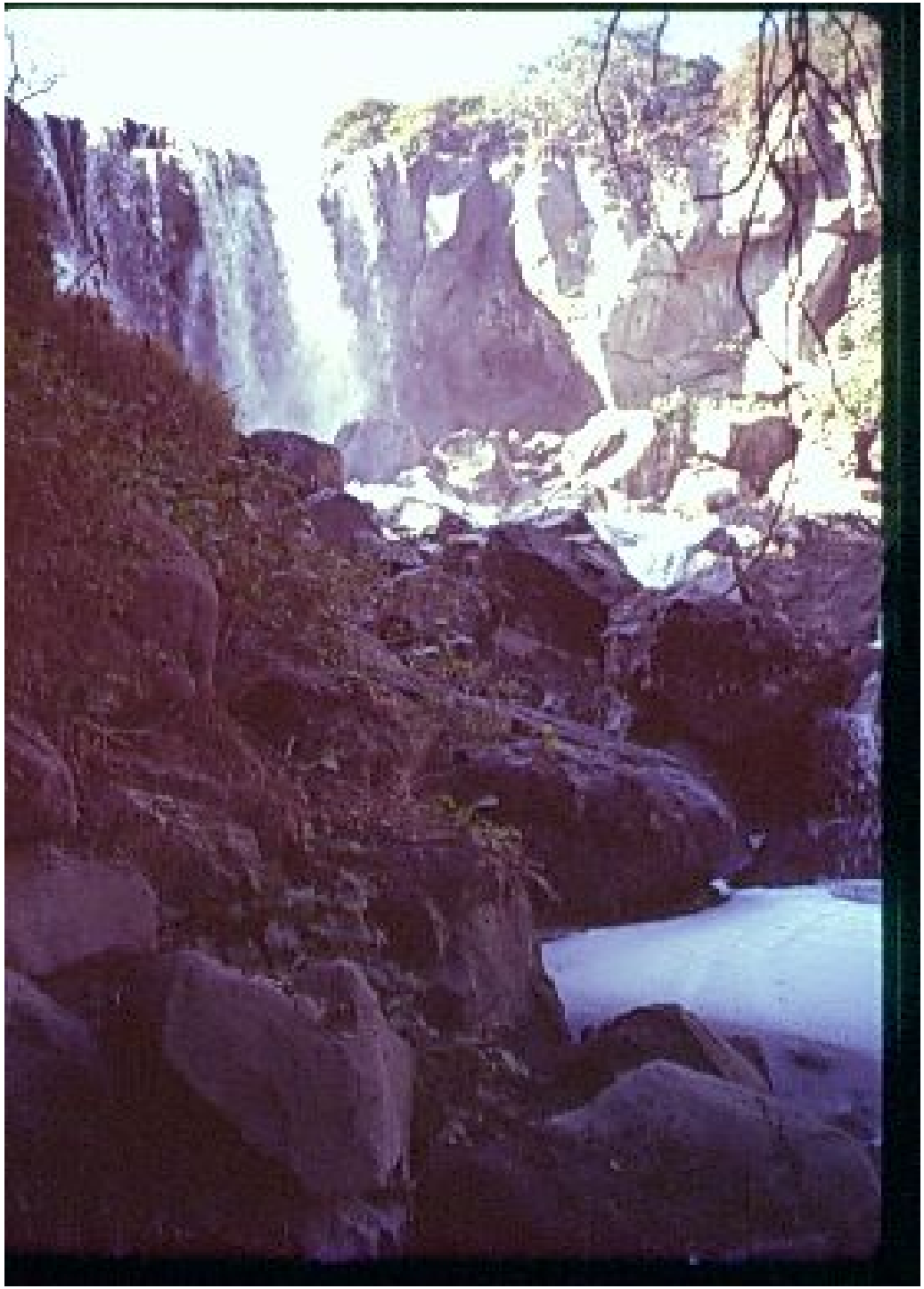
An integrated approach to health system analysis and response

Timothy J. Downs, D.Env.
Environmental Science & Policy Program, Clark University
MassCHILD NCS Study Center
Worcester, Mass.

NCS Analysis/Science Goal:

"The National Children's Study will examine the effects of the environment, as broadly defined to include factors such as air, water, diet, sound, family dynamics, community and cultural influences, and genetics on the growth, development, and health of children …"

NCS Website 08/2011



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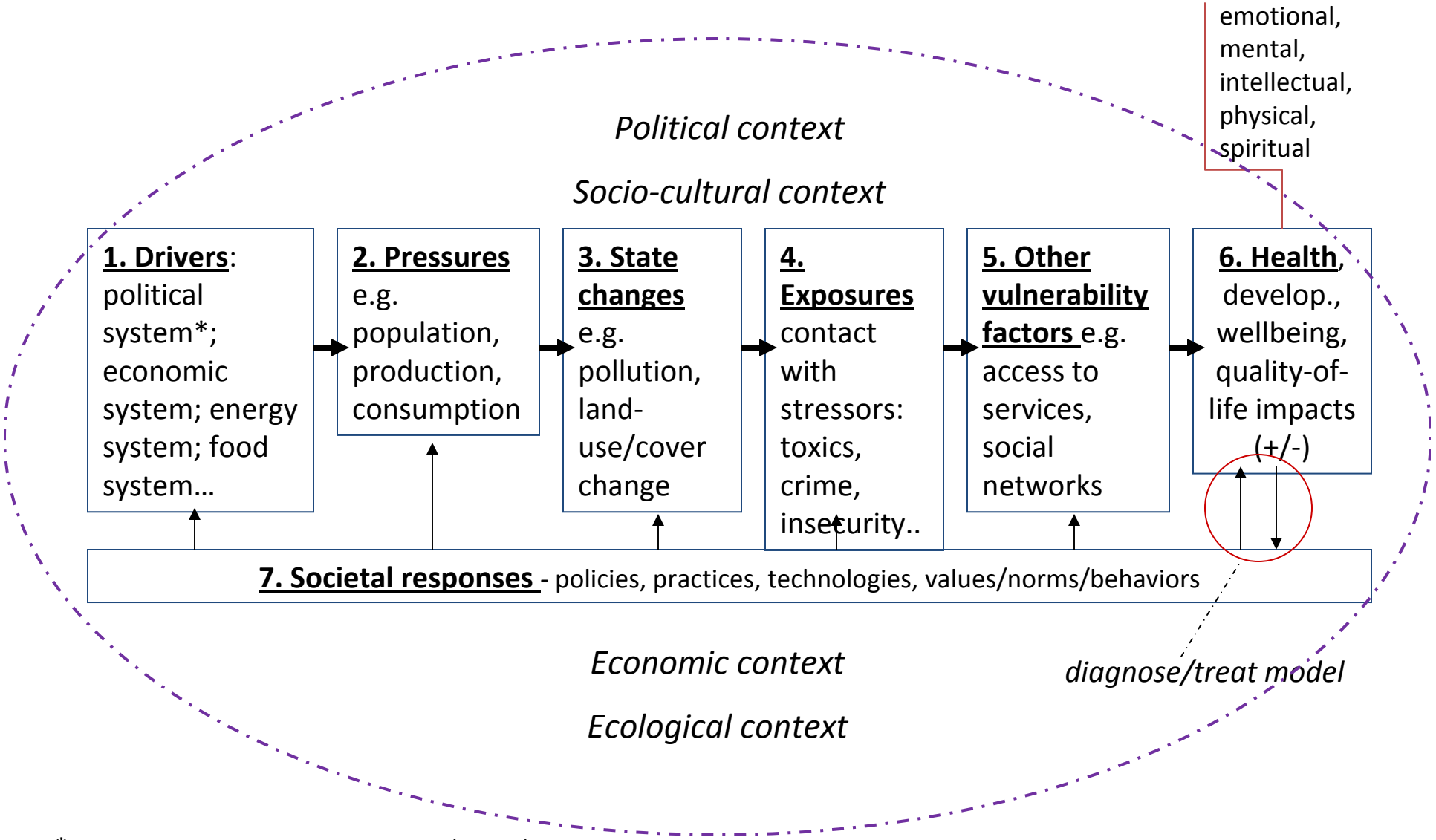
Impacts?
Drivers?
Alternatives?

Integrated Health System Frame



*policies, practices, technologies, values/norms/behaviors

Examples of System Indicators

Context: mortality and morbidity associated with coal-fired power plant emissions

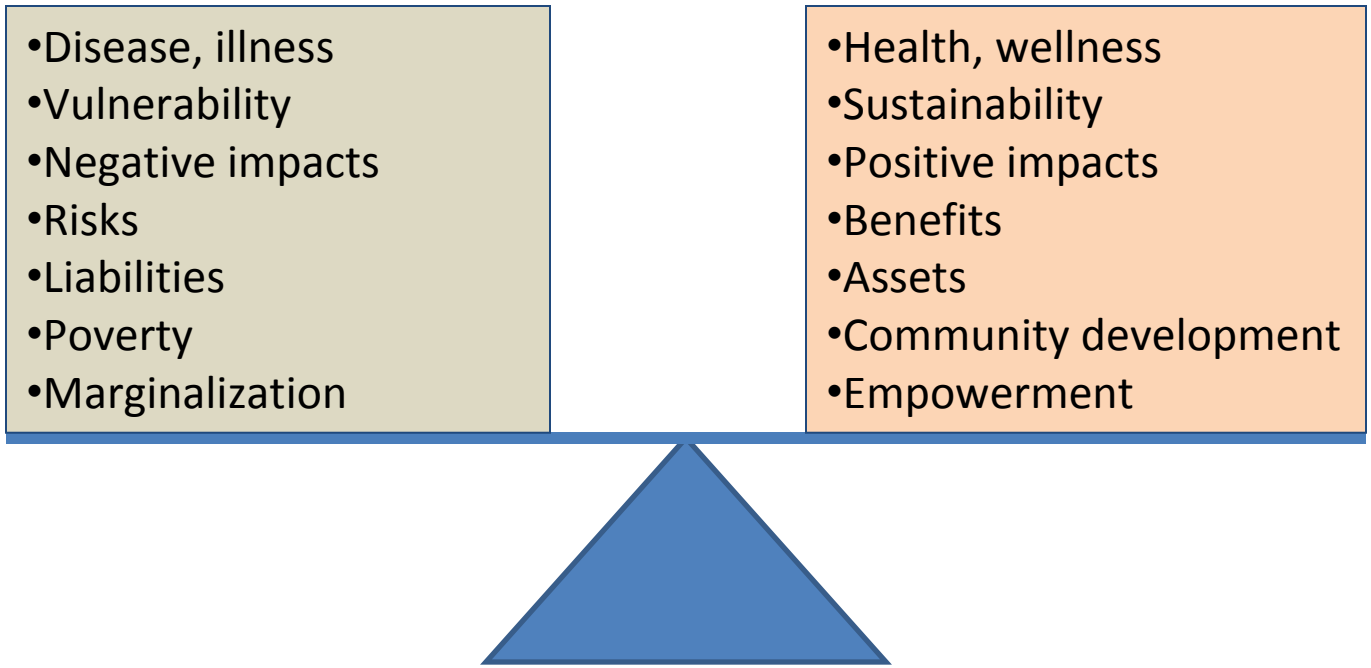
Aspect	Examples of aspect	Indicator(s)	Method
1. Drivers	Coal-fired energy system	Coal burned (tons/week)	Extant data
2. Pressures	Energy demand/consumption	Demand vs. Supply (KWh_e)	Extant data
3. State changes	Ambient air quality	Levels of PM, SO_2, Hg, NOx	Air testing
4. Exposures	Air toxicants	PM dose rate (μg/kgBW/day)	Exp. testing
5. Other vulnerability factors	•Poverty – inability to move •Access to quality health care	•Household poverty level •Access level, quality level	•Survey tool •Survey tool
6. Impacts (+/-) on: •Health •Development •Wellness/Wellbeing •Quality of life	•Resp. disease morb./mort. •Edu. access, cognitive ability •Fitness level, ability to work •Happiness level, rec. access	•Asthma, COPD rate, resp. mort. •School attendance, IQ test •Fitness metric, lost workdays, DALYs •Happiness level, green-space access	•Test, records •Survey tool •Fitness test •Survey tool
7. Societal response(s)	Energy policy, pollution policy, cleaner technology	Policy documents/reports incl. USEPA work on acid-aerosol impacts	Lit. review, case studies

Searching for a Common Language among Disciplines and Stakeholders: *Vulnerability Theory*

Aspects	Concept	Relevant indicators/data	Env *	Gen
1. Differential exposure of individuals in a group, or between groups	contacts over time w/risk agents, stressors*	•PM dose rate (inhalation) •Neighborhood crime rate •Unemployment •Health disparities	●	
2. Differential susceptibility	exposure thresholds for negative impact	•Health disparities within and between groups •genetic risk factors	●	●
3. Differential sensitivity	how risk and/or magnitude of impact changes with exposure		●	●
4. Differential preparedness to respond (or coping, or adaptability)	Individual and/or group capacity to reduce, mitigate and/or absorb impacts	Access to health care Access to social networks Individual planning capacity Group planning capacity	●	●
5. Differential resilience	Ability to 'bounce-back' from impacts	Resilience metrics e.g. illness recovery time	●	●

*expansive notion of environment: biophysical, social, political, economic, cultural

Need for balancing in dialogue & research esp. w/affected communities: otherwise *dis*empowering



Pragmatic knowledge frame: Mixed methods

Discipline/Field	Method(s)	Examples of data types
Clinical Medicine	Clinical testing	Health status, bio-specimens
Epidemiology	Case/control, cohort	Risk factors for diseases
Risk/Vulner. Analysis	QRA, exposure assessment	Dose rates for toxicants
Health Anthropology	Ethnography, listening	Narratives and contexts
Biosocial health science	Biological/sociological	Narrative/quant/qual.
Environmental Science	Air/water/soil testing	Air/water/soil quality
Geographic Info. Science	Computational, spatial stats	Maps, spatial patterns
Sustainability Sci. & Policy	Comparing options	Expected impacts of options

- Worth more attention: understanding a person's life, relationships with others, with nature, rich/nuanced health information and health contexts
- Worth more attention: integrative, can reveal spatial associations among data

GIS Analysis

Spatial Variability

Q. What does the health profile of children look like in different places?

Q. What do the environments* of those places look like?

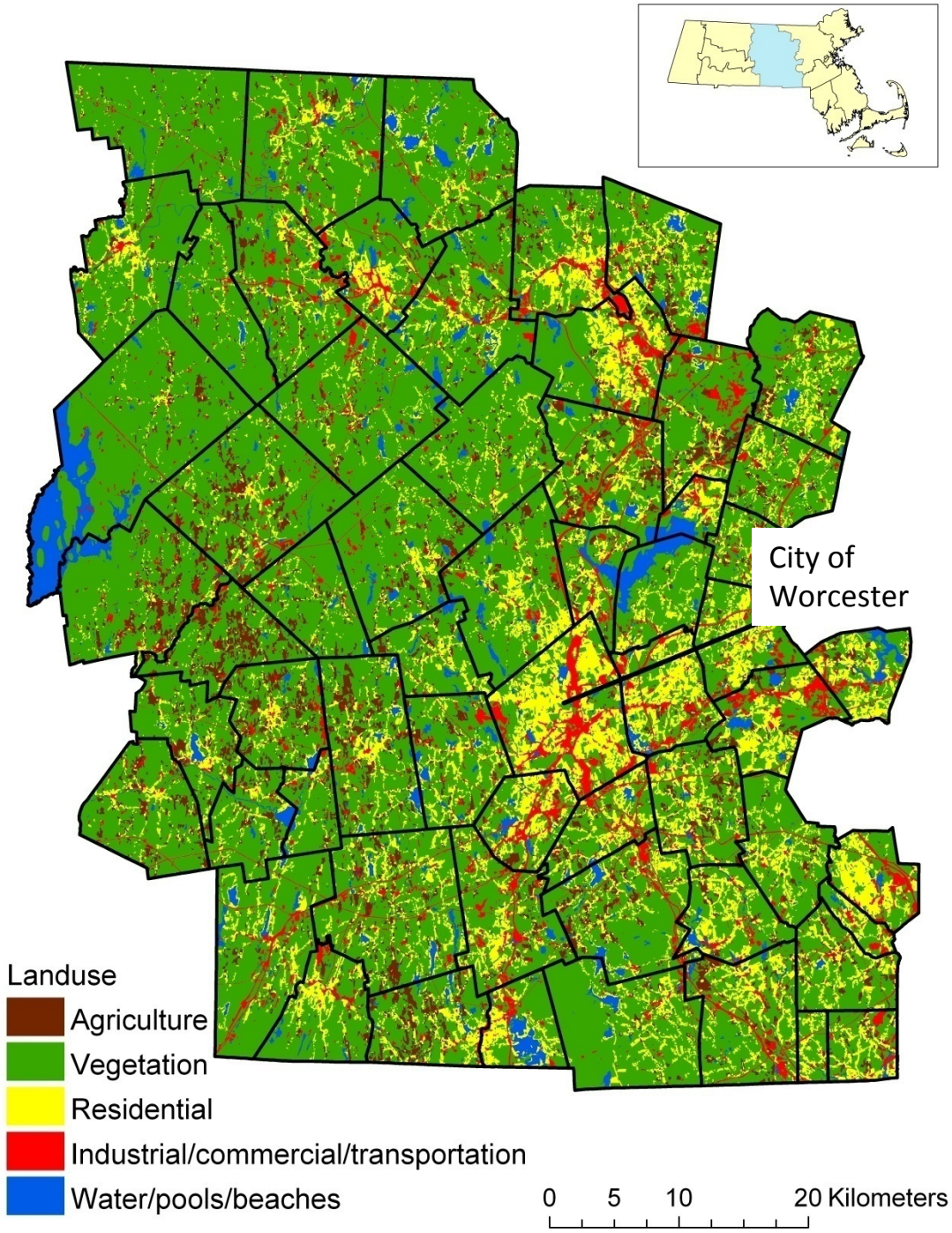
Q. How are data associated spatially?

Temporal Variability

Q. How does the health profile of children in different places change over time as they pass through major life stages?

Q. How are environments changing?

*biophysical, social, political, economic, cultural



Platforms for data gathering can be tested-as-we-go in an adaptive approach to build capacity

- Traditional quantitative, qualitative, narrative tools – *combined*
- Mobile technologies for monitoring - e.g. phones, PDAs w/GPS
- Open-source web-based monitoring - e.g. of physical environment
- Telemetric instruments - e.g. air quality stations, climate stations
- Remote sensing - e.g. satellite imagery of land use/cover change
- GIS for mapping and spatial analysis
- Ultra low cost sensors - e.g. ion-selective electrodes for metals-in-water
- Low-burden participatory testing – e.g. indoor lead-in-dust, radon
- Others…

Strategic approach to avoid data overload and cost overruns

- Choose indicators and data judiciously based on information value (for science and policy objectives) vs. cost of collection.
- Use extant data, esp. existing child and adult health data, existing socio-demographic, economic and hazards data
- Use effective mixed-methods approaches and integrative tools, e.g. GIS, low-burden participatory methods, social/env. epidem.
- Frame projects as capacity-building opportunities and leverage other resources/partnerships via social networks
- Exploit economies-of-scale across sectors, e.g. share datasets/education/training among health, energy, food, jobs, housing sectors, and others.
- Train new generation of scholar-practitioner as 'integrators'
- Train new generation of community health workers as connectors between researchers and communities

NCS Response/Policy Goal:

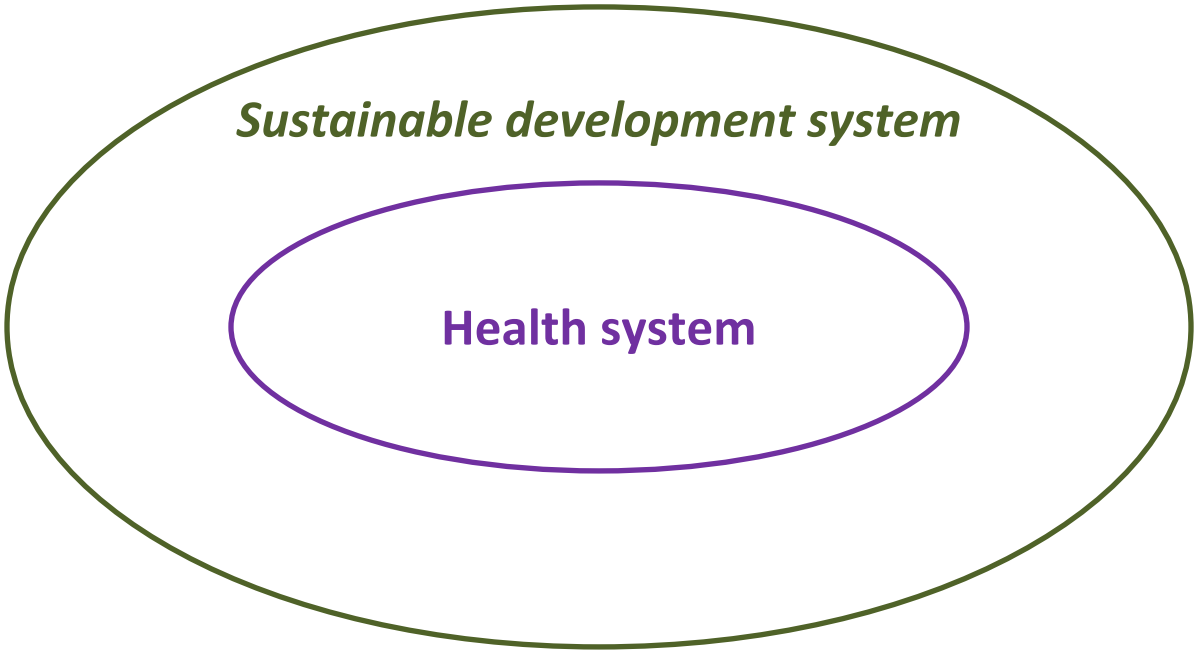
"The goal of the Study is to improve the health and well-being of children… Ultimately, the National Children's Study will …form the basis of child health guidance, interventions, and policy for generations to come."

NCS Website 08/2011

How can scientists influence policymakers?

- *By generating knowledge in an integrated, clear, concise fashion.*
- *By building-in regular science-policy interactions as we go.*
- By listening to policymakers needs, priorities - e.g. job creation, economic development, community development - and relating *health* to those concerns in ways that are meaningful.
- By stimulating dialogue that reveals the positive and negative impacts of different policy/practice options on policy priorities.
- By networking with policymakers to build the requisite social and technical capacities to understand and respond to issues.
- Fostering a common language, such as that of *vulnerability/ sustainability*, *positive/negative impacts* on the things people care most about.

Energizing Health & Sustainable Development Dialogue



Harnessing the power of positive thinking & creativity, sustainable development asks:

- How do we create a healthier future? What does that look like?
- What do you want your neighborhood/town/region to look like in 2020, 2050?
- What does a more sustainable health system look like?
- What does a more sustainable energy system look like?
- What does a more sustainable food system look like?
- What does a more sustainable economic/employment system look like? ……

Thank you for your kind attention

Cynthia Mary Downs *1929-2010*