

A decorative graphic at the top of the slide features a halftone pattern of human silhouettes in various poses, rendered in shades of gray. The silhouettes are arranged in a row, with some appearing more prominent than others due to the density of the dots.

# Health Behavior Modeling

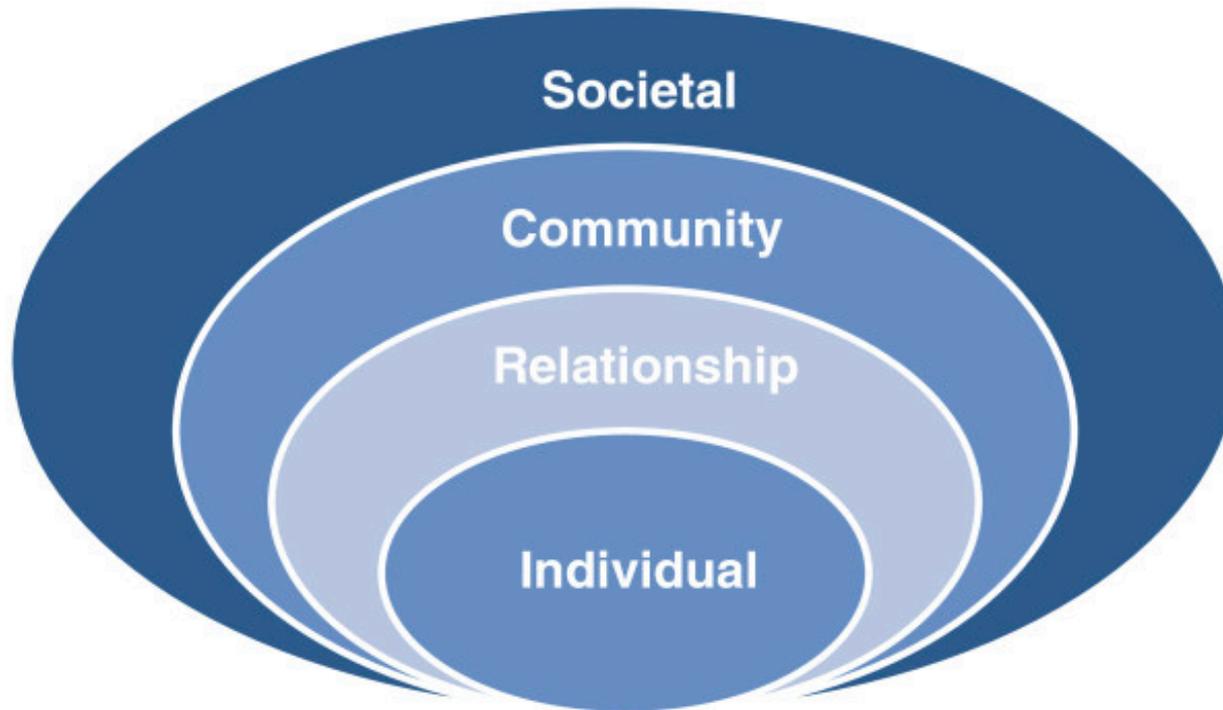
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# Public Health & Health Behaviors

- Health behavior:
  - An action taken by an individual to change or maintain their health status or prevent illness or injury
  - Substance use, violence, sexual risk, physical activity, diet, others?

# Social Ecological Model of Health Behavior



# Models of Health Behavior Change

- Multiple levels of factors influence health behaviors
- Influences interact across levels
- Multi-level interventions should be most effective in changing behavior

# Systems & Health Behavior

- What is a system?
  - *Any group of interacting, interrelated, or interdependent parts that form a complex and unified whole that has a specific purpose*
- What is systems thinking?
  - *A way of seeing and talking about reality that helps us better understand and work with systems to influence change*

# Systems Science & Health Behaviors

- What is systems science?
  - *A paradigm or perspective that considers connections among different components, plans for the implications of their interaction, and requires transdisciplinary thinking as well as active engagement of those who have a stake in the outcome to govern the course of change*

# Characteristics of Systems

- Systems have purpose
- All parts must be present for a system to carry out its purpose optimally
- The order in which the parts are arranged affects the performance of a system
- Systems attempt to maintain stability through feedback

# Intervention Implications

- Paradigm Shift: Rather than looking for what causes problems, we need to look for what “causes” solutions
- Look for leverage points
- Explore impact of systems when implemented in real world

“Bringing systems science to bear on public health problems has the potential to explain how small changes at the individual level accumulate at the population level to reveal significant shifts in the absolute causes of disease. System dynamics modeling and agent-based models are methods that can simulate the complex relationships among the components of a system and emergent behavior—that is, behavior that is observed at the bird's-eye vantage point of the system emerging from the behavior of the individual components of the system (e.g., blood clotting and scab formation emerge at the systems level from the behavior of individual cells). Because of its unique ability to consider simultaneously both the whole system and its individual parts, systems science is capable of producing solutions that take into account a broad range of factors pertinent to the problem under consideration; for instance, genetic-to-environmental–, cellular-to-behavioral–, and biological-to-social–systems approaches have proven extremely valuable when applied to problems identified in a variety of disciplines, including defense, business, and cellular biology. **Systems science shows promise for unlocking the secrets of complex, multidimensional health issues and for transforming this knowledge into effective interventions that can fundamentally change population health.**” – Mabry et al, 2008

# Why Use Agent-Based Modeling?

- To explore and better understand the complex social systems and dynamics in a variety of health areas and health behaviors – the modeling process requires you to THINK CLEARLY and to INTEGRATE KNOWLEDGE
- To adopt an integrated ecological systems approach with interactions between micro- and macro-level processes/dynamics – the models are DYNAMIC
- To inform the development, implementation and evaluation of complex interventions – the models can SIMULATE REALITY
- To make informed programmatic and policy decisions – the models are a VISUAL TOOL that can engage stakeholders

## FRED Example: Modeling Community Social Ecologies to Promote Community Prevention Efforts

- Adapts Infectious Disease Models to Behavioral Risk Models representing agent-agent, agent-environment, and group-level interactions
- Models (a) child abuse and neglect, (b) onset of alcohol use, (c) impacts of hyper-availability, (d) problem risks related to AUDs, and (e) impacts of social host ordinances on underage drinking
- Answers critical question: “What environmental prevention efforts work best in communities?”