Complexity and Health

Towards a New Perspective
On Health Policy

The Health Field Is Rapidly Changing

- Changing global economic and social conditions
- A growing recognition of the interrelations between health and other policy sectors
- New technologies in health care delivery
- New approaches to prevention and promotion
- New research on health determinants, and new ideas about health inequalities
- Many commissions and inquiries
- An apparent logjam in health policy

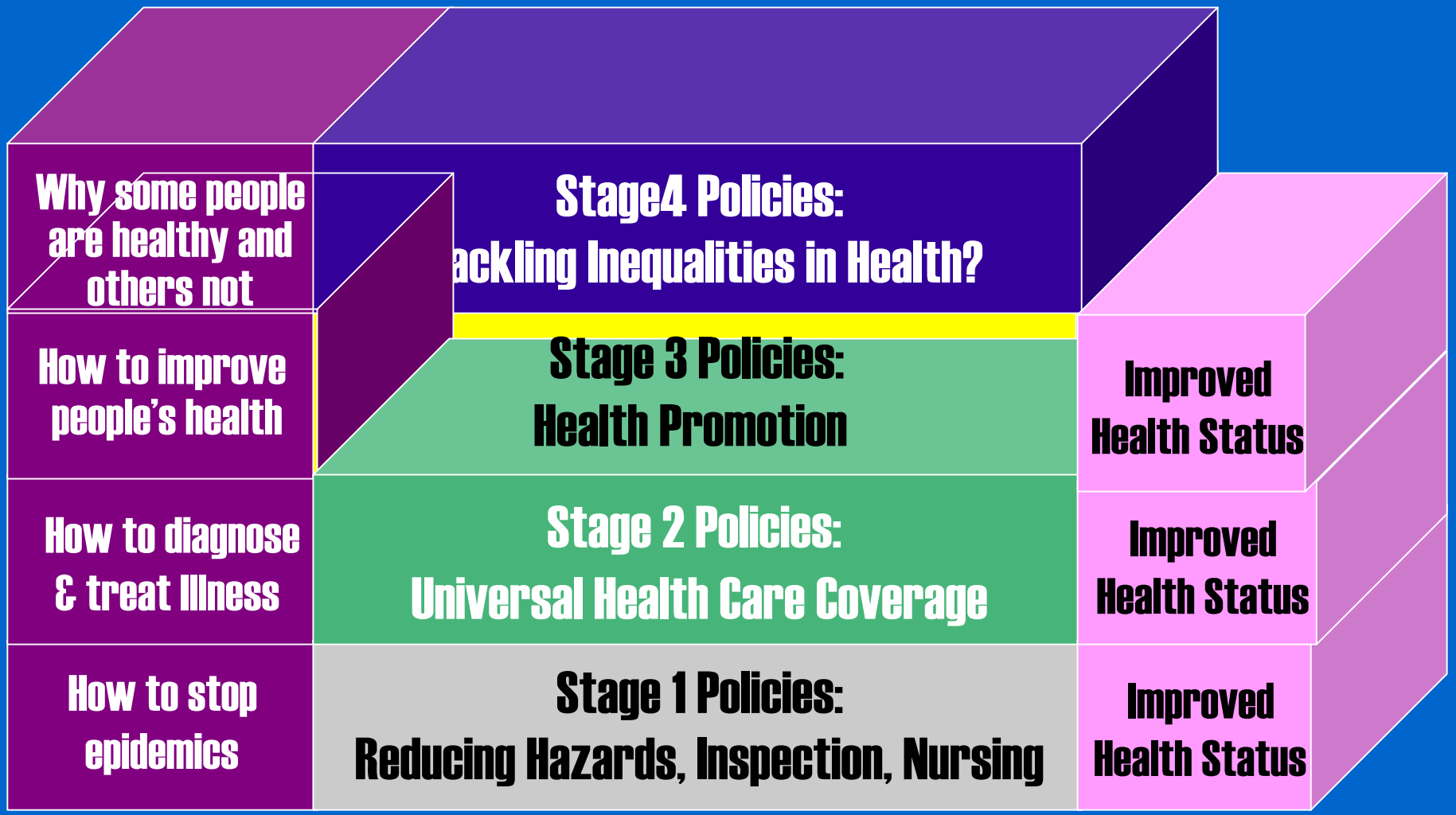
Our Last Project

- Title: *Towards a New Perspective on Health Policy*
- Contributors:
  - Ministries: Health Canada, Ontario, New Brunswick
  - International Agencies: CIDA, IDRC
  - Foundations: Ivey Foundation, Max Bell Foundation, Change Foundation
- Timeline: 1998-2001
- Products:
  - Background studies 1998-1999
  - Presentations 1998-2000
  - Discussion papers 1999-2000
  - Workshops and Roundtables 2000
  - Synthesis of Framework 2000-2001

This New Project

- Title: Health and Everything: Complexity and Health
- Contributors so far:
  - Government: Romanow Commission, Canadian Nursing Advisory Committee
  - Foundations: Change Foundation, Wellesley Central Health Corporation
  - Institutions: Riverdale Hospital, Possibly TEGH
- Timeline: 2001-2003
- Products:
  - Conceptual Framework
  - Case Studies
  - Discussion papers
  - Workshops and Roundtables
  - Report and Manuscript

The Health Edifice is Built in Stages



Different Health Related Questions

- How do we keep people healthy?
  Public Health
- How do we diagnose and treat people?
  Medicine
- How do we improve the health of the population? *Health Promotion*
- Why are some people healthy and others not?
  Inequalities in Health Research

The Health Promotion Path:

The Lalonde Report (1974): The Health Field Concept

Environment

"All matters related to health external to the human body and over which the individual has little or no control." Including the physical and social environment.

Lifestyle

The aggregation of personal decisions, over which the individual has control, affect health. Self-imposed risks created by unhealthy lifestyle choices can be said to contribute to, or cause, illness or death.

Human Biology

All aspects of health, physical and mental, developed within the human body as a result of organic make-up contribute to health.

Health Care Organization

The quantity, quality, arrangement, nature and relationships of people and resources in the provision of health care influence health.

The Health Promotion Path

Source: *Towards a Common Understanding: Clarifying the Core Concepts of Population Health; A Discussion Paper;* The Conceptual Framework Subgroup on Population Health; Health Canada, December 1996

Key Determinants of Health

- Income and Social Status
- Social Support Networks
- Education
- Employment/Working Conditions
- Social Environments
- Physical Environments
- Personal Health Practices
- Healthy Child Development
- Biology and Genetic Endowment
- Health Service
- Gender
- Culture

Health Promotion: 28 Determinants of Health

Physiological	Psychological & Behavioral	Sociodemo -graphic	Socio-economic Status	Social Environmental Medical	Outcomes
Cardio-vascular Immune Muscular Endocrine Height Weight	Psychological Distress Personality Factors Health Promoting Behaviours Health Damaging Behaviours	Age Ethnicity Gender Location	Education Income Occupation Family Wealth Perceived SES Economic Mobility Chidlhood SES Material Possessions National Income Distribution	Residential Characteristics Occupational Environment Social Support Social/ Professional Hierarchy Access to Health Care	Health and Illness

Toward Understanding the Association of Socio-economic Status and Health: A New Challenge for the Biopsychosocial Approach. Norman B. Anderson & Cheryl A. Armstead. *Psychosomatic Medicine*. 57:213-225 (95)

The Black Report (1980)

- A landmark report on inequalities in health
- Gathered large amounts of data correlating health status indicators with social class
- Made recommendations about reducing the number of years of life lost through this inequality.

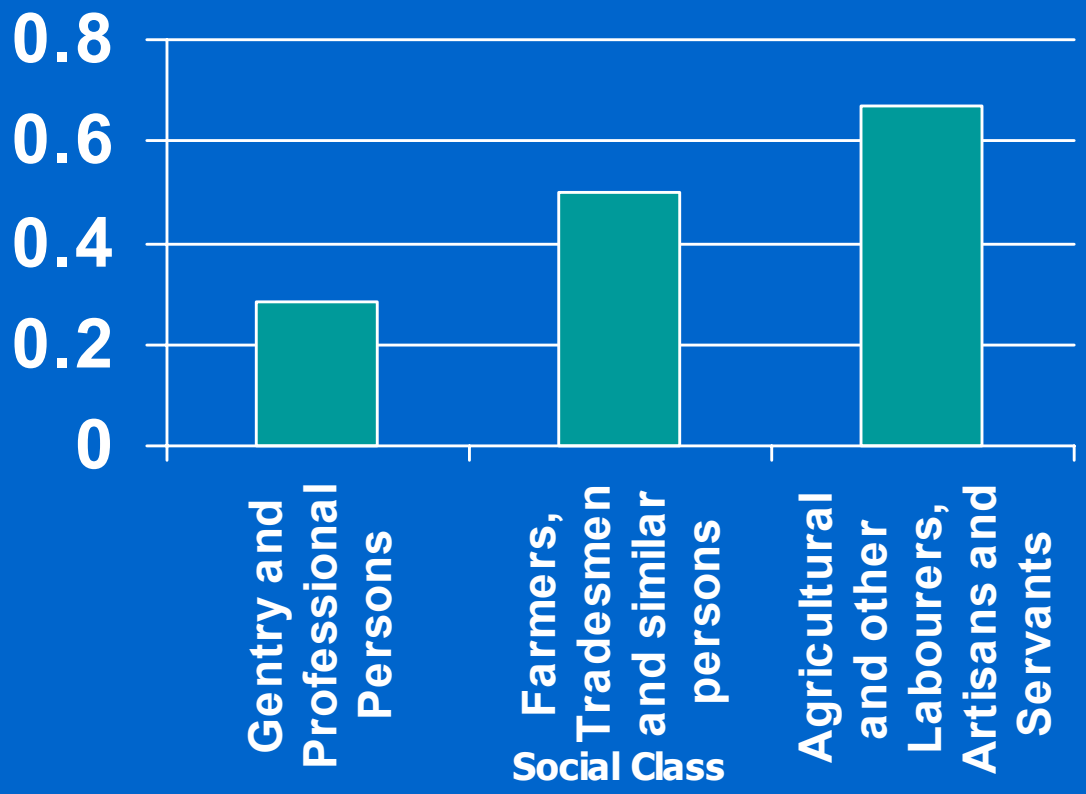
Longevity in 17th Century England

Disease Environment Proxies for Levels of Exposure to Disease

Income Level Proxies for Levels of Resistance to Disease

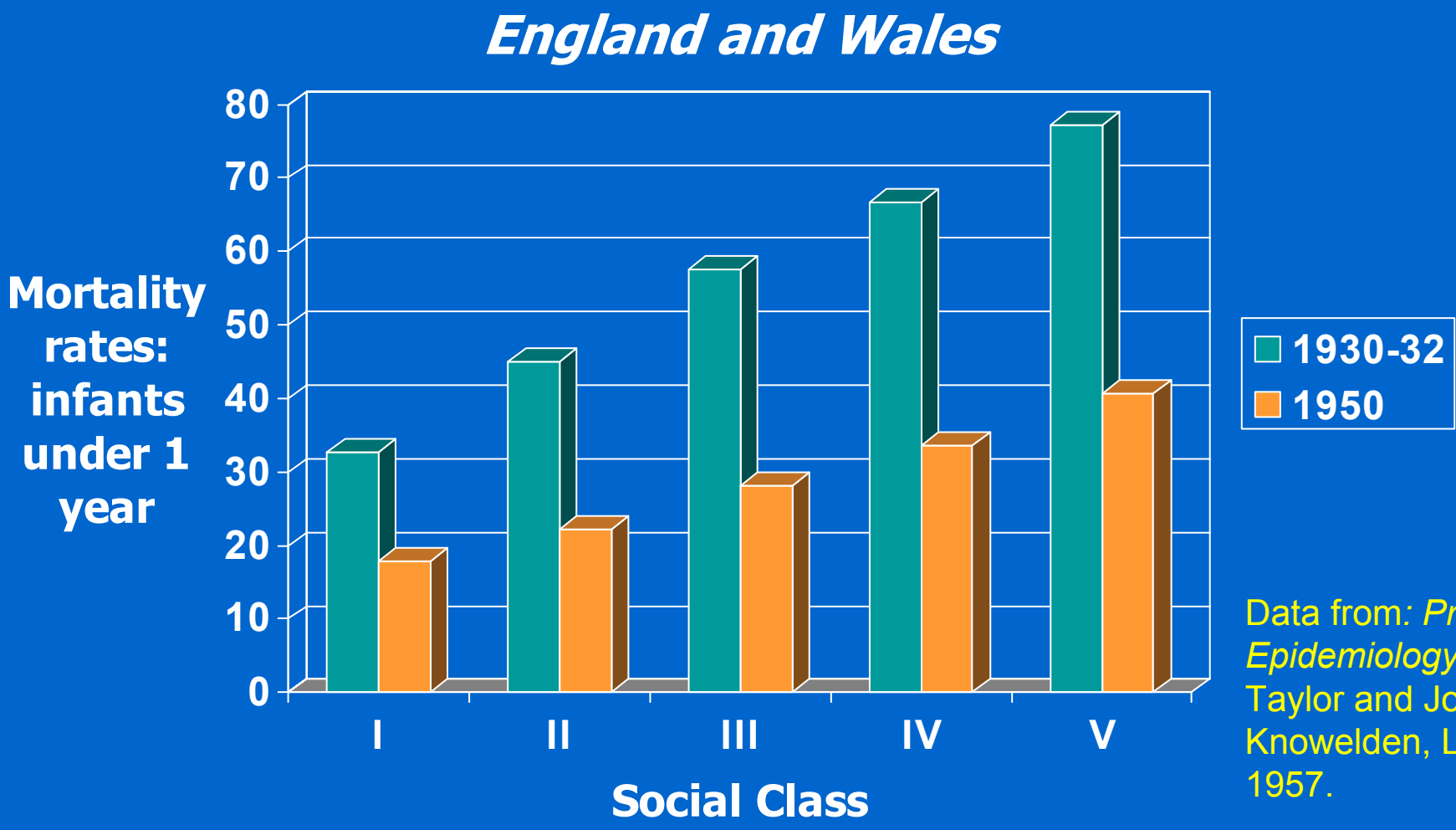
	High	Average	Low
High	**Urban Elites: 30-35 years**	**Small Town Elites: 35-40 years**	**Remote Rural Elites: 40-50 years**
Average	**Urban Middle: 25-30 years**	**Rural Typical: 30-35 years**	**Remote Rural: 35-40 years**
Low	**Urban Poor: 20-25 years**	**Rural Poor: 25-30 years**	**Remote Rural Poor: 30-35 years**

Mortality Before 20 in Different Classes



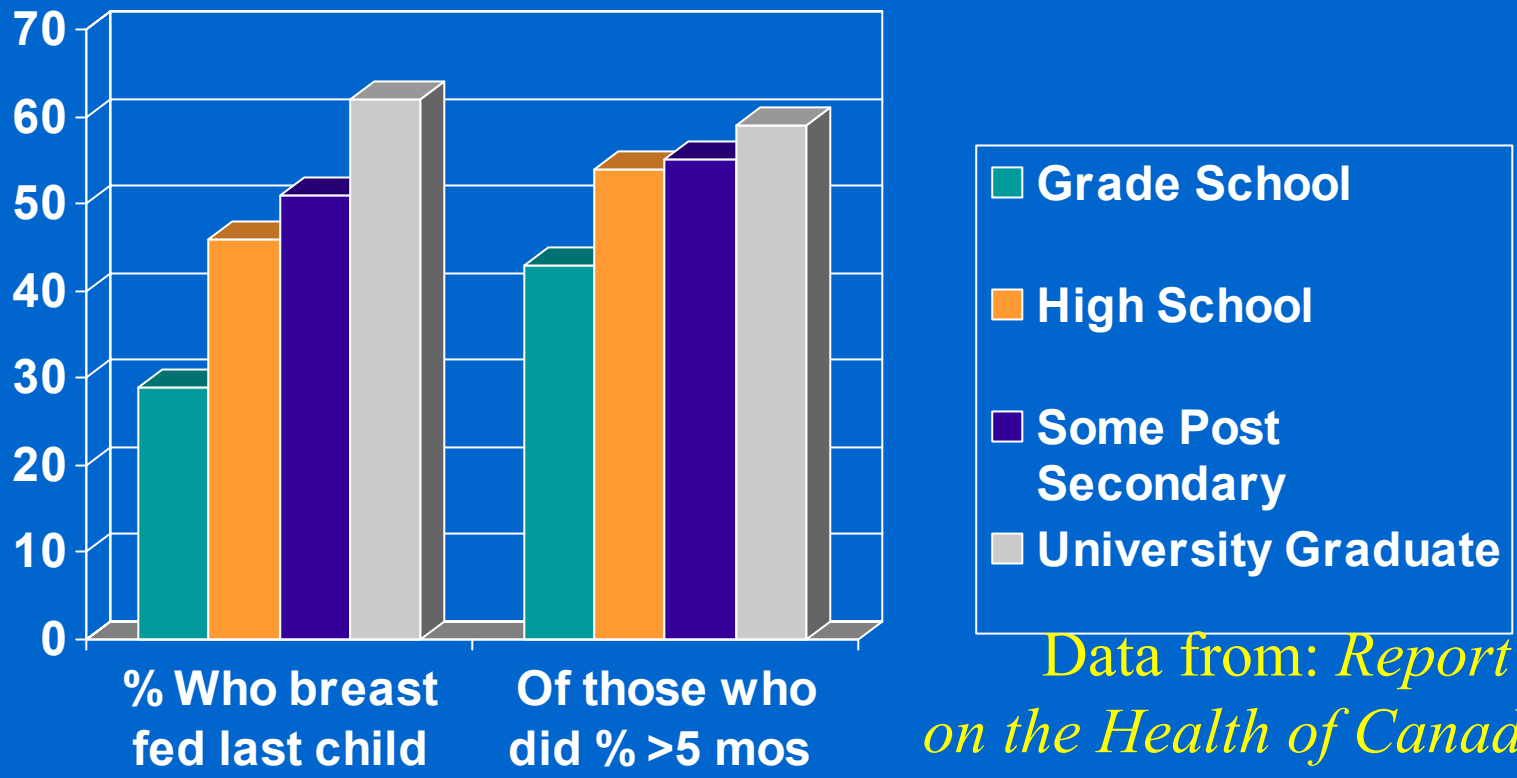
Source: *Report on the Sanitary Condition of the Labouring Population of Great Britain* by Edwin Chadwick, London 1842.

Infant Mortality Rates and Social Class



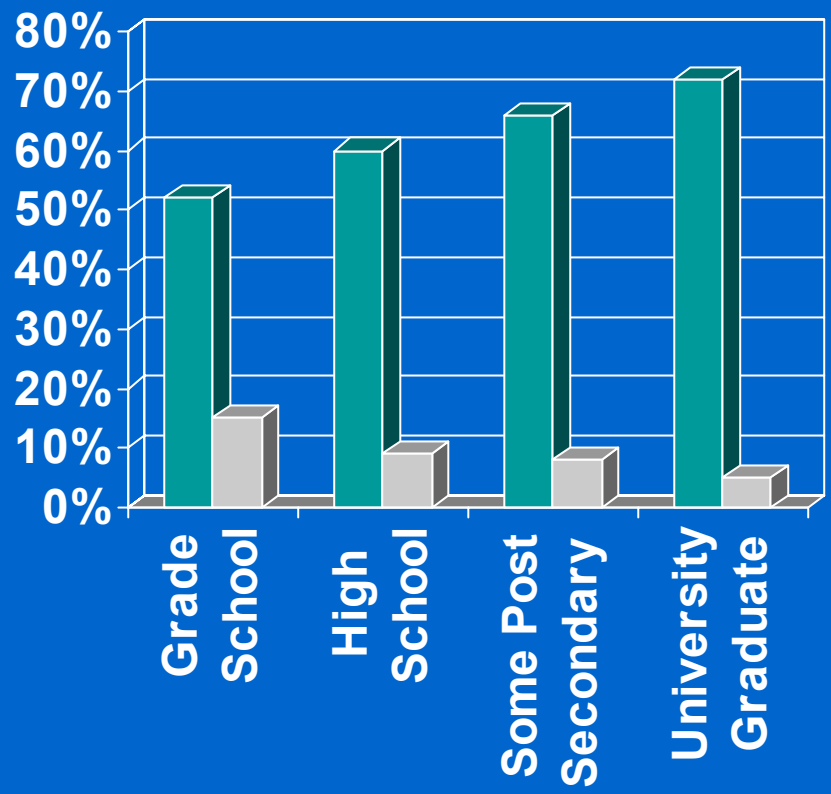
Data from: *Principles o Epidemiology* by Ian Taylor and John Knowelden, London 1957.

Breast-feeding and Level of Education



Data from: *Report on the Health of Canadians* Sept 1996

Self-rated Health Status

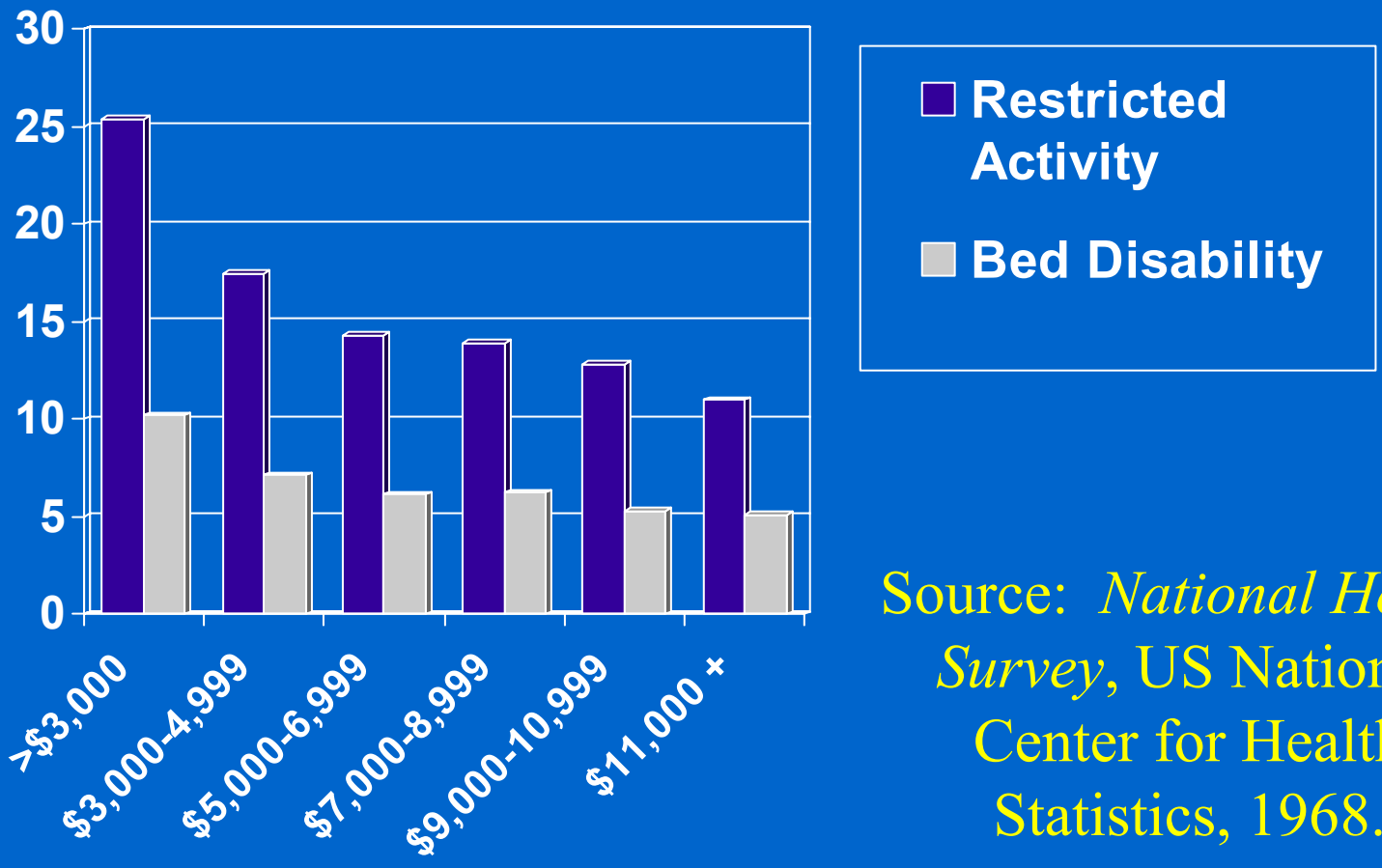


Self-rated health status
by
level of education

Data from: *Report on the Health of Canadians*
Sept 1996

Disability Days

According to Family Income, U. S., 1968

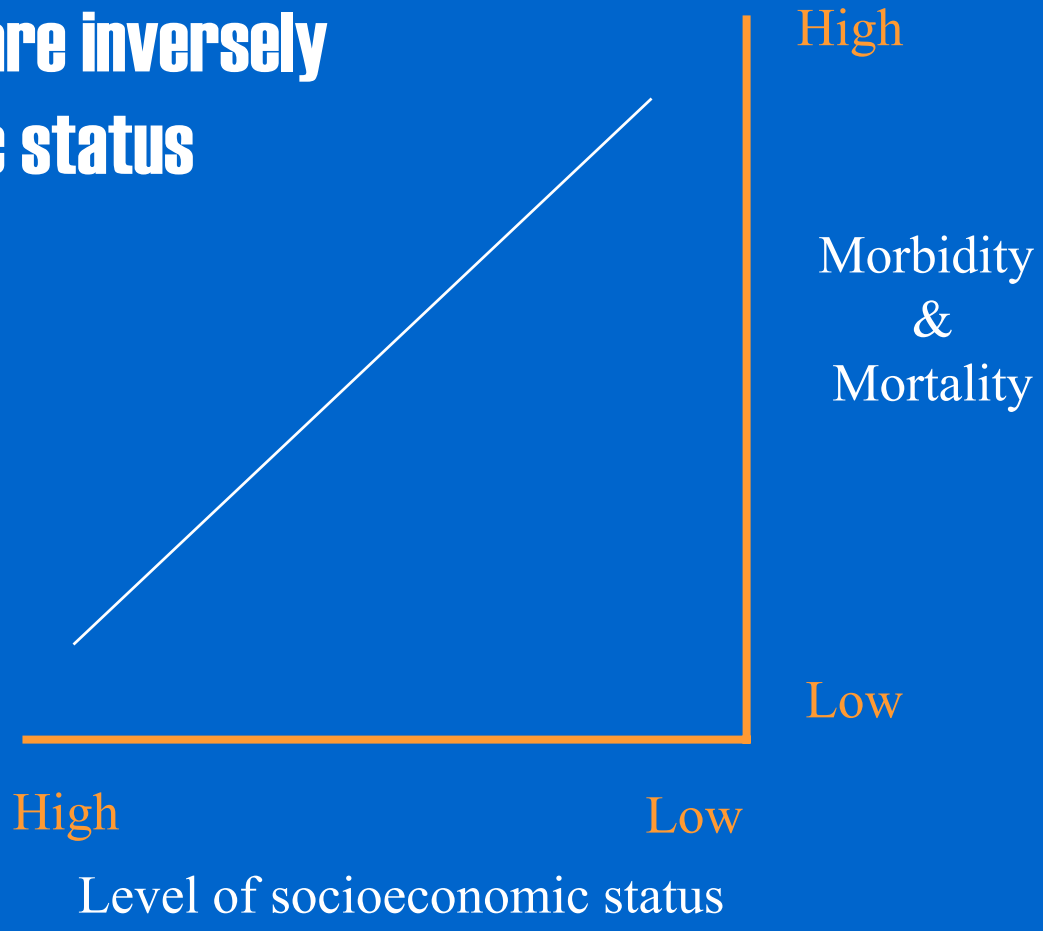


Source: *National Health Survey*, US National Center for Health Statistics, 1968.

Relationship Between SES & Health

Morbidity and mortality are inversely related to socio-economic status

Toward Understanding the Association of Socio-economic Status and Health: A New Challenge for the Biopsychosocial Approach. Norman B. Anderson & Cheryl A. Armstead. *Psychosomatic Medicine*. 57:213-225 (95)



Computing power & statistical research

TORONTO LIVE

Computer to aid health studies

The Hospital for Sick Children unveiled yesterday the most powerful computer of its type in Canada. It has the largest computer memory in the world devoted exclusively to health and biological research.

The hospital said its new Silicon Graphics Origin 2000 will accelerate research into diseases that affect children.

Dr. Jamie Cuticchia, head of the hospital's bioinformatics program (the use of information technology to answer complex biological questions), said the computer is necessary because researchers around the world are now producing more scientific data in the life sciences than has been previously generated in all of human history.

The Origin 2000 has 16 gigabytes of memory and about 1,000 gigabytes of disk space. A job that would take the fastest personal computer currently on the market three months to complete will take just a few minutes on the computer, he said. *Gay Abbate*

Globe and Mail March, 1999

- Exponentially growing computer power
- Ever more sophisticated statistical techniques
  - for sampling
  - for determining significant correlations
- Larger and more longitudinal data bases
- Increased capacity for precision and detail

Inequalities in Health Path:

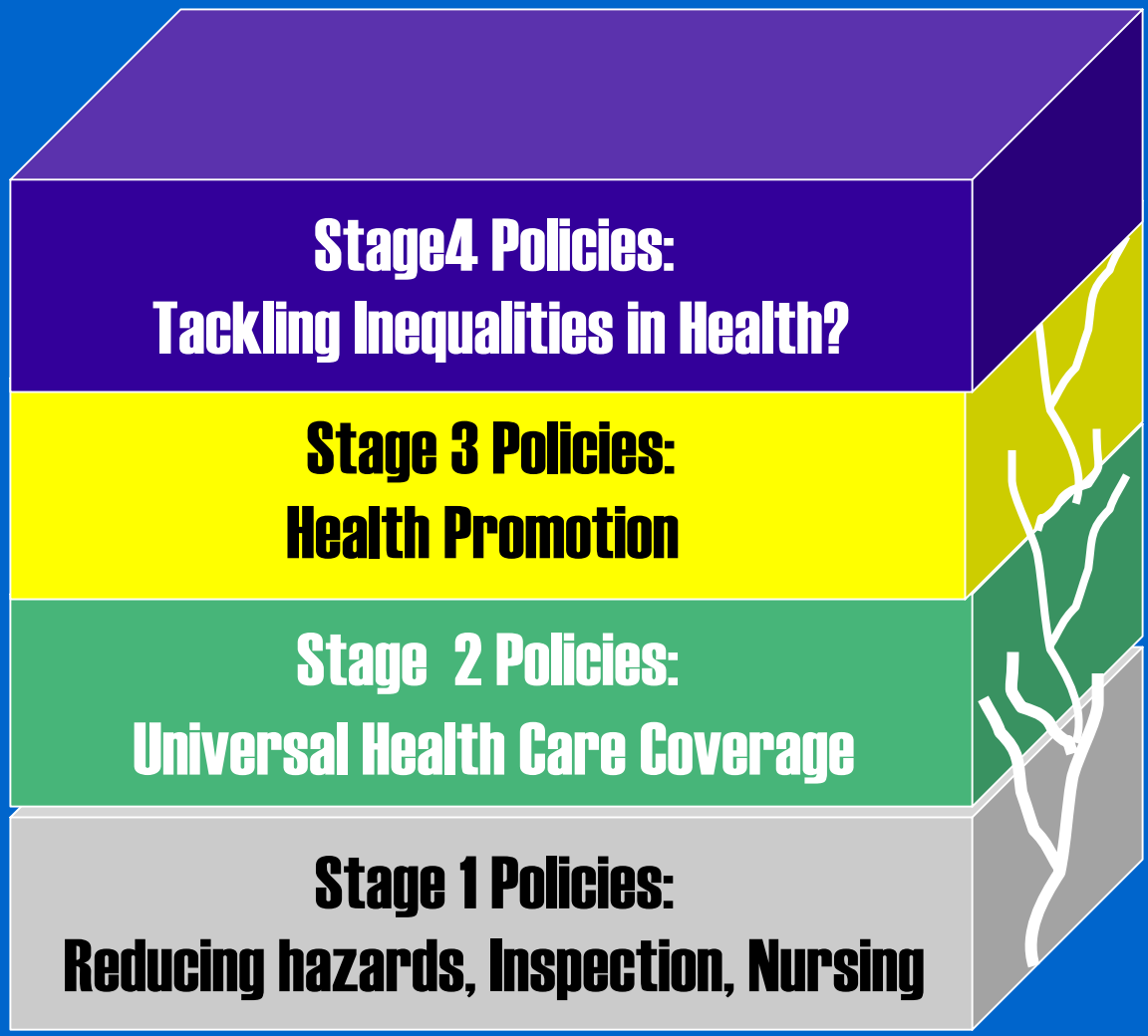
Going deeper into these conditions

- Control over work
  - Recent Whitehall study results show that lack of control over work is most significant determinant of heart disease
    - "Contribution of job control and other risk factors to social variations in coronary heart disease incidence" M G Marmot et al; *The Lancet July 26, 1997 p235-239*
- Social Supports
  - Study of Finnish men suggests that hopelessness is more closely connected with the onset of Atherosclerosis than smoking, drinking or nutrition
    - "Hopelessness and Risk of Mortality and Incidence of Myocardial Infarction and Cancer"; Susan A Everson et al. *Psychosomatic Medicine* 58:113-121 (1996)

Some Lessons Along the Way

- Each stage introduces new ideas
  - They all take a long time to implement
  - Their causal efficacy is in dispute
  - Despite their cumulative power, succeeding movements have tended to compete in Canada (Joke)
- Each stage has a different view of health
  - Stage 1: protection/prevention (population level)
  - Stage 2: diagnosis/treatment (individual level)
  - Stage 3: health improvement (both)
- The stages interconnected and interactive
  - Each stage is a prerequisite for the next one.
    - Universal coverage in the USA
  - The stages interact in complex ways

There are Cracks in the Edifice



Girls Smoking

Access

Walkerton

Ministry of Health dilemmas

- How to regain public confidence in the "health edifice"
  - public health
  - the health care system
  - health promotion
- How to apply the research into inequalities in health and build the next stage of the edifice
  - What do they mean to health policy?
  - What do they mean to public policy in general ?

Some Big Ideas are Changing

- A changing understanding of the physical world
  - less deterministic account of causality
  - more information does not lead to more certainty
- A changing relation to the physical environment
  - we now know that we cannot completely control nature
- A changing understanding of the relationship between individuals and social context
  - individuals are developed in interaction with their context

The evolution of the old physics

- The Greeks: World of becoming, opinion, uncertainty
- Mediaevals: God's creation with His mystery.
- Francis Bacon: Unlock nature's secrets; control it
- Descartes and Newton: The clockwork universe
- Laplace's demon: One state lets him deduce all…
- Explanation, causal links and prediction: More information will result in clear solutions.

Mechanical World, Mechanical Man

...if the body of man be considered as a kind of machine, so made up and composed of bones, nerves, muscles, veins, blood, and skin, that although there were in it no mind, it would still exhibit the same motions which it at present manifests involuntarily, and therefore without the aid of the mind....

René Descartes

Meditations, Book VI

Laplace's Demon

We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at any given moment knew all of the forces that animate nature and the mutual positions of the beings that compose it, if this intellect were vast enough to submit the data to analysis, could condense into a single formula the movement of the greatest bodies of the universe and that of the lightest atom; for such an intellect nothing could be uncertain and the future just like the past would be present before its eyes.

Pierre Simon Laplace

The New Physics

- What we see and how we explain
  - There are lots non-forecastable phenomena
  - Stock market, weather, the next drip of the faucet
- Heisenberg's Uncertainty Principle
- Complexity Theory
  - Usefulness of uncertainty
  - Instability and stability go together

More information will not give us certainty

"…..although we may know the initial conditions to an infinite number of decimal points, the future remains impossible to forecast."

Ilya Prigogine

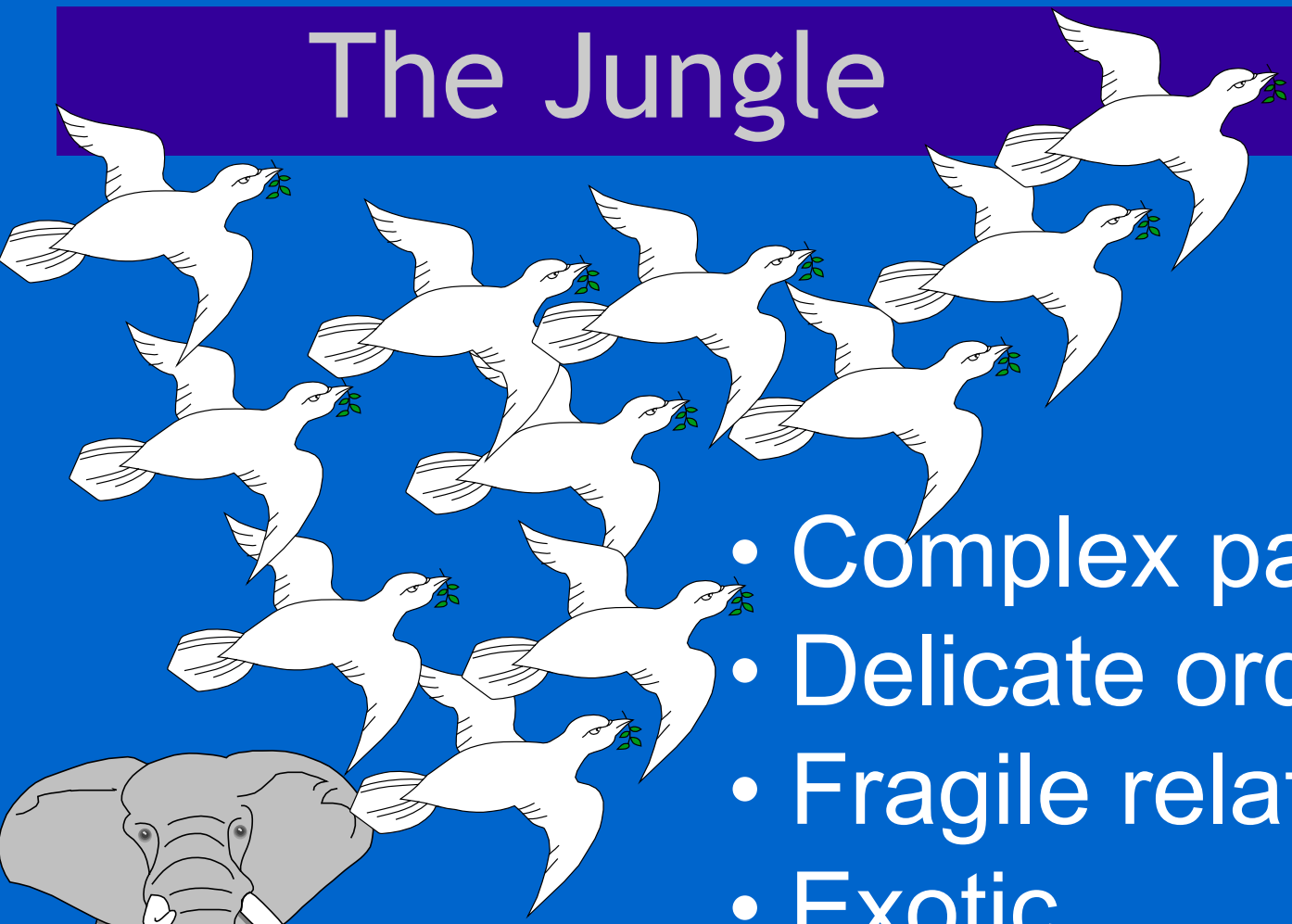
Individuals and the Physical Environment

- Paganism: humans as one element of nature
- Mediaeval notions of the world as creation
- Baconian ideas about "taming" nature for our own ends
- Scientific advance as a solution to problems
- Rachel Carson's *Silent Spring (1962)*
- Renewed realization about humans as part of Nature
- We must live in sync with nature

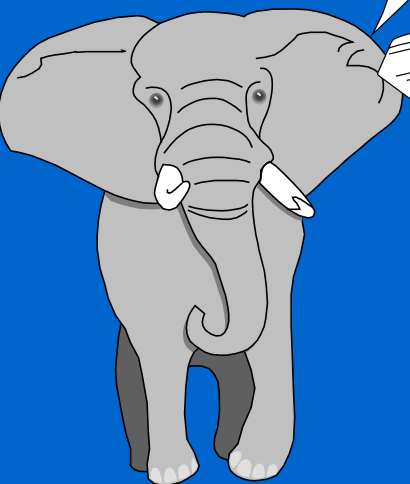
The Jungle

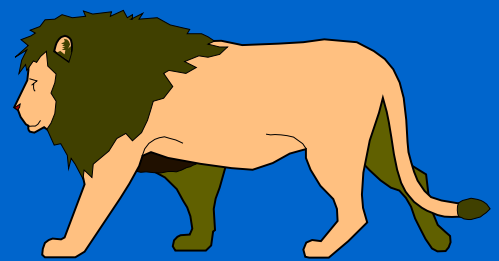
- No rules
- Chaotic
- Uncontrolled competition
- Dangerous
- Wild

The Jungle



- Complex patterns
- Delicate order
- Fragile relationships
- Exotic
- Free





The Jungle

- No rules
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- Dangerous
- Wild

- Complex patterns
- Delicate order
- Fragile relationships
- Exotic
- Free

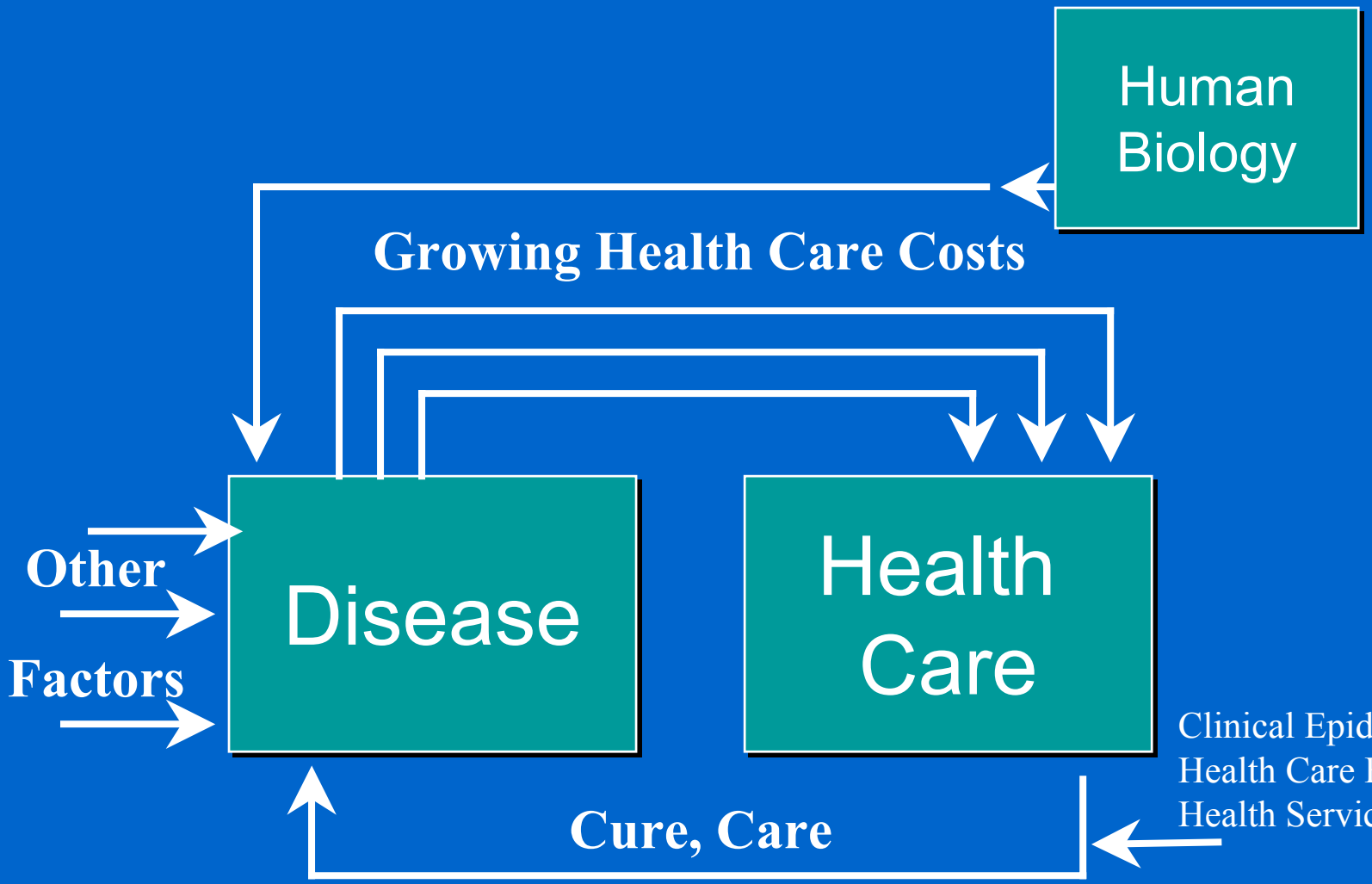
Individuals and the Social Environment

- Primitive societies:
  - individual identity by virtue of relationships - daughter, sibling or cousin of someone else.
- Discrete individualism arises gradually:
  - Mediaeval society ascribes individuals with souls
  - For Descartes humans are mechanisms with a mind.
  - Increasingly the individual soul becomes more private
- Now we see an interaction between individuals and society
  - Emerging from both right and left-leaning ideologists
  - Continued recognition of importance of individual
  - With strong experiential and social impact on identity and biology
  - Growing evidence of the importance of the interaction between individuals and their social (and physical) environment

Understanding of Health Systems and Policy Development Is Changing

- The machine organization and system
  - Smooth running, command and control
  - Policy from the top
- The specialist organization
  - division of labour in the acquisition of knowledge
  - functional policy development
- The emerging networked complex system
  - multiple players, connected to local conditions
  - policies emerge from complex interactions

How Health has Been Understood



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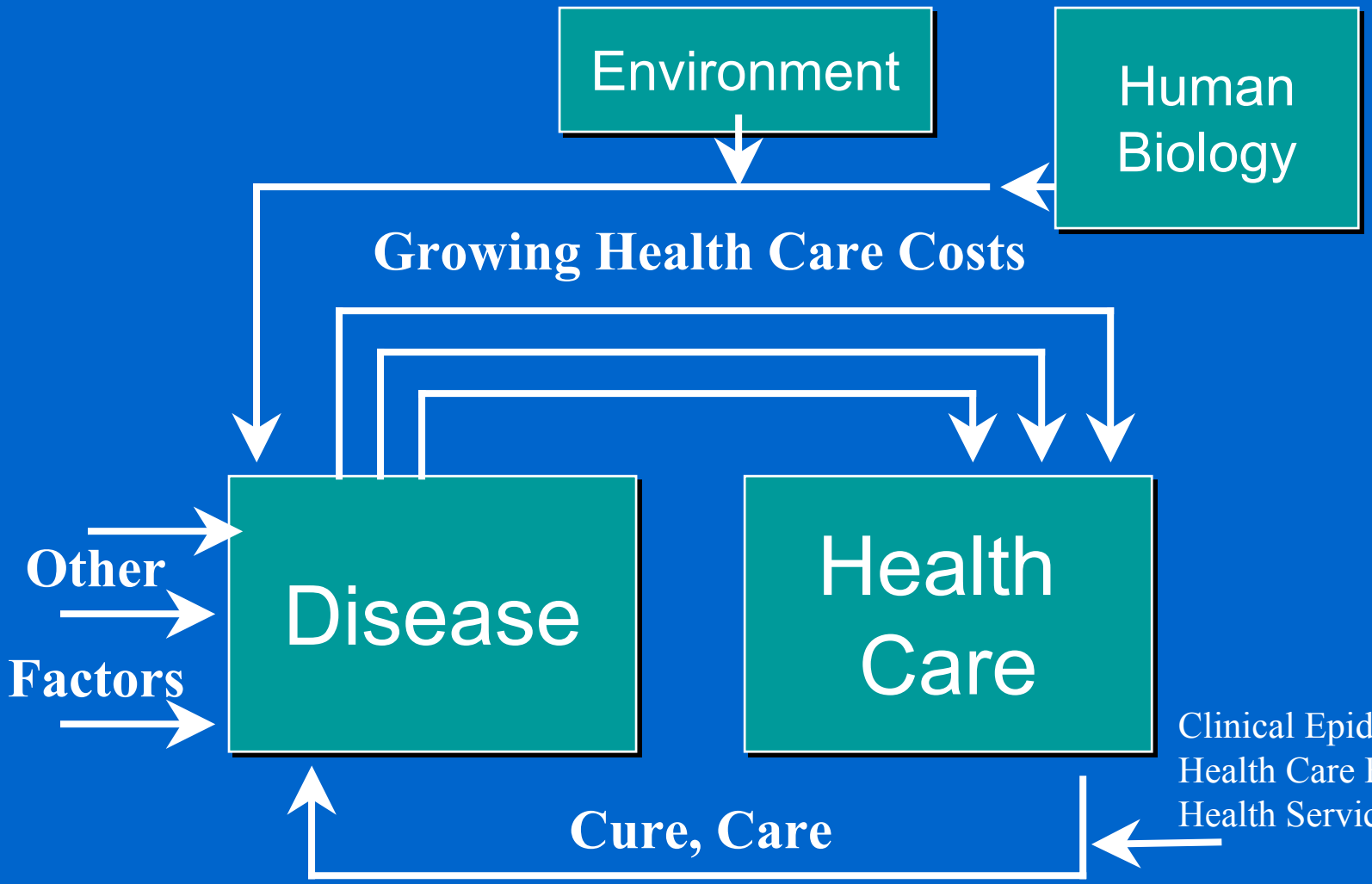

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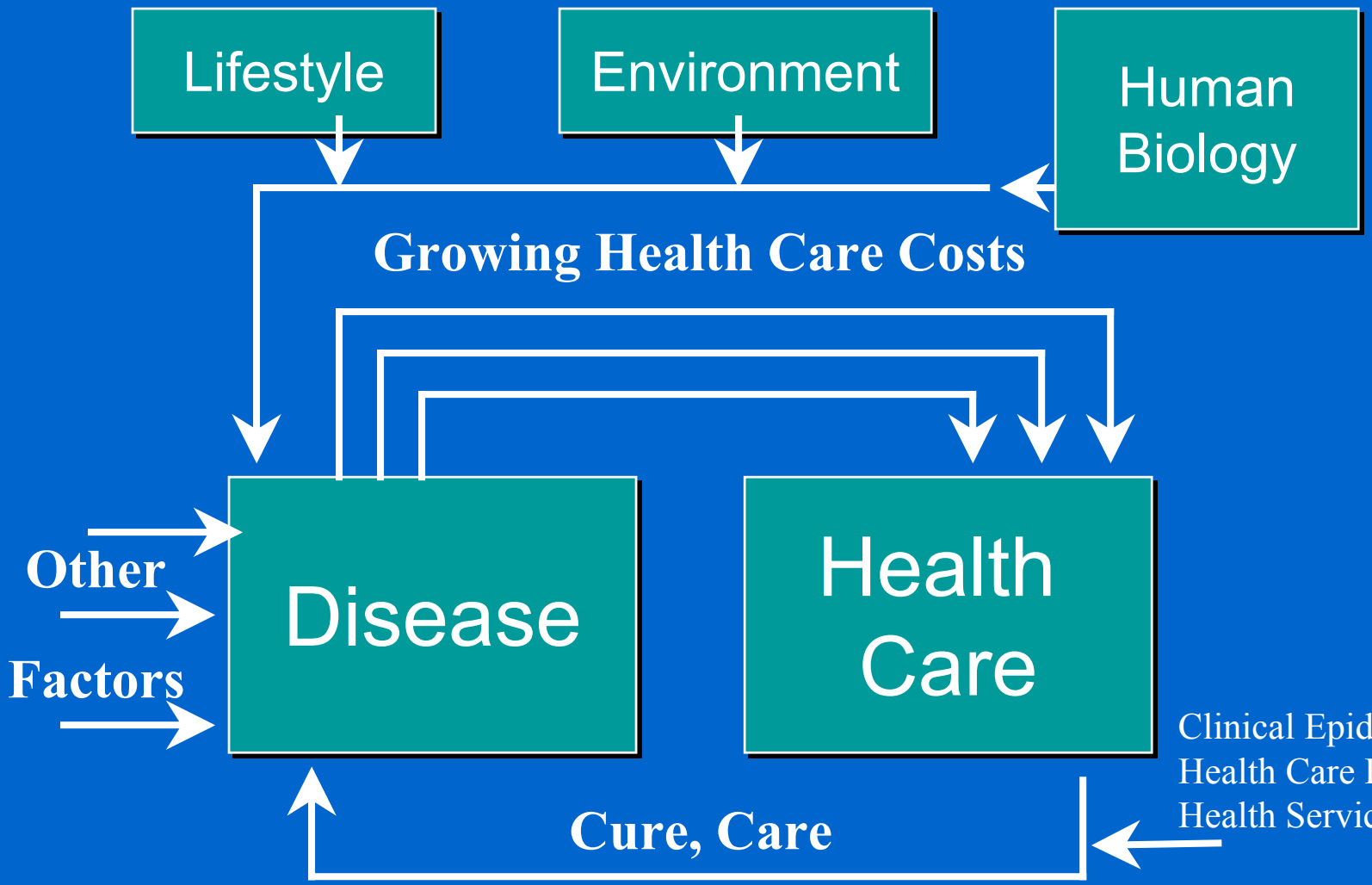
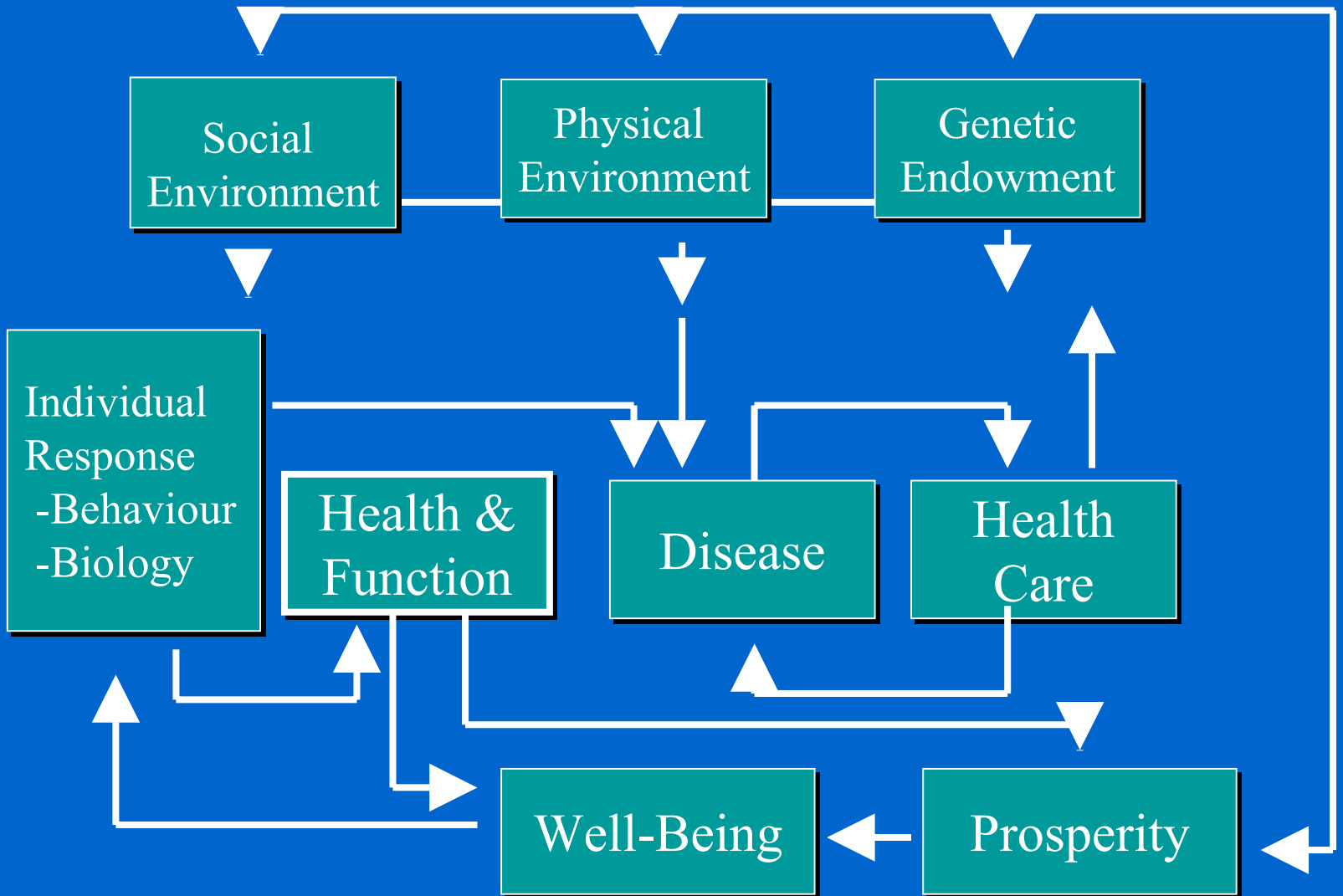


Feedback loop for human well-being & economic costs



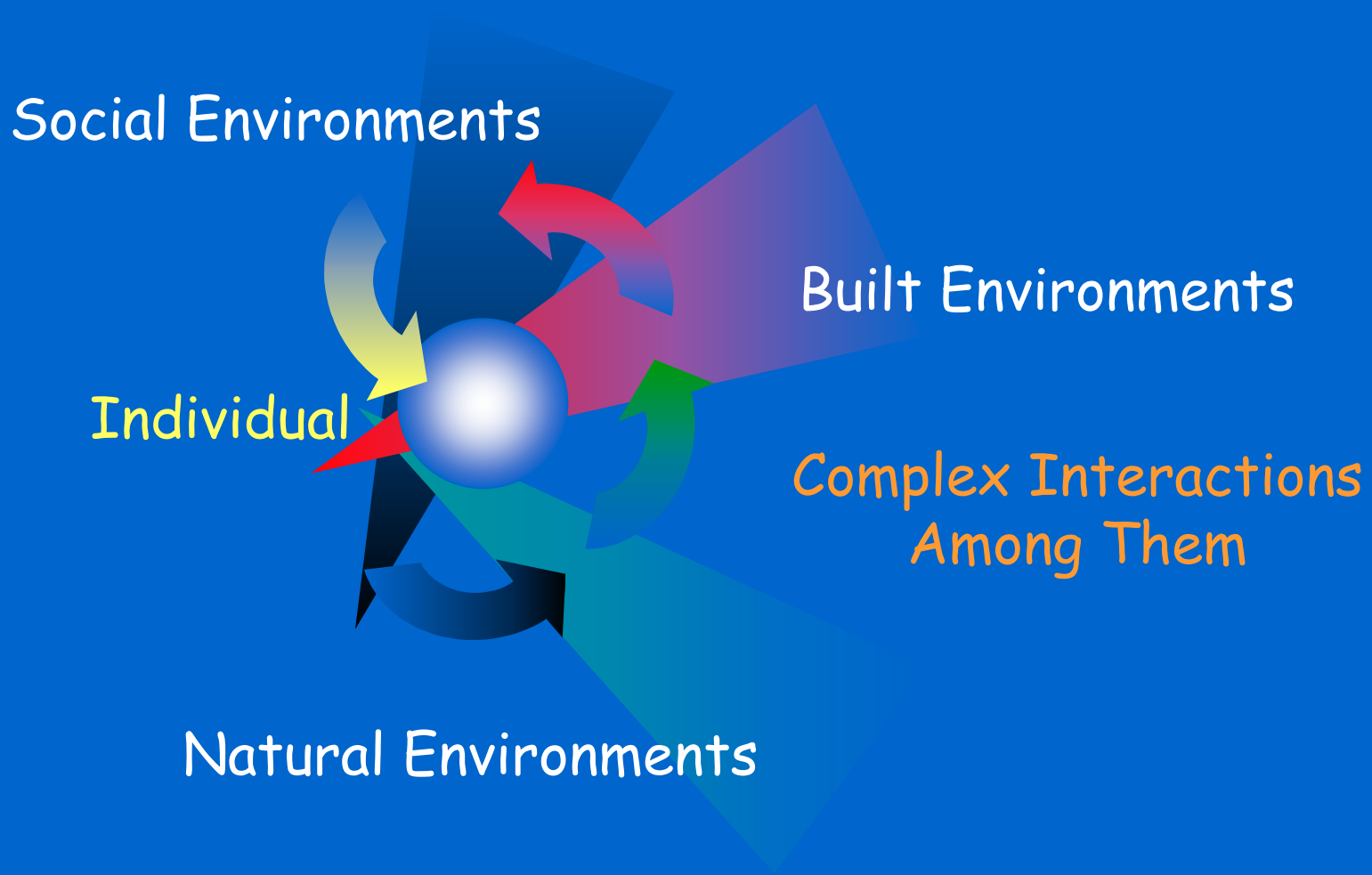
Health Concepts: Boxes and Arrows

- Boxes: The individual and the body
  - e.g. clinical medical science
  - the body as mechanism

- Boxes: The environments, natural, built and social inequalities in health
  - McKeown
  - humans as a function of environment

- Arrows: The interactions between individuals and social & physical context
  - e.g. Sociology, Complexity Theory Talcott Parsons, Aaron Antonovsky Ilya Prigogine.
  - The human understood interactively

Contributions to Health



A more realistic schema for health

Hypothesis (version 6)

The quality of the interactions between an individual and his or her environments is a major contributor to health

Elements of a Framework

- Local Conditions - Use local understanding
- Self-organization - **systems adapt without external input.**
- Variation - **Many interventions with different scales**
- Interaction - **Health interacts in complex ways with socio-economic determinants. Consider interactions**
- Selection - **Allow interventions to run their course and then select ones to grow.**
- Iteration - **Multiple tries gradually clarify issues and change**

Local Conditions

- Learn from other's experiences
- Do not ignore special local conditions
  - unique locations
  - special histories
  - particular populations
  - specific recent events
  - identifiable cultural features

Self Organization

- An essential characteristic of complex systems
- The secret of market success
- The secret of evolutionary adaptation
- Responding to problems and crises

Variation

- More variety gives a better chance of success
- Assume that participants have good will
- Expect and accept many parallel efforts
- Reduce obstacles to them
- Provide resources for small local solutions
- Small changes to big efforts
- Simple elements interact to render systems complex

Interaction

- Multiple areas of specialized knowledge
- Model the system to find unexpected results
- Build scenarios to identify fresh possibilities seeding change
- Conflict is creative
- Non-health factors interact with health

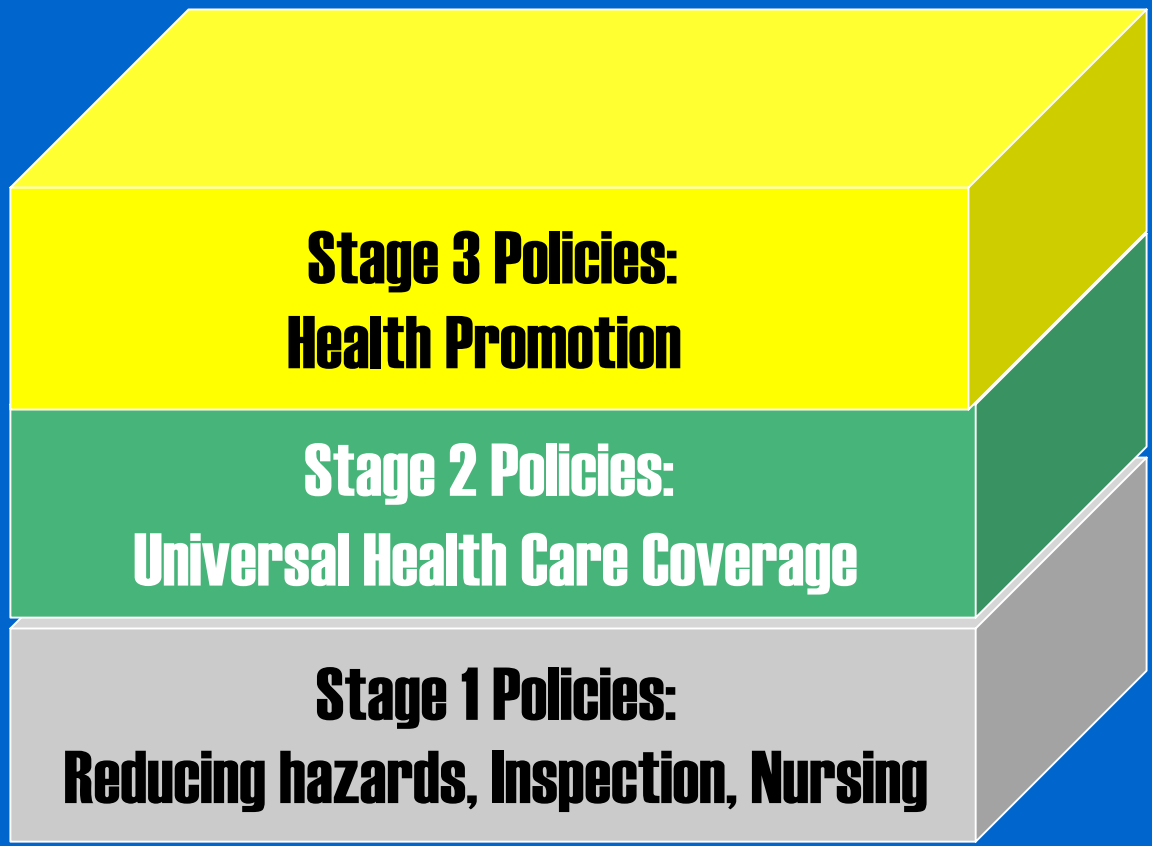
Selection

- Local monitoring can help to avert disaster
- Allow variations to follow their course
- Expect to have some failures
- Select elements of best for possible replication

Iteration

- Many attempts refine solutions
- The problem becomes clearer over time
- The development of systems is non-linear
- New cycles allow for new and more developed approaches

Apply these Ideas to Health Policy



The New Perspective

- Public Health
  - Some characteristics of Walkerton case
- Universal Health Care Coverage
  - The role of universally funded health care
- Health Promotion
  - The tobacco example

Public Health

The Water Supply in Walkerton

- Multiple Circumstances
  - Privatized water testing
  - Increased intensity of beef farming
  - Unexpected heavy rain
  - New chlorinators
- Lessons
  - No single cause
  - Chaotic tip to instability
  - Blame to system
  - Self-organized community response

Public Health

The Water Supply in Walkerton

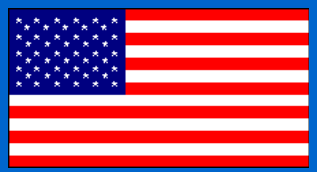
- Water Commissioner
  - Waits for retesting
    - In the past false +
    - Adjust new chlorinator
  - Is alone at the top
  - Unconnected
  - Requires proof
- Safe and Sorry

- Medical Officer of Health
  - Calls boil water alert
    - Sees sick people in hospital
    - Looks for food poison
  - Talks to others
  - Is linked to network
  - Acts without proof
- Threatened as whistle blow

Metaphors are Important

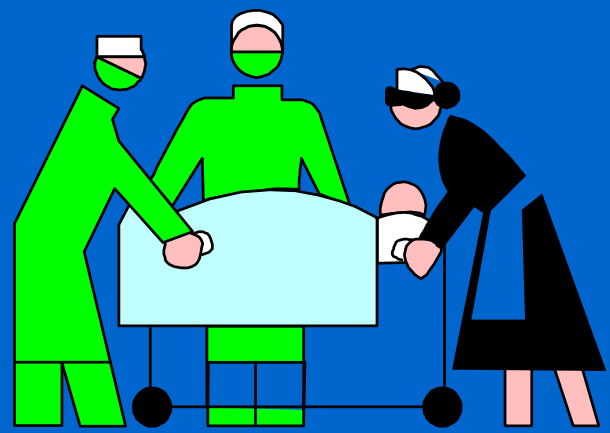
- Canada: Health care is infrastructural
  - it is among the things that keeps the country together

- UK: The NHS is a government service
  - it has some opportunity cost
  - it is ok to jump the queue by going privately



- USA: Health care is a commodity
  - it can be bought and sold
  - why should I pay for your health care?

The Role of Health Care

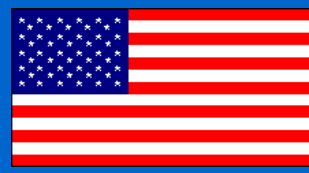


- Universal health care is a precondition for later stages
- The health care system is a valuable resource
- It contributes to a sense of security:
  - **It will be there if you need it**
- Does this improve health status?
- Putting money back into the system is a first response to the crisis of confidence.

3 Policy Intervention for Smoking

- Levers:
  - Making Smoking Illegal in Public Spaces
    - Fallout in small businesses
- Investments:
  - Education
    - Increases disparity between classes
  - Increase Tax on Smoking
    - Increases smuggling

- Seeds
  - Changing middle class attitudes
  - Encourage law suits against tobacco companies
    - Some succeed others fail
    - Cost of cigarettes goes up naturally
    - Secondary add campaign using executive testimony



Ministry of Health dilemmas

- How to regain public confidence in the "health edifice"
  - public health
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- How to apply the research into inequalities in health and build the next stage of the edifice
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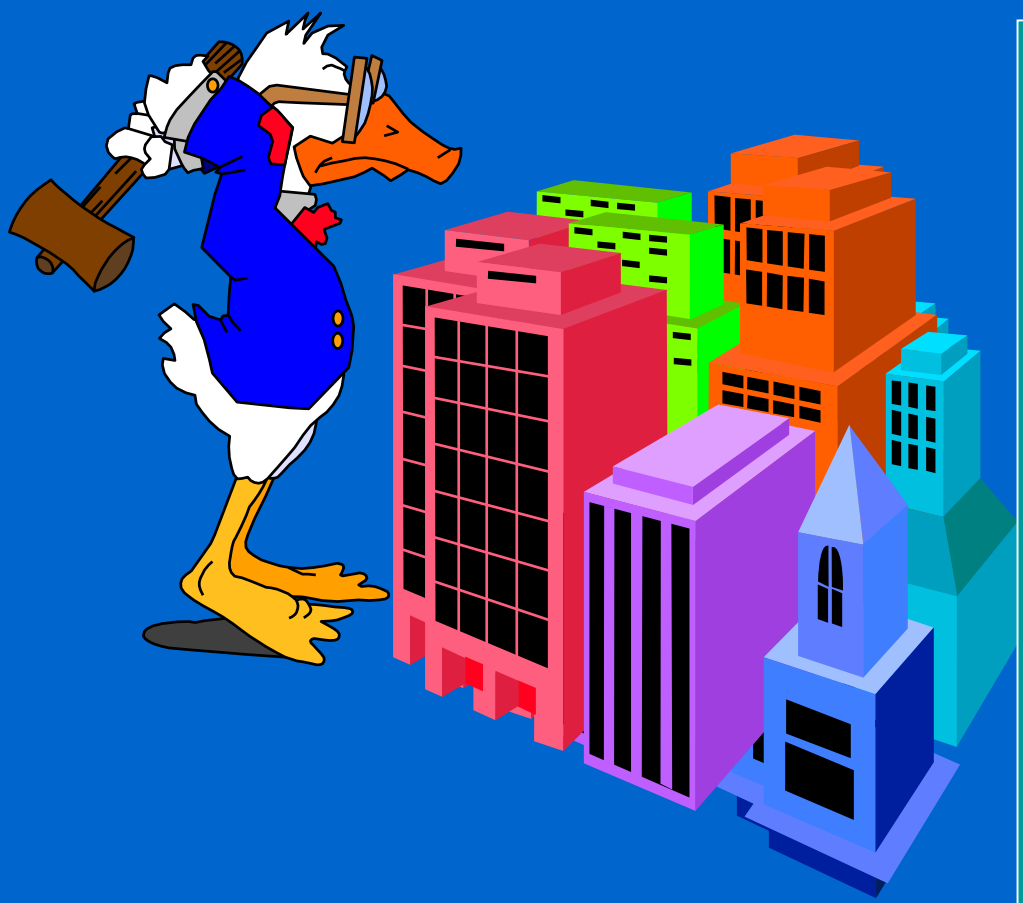
How to regain public confidence?

- Three Metaphors for Policy
  - If we look at the health edifice as a machine then we try to move it by pushing the right levers and getting it to change
  - If it is seen as a primarily financial entity then it is a matter of finding the right investments and measuring the return
  - If we think of it as a living thing then perhaps the best policy metaphor might be planting seeds and nurturing them

Levers and Restructuring



All three countries have restructured their health edifice and often created more confusion mistrust and dissatisfaction

Investments and Efficiency

All three countries have invested heavily in health and health care. Measurable efficiency has increased. Public confidence in the systems has eroded

Sowing Seeds and Nurturing

We can re-consider some of the history in this light. To some extent sowing seeds has worked. Perhaps we should try more of this approach in the future.

Examples of sowing seeds

- Incremental History of the Health Edifice
  - Epidemics to Public Health
  - Depression to greater coverage
  - Life styles to community development
  - Selection Pressures
  - Emergent strategies
- Quebec CLSCs
  - Some succeed and some fail
  - Less requirement for uniformity
  - Slow uptake and nurturing
  - Long term development of strengths
- British Physician Fund holding
  - The Clark afterthought
  - Xmas cards change direction

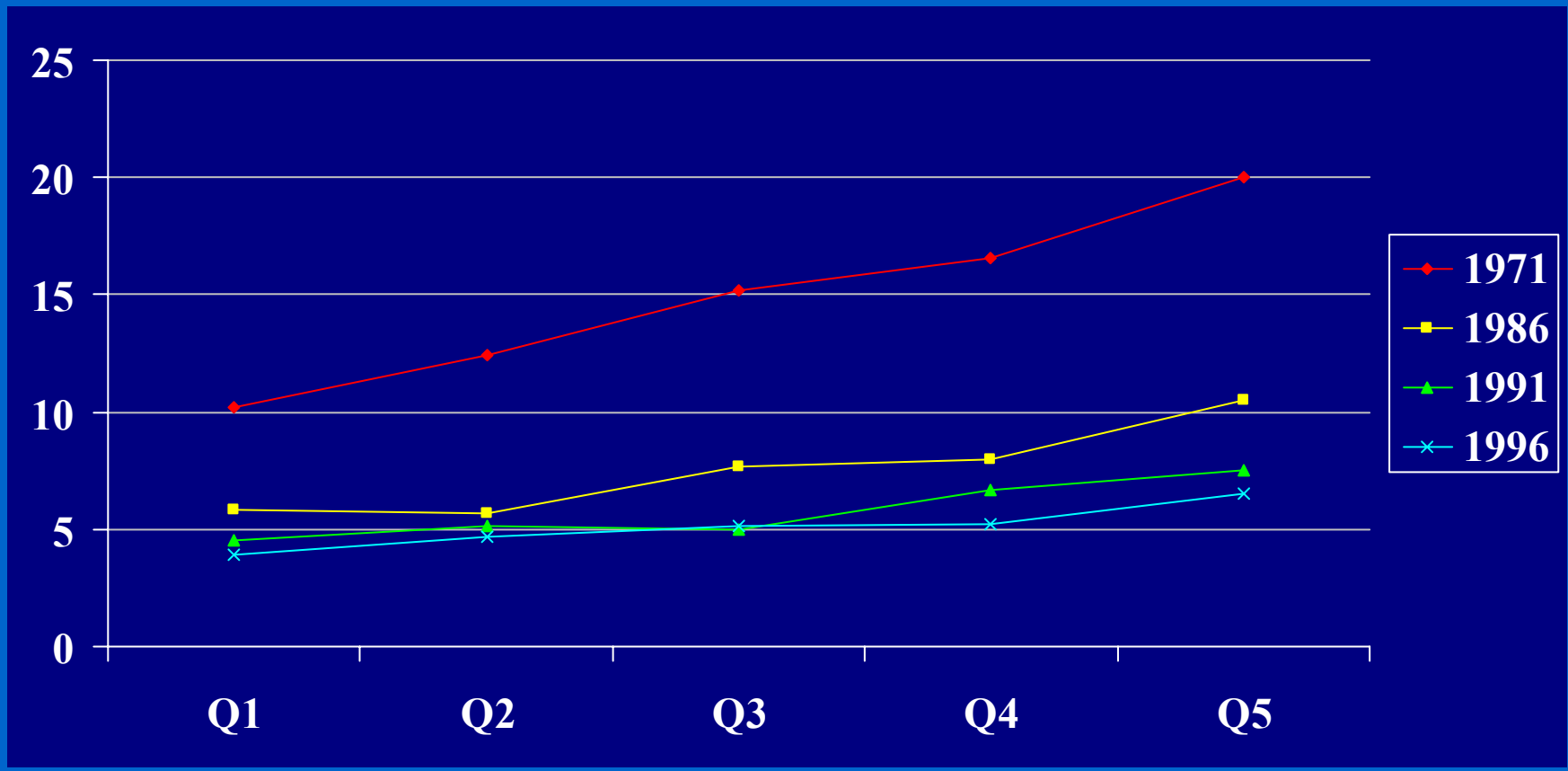
Apply the ideas to Inequalities

How do we redistribute?

- A strong edifice is redistributive
- Each of the stages of health policy is redistributive and arguably contributes to better health status
- There are many other more powerful redistributive forces

Infant Mortality Rates by Quintile

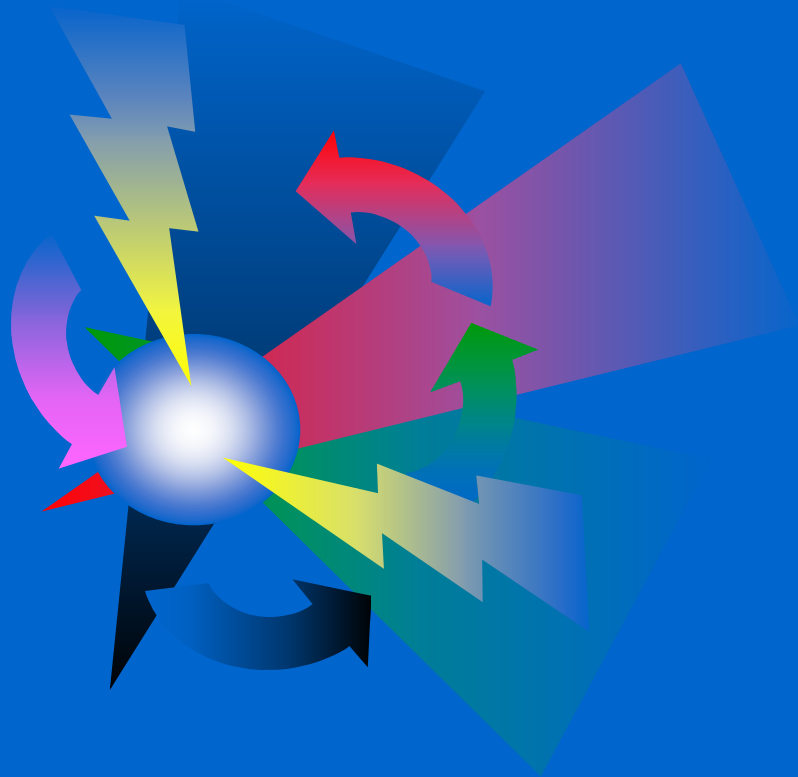
Per 1000 Births



Use health as an indicator not an end

- Health status is an important indicator of social well-being
- It shows the effectiveness of social policy
  - housing
  - community
  - education
  - income
  - control over work
  - (and health care)
- It can help the rest of government assess effectiveness of social policy

Our Schema



Next Steps

- More applications to prospective cases
  - Year 1 Develop Framework and Cases
    - 2 cases started - urban health and complex continuing care
    - Partnerships with Change Foundation, Brenda Zimmerman
  - Year 2 Application to Cases
  - Year 3 Book on Process
- To help please contact

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