Behavioral Modeling at SNL

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Exploratory Simulation Technologies

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Behavioral Response Modeling

- IC and DoD have strategic, tactical and operational needs that models can support.
  - Strategic models can help avoid unintended consequence.
  - Tactical models can ensure robust execution.
  - Operational models are easily misspecified, but can focus on avoiding bad decisions
- Emergent threats remain off security radar
  - Changing Technology Needs
  - National and Multi-national supply-chains/financial-leverage
  - Arctic and climate-induced geopolitical dynamics
- Decision-makers/experts cannot mentally comprehend dynamics
  - Models easily produce misguiding static “predictions”
  - Validation and Verification must be a priority
  - Models cannot predict, but can minimize unintended consequences.

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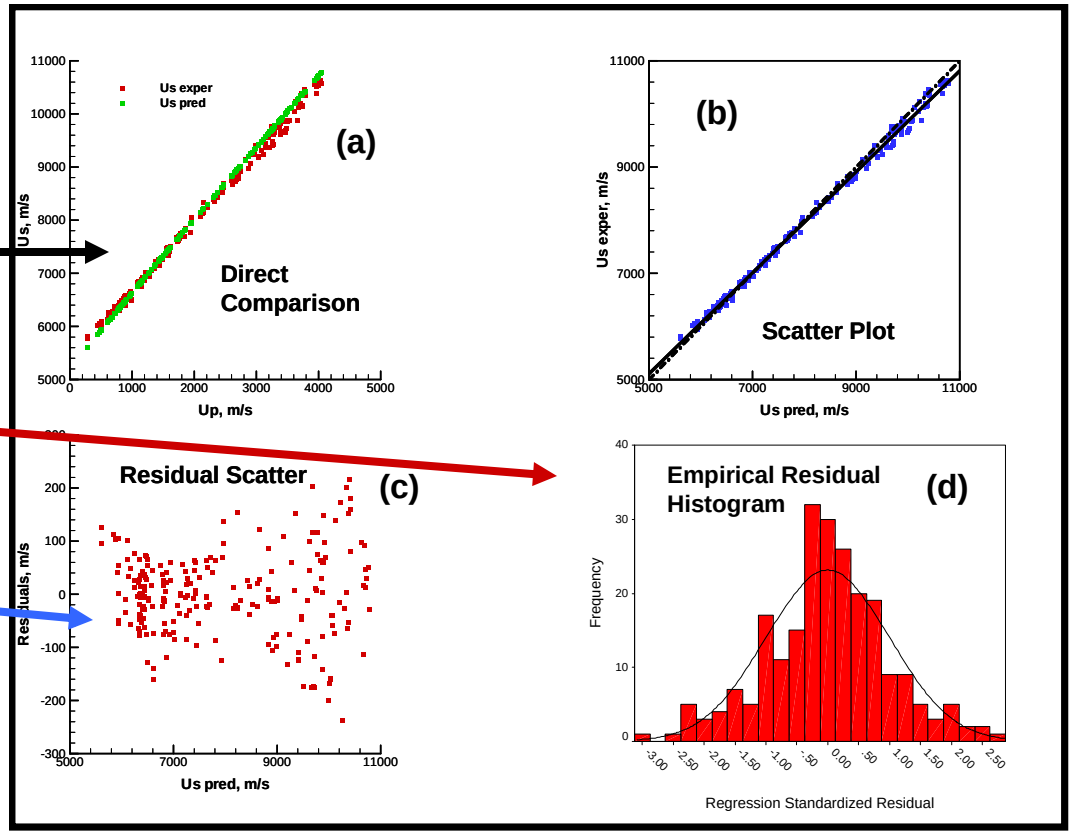
Social Models Require Validation At All Steps Of Development/Conceptualization

Uncertainty analysis and quantitative validation metrics move us from "looks pretty good" to "something is wrong" …

- Comparison of calculations and experimental data look good here.
  - Statistical analysis of the differences shows errors are too large.
    - Does hypothesis fail to give the right answer for the right reasons?



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Behavioral Modeling of Conflict Evolution/Emergence

- **System Dynamics:** Causal structure defines behaviors.
- **Agent-Based Modeling:** Captures stochastic drivers, not emergence.
- **Optimization:** Works only when one has full control and knowledge
- **Game Theory:** For exploring, but not executing strategies.
- **Accounting:** Fast, simple, but easily blind-sided
- **Econometrics:** Often misused; sophisticated statistics work.
- **Markov Chains:** Static assumption, and static distribution
- **Complexity Models:** Weak on V&V and formal causality
- **Social Network Analysis:** Statically useful; dynamics more so.
- **Social Movement Theory:** Descriptive, not predictive

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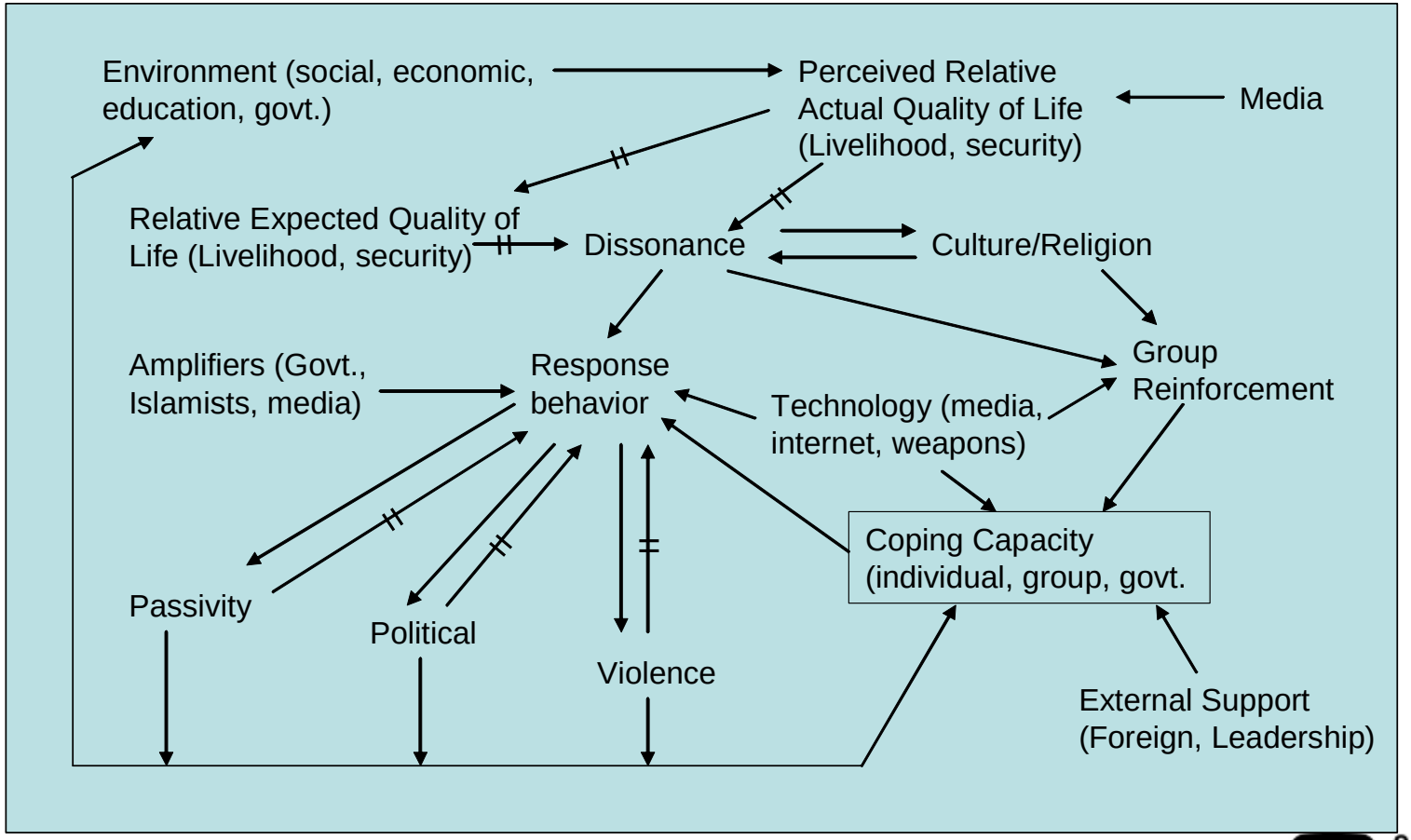
Expectation and Dissonance



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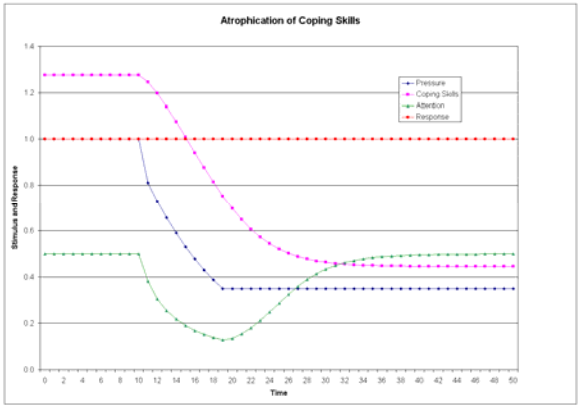
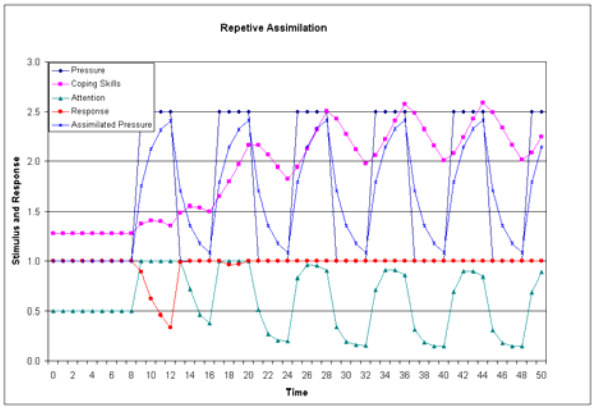
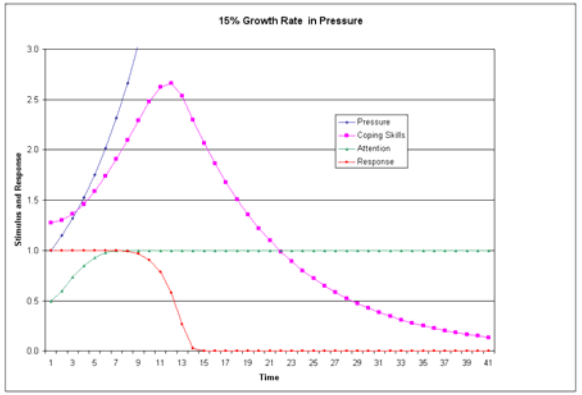
Coping and Responding Dynamics



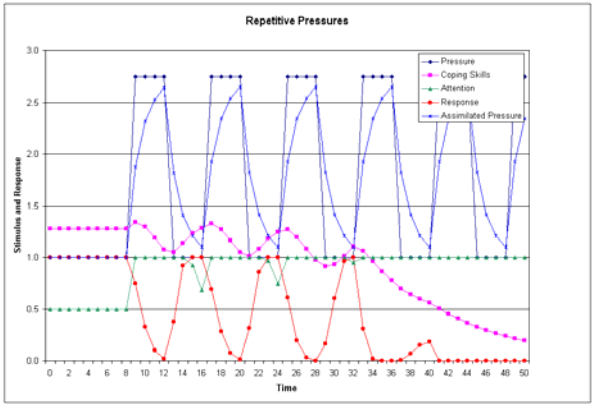
Helping can weaken.



Creating the better adversary



Giving in to pressure



Wearing us down

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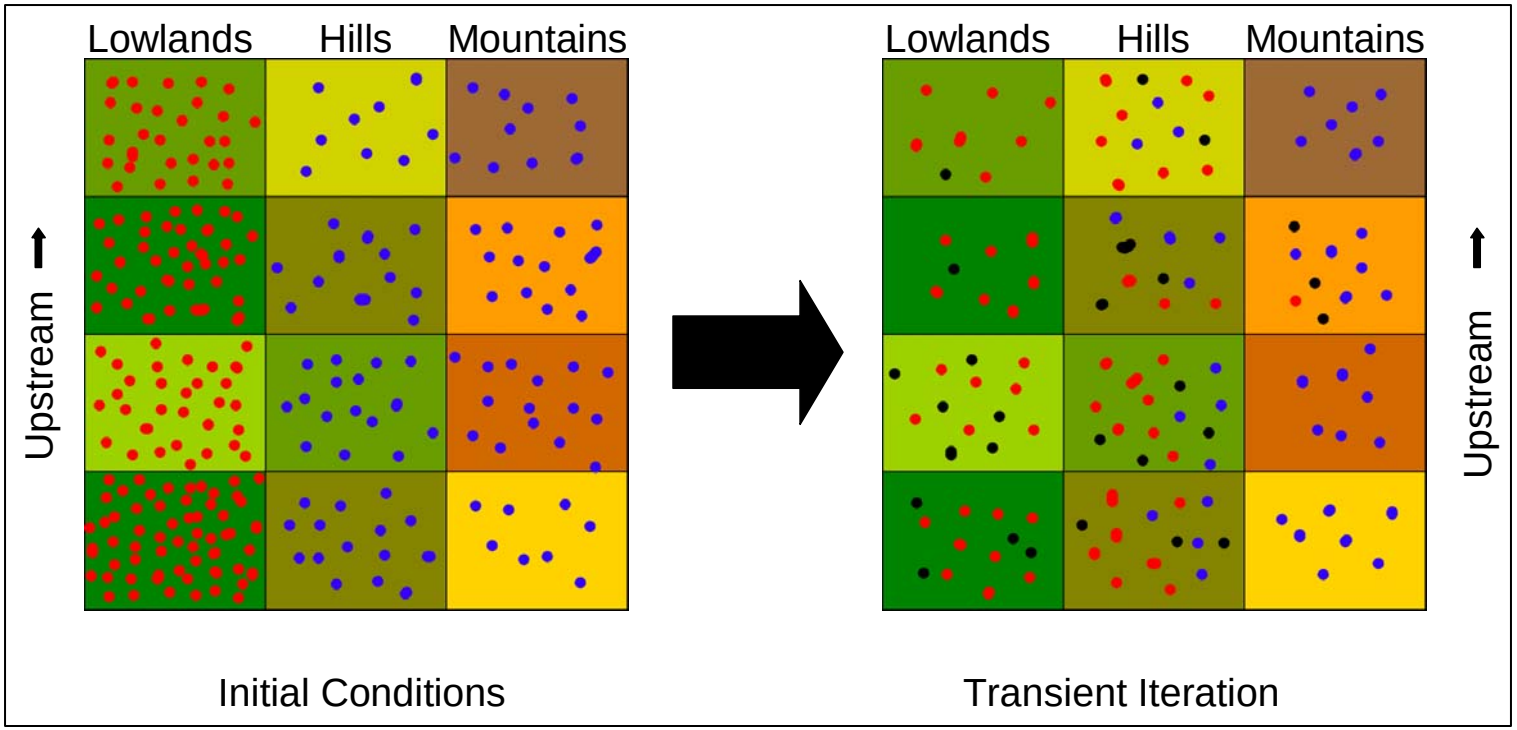
Spatial Conflict Dynamics
(flood-induced migration example)



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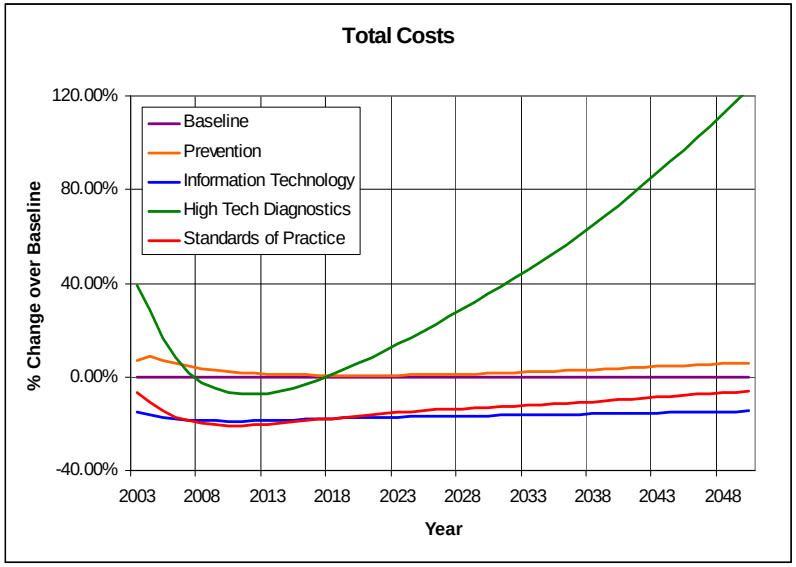
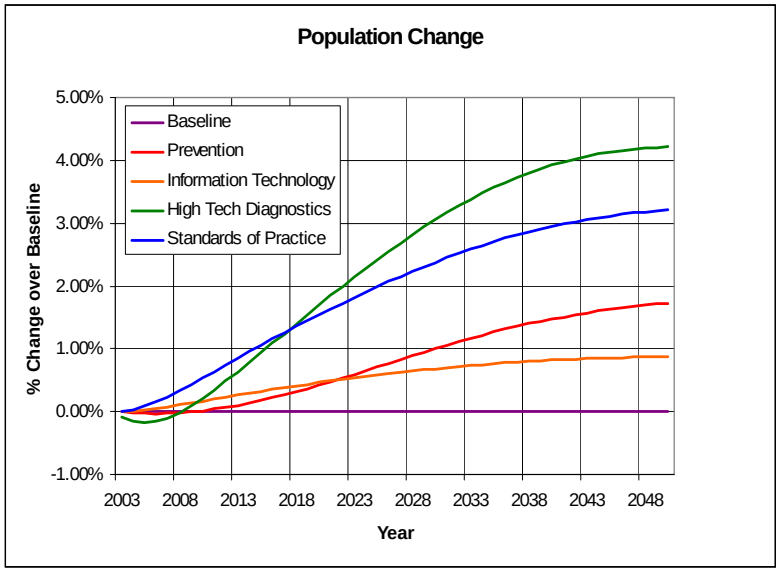
Unintended Consequences (healthcare policy example





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