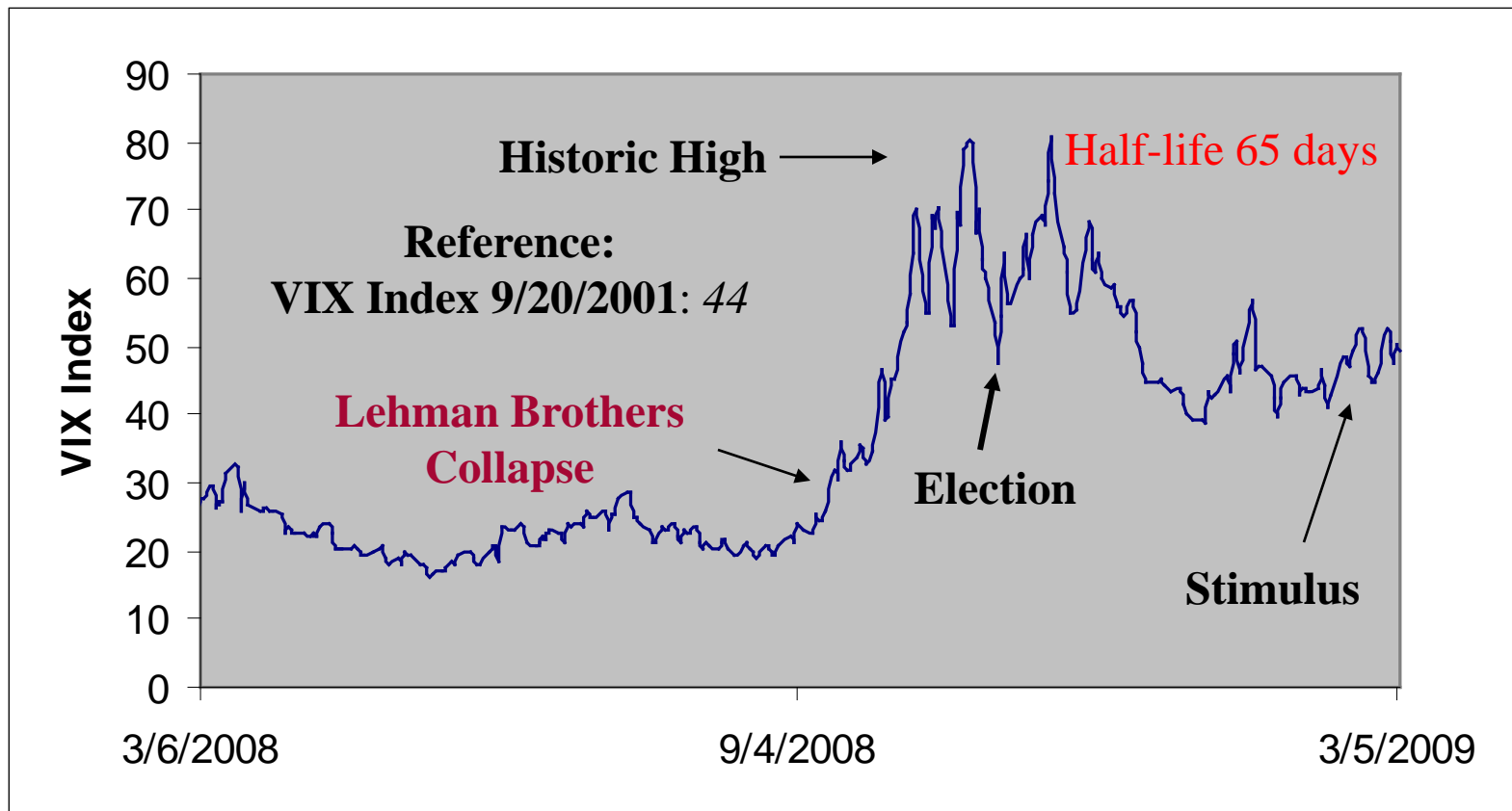
# The Economic Impacts of a Terrorist Attack on the U.S. Commercial Aviation System<sup>1</sup>

Peter Gordon, James E. Moore, II, Ji Young Park and Harry W. Richardson (2007)



<sup>1</sup>Graph based on excerpt from authors' data

# Diffusion of Investor Fear Following Announcements of “Potential Financial Meltdown”<sup>1</sup>



1: <http://finance.yahoo.com>. Retrieved data March 7, 2009

# How Does Fear Translate into Economic Impacts?

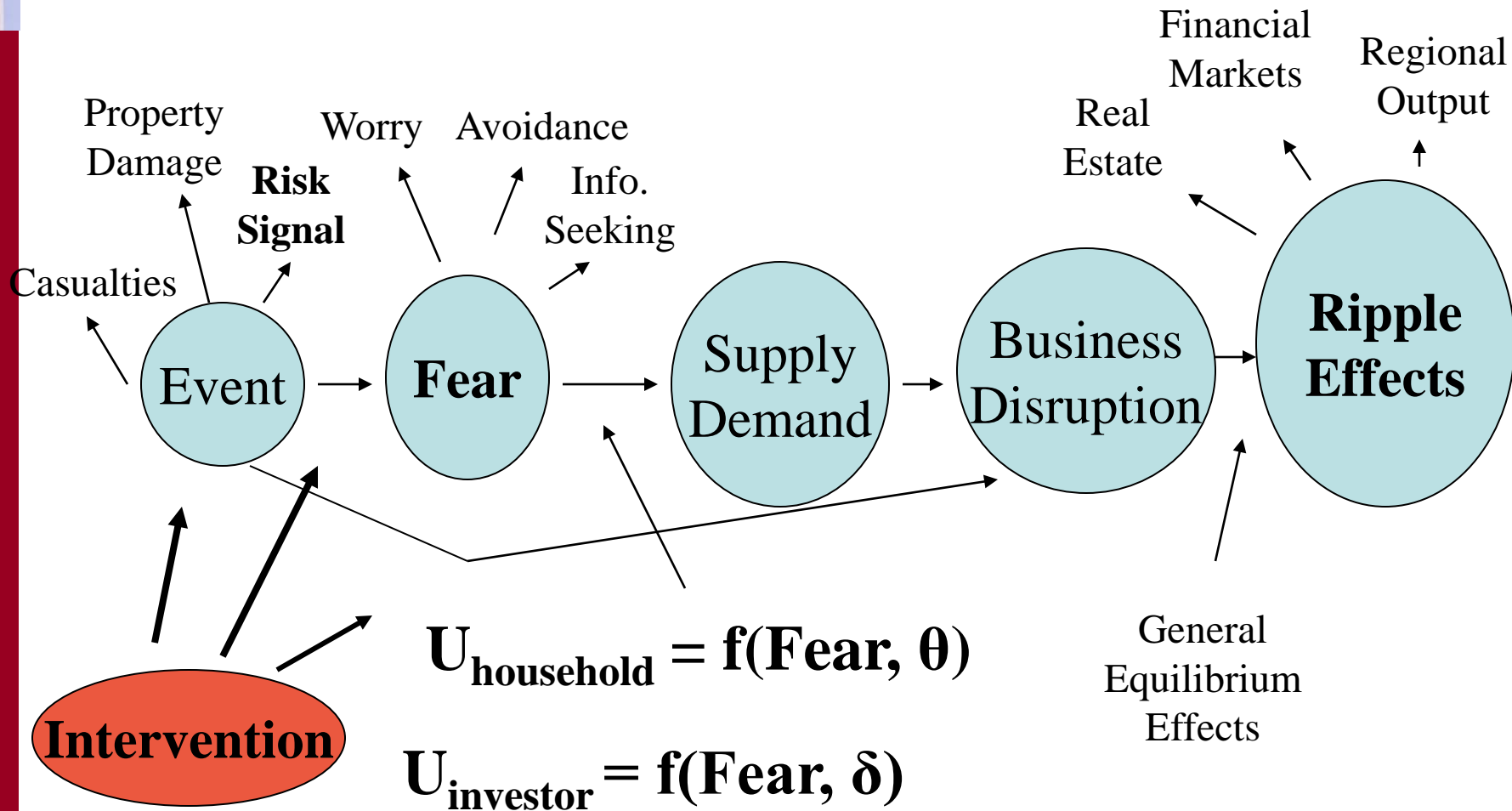






Photo by Stephen Friday (Alossix)

# The Social Amplification of Risk: Estimating the Indirect Effects of Fear and Perceived Risk



**GRP = Direct Effects + Indirect Effects**

Casualties  
Property Damage  
Business Interruption

Stigma  
Wage Premiums  
Risk Premiums

## Preliminary Results

- Computable General Equilibrium Model (CGE)
  - Los Angeles County
- Direct Effects -
  - Casualties
  - Property Damage
  - Business Interruption
- Indirect Effects (**155% Increase**)
  - Increased Required Rate of Return (3%)
  - Increased Required Wages (3%)
  - Reduced Spending (3%)

## ***The Careful Art of Risk Messaging***

- On Sears hairdryer: "Do not use while sleeping."
- On Marks & Spencer Bread Pudding: "Product will be hot after heating."
- On packaging for a Rowenta iron: "Do not iron clothes on body."
- On most brands of Christmas lights: "For indoor or outdoor use only."
- On a bottle of ALL laundry detergent: "Remove clothing before distributing in washing machine."