Environmental health (in)equity: From the molecular to the global

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Outline

1. Health (in)equity
2. The environmental determinants of health
   a) Ecotoxicity – the “enormity of tinyness”
3. Environmental health inequity
   a) Ecotoxicity and the health of children
   b) Aboriginal people
   c) Urban health inequity
      i. A little history – Manchester
      ii. The GRNUHE
      iii. Nature
      iv. Is beauty a determinant of health?
      v. Cities and natural hazards
   d) Ecosystem inequity
4. Actions for environmental justice

There are many hidden slides with more details, and I will skip through many slides.
1. Health inequity

“Differences in health which are not only unnecessary and avoidable, but, in addition, are considered unfair and unjust.”

Margaret Whitehead, 1992

“The Concepts and Principles of Equity in Health”

Int J Health Serv 22:429 - 445
Disparity, inequality and inequity

Differences in Health Outcomes

- Unavoidable
  - Acceptable
  - Unacceptable

- Avoidable
  - Acceptable
  - Unacceptable

Disparity
An observation

Inequality
An epidemiological assessment

Inequity
A value judgement

Based on Jim Frankish, October 2008
Inequality, inequity and the gradient

[Graph showing the distribution of dollars (millions) across different SES groups]

- Inequality
- Inequity
Equality of input to a conservative

Equality of outcome to a liberal
2. The environmental determinants of health

- We have spent so much time focused on the social determinants of health that we have neglected the environmental determinants
- It is not ‘either/or’, it is ‘both/and’
- We need to re-establish the balance
Our physical environment – the 80/90/100 rule

- **80**
  - We are 80% urbanised

- **90**
  - We spend 90% of our time indoors
  - And 5% in vehicles
  - = 1 hour (5%) outdoors (and mostly urban)

- **100**
  - We live 100% of the time within natural ecosystems
  - We also all carry a body burden of POPs and heavy metals throughout our lives
2 b) Ecotoxicity – the “enormity of tinyness”*

Very low levels

Oestrogen is active at levels as low as a few parts per trillion, while many of these synthetic compounds are present in human tissues at levels that may be thousands or even millions of times higher (PSR, 2001)

Bioconcentration

POPs such as PCBs, may reach concentrations in bald eagle eggs that are 25 million to 100 million times greater than the levels in the water (Gilbertson, 1998)

* Ross Hall and Donald Chant, (1979)
Multiple chemicals
It has been reported that 196 different organochlorines have been identified in the tissues of North Americans, with several hundred others detected but not chemically characterized (Thornton, 2001)

Food chain contamination
For selected organochlorines and PCBs, Ontario adults eating Ontario grown food receive 88 percent (range = 68 - 100%) of their exposure from food (Davies, 1990)
Pollution and ecotoxicity

Increase in PCB concentration from water to fish is 0.5 – 18 million times, and to seal fat is 80 million times the levels in sea water
And then we eat them!
Health impacts of ecotoxicity

What are the health impacts of hundreds of POPs and other chemicals present in the body from before birth at levels below individual effect levels?

WE DON’T KNOW!

And we should probably add nano-particles to the concept, perhaps also GMOs
An unauthorised experiment

- The entire population of the Earth – all species, not just humans – are being subjected to an experiment to which we have not consented – population-wide, lifetime exposure to persistent toxic chemicals
- This is an inequitable and unethical use of power by the corporations who are producing and using these chemicals
3. Environmental health inequity

“Environmental health inequity can be defined as the inadequate, unresponsive, and/or discriminatory policies that result in multiple environmental risks and inadequate access to environmental benefits among disadvantaged Canadian communities.”

Centre for Environmental Health Equity, Queen’s U
Who suffers from environmental health inequity?

CEHE

- Children
- Aboriginal people
- Cities – The urban poor

Also

- Rural/remote populations
- Ethno-racial minorities
- Seniors
- People with disabilities etc.
Why is London’s West End rich and East End poor?

Prevailing wind

River flow
The poor live . . .

- Downwind
- Downstream
- Downhill
  - But uphill if the slopes are dangerous
- On floodplains and other marginal lands
• Near landfills, industrial plants and hazardous sites
• In damp, unsafe, unhealthy housing
• In dangerous neighbourhoods
• And they work in unsafe, unhealthy workplaces

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This is environmental injustice
• It results in environmental health inequity
3 a) Ecotoxicity and the health of children: A case of intergenerational inequity
Children are particularly vulnerable to toxic chemicals

- Proportionately higher exposure than adults because, kg per kg of body weight, they eat more food, drink more water, and breathe more air.
- Differ behaviourally; they crawl on the floor and breath at tailpipe level; they consume significant amounts of soil when young; they indulge in riskier behaviour as they explore their environment.
• Their metabolic systems are immature at birth and for some months, even years afterwards, so they do not detoxify and excrete pollutants as well as adults do.

• From conception through to adolescence, the child is growing and developing rapidly and its organ systems - brain, endocrine, immune, reproductive, respiratory and other - are differentiating and maturing. These processes are sensitive to disruption, and such disruptions can have life-long effects.

• Infants and children have many more years of life ahead of them than adults, giving time for long-term effects to be felt.

Based on Landrigan, 2001
Children are exposed from before birth

- Children today are exposed to thousands of synthetic chemicals.
- Most have not been tested for toxicity, and especially for children
  - Information on developmental toxicity is available for less than 20% of the 3000 high production volume (HPV) chemicals
- Yet many HPV chemicals are detectable in adult blood, breast milk and infant cord blood

Landrigan, 2013
Children and toxic chemicals

“The central question in pediatric environmental health research: what is the evidence that toxic chemicals in the environment contribute to chronic disease in children?”

Dr. Philip J. Landrigan, Professor of Pediatrics
Director, Children’s Environmental Health Center,
Mount Sinai School of Medicine

New Brunswick Children’s Environmental Health Workshop, Fredericton NB, March 27th 2013
Toxic chemicals are causing chronic disease in children

- “Evidence is increasing that toxic chemicals in the environment contribute to chronic disease in children”
  - Asthma
  - Childhood cancer
  - Male reproductive disorders
  - Neuro-developmental disorders

Landrigan, 2013
3 b) Aboriginal People in Canada

- Aboriginal people suffer the greatest inequity
- This is our version of environmental racism
  - Loss of traditional lands and resources
  - Climate change, esp in the Arctic
  - Ecosystem contamination
  - Poor quality locations
  - Poor housing conditions

http://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php
The Inuit and POPs

- “As the Inuit diet is comprised of large amounts of tissues from marine mammals, fish and terrestrial wild game, the Inuits are more exposed to food chain contaminants than human populations living in temperate regions.”
- “…their infants are exposed through transplacental and breast milk transmission from the Inuit mother.”

Dewailly, 2006
Canada’s worst housing

The worst housing conditions in Canada are found among Aboriginal people – and it is getting worse!

Proportion of dwellings in need of major repairs by Aboriginal identity, population aged 15 and over

http://www.statcan.gc.ca/pub/89-645-x/2010001/housing-logement-eng.htm
3 c) Urban health inequity
3 c) I - A little history - Manchester
Manchester was the first industrial city

Massive problems

- Rapid population growth
- Appalling slums
- Appalling environments
- Appalling health status

The description is not that different from the slums of many cities around the world today

See 5 hidden slides

Source: Douglas, Hodgson and Lawson, 2002
Appalling health status

• “Infant mortality in Manchester in 1798 may have been as high as 300 per 1000 live births.”
• “In 1890, the infantile death rate for the offspring of cotton workers and labourers in Blackburn was 252 per 1000 births compared with 160 for the offspring of all other parents.”

Source: Douglas, Hodgson and Lawson, 2002
Urban rural differences in under-five mortality, Kenya

Source: African Population and Health Research Centre, with permission
The health impact

• Life expectancy for mechanics and labourers in Manchester in 1842 was 17 years

Edwin Chadwick

The Report from the Poor Law Commissioners on an Inquiry into the Sanitary Conditions of the Laboring Population of Great Britain
3 c) ii The Global Research Network on Urban Health Equity

- Funded by the Rockefeller Foundation
- Grew out of the WHO Commission on Social Determinants of Health
  - Knowledge Network on Urban Settlements

GRNUHE reports are available at

http://www.ucl.ac.uk/gheg/GRNUHE/GRNUHEPublication
The line between rich and poor - Morumbi and the Paraisópolis favela, São Paulo, Brasil
Four key research questions

1. How to ensure urban social conditions promote health equity
2. The added pressure of climate change on urban health inequities
3. How to put health equity at the heart of urban planning/design
4. How to put health equity at the heart of urban governance

For details, see 6 hidden slides
Key issues and roles for urban planning and governance in ensuring health equity

Urban planning can help ensure:

- Equitable access to the benefits of urban life
- Access to adequate housing
- Safe living environments
- Food and nutrition security*
- Physical activity*

* See hidden slides
a) Equitable access to the benefits of urban life

- Livelihood opportunities are important determinants of inequities. The time and effort required to get to work, which depends upon the nature of the physical urban environment, is an important issue.

- Long commutes represent a form of family and community time-deprivation; a two hour commute each way is 20 hours per week, or the equivalent of two 40 hour work weeks every month.
• **Access to shops, facilities and community spaces (both outdoor and indoor).**
  ◦ “Shops, services and other destinations can encourage physical activity, social interaction and conviviality...”
  ◦ Quite apart from what is learnt in schools, including life skills and health literacy, there are health benefits associated with the physical presence of schools within communities” (Capon and Blakely 2007).

• **Access to health care facilities**
b) Access to adequate housing

In terms of health inequities the key housing issues are:

- **Location** (presence or absence of hazards, e.g. pollution or risk of flooding);
- **Access to basic services** such as water, sanitation and refuse removal, and access to an energy source;
- **The quality of the shelter itself** – protection from the elements, and sufficient living space.

GRNUHE Final Report, 2010
Provision of toilets by socio-economic group, Bangalore

Source: Sinclair Knight Merz and Egis Consulting 2002, cited in GRNUHE, 2010
c) Safe living environments

Key issues:

- transport safety
- home and leisure safety
- children’s safety
- safety of the elderly
- occupational safety
- crime and violence prevention
- suicide prevention; and
- disaster preparedness and response.

GRNUHE Final Report, 2010
Inequitable risk of injury

The poor are often at a high risk of injury, because they are faced with hazardous situations on a daily basis . . .

- their means of transport are overcrowded and poorly maintained
- as pedestrians on unsafe roads, they are vulnerable to being crushed by cars and buses
- their homes, often poorly constructed, are vulnerable to fire.
- In general, the poor have less chance of survival when injured because they have less access to health services.
3 c) iv Engaging with nature

There are health benefits from

1. Viewing nature
   ◦ As through a window, or in a painting

2. Being in (the presence of nearby) nature
   ▪ May be incidental to some other activity

3. Active participation and involvement with nature

Countryside Recreation Network (UK)
The health impacts of ‘less green’ environments

Social breakdown
- Less strength of community, courtesy, mutual support, supervision of children outdoors
- More loneliness, graffiti, noise, litter, loitering, illegal activity, property crime, aggression, violence, violent crime

Psychological breakdown
- Less attention, learning, management of major life issues, impulse control, delay of gratification
  - Greener schools related to better scores, greening schools leads to improved scores
- More ADHD symptoms, clinical depression, anxiety attacks
Physical breakdown

- Poorer recovery from surgery, self-reported physical health, immune functioning
- More obesity in children, physician-diagnosed diseases, mortality

Strength of evidence

- Based on hundreds of studies involving millions of people
- Multiple methodologies, multiple outcomes
- Many diverse populations

Based on Ming Kuo’s presentation
‘Vitamin G’

If this was a drug, we would call it a miracle drug!
Health benefits of urban parks

- Physical (exercise)
- Social (being with others)
- Mental/emotional (relaxation, etc)
- Spiritual (connecting with nature)
- Ecological (air quality, temperature regulation etc)
Parks for all

- Given the inequalities in health we face, how do we ensure the most disadvantaged get the benefits that ‘Vitamin G’ offers?
- How do parks meet the needs of ethno-racially diverse communities?
- Age–friendly parks?
- How do we bring nature indoors?
Relatively barren and relatively green courtyards at Ida B. Wells (aerial photo)

Photo credit William C. Sullivan
School of Public Health & Social Policy
Relatively barren and relatively green courtyards at Ida B. Wells

Photo credit William Sullivan
Ming Kuo’s research

- The greater the amount of greenery in common spaces, the higher the levels of mutual caring and support among neighbours.
- The higher the amount of vegetation, the lower the crime rate.
- Higher levels of residential greenery are associated with lower levels of aggression against domestic partners.
Ming Kuo’s research/2

- The more natural the view from home, the better girls scored on tests of concentration and self-discipline
- The more greenery, the higher levels of optimism and sense of effectiveness
- The greener the setting in which children with ADD spend time, the more their symptoms are relieved
c) iv  Is beauty a determinant of health?

- Every culture has decorative art, music, dance, jewelry
- Every culture has ideas of beauty and seeks to create beauty
- So it seems beauty is fundamental to human societies and culture
- That suggests to me that beauty is likely to be good for health and social wellbeing
- Presumably, ugliness is bad for health
If so . . .

- Do disadvantaged groups experience a lack of beauty or an excess of ugliness?
- Does this contribute to inequalities in health?
- If so, should we not preferentially create beauty and ensure access to nature, art and beauty in disadvantaged communities?
Cities and natural hazards

Natural hazards include

- Cyclones
- Droughts
- Earthquakes
- Floods
- Landslides, and
- Volcano eruptions

Remember . . .
The poor live . . .

- Downwind
- Downstream
- Downhill
  - But uphill if the slopes are dangerous
- On floodplains and other marginal lands
For the 63 most populated urban areas (>5 million inhabitants in 2011)

- 39 are located in regions that are exposed to a high risk of at least one natural hazard
  - Flooding – 30 cities
  - Cyclones - 10 cities,
  - Droughts - 9 cities, and
  - Earthquakes - 6 cities
3 d) Ecosystem inequity

An appropriation of ‘natural capital’ that exploits and destroys the environment of others

- Social inequity
  This will deprive future generations of the resources they need to meet their needs

- Intergenerational inequity
  Also deprives other species of what they need to survive

- Interspecies inequity
Climate change and health inequity

Changes in climatic conditions will increasingly exacerbate existing social and health inequities, with those most at health risk being

- in low-income countries
- poor people living in urban areas
- elderly people
- children
- traditional societies,
- subsistence farmers, and
- coastal populations

• Friel et al. 2008
Inequity in the Ecological Footprint

Figure 6: Ecological Footprint per capita (gha) in high-, middle- and low-income countries (World Bank classification and data) between 1961 and 2010. The green line represents world average biocapacity per capita. (Global Footprint Network, 2014).

Key
- High income
- Middle income
- Low income
- World biocapacity
The Living Planet Index 1970 - 2010 shows a 52% decline in the number of mammals, birds, reptiles, amphibians and fish across the globe, on average, about half the size it was 40 years ago. Latin America shows the most dramatic decline – a fall of 83 per cent.
Inequity in the Living Planet Index

Figure 7: LPI and country income groups (World Bank classification), 1970-2010. (ZSL, WWF, 2014).

- High-income countries - 10% increase
- Middle-income countries - 18% decline
- Low-income countries show – 58% decline

Key

- High income
- Middle income
- Low income

Index Value (1970 = 1)

Year

4. Actions for environmental justice

a) Health equity impact assessment
b) Proportionate universalism
c) Environmental justice for Aboriginal people
d) Children’s environmental rights
   a) Intergenerational equity
   b) Child-friendly communities
e) Urban planning guidelines
Environmental justice

1. **A social movement** in the United States whose focus is on the fair distribution of environmental benefits and burdens.

2. **An interdisciplinary body of social science literature** that includes (but is not limited to) theories of the environment, theories of justice, environmental law and governance, environmental policy and planning, development, sustainability, and political ecology.

http://en.wikipedia.org/wiki/Environmental_justice
US EPA definition

- Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.
Disparity, inequality, inequity and justice

Differences in Health Outcomes

Unavoidable

Acceptable

Avoidable

Unacceptable

Disparity
An observation

Inequality
An epidemiological assessment

Inequity
A value judgement

The pursuit of equity is the pursuit of social and environmental justice

Based on Jim Frankish, October 2008
4 a) Health equity impact assessment (HEIA)

- The ‘equity lens’ in BC’s Core Public Health Programs
- Formal HEIA processes
  - See ELPH report on Health Equity Tools
    - [http://www.uvic.ca/research/projects/elph/assets/docs/Health%20Equity%20Tools%20Inventory.pdf](http://www.uvic.ca/research/projects/elph/assets/docs/Health%20Equity%20Tools%20Inventory.pdf)
  - See MoHLTC in Ontario – HEIA Toolkit
  - See Wellesley Institute resource page
Ontario’s HEIA Toolkit

The HEIA tool that has been developed by MOHLTC has four key objectives:

- Help identify unintended potential health equity impacts of decision-making (positive and negative) on specific population groups
- Support equity-based improvements in policy, planning, program or service design
- Embed equity in an organization’s decision-making processes
- Build capacity and raise awareness about health equity throughout the organization

Proportionate universalism

Focusing solely on the most disadvantaged will not reduce health inequalities sufficiently. To reduce the steepness of the social gradient in health, actions must be universal, but with a scale and intensity that is proportionate to the level of disadvantage. We call this proportionate universalism.

*Fair Society, Healthy Lives*

The UK Marmot Review, 2010
The urban poor suffer environmental injustice

Not just basic needs

- Poor water supply, worse housing, less access to healthy food, worse air pollution, poor public transport, etc.

but also broader human needs

- Less access to nature, art, beauty, libraries, museums etc.
We should preferentially create healthier environments for disadvantaged groups

They need MORE

- Public transport
- Libraries
- Recreational and cultural facilities
- Parks and access to nature
- Art
- Beauty
- etc.

Has to be done WITH, not for or to communities – see this as an opportunity
Environmental justice for Aboriginal people

- ‘Land’ is a fundamental issue for Aboriginal people
- Control over their traditional lands
  - The Tsil’cotin decision
- Climate change and the Inuit
- Improved housing
Environmental justice for children

“Given our rapidly advancing knowledge of
  ◦ early brain development,
  ◦ the differential effects of the physical environment on the developing child,
  ◦ epigenetics,
  ◦ the prevalence of environmental injustice, and
  ◦ the potential effects of climate change on children

it is incumbent on society to consider the environment and environmental justice in the context of child health equity.”
Creating better environments for ALL children – What can we do?

Remember – get it right for kids and you protect all of us – and future generations (intergenerational equity)

- Pay as much attention to the environmental determinants of health as the social determinants
- Recognise that ecosystem health is the ultimate determinant of the health of this and future generations
- Pay attention to and point to environmental health inequity wherever you see it
- Pay far more attention to
  - the built environment
  - the importance of access to play and to nature
  - POPs and other eco-toxic chemicals
An Environmental Bill of Rights (for children)

- Children should have the RIGHT to a toxin-free consumer environment
  - Children’s rights trump corporate rights
  - Chemicals are not people – they are not innocent until proven guilty

- And a healthy built environment
- And a healthy ecosystem
- Based on the Convention on the Rights of the Child - which Canada has signed
- New Brunswick has recently introduced a Bill (before the election)
Child Friendly Communities

A child friendly city is the embodiment of the Convention on the Rights of the Child at the local level, which in practice means that children’s rights are reflected in policies, laws, programmes and budgets. In a child friendly city, children are active agents; their voices and opinions are taken into consideration and influence decision making processes.

Unicef

http://www.childfriendlycities.org/
It is “a system of local governance, committed to fulfilling children's rights, including their right to” (among other things)

- Drink safe water and have access to proper sanitation
- Walk safely in the streets on their own
- Meet friends and play
- Have green spaces for plants and animals
- Live in an unpolluted environment

Unicef

http://www.childfriendlycities.org/
National and local government action for health equity (WHO CSDH, 2008)

- Progressive building of universal health-care services;
- establish a central gender unit to promote gender equity across government policy-making;
- improve rural livelihoods, infrastructure investment, and services;
- upgrade slums and strengthen locally participatory healthy urban planning;
- invest in full employment and decent labour policy and programmes;
- invest in ECD;
- build towards universal provision in vital social determinants of health services and programmes regardless of ability to pay, supported by a universal programme of social protection; and
- establish a national framework for regulatory control over health-damaging commodities.
Put health equity at the heart of urban planning/design

Through impacting on the physical urban environment, urban planning/design can impact on health and health equity in various ways, by facilitating:

- access to shelter and basic services
- access to work and amenities
- physical activity
- food security
- safe living environments (i.e. with low risk of injuries)
- a healthy natural environment
- good mental health
- mobility for people with disabilities, children and seniors
- effective health care
Social Urbanism: Medellin’s City Plan Guidelines

- The indicators of human development and quality of life will guide the public investment, focusing on first serving the ones in the biggest need.
- Public space and infrastructure must become the framework where education and culture are cultivated in places of encounter and coexistence.
• Urban projects must simultaneously integrate physical, cultural and social components; improving not only places but also the life and interactions of people in the communities.

• The Integrated Metropolitan Transport System must be used as the organizing axis of mobility and projects in the city. All projects have to be directly linked to the main transport system.

• The decision to make Medellín an educated city. Education and culture as priorities that guide programs and projects.
Aerial tramway and Library at Parque Espana
Credit: Julio Davila, UCL News