Promoting health in the Anthropocene

Prof Tony Capon
UNU-IIGH Director
This talk

• The Anthropocene epoch

• Urbanization and health to illustrate the value of eco-social understandings in health promotion

• Human ecology and systems thinking as methods for promoting health

• The Rockefeller Foundation–Lancet Commission on planetary health

• Implications for health research and capacity building
The Anthropocene epoch
Life expectancy in years

(World Bank)


- North America
- Europe
- Latin America and the Caribbean
- East and South-East Asia
- World Average
- South-Central and West Asia
- Africa
Global epidemics of NCDs
(Nature, 2011)

UN targets stop killers
International summit considers how to stem the rise in non-communicable diseases.

By Declan Butler

When heads of state and health ministers gather in New York next week for the first United Nations (UN) high-level summit on non-communicable disease (NCD), they will be presented with some jaw-dropping statistics. According to UN reports released before the meeting, NCDs such as cardiovascular disease and cancer killed 33 million people in 2008, accounting for 63% of all deaths. Although NCDs are often mistakenly thought of as diseases of affluence, more than 60% of the NCD deaths occurred in low- and middle-income countries (see Total deaths).

By 2030, says the UN, the global annual toll of NCD will rise to 52 million deaths.

Total death statistics also suggest that apart from in the poorest countries in Africa, NCDs kill many more people than communicable diseases such as AIDS, malaria, tuberculosis or meningitis. This has led to a growing number of health experts to demand global action.
Population of the world
(billions, UN estimates)

The urban and rural population of the world, 1950-2030

- World, total population
- World, urban population
- World, rural population

UNITED NATIONS UNIVERSITY
Historical view of urban health penalties (developed country perspective)

- Infectious diseases
- Urban air pollution
- Road trauma
- Greenhouse gas emissions → climate change
- Obesity

Time:
- 1800: Industrialisation
- 1900: Modernisation
- 2000: Globalisation
- Future

Health risk/impact

McMichael 2007
Transport systems and health

Urban planning: values, preferences, theories

Transport system (inherited/evolved/planned)

↓

History

Transport Modes
- public/private
- convenience
- costs

Associated infrastructure

Energy needs

Air pollution

GHG emissions

Global climate change

Respiratory disease
- Asthma
- Cardiovascular disease
- Fetal/infant brain debt

Stress (hypertension)
- Sleep disturbance
- Impaired child learning

Physical activity patterns

- Weight;
- Endorphins (wellbeing);
- Social contact

Influences on green space (heat island effect; visual calming; biodiversity)

Road safety

Urban/suburban landscape; local ‘walkability’ impacts on neighbourhood/community

Easy personal mobility

Noise

Respiratory disease

Global climate change

Social contact patterns; reliance on supermarkets (food choices); etc.
### Framework for urban sustainability and population health

**Ecological footprint**

<table>
<thead>
<tr>
<th>Economy and work</th>
<th>Transport and urban form</th>
<th>Housing and buildings</th>
<th>Water and sanitation</th>
<th>Nature and landscape</th>
<th>Media and communication</th>
<th>Culture and spirituality</th>
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<td>Air, water, noise, infection, allergens, chemical exposures, local climate</td>
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<td>Food security</td>
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<td>Family relationships</td>
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<td>Social capital</td>
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“Climate change is the biggest global health threat of the 21\textsuperscript{st} Century”

May, 2009
Pathways between climate change and human health

(McMichael 2009)

1. Direct impact
   - e.g. heatwaves, floods, fires, storms; water shortage

2. Indirect (system-mediated) impacts
   - Changes to physical systems/processes
     - e.g. urban air pollution (ozone formation; aeroallergens)
   - Biological changes: processes, timing
     - e.g. mosquito density, range; temp, soil moisture → crop yields
   - Changes to ecosystem structure and function
     - e.g. fisheries; constraints on microbes; nutrient cycles; forest productivity

3. Flow-on effects, via social, economic, demographic disruptions

Health impacts
Good news story – ‘co-benefits’

Health co-benefits from action on climate change
Lancet series on health and climate change:

– Energy generation
– Mobility
– Food choices
– Housing
Boyden’s biosensitivity triangle

- Human activities
- Health of people
- Health of planet
Universal health needs of the human species

<table>
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<tr>
<th>Bio–physical</th>
<th>Psycho–social</th>
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<tr>
<td>Clean air</td>
<td>An emotional support network</td>
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<td>Clean water</td>
<td>The experience of conviviality</td>
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<td>A natural diet</td>
<td>Opportunities for co-operation</td>
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<td>Absence of harmful levels of radiation</td>
<td>A natural level of sensory stimulation</td>
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<td>Minimal contact with pathogens</td>
<td>An interesting environment</td>
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<td>Protection from extremes of climate</td>
<td>An aesthetically pleasing environment</td>
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<td>A natural amount of physical activity</td>
<td>Opportunities for creative behaviour</td>
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<td>Sleep</td>
<td>Opportunities for learning</td>
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<td>Opportunities for recreation</td>
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<td>Opportunities for spontaneity</td>
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<td>Variety in daily experience</td>
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<td>Absence of alienation and deprivation</td>
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<td>A sense of belonging, purpose and love</td>
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Systems thinking

- Dynamic interactions
- Feedback
- Policy resistance
- Leverage points
- Unintended consequences
Examples of ‘system’ problems

*Unintended consequences*

200 years ago, health problems in industrialising cities in England led to the ‘garden cities’ movement. In the 21st century, we face new health problems from urban sprawl

*Feedback*

Climate change is increasing the intensity of heat waves which is leading to increased demand for air conditioning, thereby increasing energy use and greenhouse gas emissions from climate control in homes and workplaces
Collaborative conceptual modelling

(Newell and Proust)
Relationships between urban transport, land use and health and wellbeing
Health and Wellbeing in the Changing Urban Environment using Systems Approaches


International programme office
Xiamen, China
Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health

“Put simply, planetary health is the health of human civilisation and the state of the natural systems on which it depends.”

http://www.thelancet.com/commissions/planetary-health
Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health

Commissioners: Prof Chris Beyrer, Dr Fred Boltz, Prof Tony Capon, Dr Alex Ezeh, Prof Gong Peng, Prof Sir Andy Haines (Chair), Dr Richard Horton, Dr Sam Myers, Dr Sania Nishtar, Dr Steve Osofsky, Prof Subhrendu Pattanayak, Dr Montira Pongsiri, Dr Agnes Soucat, Dr Jeanette Vega, Dr Derek Yach, Dr Sarah Whitmee (Commission Researcher)

Building on previous work e.g. Brundtland Commission, IPCC, MA, CBD/WHO, Tony McMichael
COMMISSION ON PLANETARY HEALTH

THE HUMAN POPULATION IS HEALTHIER THAN EVER BEFORE

LIFE EXPECTANCY
- Average global life expectancy at birth (years)
- 1950: 46
- 2000: 80

POVERTY
- Proportion of people in poverty (%)
- 1950: 30%
- 2000: 15%

CHILD MORTALITY
- Recorded deaths of under-fives
- 1990: 5M
- 2000: 3M

BUT TO ACHIEVE THIS WE’VE EXPLOITED THE PLANET AT AN UNPRECEDENTED RATE

CARBON DIOXIDE EMISSIONS
- Atmosphere concentration of CO₂ (ppm)
- 1950: 290
- 2000: 390

OCEAN ACIDIFICATION
- Global ocean pH (change from 1990 value)
- 1990: 8.2
- 2000: 8.1

ENERGY USE
- World primary energy use (EJ)
- 1950: 1000
- 2000: 1500

TROPICAL FOREST LOSS
- Global (natural forest loss compared with 1990 baseline %)
- 1990: 0%
- 2000: 4%

WATER USE
- Water use (thousand km²)
- 1990: 500
- 2000: 1000

FERTILISER USE
- Global fertiliser use (Nitrogen, Phosphorus, Potassium, thousand tonnes)
- 1990: 0
- 2000: 100

Image: Globaia
Planetary boundaries
(Steffen et al Science 2015)
What is planetary health?

“Put simply, planetary health is the health of human civilisation and the state of the natural systems on which it depends.”
Links with health

Environmental changes and ecosystem impairment:

- Climate change
- Stratospheric ozone depletion
- Forest clearance and land cover change
- Land degradation and desertification
- Wetlands loss and damage
- Biodiversity loss
- Freshwater depletion and contamination
- Urbanisation and its effects
- Damage to coastal reefs and ecosystems

Examples of health effects:

Direct health effects:
- Floods, heatwaves, water shortage, landslides, exposure to ultraviolet radiation, exposure to pollutants

Ecosystem-mediated health effects:
- Altered infectious disease risk, reduced food yields (undernutrition, stunting), depletion of natural medicines, mental health (personal, community), effects of aesthetic or cultural impoverishment

Indirect, deferred, and displaced health effects:
- Diverse health consequences of livelihood loss, population displacement (including slum dwelling), conflict, inappropriate adaptation and mitigation
Effects of multiple environmental changes on food availability and quality

- Climate change
  - Temperature/ extreme events
  - CO\textsubscript{2} fertilization
  - Ozone
  - Pests, mold and fungi
- Land degradation and soil erosion
- Water scarcity (from overconsumption, diversion to non-food crops, climate change and changes to ecosystem function)
- Loss of pollinators
- Overfishing/Ocean acidification
Estimates of air pollution deaths
(WHO 2014, Lim et al LANCET 2012 ;380)

• Ambient particulates >3 m deaths p.a.
• Household from solid fuels >4 m deaths p.a.
• More than 7 million in total
Annual average global mortality (1997–2006) due to Landscape fire smoke

Reproduced from Johnston and colleagues 2012; by permission of Environmental Health Perspectives.
Emerging diseases
Disasters and displacement – the example of Pakistan
Meeting the challenges
Developing sustainable and healthy cities

- Active travel /public transport
- Reduced fine particulate air pollution
- Green spaces – biodiversity, reduced heat island and mental health benefits
- Watershed conservation
- Access to healthy food
- Increased resilience to floods, storms and droughts
Multiple approaches for meeting increased food requirements

- Sustainable intensification
- Efficient use of water and fertilizer
- Sustainable aquaculture
- Support for subsistence farmers
- New sources of nutrition and diversification
- Biofortification
- Change of diets and redirect landuse back to food
- Reduced food waste

Tester and Langridge (2010)
Reducing food waste

Nearly 30% of the world’s total agricultural land is used to produce food that is never eaten. Various strategies needed e.g.

Reducing aflatoxin through aflasafe


UN World Food Programme’s ‘Training Manual for Improving Grain Postharvest Handling and Storage’
Reduced GHG emissions and land use requirements from healthy diets

Hallstrom et al. 2014
Future fish requirements

The graph illustrates the increasing demand for fish, with projections showing a significant rise in both wild (capture) fisheries and aquaculture production. The data suggests that wild fisheries are expected to plateau, while aquaculture is forecast to continue growing, meeting an increasing portion of global fish demand.

Key points:
- The demand for fish is expected to increase exponentially by 2050.
- Wild fisheries are projected to remain relatively stable.
- Aquaculture production is anticipated to significantly increase.

The implications of this trend are numerous, including potential strain on wild fish populations and the need for sustainable aquaculture practices.
How Forest Conservation Reduces Disease risks – examples from the Brazilian Amazon

Malaria transmission
- fewer vector breeding sites.
- larger vector predator populations and greater diversity of mammalian species (promoting dilution effects)
- microclimate inhibits anopheline mosquitoes.

Acute Respiratory Infections (ARI)
- forests may filter air particulates
- fewer fires and lower smoke emission
- reduced collection and burning of biomass fuels

Diarrhea
- forest may reduce flooding and filter pathogens from surface water.

Bauch, Birkenbach, Pattanayak and Sills PNAS 2014
Circular economy
Increasing access to modern family planning

Around 225 million women who want to avoid pregnancy are not using effective contraception.

Access to family planning could cut maternal deaths by around 30%.

Meeting the needs for modern contraception in low-income countries would cost only an additional $5.3 billion per year.

Source: UN Millennium Development Goals Report 2012
Solutions lie within reach and require a redefinition of prosperity to focus on quality of life and improved health for all, together with respect for the integrity of natural systems.

This endeavour will necessitate that societies address the drivers of environmental change by promoting sustainable and equitable patterns of consumption, reducing population growth, and harnessing the power of technology for change.
Implications for health research and capacity building

- Stronger focus on ecological determinants of health: ‘eco-social approach’ to health
- Health and wellbeing of future generations: intergenerational health equity
- Interdisciplinary and integrative research: human ecology and systems thinking