Eating, Moving, Surviving
Will rectifying our environmentally non-sustainable ways of living promote population health?

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Central Argument

Rises in both global temperatures and obesity reflect a culture of excessive consumption and unprecedented reliance on fossil fuel energy.

An environmentally sustainable way of life will bring healthier diets and increased physical activity into our daily life.
A safe operating space for humanity

Identifying and quantifying planetary boundaries that must not be transgressed could help prevent human activities from causing unacceptable environmental change, argue Johan Rockström and colleagues.

Green = safe operating space

Nature 461, Sept 24, 2009
Multi-Scale Influences on Population Health
from Personal Behaviours, through Localised Exposures/Conditions,
to Transboundary/Global Changes

“Risk factor” epidemiology
- Access to health-care
- Alcohol consumption
- Food choices, dietary intake
- Genes
- Smoking
- Reproductive choice

Environmental epidemiology
- Public health programs: sanitation, vaccination, screening, education, etc.
- Physical activity
- Food safety
- Air quality
- Water quality
- Endemic infectious diseases

Local conditions
- Income distribution
- Social relations & institutions

National/regional
- Agro-ecosystem health
- Environmental epidemiology
- National/regional

Global changes
- International trading regimes; capital flows
- Impacts of global climate change
- Ocean temp and pH: reduced marine productivity
- Biodiversity losses
- Stratospheric O$_3$ depletion

Multi-Scale Influences on Population Health
from Personal Behaviours, through Localised Exposures/Conditions,
to Transboundary/Global Changes
CAUSE?
Deviant personal behaviour
Lack of self-discipline
Greed
Laziness
Genetic susceptibility

Food processing
Food marketing, advertising
Transport modes
Recreation options, patterns
Physical work demands
The causal chain. Major causes of ischaemic heart disease

- Food yields
- Climate change
- Energy use, Land use
- Transport options
- Urban form, infrastructure
- Social contact: wellbeing
- Food choice and prices
- Physical activity
- Age
- Fat intake
- Type 2 diabetes
- Education
- Overweight
- Cholesterol
- Overweight
- Income
- Alcohol
- Blood pressure
- Smoking

WHO, 2009
GLOBAL HEALTH RISKS
Mortality and burden of disease attributable to selected major risks

Culture
Wealth
Population size
Urbanism
Technologies
Economic system
Rapid changes in dietary fat intake and fat composition since industrialisation

Fat intake as % of total energy intake (high-income countries)

200,000 yrs ago (advent of modern Homo sapiens) 1800 2000

Year

Note:
1. Change in ratio of \( n6 : n3 = 1:1 \rightarrow 15:1 \)
2. Recent rise in trans FA intake

Total fat
Sat (animal) fats
Unsat fats/oils
n-6 (~veg oils)
Trans fats
n-3 (omega-3: ‘fish oils’)
Rise-and-Fall of ‘Urban Health Penalties’
The Developed Country experience

Health risk/impact

1800
1900
2000

Industrialisation
Modernisation
Globalisation

Time

Infectious diseases
Urban air pollution
Road trauma
Obesity

Greenhouse gas emissions → climate change → health risks

Not Sustainable

McMichael 2007
Trends/projections in per-person food energy intake 1965-2030

Kcals/person/day

- World (22% increase: 1965-present)
- Developing countries
- Near East and North Africa
- Sub-Saharan Africa
- Latin America and the Caribbean
- East Asia
- South Asia
- Industrialized countries
- Transition economies
Rising wealth & consumerism

Increased:
- extraction/harvesting,
- processing,
- energy use,
- consumption,
- waste generation

More people

Greenhouse Gases

CC Mitigation: reduced methane from livestock sector

Less sat fat & energy intake

Rise in Obesity

Decline in per-person physical activity

More energy needed to transport heavier people

increased per-person food intake

Biomedical profile of obese persons

Increase in non-communicable disease (NCD) incidence

Less able to cope with very hot weather

Increased health risk from heatwaves and hot summers

More extreme temperatures

Increase in obesity

More people increased per-person food intake

More energy needed to transport heavier people

Rising wealth & consumerism

Increased:
- extraction/harvesting,
- processing,
- energy use,
- consumption,
- waste generation

More people

Greenhouse Gases

CC Mitigation: reduced methane from livestock sector

Less sat fat & energy intake

Increased demand on the health-care system

Lower food yields in some regions, food poverty, under-nutrition

Reduced incidence of Obesity
OK, some good news for Health Promotion Programs/Strategies
Climate Change: Adaptation and Mitigation

Adaptation: Risk management
Options for adaptation
- Immediate protection (heat-wave warning systems, dams/sea-walls)
- Longer-term protection (urban design, green spaces, vaccines, etc.)

Mitigation: Health Co-Benefits to local population
- Cleaner urban air
- More walking/cycling
- Healthier climate-proof house design
- Diet: local fresh foods; less red meat*

* Livestock = 58% of Australia’s agricultural sector emissions
Ruminant Production/Consumption: **Meat, Methane, Heat**

Current upsurge in world meat (esp. ruminant) production (e.g. East Asia) threatens both local environments and global climate.


Global livestock sector (including feed-grain production) = **15-20%** of global greenhouse CO$_2$-e emissions.  
Ruminant-regurgitated methane (potent greenhouse gas) is major problem.
THE CARBON COST OF FOODSTUFFS

Kilograms of CO$_2$e emitted per kg of product

Choice of Meat?
- Greenhouse gas emissions
- Dietary fat content

**Tonnes of GHG (methane) emissions per head per year (CO₂ equivalents)**

- **CATTLE:** 1.67
- **SHEEP:** 0.14
- **KANGAROO:** 0.003

**Fat content (gms) per 100 gms of raw meat**

- **BEEF Lean fillet:**
  - Total fat: 6.3 gms
  - Saturated fat: 5.8 gms
- **LAMB Trimmed steak:**
  - Total fat: 5.8 gms
  - Saturated fat: 1.6 gms
- **CHICKEN Lean breast:**
  - Total fat: 1.3 gms
- **KANGAROO Fillet or steak:**
  - Total fat: 1.3 gms

New Scientist, Oct 9, 2010
Promoting healthy eating and physical activity:
The latest international research

2011 Annual Meeting of the
International Society for Behavioral Nutrition and Physical Activity

DATES
- Abstract Submissions Opened: December 2010
- Registration Opened: November 2010
- Call for Abstracts Closed: 3 December 2010
- Early Bird Registrations Extended to 14 March 2011
Lansdown Research Station (CSIRO) Field Day

Greenhouse Gases and the Cattle Industry

Friday, 27 May 2011

Learn about CSIRO's research:

• improve productivity levels of cattle and reduce methane emissions
• develop technology to measure GHG emissions from grazing animals
• understand interactions between cattle and their grazing environment, using wireless sensor networks
• develop practical on-farm solutions.

Join a field demonstration to see how methane emissions from cattle can be measured with lasers
International Study of Mitigation-related Health Co-Benefits, 2009

Scenarios
- Interventions of type and scale needed to achieve national 2030 GHG emissions-reduction targets
- Case studies in high-income and low-income countries

Sectors
- Household energy
- Transport
- Food and agriculture
- Electricity generation
Estimating the Health Co-Benefits of Mitigation

Cycling to work and all-cause mortality
Copenhagen cohort studies

<table>
<thead>
<tr>
<th>No. of participants</th>
<th>6954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20-65 yrs</td>
</tr>
<tr>
<td>Mean follow-up</td>
<td>15 years</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>0.72 (95% Conf Interval = 0.55 - 0.89)</td>
</tr>
<tr>
<td>Adjusted for</td>
<td>Age, sex, education, leisure activity, BMI, blood lipids, smoking, blood pressure</td>
</tr>
</tbody>
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Apply this RR to future scenarios of increased use of public transport, as part of GHG emissions reduction

Arch Int Med 2000;160:1621-8
London: Lower-Carbon Urban Mobility*

*(more cycling and walking)*

Changes in population health, by major disease, by 2030

<table>
<thead>
<tr>
<th>Disease</th>
<th>Change in disease burden</th>
<th>Change in annual no. of premature deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischaemic heart disease</td>
<td>10-19%</td>
<td>1950-4240</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>10-18%</td>
<td>1190-2580</td>
</tr>
<tr>
<td>Dementia</td>
<td>7-8%</td>
<td>200-240</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>12-13%</td>
<td>200-210</td>
</tr>
<tr>
<td>Road trauma</td>
<td>19-39%</td>
<td>50-80</td>
</tr>
</tbody>
</table>

* Commensurate with UK national government’s emissions reductions target

Woodcock et al., *Lancet* 2009
Many climate change mitigation actions have ancillary health effects – mostly, but not always, beneficial.

Health ‘co-benefits’ can reinforce and refocus health promotion – and offset mitigation costs.

Co-benefits are often greater in low-income settings (viz. international comparisons).
A unified theory of urban living

It is time for a science of how city growth affects society and environment, say Luis Bettencourt and Geoffrey West.

912 | NATURE | VOL 467 | 21 OCTOBER 2010
Central Argument

Rises in both global temperatures and obesity reflect a culture of excessive consumption and unprecedented reliance on fossil fuel energy.

An environmentally sustainable way of life will bring healthier diets and increased physical activity into our daily life.
What if it's a big hoax and we create a better world for nothing?

- Energy independence
- Preserve rainforests
- Sustainability
- Green jobs
- Livable cities
- Renewables
- Clean water, air
- Healthy children
- Etc. etc.
OK: That's All
- Loss of community: anomie, ‘bowling alone’, mental health disorders
- Ambient air quality
- Endemic lower respiratory & exanthematous infectious diseases
- Diarrhoeal disease
- Road trauma
- Overweight, obesity
- Loss of community: anomie, ‘bowling alone’, mental health disorders
- Risks of climate-sensitive infectious diseases
- Heat Island effect: heat-wave impacts
- Vulnerability to extreme weather events

1800 1850 1900 1950 2000 2050