Healthy Communities

Yvonne Rydin, Bartlett School of Planning, UCL & Chair of the UCL-Lancet Commission on Healthy Cities

Introduction

Human well-being is an essential element of sustainable development. While the concept rightly forces us to look ahead and consider how environmental constraints may impact on future generations, the Brundtland definition also encourages us to be aware of current generations' needs. Often this is interpreted in economic terms as relating to material income and, of course, a sufficient livelihood is necessary to meet human needs. However, well-being is much more than economic survival. It about having the capacity to live life to the full and health is a key element of this. The World Health Organisation understands health not just as the absence of illness, disease and injury but embraces the extension of health to well-being. Their ambitious definition is a 'state of complete physical, mental and social well-being – and not merely the absence of disease or infirmity' (Huber et al., 2011).

A wealth of research now identifies ways in which environment within which communities live can be planned and managed so that it supports health and well-being (Northridge et al., 2003; Sclar et al., 2004; Boyce and Patel, 2009; Harpham, 2009; GNRUHE, 2010). Broadly speaking healthy communities require eight elements to be apparent in their local environment:

- **Clean water and good sanitation**: a supply of potable water and sanitation infrastructure for sewage treatment and disposal
- **Clean air**: good air quality

- **Clean land**: decontamination of polluted land and facilities for safe waste disposal

- **Safe homes**: housing that provides protection from the weather and a safe indoor environment

- **Secure neighbourhoods**: localities offering security and a sense of community

- **Car-independence**: frequent, affordable and accessible public transport and provision for safe walking and cycling to support mobility and exercise

- **Green and blue spaces**: an infrastructure of greenery and water features for exercise, local climate control, flood prevention and mental well-being

- **Healthy facilities**: an accessible, equitable and functioning system of health care facilities

In this paper, four key areas of action for healthy communities will be briefly reviewed: sanitation and wastewater management; urban transportation and mobility; measures to deal with the urban heat island; and building standards and indoor air quality. The final section draws together some lessons for urban planning and management.

Sanitation and wastewater management[1]

While communities in higher income countries can expect potable water to be supplied to their buildings, flush toilets to take away human waste and storm drainage to prevent flooding, these facilities are often missing in all but the wealthiest parts of settlements in low-middle income countries. Yet the absence of such infrastructure has major global health impacts. It is difficult to isolate the individual factors in the faecal-oral infection route and so instead there is often recourse to a composite risk factor of water, sanitation and hygiene (Cotton and Tayler, 2000; Prüss-Üstün and Corvalán, 2006). What is clear is that diseases such as diarrhoeal diseases, trachoma, schistosomiasis, ascariasis, trichuriasis, and hookworm are all linked to poor water, sanitation and hygiene (WHO, 2004, 2006).

---

[1] The chief authors for this section of the original report were Julio D Dávila and Ka Man Lai

Sanitation is often conceived in progressive terms from open defecation, to unimproved, then shared and finally improved facilities (WHO-UNICEF, 2010). The UN define 'improved facilities' as providing hygienic separation of human excreta from human contact, which could mean pipe sewerage systems but also pit latrines and composting toilets. In practice the standard of provision and management can be such as to continue to pose a considerable health risk (WSP, 2005; UNDP, 2006). Even with a very basic standard, some 2.6 billion people do not have access to such 'improved facilities', mainly in Southern Asia, followed by Easter Asia and Sub-Saharan Africa WHO-UNICEF, 2010).

Wastewater management more generally is essential for community health. Such wastewater is defined as any water that has been used and is unfit for further use (WHO, 2006). Considerable quantities of such wastewater arise from domestic, commercial and industrial sources, as well as from storm-water effluent from agriculture (Corcoram et al., 2010). Such wastewater can contain high levels of organic material, pathogens and toxic compounds, ranging from heavy metals to newly emerging contaminants such as endocrine disrupting substances and pharmaceutical products (Ingallinella et al., 2002; Kummerer, 2008).

Management, treatment and disposal of wastewater is therefore essential to avoid human and environmental exposure to potential hazards. Yet wastewater treatment is frequently absent or poorly managed (UN-Habitat, 2008). An average of 35% of total wastewater in Asia is treated, with the proportion dropping to 14% in Latin America & the Caribbean, and to zero in Sub-Saharan Africa (Jiménez, 2004). That this is not a high priority in many countries is evidenced by the fact that, in middle-income countries, city sewerage systems have been growing faster than wastewater treatment systems (McGranahan et al., 2001).

Wastewater can though be conceived of as a resource. With separation of household wastewater into black-water (from toilets), grey-water (from showers, sinks and washing), brown-water (containing faecal matter) and yellow-water (urine), different waste streams can be treated and

reused. The recycling of wastewater can be a valued element of urban planning, particularly in contexts of water scarcity; energy generation can also go alongside anaerobic digestion of sludge or wastewater to provide potable water. And where agriculture is present, wastewater can potentially be a source of nutrient-rich irrigation although the presence of pathogens and chemical pollutants can restrict this possibility (Cofie et al., 2005; Brook and Dávila, 2010; Brook and Drechsel, 2010).

Urban transportation and mobility[2]

The evidence is clear that both objective and perceived features of the local environment have a positive impact on health outcomes in terms of both physical and mental conditions: reduced obesity, greater cardio-vascular health, a lesser tendency to depression, for example (Giles-Corti, 2006; Porter and Jones, 2010). However, it is important to understand how this insight carries different weight in lower and higher income countries and among lower and higher income social groups. Walkability of the local environment may enhance leisure activities for the better-off but walking can be a considerable burden to the less well-off where they are undertaking physical activity out of necessity, to get to work or shops or water (Florindo et al., 2009) and often have to traverse dangerous streets with greater risk of accidents (from cars and potholes) and pollution.

There is a complex interplay of factors involved in understanding mobility from leisure and utilitarian points of view as it affects different communities. Judgements about safety and security – from cars, from crime, from strangers – are often important elements in deciding to adopt active forms of mobility (Carver, 2008; Anorim et al., 2010). However broader strategic issues such as urban density levels can also be relevant (Frumkin, 2002; Woodcock et al., 2007; Saelens and Handy, 2008; Butler et al., 2011) In high-income countries, urban sprawl is associated with obesity and less utilitarian (though not leisure) walking (Lopez, 2004; Ross et al., 2007); however, the evidence in low-middle income countries is less consistent (Parra et al., 2010) Patterns of land use and spatial connectivity also need to be considered (Cervero et al., 2009; Sarmiento, 2010 a and b).

---

[2] The chief authors for this section of the original report were Julio D Dávila and Pedro C. Hallal

Thus there is scope to improve health by increasing walkability through an enhanced sense of security, increased urban densities, diversified land uses and greater street connectivity. But, given the utilitarian nature of much local travel, provision of affordable public transport is also an important element in urban planning for mobility, particularly where lower-income groups are concerned.

The urban heat island[3]

The impact of the urban heat island is due to a combination of the way that the built environment affects ambient temperatures and the potential for climate change to exacerbate that effect through increased frequency of extreme temperature episodes. It is characterized by the temperature difference between the urban and surrounding rural regions (Oke, 1973, 1987; Tahu, 1997). This is influenced by a variety of factors: the solar energy captured, stored and released by urban surfaces; the influence of urban geometry on the release of heat, convection and advection; evapo-transpiration; and anthropogenic heat sources. The health effects derive from the direct effects of temperatures above the threshold that local residents can cope with (Kovats et al., 2008; McMichael et al., 2008; O'Neill, 2009) but also the related production of ozone (Knowlton et al., 2008).

Urban expansion exacerbates the urban heat island effect, particularly where it takes the form of a greater spread of impermeable surfaces, a greater mass of buildings and heat-dumping into the local environment, say from air conditioning. The anthropogenic element of the heat balance of urban areas has been shown to increase the urban heat island increment by as much as 1-2°C (Taha, 1997; Bohnenstengel et al., 2010). However urban planning can also help reduce the urban heat island effect through provision of green and blue infrastructure, increasing the solar reflectiveness of hard surfaces, reducing anthropogenic heat emissions and increasing the flow of air through the urban form by managing building locations and heights. In undertaking such policies, care needs to be

---

[3] The chief authors for this section of the original report were Michael Davies and Ian Hamilton

taken not to reduce the urban heat island effect at the expense of greater energy demands (or less internal warmth) in winter months.

As stressed above though, the impacts of extreme heat events, exacerbated by the urban heat island, are culturally specific. Much depends on vernacular forms of architecture and urban design but also on patterns of behaviour (the adoption or loss of the siesta, for example) and the extent of social capital networks within local communities as such networks can be effective means of coping through neighbourliness and elder care.

Building standards and indoor air quality[4]

The quality of people's houses has a considerable impact on their health through the extent of protection provided against cold and heat, often with associated impacts on mental well-being through the level of comfort) and through indoor air quality, itself a product of air exchange, outdoor pollutant levels, and production of indoor pollutants (such as products of combustion, tobacco smoke, radon and specific agents derived from materials and products contained within the home).

The way to improve community health by influencing the quality of housing depends heavily on local context. In India and China, for example, exposure to poor indoor air pollution from the inefficient and inadequately ventilated combustion of biomass for cooking and heating has a considerable impact on household health (Zhang and Smith, 2007). This particularly affects women and the infants and young children they care for. Women spend more time indoors and are responsible for cooking; they are known to exhibit higher rates of chronic obstructive pulmonary disease and risk of lung cancer; infants and young children are also adversely affected as exposure to pollutants can result in acute infections of the lower respiratory tract (Wilkinson et al., 2007; Howden-Chapman et al., 2008). Clean stove technology here could yield significant health benefits (while also reducing carbon emissions).

---

[4] The chief authors for this section of the original report were Michael Davies, Ian Hamilton and Paul Wilkinson

In northern climates, a different approach is needed, particularly where fuel poverty is a major concern (defined as where more than 10% of household income is spent on energy costs) (ECCC, 2010). Lack of access to affordable energy negatively affects health in low income but also in higher income countries (Wang and Smith, 1999; Healy, 2003). In England and Wales, for example, during the winter of 2007-8, there were over 25,000 more deaths compared to the average for the rest of the year, many due to inadequate heating for elderly and immobile populations (Howden-Chapman et al., 2009). Building insulation can make a major difference here although care needs to be taken to ensure that measures for energy efficiency do not reduce air movement or create thermal bridges within buildings that can then result in indoor mould.

Lessons for urban planning and management

While there is considerable knowledge about the features that create healthy communities, it has proved difficult to put this knowledge into practice. Two different approaches have emerged.

One approach has been to rely on bottom-up initiatives. This has largely been the philosophy of the Healthy Cities movement, which originated in the mid-1980s and has spread across Europe and Northern America and, to a much lesser extent, the global South (Ashton, 1986; Hancock, 1993; WHO Regional Office for Europe, 1997; Kenzer, 1999). While prompting much interest in the healthy communities agenda, evaluations of this programme have repeatedly pointed to limited achievements compared to ambitions, problems of monitoring and the absence of a conceptual framework in which to ground local action (Werner and Harpham, 1996; Petersen, 1996; Goumans and Springett, 1997; WHO Regional Office for Europe, 2008; Ritsatakis and Makara, 2009).

An alternative approach has been the emphasis on identifying the social determinants of health (Marmot, 2000; CSDH, 2008). This widely esteemed literature has highlighted that health inequalities are closely correlated with income inequalities. This has been shown to be the case at a variety of scales from international, through national down to urban. While this is clearly an

important finding, this approach tends to throw the emphasis back on macro-economic policy, either to raise income levels across the board within a society or to deal with income inequalities within that society. This approach misses what can be achieved at the local level as indicated above.

However, for an urban planning and management approaches to be effective in delivering better health outcomes for communities, it needs to recognise the complexity of the relationships that determine such outcomes at the local level and the potential for bi-directional links of causality and feedback loops, often leading to unintended consequences of policy. As well as suggesting a policy approach based on a complex systems viewpoint, this puts the emphasis on effective monitoring to identify such consequences and adjust the planning approach. The UCL-Lancet commission, upon whose work this paper is based, identified a set of indicators to aid such monitoring at the city level, linking each indicator to the eight key features of a healthy community outlined above (see Box 1).

These indicators have been divided into core and progressive sets, based on the International Covenant for Economic, Social and Cultural Rights (ICESC) (Backman, 2008). The core set establishes a baseline set of actions that all communities should be able to rely on in improving or maintaining their collective and individual health. The progressive set identifies a number of other actions contributing to better health outcomes where communities should be able to expect progressive improvements. As well as the ethical judgements underpinning the ICESC approach, there are two practical reasons for adopting such indicators sets.

First, it should be recognised that health is not always (perhaps ever) the political priority within policy systems, at national or local scales. This suggests that looking for the co-benefits for healthy communities of existing policies can be helpful. But it also suggests that the need to make policy choices with limited resources is a key issue. The core and progressive approach identifies areas where improvements should be made and maintained but allows discretion in other areas dependent on local circumstances and priorities.

Second, local communities are facing very different economic circumstances across the world. Each locality represents a specific economic space within the country and it in turn patterned by intra-urban inequality. Different economic circumstances, for a country or city as a whole and for individual households and social groups within it, therefore influence the dominant health burdens. Richer households within relatively prosperous countries may experience the negative health impact of high-income living, due to sedentary life styles and an affluent diet. Meanwhile the poorest households within low-income countries are still struggling with inadequate water and sanitation infrastructure in informal settlements. Spillover effects of unregulated economic growth, such as air and water pollution, will impact on higher income groups in less wealthy countries, while lower income groups even in wealthy countries will be disproportionately burdened with health inequalities. The core and progressive approach allows local monitoring to meet local circumstances.

Thus there is considerable potential for creating healthy communities through interventions in the local environment. To deliver on this potential will involve recognition of the complexity of urban systems, an acknowledgement of the tendency to under-prioritise community health, particularly in the face of limited resources, and the very different situations that communities across the world face in terms of health burdens. Urban planning and management can shape local environments and the UCL-Lancet set of core and progressive indicators could be a valuable aid to monitoring progress towards health communities in all countries and localities.

Acknowledgements

Box 1   A Healthy Cities indicator set

Key Feature of a Healthy Urban Environment	Proposed core indicator	Proposed progressive indicator
Clean Water and Good Sanitation	100% household access to safe water	Improvement in ease of access to safe water (e.g. distance water carried)
	100% access to improved sanitation	Upgrading the standard of the category of 'improved sanitation'
		Improvement in standard of wastewater and solid waste treatment
Clean Air	Local baseline air quality standards met	Movement towards compliance with WHO standards on air quality
Clean Land	No households to be living directly on contaminated land	Progressive clean up of all urban contaminated land
		Reduction in inequality in location of contaminated land across the city
Safe Homes	Minimum standards for upgraded informal settlement dwellings	Reduction in households using solid fuels for indoor heating and cooking
		Reduction in households with poor indoor air quality
		Reduction in number of households in fuel poverty
		Reduction in number of houses located in areas at risk of natural hazards without mitigation measures in place
Secure Neighbourhoods	Policy on provision of safe, connected public spaces in place	Increased lighting in public spaces
		Reduction in number of personal assaults in public spaces
Car-Independence	Policy on safe and active mobility in place	Increase in capacity of affordable public transport
		Increase in provision for safe cycling and walking
		Reduction in transport-based fatalities
Green and Blue Spaces	Policy on green and blue infrastructure provision in place	Increase in multi-functional green space coverage, providing for local demands on such space as appropriate
		Reduction in inequality of access to green space across city
Urban Health Facilities	100% access to basic level of primary care	Improvement in standard of primary and preventative health care across public and private sectors
		Improvement in equality of access to health care across the city

References

Amorim TE, Azevedo MR, Hallal PC. 2010 Physical activity levels according to physical and social environmental factors in a sample of adults living in South Brazil. *J Phys Act Health,* 7:204-212.

Arnfield AJ. 2003 Two decades of urban climate research: a review of turbulence, exchanges of energy and water, and the urban heat island. *International Journal of Climatology*, 23(1):1-26.

Ashton J. 1986 Healthy cities: WHO's new public health initiatives. *Health Promotion,* 1(3):319-324.

Backman, G. 2008 Health systems and the right to health: an assessment of 194 countries. *The Lancet.* 372(9655):2047-2085.

Bohnenstengel SI, Evans S, Clark PA, Belcher SE. 2010 Simulations of the London urban heat island. *Q.J.R. Meteorol*. *Soc*.

Boyce T, Patel S. 2010 *The Health Impacts of Spatial Planning Decisions*, London: The King's Fund.

Brook Drechsel P. 2010 *Wastewater irrigation and health: assessing and mitigating risk in low-income countries*. London: Earthscan.

Brook R, Dávila JD. 2000 *The peri-urban interface: a tale of two cities*. Bangor and London: University of Bangor,University College London.

Butler EN, Ambs AM, Reedy J, Bowles HR. 2011 Identifying GIS measures of the physical activity built environment through a review of the literature. *J Phys Act Health*. 8(1):91-97.

Carver A, Timperio A, Crawford D. 2008 Playing it safe: The influence of neighbourhood safety on children's physical activity - A review. *Health & Place*. 14:217–227.

Cervero RB, Sarmiento OL, Jacoby E. 2009 Influences of built environments on walking and cycling: lessons from Bogotá. *International Journal of Sustainable Transportation*. 3(4):203–226.

Cofie OO, Kranjac-Berisavljevic G, Drechsel P. 2005 The use of human waste for peri-urban agriculture in Northern Ghana. *Renewable Agriculture and Food Systems*, 20:73-80

Corcoran E, Nellemann C, Baker E, Bos R, Osborn D, Savelli H. 2010 *Sick Water? The central role of wastewater management in sustainable development. A rapid response assessment*, Geneva: United Nations Environment Programme. UN-HABITAT, GRID. Arendal.

Cotton A, Tayler K. 2000 *Services for the Urban Poor. Guidelines for Policymakers. Planners and Engineers, Water, Engineering and Development Centre*. Loughborough: Loughborough University.

CSDH. 2008 *Closing the gap in a generation: health equity through action on the social determinants of health*. Final Report of the Commission on Social Determinants of Health.Geneva: WHO

Energy and Climate Change Committee. 2010 *Fuel Poverty - Fifth report of session 2009 -2010*. London: House of Commons.

Florindo AA, Guimarães VV, Cesar CLG, Barros MBA, Alves MCGP, Goldbaum M, Carandina L. 2009 Epidemiology of leisure, transportation, occupational and household physical activity: prevalence and associated factors*. JPhys Act Health* 6:625-632.

Frumkin H. 2002 Urban sprawl and public health. *Public Health Reports*. 117(3):201.

Giles-Corti B. 2006 People or places: What should be the target? *Journal of Science and Medicine in Sport,* 9:357-366.

Goumans D, Springett J. 1997 From rhetoric to reality: barriers faced by health for all initiatives *Social Science & Medicine*, 63(1): 179-188.

GRNUHE. 2010 *Improving urban health equity through action on the social and environmental determinants of health* Global Research Network on Urban Health Equity.

Hancock, T. 1993 The evolution, impact and significant of the healthy cities. Healthy communities movement. *Journal of Public Health Policy*. 14(1):5-18.

Harpham T. 2009 Urban health in developing countries: what do we know and where do we go? *Health and Place*. 15:107-16.

Healy JD. 2003 Excess winter mortality in Europe: a cross country analysis identifying key risk factors. *J Epidemiol Community Health*. 57(10):784-749.

Howden-Chapman P, Pierse N, Nicholls S, Gillespie-Bennett J, Viggers H, Cunningham M. 2008 Effects of improved home heating on asthma in community dwelling children: randomised controlled trial. *BMJ*. 337:1411.

Howden-Chapman P, Viggers H, Chapman H, O'Sullivan K, Telfar-Barnard K, Lloyd B. 2009 Tackling cold housing and fuel poverty in New Zealand: a review of policies, research and health impacts. Energy Policy. In press. Williams, P. *Joint Review of Winter Deaths and Fuel Poverty Centre for Public Scrutiny*, 2009. www.cfps.org.uk/scrutiny-exchange/library/health-and-social-care/?id=2531 [Accessed 16 June 2011].

Huber M, Knottnerus JA, Green L, van der Horst H, Jadad AR, Kromhout D. 2011 How should we define health? *BMJ*. 343:4163.

Ingallinella AM, Sanguinetti G, Koottatep T, Montangero A, Strauss M. 2002 The challenge of fecal sludge management in urban area: strategies, regulations and treatment options. *Water Science and Technology*, 46(10):285–294.

Jiménez B. 2004 Sustainable sludge management in developing countries. *Water Science and Technology.* 49(10):251–258.

Kenzer M. 1999 Healthy cities: a guide to the literature. *Environment and Urbanization*, 11(1):201-220.

Knowlton K, Hogrefe C, Lynn B, Rosenzweig C, Rosenthal J, Kinney P.2008 Impacts of Heat and Ozone on Mortality Risk in the New York City Metropolitan Region Under a Changing Climate. *Advances in Global Change Research*. 30(2):143-160.

Kovats RS, Hajat S. 2008 Heat Stress and Public Health: A Critical Review. *Annu. Rev. Public. Health*. 29(1):41-55.

Kummerer K. 2008 *Pharmaceuticals in the environment: sources, fate, effects, and risks*. Springer-Verlag.

Lopez R. 2004 Urban sprawl and risk for being overweight or obese. *Am J Public Health*. 1(94) (9):1574-1579.

Marmot M.2000 The *Marmot Review. Strategic Review of Health Innequalities in England post 2010*. London.

McGranahan GP, Jacobi J, Songsore C, Surjadi, Kjellén M. 2001 *The Citizens at risk. From urban sanitation to sustainable cities*. London: Earthscan.

McMichael AJ, Wilkinson P, Kovats RS, Pattenden S, Hajat S, Armstrong B.2008 International study of temperature, heat and urban mortality: The ISOTHERM Project. *Int J Epidemiol*. 37(5):1121-1131.

Northridge M, Sclar E, Biswas P. 2003 Sorting out the connections between the built environment and health: a conceptual framework for navigating pathways and planning healthy cities. *Journal of Urban Health*. 80(4):556-568.

O'Neill MS, Ebi KL. 2009 Temperature extremes and health: impacts of climate variability and change in the United States. *J. Occup. Environ. Med*. 51(1):13-25.

Oke TR. 1987 *Boundary layer climates*. London: Routledge.

Oke TR. 1973 City size and the urban heat island. *Atmospheric Environment*. 7:769-773.

Panter JR, Jones A. 2010 Attitudes and the Environment as Determinants of Active Travel in Adults: What Do and Don't We Know? *Journal of Physical Activity and Health*, 7:551-561.

Parra DC, Hoehner CM, Hallal PC, Ribeiro IC, Reis R, Brownson RC, Pratt M, Simoes EJ. 2010 Perceived environmental correlates of physical activity for leisure and transportation in Curitiba, Brazil. *Prev Med*.

Petersen A. 1996 The healthy city, expertise, and the regulation of space. *Health and Place*. 2(3):157-165.

Prüss-Üstün A, Corvalán C. 2006 *Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease*. Geneva: WHO.

Ritsatakis A, Makara P. 2009 Gaining health: analysis of policy development in European countries for tackling noncommunicable diseases. *World Health Organization*. 12: 188.

Ross NA, Tremblay S, Khan S, Crouse D, Tremblay M, Berthelot J-M. 2007 Body Mass Index in Urban Canada: neighbourhood and metropolitan area effects. *Am J Public Health*. 1(97)(3):500-508.

Saelens BE, Handy SL. 2008 Built environment correlates of walking: a review. *Med Sci Sports Exerc*. 40:550-566.

Sarmiento OL. 2010a Quality of life, physical activity, and built environment characteristics among Colombian adults. *Journal of Physical Activity and Health*, 7(2):181-195.

Sarmiento OL. 2010b The Ciclovía-Recreativa: A mass-recreational program with public health potential. *Journal of Physical Activity and Health*. 7(2):163-S180.

Sclar E, Garau P, Carolini G. 2005 The 21st century health challenge of slums and cities. *The Lancet*. 365:901-903.

Taha H. 1997 Urban climates and heat islands: albedo, evapotranspiration, and anthropogenic heat. *Energy and Buildings*. 25(2):99-103.

UNDP. 2006 *Beyond scarcity: power, poverty and the global water crisis. Human Development Report.* New York: UNDP.

UN-HABITAT. Global atlas of excreta. 2008 *Wastewater sludge, and biosolids management: moving forward the sustainable and welcome uses of a global resource*. Nairobi: UN-Habitat.

Wang X, Smith KR, 1999 Secondary Benefits of Greenhouse Gas Control: Health Impacts in China. *Environmental Science and Technology*. 33(18):3056-3061.

Werna E, Harpham S. 1996 *Urban health research in developing countries: implications for policy.* Wallingford, Oxon: CAB International .

WHO Regional Office for Europe. 1997 *Healthy Cities Project Phase III (1998 – 2002): The requirements and the designation process for WHO project cities*, Copenhagen. http://www.who.it/document/hcp/ehcpphas3.pdf [Accessed 27 Sept 2011]

WHO. 2006 *Guidelines for the safe use of wastewater, excreta and greywater. Wastewater use in agriculture. Wastewater and Excreta Use in Aquaculture*. Geneva: WHO.

WHO. Regional Office for Europe. 2008 *City leadership for health: summary evaluation of Phase IV of the World Health Organization*. European Healthy Cities Network. http://www.euro.who.int/document/E91886.pdf. [Accessed 27 Sept 2011]

WHO. 2004 Water, Sanitation and Hygiene.

WHO-UNICEF. 2010 Progress on sanitation and drinking-water: update. Geneva: WHO.

Wilkinson P, Smith KR, Joffe M, Haines A. 2007 A global perspective on energy: health effects and injustices. *The Lancet*. 9:370(9591):965-978.

Woodcock J, Banister D, Edwards P, Prentice AM, Roberts I. 2007 Energy and transport. *The Lancet.* 370(9592):1078-1088.

WSP. 2005 *Understanding small scale providers of sanitation services: A case study of Kibera*. Field Note. Water and Sanitation Program. Nairobi: World Bank.

Zhang JJ, Smith KR. 2007 Household air pollution from coal and biomass fuels in China: measurements, health impacts, and interventions. *Envir Health Persp*. 115(6):848-55.