Health and Sustainability

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Disclosure: Presenter has a book by this title released 27 February 2015 (Oxford Univ. Press).
Why “Health and Sustainability”?“?

**Sustainability is important to health.**

- Sustainable development does not automatically lead to health gains.
- Sustainability conscious of health goals is achievable.
- Sustainability can be a strategy to reduce health disparities.
- Continuity of health services and prevention

**Health is important to sustainability.**

- Compromise in health undermines confidence in sustainability.
- Health protection a goal of sustainability.
- Required to support dynamic sustainability.
- Health care sector is major consumer of nonrenewable resources and energy
What is Health?

• WHO definition is the point of departure: a "State of complete physical, mental, and social well being, and not merely the absence of disease or infirmity."

• Essential to understanding concept of health, however, is the notion of being “whole”
  – Etymologically related to the word “health”
  – Traditional connotation of being “right” with the world, hence environment – we can work with this!

• Concept has been medicalized to a mean baseline state of function, = absence of disease
Health Promotion

• Background:
  – Medical care is most important for individuals, but only a small % of people are *that* sick at any one time.
  – Population health is measured by the frequency of conditions and risk factors in a population/community.
  – Population health is primarily affected by preventive medicine and public health.
  – Preventive medicine (preventing disease in one person at a time) and public health (preventing disease for all at the community level) have greatest effect on population health.
• “Disease prevention” turned out to carry negative associations for people: perceived as threatening, distasteful, negative, and scary. Compliance was poor for many prevention measures.
• In the 1970’s, a new approach to public health and prevention was created (mostly by WHO, US Surgeon General, and Health Canada):

  “Health Promotion”
Health Promotion in Action

• Health promotion is a systematic approach to empowering people to take control of their own health and to enhance wellness by:
  – Preventive services
  – Behavioral interventions
  – Social action (including healthy public policy)
  – Community changes (e.g. traffic safety)
  – Access (to exercise, affordable good food, etc.)
  – Education, beyond traditional “health education”
• The “Ottawa Charter” (1986) – clunky logo to right.
• Had the effect of turning a negative into a positive!
  – Negative, demotivating message: “I must avoid things that make me sick.”
  – Positive, empowering message: “I can make choices that make me healthier and happy.”
• Health promotion was a breakthrough, highly effective.
• Sustainability is doing the same thing! Flipping the message!
  – Negative, demotivating message: “We must prevent terrible environmental destruction.” (Resulting in fear.)
  – Positive, motivating message: “We are building a sustainable, desirable world.”
What is Sustainability?

• Sustainability is a neologism (1972)
• Derives from “sustainable development”: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
• Balancing what is taken and what is given

Gro Harlem Brundtland, chair, World Commission on Environment and Development (1987)
Elements of Sustainability

Most definitions of sustainability seem to include at least three of the following ten distinct elements, although most do not contain them all:

I. unlimited (at least within the foreseeable future), long-term continuity
II. no or minimal harm to the environment
III. conservation of resources for the future
IV. either no harm to or enhancement of social structures
V. maintaining health and the quality of life
VI. optimization or maximization of economic, social, and environmental performance
VII. a low risk of catastrophic disruption
VIII. compliant with regulation and best practices
IX. stewardship and a responsibility that goes beyond ethics in dealing with other people to include other species, life and some notion of Nature
X. capable of continuing progress under its own momentum and therefore stable in the short term.
Penetration of Sustainability as a Business Practice

Validation
• McKinsey survey, 2011: n = 2956, of which:
  – 63%: energy-related sustainability programs
  – 61%: waste-reduction, elimination programs
  – 43%: emissions-reduction programs
  – 36%: water use-reduction programs
• 57% into strategic planning
• 54% into marketing
• And that was back in 2011!

Mainstreaming
• Most cited reason for sustainability programs
  – Before 2011: reputation
  – 2011+: cost savings
• Sustainability leaders (top ~10%) reported:
  – Lower costs
  – Higher margins in sales
  – Higher growth
  – ROI on sustainability
• Pathway
  Compliance or public relations → Efficiency → ROI → Innovation, strategic planning
Acceptance of Sustainability

- Not just eco-porn, greenwash
- “Sustainability managers”
- Professionalization
- “Chief sustainability officers” in major corporations
- Widespread adoption
- Becoming institutionalized
- Does not depend on “corporate responsibility” credo
- Becoming normative behavior
- Generational turnover

- Unexpected ally: the business sector!
- Sustainability provides a less confrontational approach: no (or at least a lot less) head banging.
Sustainability Accounting

• Environmental sustainability
  – Ecological sustainability
  – Environmental quality
  – Environmental services
  – Environmental protection

• Economic sustainability
  – Macroeconomic
  – Enterprise-level

• Social sustainability
  – Incorporates health account
  – Religious, moral, ethical, spiritual

• Problems with subsuming health under social!
Health and Environmental Protection (Sustainability)

<table>
<thead>
<tr>
<th>Health</th>
<th>Environmental Protection (Sustainability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical sciences</td>
<td>Environmental sciences</td>
</tr>
<tr>
<td>Epidemiology</td>
<td>Population biology (and evolution)</td>
</tr>
<tr>
<td>Toxicology and routes of exposure</td>
<td>Ecotoxicology, fate and disposition</td>
</tr>
<tr>
<td>Exposure science</td>
<td>Environmental monitoring</td>
</tr>
<tr>
<td>Health risk assessment</td>
<td>Ecological risk assessment</td>
</tr>
<tr>
<td>Population health and public policy</td>
<td>Environmental policy</td>
</tr>
<tr>
<td>Social and behavioural sciences</td>
<td>Environmental studies</td>
</tr>
<tr>
<td>Medicine</td>
<td>Conservation biology</td>
</tr>
<tr>
<td>Prevention science</td>
<td>Environmental impact assessment</td>
</tr>
<tr>
<td>Health promotion</td>
<td>Sustainability</td>
</tr>
</tbody>
</table>

Goal: Development of more comprehensive models for more robust analysis and sociotechnical solutions to “wicked problems”.

### Defining Problem Classes

<table>
<thead>
<tr>
<th>Problem Class</th>
<th>Example in book</th>
<th>Preferred Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic discontinuity</td>
<td>Climate change</td>
<td>Nonlinear</td>
</tr>
<tr>
<td>Pollution</td>
<td>Fine particulate air pollution (many other examples in book)</td>
<td>Source-Effect Model, epidemiological triangle, threshold risk assessment</td>
</tr>
<tr>
<td>Infectious disease and stochastic events</td>
<td>Malaria, emerging infections</td>
<td>Epidemiological triangle, stochastic risk assessment</td>
</tr>
<tr>
<td>Ecological change and socially-mediated events</td>
<td>Cod fishery collapse</td>
<td>DPSEEA+C, MEMEs</td>
</tr>
<tr>
<td>Ecosystem Services</td>
<td>Water (many other examples in book)</td>
<td>Resource economics</td>
</tr>
<tr>
<td>Culture</td>
<td>Environmental rights, health rights, NIMBY</td>
<td>Justice, cultural continuity</td>
</tr>
<tr>
<td>Spirituality</td>
<td>“Deep ecology”</td>
<td>Values embedded in culture</td>
</tr>
</tbody>
</table>

**Environmental Sciences**

**Environmental Studies**
Models Fall Short of Reality
The Source-Effect Model
Limits of the Model

• Source-Effect model only gets us so far.
  – Does not explain what came before – the *why*?
  – Does not assess agency – the *who*?
  – Does not predict the future – *what next, when*?

• Need to look upstream and downstream
Problem Class 3: Social Mediation

"DPSEEA + C"
Social Drivers

- Industrialization
- Technological choices
- Economic choices
- Population

Atmospheric Change
- Greenhouse gases → Climate change
- O$_3$ depleting chemicals released → Increasing incident UV radiation
- Acidifying pollutants → Acid deposition
- Persistent organic pollutants → Long-range transport of POPS
- Air toxics → Air toxics
- Ambient air pollutants → Ambient air pollution
- Air quality in the built environment → Indoor air quality issues
- Biomass burning → Household air pollution
- Airborne emissions in the workplace → Occupational respiratory hazards
Looking Forward to Prediction: Translation to Risk Assessment

Research
- Hazard Identification
  - Epidemiology
  - Clinical Studies
  - Animal Studies
  - Mechanistic Studies
  - Exposure Monitoring
  - Fate and Transport Models
  - Ecotoxicology
- Exposure Assessment
  - Direct Measurement
  - Environmental Monitoring
  - Biomonitoring
  - Simulation
  - Modeling

Media and Public Attention
- Issue Identified
- Risk Assessment
  - Opportunities for exposure
  - Exposure-Response
  - Levels of exposure
  - Population exposed
  - Susceptible subgroups
- Risk Communication
- Risk Management
  - Decision or Action

Repeat steps as needed
Looking Backward to Causation
A little more complicated.

- Causes A and B and I
- Effect E
- Confounder C
- Common driver D?
- Effect modifier F
- Susceptibility state G
- Health outcome H
- ’ representing indicators
Causation Analysis

- Working *backward* from individual case that has *already occurred*
- Forensic toxicology not developed for this
- Bayesian statistics: essential terms are usually guesses

\[
P(A|B) = \frac{P(B|A)P(A)}{P(B)}
\]

\[
P(H|DX) = \frac{P(H|X) \times P(D|HX)}{P(D|X)}
\]
Sustainability is Transformative

• Roots from both modern ecology movement and established “sustainable yield” principles
• Turns a negative threat into a positive commitment
• Cooperation from business and private sector, lack of resistance
• Transformative for making environmental protection accepted and cultural value
• Similar trajectory and potential to health promotion
## Turned on its Head!

<table>
<thead>
<tr>
<th>Health</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Health:</strong> Negative!</td>
<td>Environmental Protection: Negative!</td>
</tr>
<tr>
<td>• existential threat, we’re doomed!</td>
<td>• natural world is in peril</td>
</tr>
<tr>
<td>• stop terrible things from happening</td>
<td>• everything is confrontational</td>
</tr>
<tr>
<td>• filth, germs, toxic chemicals, schmutz</td>
<td>• every loss is blow to the ecosystem</td>
</tr>
<tr>
<td>• if you don’t change your lifestyle, you are toast and your children will get sick</td>
<td>• struggle against the deniers and polluters</td>
</tr>
<tr>
<td>• Live in fear!</td>
<td>• Save what you can, stop the destruction!</td>
</tr>
<tr>
<td><strong>Health Promotion:</strong> Positive!</td>
<td><strong>Sustainability:</strong> Positive!</td>
</tr>
<tr>
<td>• opportunity for wellness!</td>
<td>• opportunity for better world</td>
</tr>
<tr>
<td>• make good things happen!</td>
<td>• enhance the world you live in</td>
</tr>
<tr>
<td>• engage in a healthy lifestyle and feel better!</td>
<td>• adopt behaviors into lifestyle that make you feel worthy</td>
</tr>
<tr>
<td>• join your friends and neighbors in positive normative health risk-reduction behavior!</td>
<td>• join your friends and neighbors in positive normative ecosystem risk-reduction behavior!</td>
</tr>
<tr>
<td>• Have fun!</td>
<td>• Have fun!</td>
</tr>
</tbody>
</table>

- **Schmutz**: A German word for filth or dirt.
Parting Thoughts

• Sustainability and health do belong together.
• Sustainability has replaced “environmental protection” as the path of least resistance.
• Sustainability can transform environmental protection and environmental health much as health promotion transformed public health.
• Education in sustainability needs health content and analytical skills.
• Education in health can profit from knowing more about sustainability.
Health and Sustainability

Diagram:

- Healthy, Sustainable Future
  - Healthy Branches
  - Dead Branches (falsified or unprovable ideas)
  - Health
    - Biomedical Sciences
    - Medical care
    - “Aesculapius”
  - Population health
    - Public Health
    - “Hygeia”
  - Economics
    - Political economy
    - Moral philosophy
  - Environmental protection
    - Ecology
    - Natural philosophy

- Sustainability
  - Dead Branches (falsified or unprovable ideas)

- Traditional
  - Modern