Complexity and Public Health Policy

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Focus of Research

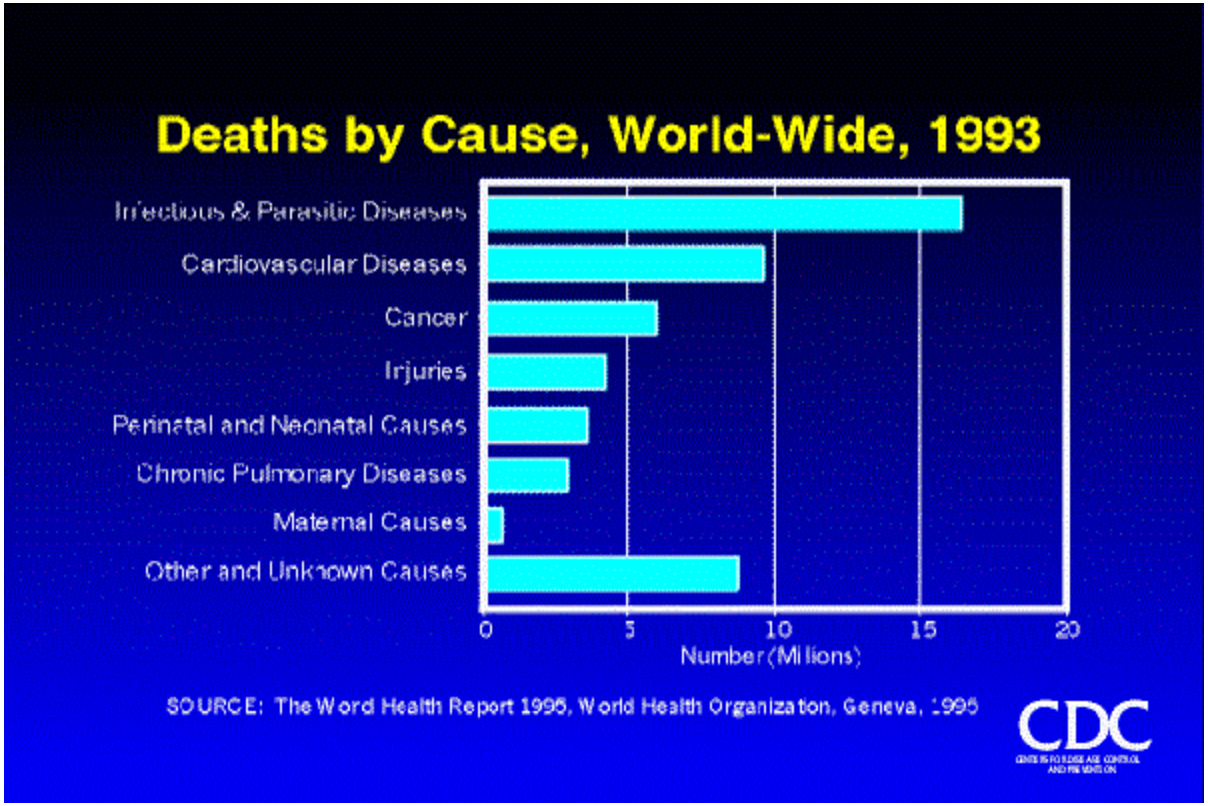
- public health concern of controlling emerging infectious disease
- current public health concern
- matches personal research interests in international health concerns, complex systems and ecological systems

Tilting at windmills...

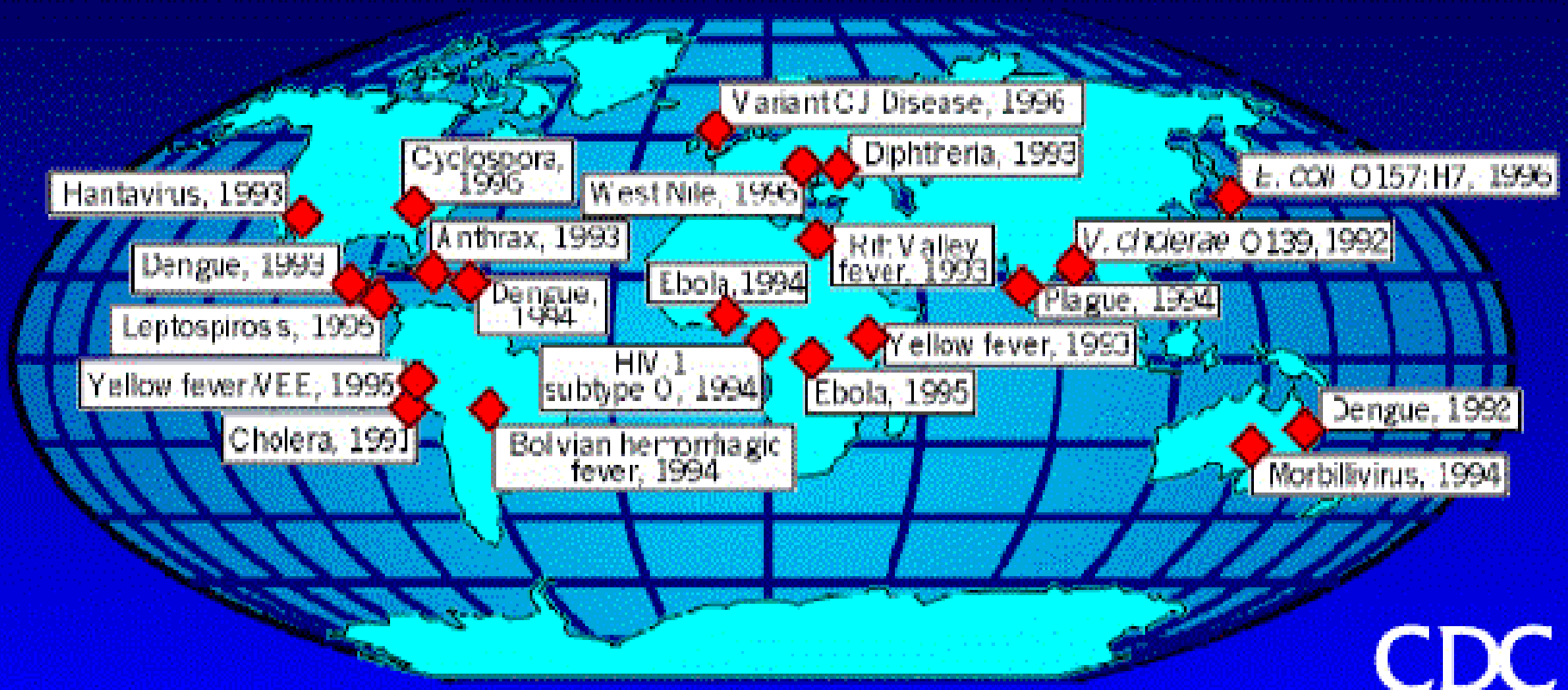
- Complexity, systems science...changing vocabularies...still looking at complex adapting systems
- A critique of the largest and successful entities addressing these issues....?
- Using HT, complexity/systems concepts, specific frameworks to address EID

  Scope of this issue...

EIDs


Deaths by Cause, World-Wide, 1993
Infectious & Parasitic Diseases
Cardiovascular Diseases
Cancer
Injuries
Perinatal and Neonatal Causes
Chronic Pulmonary Diseases
Maternal Causes
Other and Unknown Causes
0
5
10
15
20
Number (Millions)
SOURCE: The Word Health Report 1995, World Health Organization, Geneva, 1995
CDC

Global Microbial Threats in the 1990s



CDC

CENTERS FOR DISEASE AND CONTROL AND PREVENTION

Frameworks and constructions

- Dividing HT theorists into those with a framework (e.g. Boulding) and those of an interpretive, observer-driven approach (e.g. Allen)
- HT began with great chain of being
- 16th and 17th century moved from “The Hierarchy” to many
- Comte’s first work, followed by Durkheim and Freud (inter-relationships and the collective)

Hierarchy theory...

- Comte: ... a hierarchy of disciplines, that hierarchy was “the fundamental condition imposed by the general theory of classifications” (Comte, 1937) and that there was a genuine continuum among these same sciences. In his view, each science is at least in part at once sovereign and subordinate....

Hierarchy...

- ...there is ‘an hierarchic order to the world’ (von Bertalanffy, 1968) that can be presented in a form of a static framework displaying that progression of order; and
- Whyte (1969a) noted four very early thinkers, Newton (1705), Lambert (1761), Fourner d’Albe (1907) and Charlier (1908) who used static frameworks to explore a hierarchical structure for the physical universe

GST- Boulding

- So we come to the framework of Boulding
- ...it aims to point out similarities in the theoretical constructions of different disciplines, where these exist, and to develop theoretical models having applicability to at least two different fields of study. At a higher level of ambition, but with perhaps a lower degree of confidence it hopes to develop something like a "spectrum" of theories—a system of systems which may perform the function of a "gestalt" in theoretical construction." (Boulding, 1956, p197).

The process…

- To use hierarchical frameworks and interpretivist approaches to hierarchy to look at the issue of EID and if this can improve public health policy making
- First step was to gather data about the risk factors in emerging infectious disease
- To determine the disciplines needed to address those risk factors, analyze the current EID policies from both perspectives, and to highlight any gaps in disciplines missing in use by them

The Skeleton of Science

Level	Description	Characteristic	Example	Discipline
1	Structures and frameworks	Static, spatial pattern	Bridge, mountain, crystal, atom	Descriptive elements of all disciplines
2	Clockworks	Predetermined motion	Clocks, machines, solar system	Physics, astronomy, engineering
3	Control mechanisms	Closed-loop control	Thermostat, homeostasis	Cybernetics
4	Open systems	Structurally self-maintaining	Flames, cells	Theory of metabolism
5	Genetic–societal systems	Society of cells, functional parts	Plants	Botany
6	Animals	Nervous system, self-awareness	Birds and beasts	Zoology
7	Humans	Self-consciousness, knowledge, language	Human beings	Biology, psychology
8	Socio-cultural systems	Roles, communication, values	Families, boy scouts, clubs	History, sociology, anthropology
9	Transcendental systems	Inescapable unknowables	God?	Philosophy, religion

Definitions of risk factors…

- H: “Biological, social, and behavioral characteristics … that are relevant to health...”
- A: “A factor, such as a microorganism, chemical substance, or form of radiation, whose presence, excessive presence, or (in deficiency diseases) relative absence is essential for the occurrence of a disease.”
- T: “Any mechanism by which an infectious agent is spread from a source or reservoir to another person.” These mechanisms can be direct or indirect.
- E: “All that which is external to the individual human host. Can be divided into physical, biological, social, cultural, etc., any or all of which can influence health status of populations.”

Host, agent, transmission, environment factors…

Host factors…what disciplines appear to be needed...

- higher concentrations in population; 7 population biology; 8 sociology, economics
- movement of populations; 3 feedback, cybernetic systems; 8 sociology, politics
- susceptibility to infection; 4 molecular/biochemistry; 8 sociology, psychology
- speed of global transport of people; 2 clockworks; 8 sociology
- changes in human behaviour; 8 sociology, politics, psychology; 9 religion, philosophy
- herd immunity; 3 feedback mechanisms; 8 sociology, psychology
- recreational travel; 8 sociology, economics
- business travel; 8 sociology, economics

The policy addresses…

- Surveillance and response: Objective I-A. Strengthen infectious disease surveillance and response.Objective I-B. Improve methods for gathering and evaluating surveillance data.Objective I-C.Ensure the use of surveillance data to improve public health practice and medical treatment.Objective I-D. Strengthen global capacity to monitor and respond to emerging infectious
- This goal focuses on improving our country's early warning network and developing more effective international surveillance networks

Probable:

Information systems (4) feedback modelling (3)analysis of statistics/patterns (looking for the differences) (1, 2)operations research (1, 2)mathematical modelling (1, 2)

Possible:

behavioural sciences (7, 8) for investigating "the factors influencing their emergence", although not detailed. Emphasis on clinical epidemiology.

Surveillance Recommendations

- a single network for all agencies on same levels of analysis…
- qualitative and quantitative data gathering incorporated into the same databases. This will require advances in models and methodologies which are capable of mixing and interpreting such data.
- ecological approach to surveillance is necessary…with not just the biological and social (Krieger, 1994) but multiple disciplines who can also communicate with each other

Health Promotion/Education Recommendations

- addressing the balance between the individual and social concerns inherent in health promotion ... explored by complexity and critical systems thinking and this expertise should be incorporated into the design and implementation of health promotion programmes.
- a second recommendation in this area is to refocus the educational content in the teaching of public health and epidemiology to emphasis learning across disciplines

Proposed Model

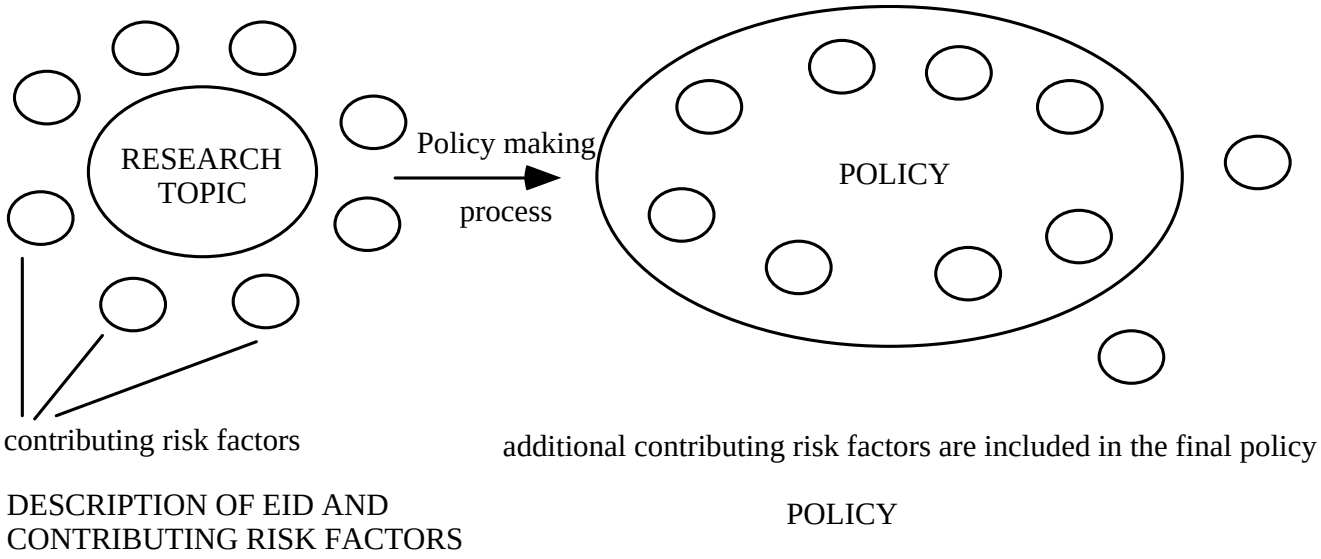


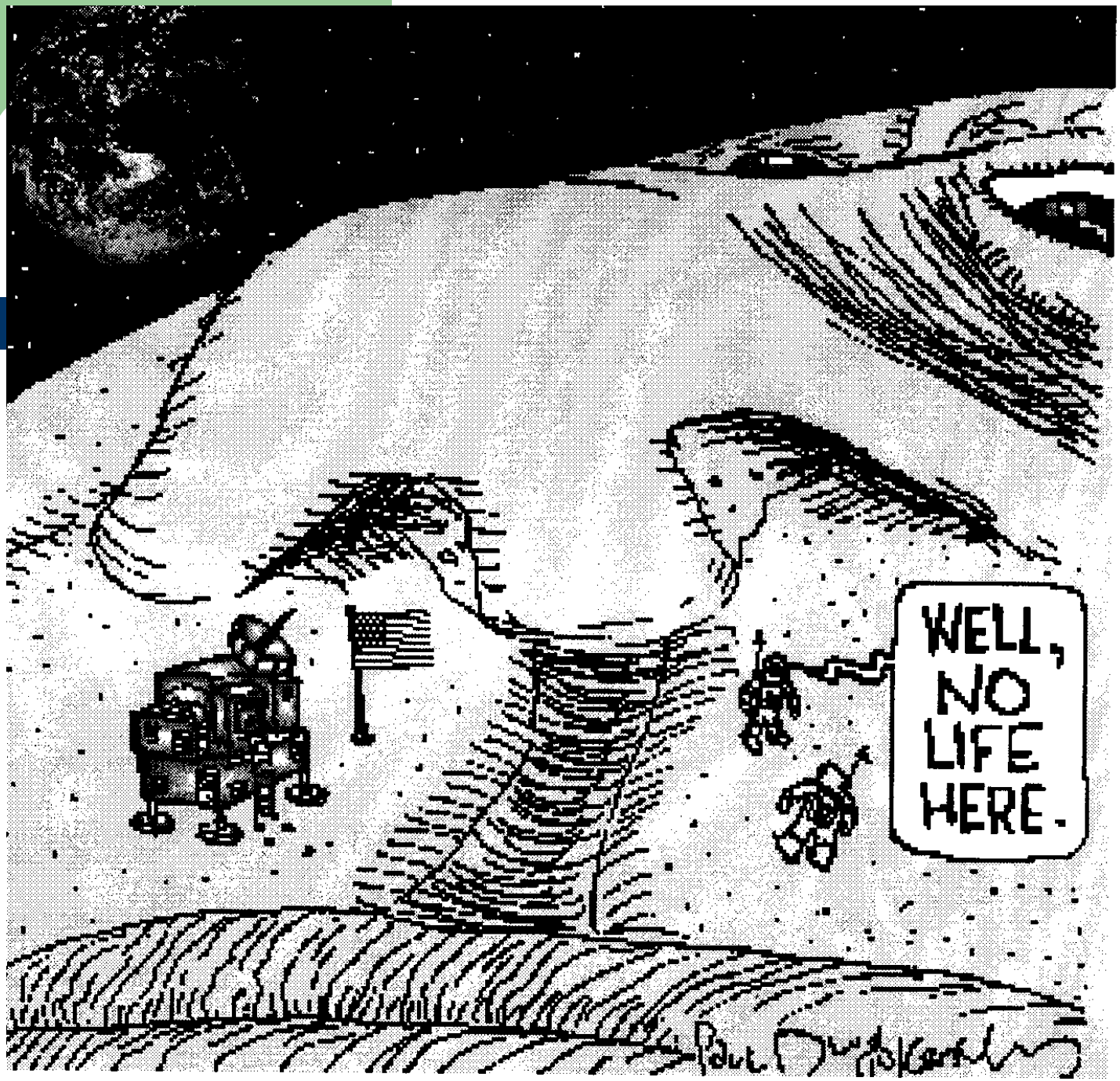
Figure 3: Policy Making with Multi-disciplinary Epidemiology

Applied Research Recommendations

- wise to expand the range of disciplines used in the investigation of EID in order to recognise emergent properties that come from intervening on levels that are beyond a singular discipline's capacity for understanding
- individual disciplines alone (and their discipline-focused research methods) cannot address the full complexity of such research issues
- an approach is needed to incorporate all disciplines and increasing complexity and that is what systems thinking (complexity science) can offer international public health policy making and its implementation

Finally...

- A complex system is defined when more than one level of analysis is required for its adequate description
- We have to move to recognising this way of analysis while also understanding that we may never be able to work at scales necessary and sufficient for that analysis
- And a reminder from Kolasa at McMasters on this point is...


WELL, NO LIFE HERE.