Abstract
While health has improved for many, the extent of health inequities between and within countries is growing. Meanwhile, humankind is disrupting the global climate and other life-supporting environmental systems, thereby posing serious risks to health and well-being, especially in vulnerable populations but ultimately for all. The underlying determinants of health inequity and of environmental change overlap substantially. They reflect, in particular, an economic system predicated on asymmetric growth and competition, shaped by market forces that mostly disregard health and environmental consequences and limits rather than by values of fairness and support. A shift is required in priorities in economic development, healthy forms of urbanisation, more efficient and renewable energy modes and a sustainable and fairer food system. Addressing the social determinants of health will not only improve global health, but advances will also be made in poverty eradication and social equity such that people, communities and nations will be able to resist current climate change and avert further damage to the global environment and climate. This paper will explore in particular the issues of economic development, urbanisation and food systems in the context of global health equity and climate stabilisation.
Global health inequities
Modern society has done much good for the health and well-being of people – the average global life expectancy has increased by more than two decades since 1950. However not everyone experienced this to the same degree. Difference in health between and within countries have perpetuated and worsened, particularly over the last three decades. Life expectancy is often used as a marker of population health. Regionally, the health achievements that the OECD countries have enjoyed have already started happening in South Asia and elsewhere (Figure 1) – but have considerable distance still to go. The lack of improvement in life expectancy in Central and Eastern Europe and the former Soviet Union is of concern. That life expectancy in SSA showed almost no change in a thirty year period must be considered a failure of the global public health community.

Figure 1: Life expectancy at birth by region, 1970–1975 and 2000–2005

![Life expectancy at birth by region](image)


The sub-regional level tells a story of marked inequalities between countries within the same region as well as across regions. Major differences exist in early death. Recent estimates from WHO suggest that living past the age of sixty years is not the norm in 45 out of 195 countries. The inequality is even more pronounced among the male population – life expectancy at birth for males in 55 countries is 60 years or less. The risk of dying at a very early age is higher today compared to almost fifty years ago among the poorest countries. Figure 2 illustrates how life expectancy at birth has stagnated and even deteriorated to less than forty years in a number of African countries. Incredibly high levels of infant mortality in many of these countries continue to pull down the countries life expectancy.
Health within countries is also unequally distributed. These differences in health occur along a number of axes of social stratification including socioeconomic, political, and cultural. One way of describing the magnitude of inequality is the gap between top and bottom socioeconomic groups. In El Salvador, for example, if mothers have no education their babies have 100 chances in 1000 of dying in the first year of life; if mothers have at least secondary education the infant death rate is a quarter of that. Such dramatic differences in health within countries are seen in rich as well as poorer countries. In the Scottish city of Glasgow, life expectancy of men in one of the most deprived areas was 54 years, compared with 82 years in the most affluent.

Focusing on the health gap between top and bottom, however, fails to draw attention to a pervasive phenomenon that, in many countries, has increased over time: the social gradient in health, see Figure 3. With few exceptions, the evidence shows that the lower an individual’s socioeconomic position the worse their health. This is a global phenomenon, seen in low, middle and high income countries, see Figure 4. The gradient in health should not deflect attention from the plight of people at the bottom of the gradient, the poorest of the poor. Rather, the social gradient in health means that we are all implicated.
Figure 3: Trends in male and female life expectancy at age 20, by educational attainment, Russian Federation

Note: elementary education (open circles), intermediate education (triangles), and university education (filled circles).

Figure 4: Under 5 mortality rates, select countries, by household wealth

These systematic differences in health between groups and countries are avoidable by reasonable social action. That they continue to exist is unfair, inequitable. Social injustice is killing people on a grand scale, and the reduction of health inequities, between and within countries, is an ethical imperative.
Climate change
In addition to exacerbating inequity in health, modern society has either inadvertently or with ill-informed indifference, begun to seriously perturb and deplete the Earth system that sustains us and future generations. Human activity has increased the levels of natural greenhouse gases, particularly CO₂, methane and nitrous oxide, to a critical state. In the last 150 years, the 12 warmest years on record have occurred in the last 13. Business as usual estimates suggest that global greenhouse gas emissions will grow by a further 52% to 2050. This could result in an increase in global temperature over pre-industrial levels in the range of 1.7-2.4°C Celsius by 2050. Analysis of palaeoclimatic data points to the need to reverse greenhouse gas build-up over coming decades and reduce the CO₂ concentration, currently 385 ppm and rising, to around 350 ppm.

Just as health is unevenly distributed between nations and population groups so is this environmental disruption and damage (Figure 5). The carbon footprint of the poorest 1 billion people is around 3% of the world’s total footprint. This reflects geographic vulnerability, lack of political and economic power, and the urgent, often desperate, need of impoverished groups to exploit local environments for their own immediate survival.

Figure 5: Density-equalling cartogram. Billion tonnes of carbon equivalent, 2002

Source: Patz et al 2007

Climate change and health inequities
Climate change is not just an environmental issue, it is one of the biggest global health threats of the 21st century. As the temperature of the planet rises there will be increased, and more severe, heat waves, droughts, storms and floods. For the first time ever ships can sail, during a few weeks of the Northern summer, from the Atlantic to the Pacific Ocean without having to go through either the Panama Canal or around the Cape of Good Hope: the permanent ice cap at the North Pole is being eroded. One third of the world's population lives within 60 miles of a shoreline and thirteen of the world's twenty largest cities are located on a coast. If sea levels rise by up to 13m by the middle of the next century, as some scientists predict, more than a billion people could be displaced in environmental mass migration.
The number of people living in areas affected by severe water stress is expected to increase by another 1 billion to over 3.9 billion. Half of the world's population could face severe food shortages and water insecurity by the end of the century as rising temperatures and water stress take their toll on farmers' crops. Declining crop yields could increase food insecurity greatly within the next two decades. Climate change will have devastating consequences for human health from changing patterns of infections and insect-borne diseases, and increased deaths due to heat waves. The health of billions of people will be compromised through an increase in the frequency and magnitude of extreme climate events (hurricanes, cyclones, storm surges) causing flooding and direct injury; increasing the health risk among those living in urban slums and where shelter and human settlements are poor.16 Climate change will indirectly affect health through the major adverse impacts on agricultural productivity, and extensive displacement of people and livelihoods.

Climate change is a major additional challenge to health equity, together with poverty, inequity, and the already large burden of infectious and non-communicable diseases.18,19 In general, the greatest health risks are experienced by those contributing least to the underlying environmental damage i.e. the least economically advanced countries and lower social status groups within rich and poor countries alike.20 The conservatively estimated 150,000 additional deaths each year attributable to climate change that has accrued over the last few decades were almost entirely concentrated in the world’s poorer and vulnerable populations (Figure 6).15 Within that estimate, the resultant loss of healthy life-years in low-income African countries, for example, is predicted to be 500 times that in Europe. Without a lessening of background rates of disease and premature mortality, the multiplier effects of climate change on health outcomes will greatly exacerbate the between and within country health inequities.

Figure 6: Deaths attributable to anthropogenic climate change between 1970 and 2000, density-equalling cartogram.15

Source: Patz et al 2007

**The common causes of health inequity and climate change**

The improvement of health for people everywhere, the protection of the climate and natural environment, and the reduction in social inequity are inextricably linked. The way in which modern day society operates is fuelling dangerous climate change
which in turn affects health inequity. That same operating system also shapes peoples’
daily living conditions – their access to health care, schools, and education, their
conditions of work and leisure, their homes, communities, towns, or cities, each of
which impacts significantly on health inequity. At the root of these two statements are
politics, governance and economic and social policies, each of which generates and
distributes power, income, goods and services, globally and nationally, and the
consequent unfairness in the immediate, visible circumstances of peoples lives.10,21

Key elements of our modern global world - asymmetric economic growth, unequal
improvements in daily living conditions, unequal distribution of technical
developments and suppression of human rights have, arguably, widened global health
inequities and accelerated dangerous climate change. Addressing these ‘social
determinants of population and planetary health’ will not only improve global health,
but advances will also be made in poverty eradication and social equity such that
people, communities and nations will be able to resist current climate change and
avert further damage to the global environment and climate. Of critical importance to
both health equity and climate stabilisation are issues of economic development,
urbanisation and food systems, each of which is now discussed briefly.

The global economic operating system
To address climate change, social determinants and health inequities, it is important to
understand the structural backdrop from which these emerge and continue to be
shaped. Particularly since World War II, the nature of global politics and economic
and social policy has changed dramatically, with far-reaching health and
environmental ramifications. New institutions, new rules and new agreements – each
hoping to rebuild a world exhausted from two world wars. In 1944 the Bretton Woods
accords aimed to generate economic growth based on a liberal system of open
markets. Institutions were put in place which determined the global distribution of
development capital and hard currencies and set the framework for future
international trade agreements.22 The General Agreement on Tariffs and Trade
(GATT) which arose from these negotiations, and subsequently the World Trade
Organisation (WTO) in 1994, liberalised the market, established general principles of
free trade and aimed to reduce tariffs and quotas for trade among its 23 participating
nations.23

Economic policy changed again throughout the last three decades of the 20th century,
liberalising the markets and global financial flows even further. The record-high
interest rates of the early 1980s, caused by the Federal Reserves efforts to curb the oil-
based inflation of the 1970s, brought on a global recession and helped to trigger the
overall debt crisis, with 40 countries in arrears to the scale of hundreds of billions of
US dollars by the end of 1982. During the 1980s and 1990s, the international financial
institutions embraced a set of economic policies known as “the Washington
consensus.” Advocated primarily by the United States and the United Kingdom, these
policies were designed to promote the role of the market (involving deregulation,
privatization of public services, measures designed to achieve low inflation rates and
stable currencies, and mechanisms enhancing the operations of multinational
corporations), and propelled the world towards even greater economic integration and
deregulation.
All of the above is by way of illustrating how the economic pathway followed post WWII has helped create, especially since the early 1980s, a degree of global interconnectedness and interdependence, hitherto unheard of. While beneficial in many respects - facilitating greater transfer of capital, technology, knowledge and people - the gains have been uneven, with asymmetries in power, income, goods and services at the global level.\textsuperscript{24} Some countries and regions have grown and reduced poverty much more slowly that others. There are still nearly 3 billion people living on less than 2\$ per day.\textsuperscript{25} Around two-thirds of the world’s poor are to be found in Asia\textsuperscript{26} and every second child on the planet lives in poverty.\textsuperscript{27} It has been argued that the structural adjustment policies introduced by the IMF and World Bank to ensure debt repayment and economic restructuring, diverted government resources away from things like health, education and sustainable development and may be one of the central causes of widening relative income inequalities in many countries.\textsuperscript{22,28} So too the nature of international trade agreements, transforming government capacity to protect public health, to regulate occupational and environmental health conditions and food products, and to ensure affordable access to medications,\textsuperscript{29} each of which has serious implications for health equity between and within countries.\textsuperscript{30}

And, in creating such a global marketplace that demands ever-increasing volumes of production and, with increasing wealth, encourages more and more consumption of goods,\textsuperscript{31} the same economic pathway has helped create a global society that is increasingly dependent on finite natural resources.\textsuperscript{32} Compounding the environmental degradation from the activities of mid-nineteenth century industrialisation, modern society has destabilized the ecosystem and exacerbated climate change\textsuperscript{33}, see Figure 7. This will get worse if business as usual continues. The global importance of rapidly emerging economies is growing as they become major economic and trade partners, competitors, resource users and polluters on a level that compares to the largest of OECD countries. The primary energy consumption of Brazil, Russia, India and China together is expected to grow by 72\% between 2005 and 2030, compared with 29\% in the 30 OECD countries.\textsuperscript{34}

Add to this the growing global population (2.5 billion in 1950, 6.1 billion in 2004 and UN estimates between 9 and 13 billion by 2040). The combination of economic growth at any cost, entrenched social inequities and already dangerous climate change plus many more people living on the planet will exert potentially catastrophic demands on natural resources and widen health inequities. There will be greater pressures on food supplies, greater internal and international migration of large swathes of people, particularly towards the bounty perceived to be on offer in urban areas, and potentially greater social disruption and conflict as land and vital resources become scarce.\textsuperscript{35}
Food systems, health equity and climate change

Close to 1 billion people worldwide are undernourished. Concurrency, a nutrition transition to energy-dense, nutrient-poor diets is occurring, leading to obesity and concomitant health conditions, particularly among many socially disadvantaged groups in all but the poorest countries.

The food system contributes to inequalities in diet-related health outcomes through inequities in global and domestic food availability, accessibility and affordability (termed here the Triple A rating). The Triple A rating of the food system is partly determined by conditions of trade, agricultural production, food provisioning systems, price, and food preparation. Not only does the food system affect health, it is a major contributor to greenhouse gas emissions (~30% globally) and thus to climate change. The food system produces emissions at all stages in its life cycle - from the farming process itself (and associated inputs) to manufacture, distribution and cold storage through to food preparation and consumption and the disposal of waste. IPCC estimates that global agricultural emissions could grow by between 36-63% by 2030. Global food systems are also increasingly affected by climate change. The serious drought conditions in Australia and elsewhere, rising sea levels, increasing frequency of flooding, and acidification of oceans are causing major disruption to the quantity, quality and affordability of food in the majority of countries worldwide.

Structural adjustment in low and middle income countries, coupled with increasing trade liberalization (IMF 2001), particularly the agriculture trade agreement in the 1994 Uruguay Round of the General Agreement on Tariffs and Trade (GATT) opened up these countries to the international market. Regional trade agreements soared at a rate of 15 per year in the 1990s and the 1994 Uruguay Round of the GATT pledged countries to reduce tariffs, export subsidies and domestic agricultural support. Although trade can be a mechanism for countries to reduce poverty and improve food
security, unilateral trade liberalisation and uneven distribution of global food stocks through protectionist trade arrangements have been associated with greater economic insecurity and adverse dietary changes, while the expected benefits to economic growth have not accrued evenly. Many developing countries experienced more than a doubling of food import bills as a share of GDP between 1974 and 2004. Emerging economies, such as Brazil, Russia, India, and China, have seen massive increases in their purchasing power, particularly among the urban middle classes, contributing to population shifts from diets based on traditional plant-based staple foods to more expensive and greenhouse gas emissions-intensive animal source products.

Blouin and colleagues argue that trade liberalization has distorted the food supply in developing countries in favour of highly processed, calorie-rich, nutrient-poor food, thereby contributing to the double burden of under and over-nutrition. The amount of trade in processed agricultural products rose much faster than primary agricultural products. With increased trade liberalisation and greater foreign direct investment the increasing market penetration by trans-national food corporations means increasingly more countries are crammed with energy-dense, nutrient-poor foods, while externalising the real costs of food and affecting local markets. These same foods are water and fossil-fuel-intensive to produce. The type and cost of food on offer is also affected by transport costs, whether through access to local supplies in street markets or air-freighted salads in supermarkets. As refrigeration becomes more expensive, there will be knock on implications for food price and the types of foods stocked by retailers and food vendors.

The recent global food price rise show that the global agricultural and food production system is vulnerable to short term shocks that threaten the sustainability of the food supply chain, especially in low income countries which rely heavily on food imports. Speculative investment in food derivatives is a fairly recent development, causing inflationary pressure, increased food demand and subsequently, inflated food prices. The production of crops for biofuels is impacting on food production, depleting biodiversity and water, worsening climate change and contributing to food price increases. Rising food prices will hit the poorest hardest. Household expenditure on food as a proportion of weekly household income varies enormously between countries—from around a high of 74% in Azerbaijan to a low of 10% in the USA (USDA, 2003) and the proportionate expenditure on food is greater among low income households compared to more affluent households. However, as the cost of the collective basket of household goods starts to increase more rapidly, and income does not, all but the super-rich will likely feel the effects. Some will be able to maintain a healthy diet of fresh produce, fish, lean meat and grains; some will only be able to purchase the cheapest sources of calories—highly processed, long shelf-life products, containing hardened fats and bulk starches, preserved with sugar or salt that increase the risk of obesity and diabetes, and many millions will be unable to afford even that.

Urbanisation, climate change and health equity
Accompanying globalisation, market liberalisation and economic integration has been the urbanisation of the planet. This has come at a cost, both to population health and to the environment. While urban living can provide many benefits, poor urban living conditions, particularly those among the one billion people living in low income urban settlements (‘urban slums’) are the breeding ground for communicable...
disease. And as the degree of urbanisation and national income increase so too does
the prevalence of new urban health problems including diabetes, heart disease,
obesity, mental health problems, alcohol and drug abuse and violence, and impact
from ecological disaster. 59-61 Road traffic injuries, vehicle-related air pollution and
traffic noise causes thousands of cases of poor health and deaths each year, with urban
areas by far the most affected. 62 This urban-related epidemiological transition towards
non-communicable diseases occurred initially in high income countries but has
increased dramatically among low and middle income countries, increasing the
pressure on health systems already stressed from the burden of communicable disease.

The urban environment influences every aspect of health and well-being through what
people eat, the air they breathe and the water they drink, where (or if) they work, the
housing that shelters them, where they go for healthcare, the danger they encounter on
the street, and who is available for emotional and financial support. 63 Almost two
thirds of urban dwellers live in developing countries in cities that have grown at
breakneck speed with limited investment in infrastructure, housing, human resources
and public health partly as a result of reduced State capacity due to the structural
adjustment policies of the 1980s and 1990s. 64 In many transitioning countries the push
in urban areas has been towards informal, unprotected labour. Ghosh argues that in
India, with wages not indexed to inflation and little or no social protection, this
growing social group is disproportionately affected by rising commodity prices and
general living expenses. 65 The design of cities - increasingly large sprawling
conglomerations – fuels the nutrition transition and associated obesity epidemic,
partly through urban planning that ignores the need for walking, cycling and playing
in the urban landscape. 39,61 The same urban landscape encourages more crime and less
social cohesion ; and promotes use of the car thereby perpetuating air pollution, fossil
fuel use and risk of road traffic accidents. 66 The unequal nature of urbanization and
the resulting built environment impacts more adversely on low income groups who
live in poorer conditions, are more constrained by lack of transportation and lack of
healthful purchasing choices in lower-income neighbourhoods. 12,57

And the current model of urbanisation poses significant direct environmental
challenges. Urban air pollution from transport, industry and household heating is a
major problem, though now declining in high-income countries. 57 Transport and
buildings contribute an estimated 21% of global CO2 emissions 18 – mostly from cities
in the developed world. However, the combination of rapid economic development
and concurrent urbanisation in poorer regions means that developing countries will be
both vulnerable to health hazards from climate change and increasing contributors to
that problem. 67 Indeed, with improved financial means, particularly among the
burgeoning urban middle classes in developing countries, more people - 1.3 billion
globally - have moved to the top end of the consumption ladder characterized, among
other things, by more, and more frequent use of energy guzzling private cars. 68
Ongoing climate change as well as the heat island effect in cities is expected to cause
increasing heat stress levels and increasing health risks. 69 Poor neighbourhoods with
little environmentally friendly infrastructure/buildings/green space are likely to be
more exposed to urban heat compared to more affluent neighbourhoods, and have less
capacity to adapt to the impact. Lower socio-economic groups are more likely to be
those urban workers exposed to working conditions with excess heat and therefore at
increased risk compared to higher SES groups. 70
Time to reboot

The nature of international and domestic policy is killing humans and the planet on a catastrophic scale hitherto unrealized. The opportunity now presents itself to use the unprecedented global knowledge on the social causes of health inequity and the causes of climate change, to rebalance these policy trajectories. Many public health professionals and social scientists are concerned with the promotion of well-being for all and the prevention of ill-health through action on the social determinants of health. Environmental scientists have extensive knowledge of how disruption to the ecosystem within which humans live can and will affect climate change. The depreciation of social and natural capital has recently captured the attention of an increasing number of economists concerned with identifying ways of using scarce resources to meet human needs. There is an increasingly public consciousness for making poverty history, global health equity and climate preservation, with increasing numbers of civil society organisations and rising public awareness that something must change. Bringing these voices together, with strong political leadership will help create the new model of development that is now needed - a model that combines investment in health with social and environmental justice and uses action on the social determinants of health as a means to achieve this.
References


49. Hawkes C. Uneven dietary development: linking the policies and processes of globalization with the nutrition transition, obesity and diet-related chronic diseases. *Globalisation and Health* 2006.
60. Roberts H, Meddings DR. What can be done about the social determinants of violence and unintentional injury. Background paper of the Priority Public


