

**Human health in *The London Plan*:
How health is framed in a world city's spatial development and climate action strategy**

Christopher Coutts

Florida State University
Local Benefits of Sustainability Symposium

2/25/12

Abstract

Much of the discourse on global climate change mitigation and adaptation has taken place at the national level, but it has been local governments that have assumed a leading role in implementation. A motivation for local climate change planning may be the realization of localized benefits. Although human health is a fundamental co-benefit and indeed among the original justifications for planning (Ashton and Ubido, 1991; Hebbert, 1999; Shilling and Linton, 2005), it has largely been overlooked among the myriad benefits motivating local governments to plan for climate change. A conceptual content analysis of the July 2011 version of *The London Plan: Spatial Development Strategy for Greater London* was performed to address how the local co-benefit of human health is tied to climate change mitigation and adaptation goals and actions in a world class spatial development strategy.

The coding of the 317 page London Plan resulted in eight distinct health frames and nearly 200 instances of the keyword “health.” The health inequality and healthy built environment frames were the most prevalent and distributed the most evenly throughout the nine plan chapters. There are at least three distinct conclusions in answering how the local co-benefit of health is tied to climate change goals and actions. First, although the plan recognizes London’s influence on the global environment, the stated threats to health are truly localized affects from predicted flooding, higher average temperatures, and drought are addressed with very locality-specific policies. Second, the planning policies that address health mostly acknowledge the health benefits derived from adapting to climate variability rather than the more long term health benefits of mitigation efforts. Third, addressing health inequalities and creating an environment supportive of health are presented as the most salient cross cutting issues.

Introduction

Planning for sustainable urban development and climate change adaptation is, at a very fundamental level, an attempt to protect ourselves and our social systems from harm. In our attempts to adapt to a changing environment there are many, often inter-related, elements that must be considered. One of the most indispensable is the protection of human health and well-being. Therefore, it is critical to consider human health impacts and its relationship to the many other social, political, economic, and environmental considerations. With events such as sea level rise being exacerbated by a changing climate, the health of hundreds of millions of persons worldwide will be affected. The research conducted here addresses the following questions: How is the local co-benefit of human health portrayed in a world class spatial development strategy, and how is health and well-being tied to climate change mitigation and adaptation goals and actions? Is health tied to climate actions in the plan that are not yet being addressed by health and climate change research? These questions are addressed through a content analysis of the 2011 *Spatial Development Strategy for Greater London* (UK). London, as a leader in climate change planning and as a world city, is a model for other urban areas preparing for climate change and aiming to prevent its deleterious effects.

Municipalities in Europe aiming to create local climate plans often operate under some national level direction. Unlike the US that has no national adaptation strategy (Ebi, 2010), most European countries either have a national climate change strategy or are creating one. The UK, as the first country to complete its plan, provides national level guidance, but cities within the same country might face very different impacts from changing trends in drought, flooding, and rising temperatures. The Intergovernmental Panel on Climate Change (IPCC) has proposed adaptation responses at the national/regional and individual responses scales but not at the more

localized city-level (Confalonieri et al., 2007). It is possibly frustration over the ongoing international diplomatic stalemate that has led urban leaders to adopt solutions for limiting greenhouse gas emissions and preparing for the effects of global warming (Rosenzweig, 2011). Much like other climate vulnerabilities, the health impacts of climate change vary by location and are often most accurately considered at geographic scales such as cities. The apparent solution to addressing the effects of climate change has been to “think globally by planning locally for public health” (Coutts, 2010, p. 54).





Specific to the UK, there has long history of connecting urban form to public health (Ashton & Ubido, 1991; Hebbert, 1999). The connection between one’s environment and health stems from understanding that health is a prerequisite for achieving other social goals. As the environment changes, health will be affected. Recent evidence from the US reveals that it is climate change and sustainable plans that are capturing health outcomes more than their traditional comprehensive plan counterpart (American Planning Association, 2011). The question remains: Does London recognize the fundamental importance of health and its connection to a changing physical environment?

Health and Climate Change

Over the past five years, there has been a small surge in the literature exploring the health impacts of global climate change and variability. The volume of research has increased, but it is still sparse and the outcomes examined have largely been limited to the health effects of heat waves and air pollution (Ebi et al., 2009). A number of articles have provided a litany of anticipated health effects (Frumkin, 2008; McMichael, Woodruff & Hales, 2006), environmental health indicators (English et al., 2009), and have focused on the childhood populations that are most vulnerable to anticipated events (Kisten et al., 2010; Sheffield & Landrigan, 2011). Table 1

is a synopsis of climate change events and their theorized health effects.

Table 1. Health effects of climate change

Climatic Event	Intermediary	Health Outcome
Heat waves	direct to 	Heat stress, stroke
	Increased ground-level ozone, pollen	Respiratory disease exacerbation
Increased mean temperature	More hospitable to disease agents (mosquito, ticks)	Vector-borne diseases (e.g. Lyme, malaria, dengue)
	More hospitable to infectious agents (bacteria)	Food-poisoning, infectious disease (cholera)
		Positive: Less hypothermia
Ozone depletion	UV radiation	Skin and eye disease
Drought	Food/water shortage	Dehydration, malnutrition
	Lack of food/water safety	Food/water-borne disease
Extreme weather event (flooding, tornado, hurricane)		Injuries, drowning
	Population movement	Conflicts
Sea-level rise		Injuries, drowning
	Population movement	Conflicts
	Water/soil salinization	Dehydration, malnutrition
	Ecosystem disruption	
Climate change generally	Stress	Mental health

Source: Adapted from Confalonieri et al., 2007; Frumkin 2008; Kovats et al., 2005; McMichael, Woodruff, & Hales, 2006

Although we can count on with relatively certainty that the climate is changing and the level and type of disease burden in all countries and regions will progressively increase with a changing environment (Confalonieri et al., 2007), projecting the increase in morbidity and mortality caused by climate change is extremely complex and fraught with uncertainty. Taking this difficulty into account, there have been efforts by public health researchers to quantify the added disease burden caused by climate change (WHO, 2003). In the Fourth Assessment from Working Group II of the IPCC it was noted that “at this early stage the effects are small but are projected to progressively increase in all countries and regions” (Confalonieri et al., 2007, p.393). McMichael et al. (2004) calculated that in the year 2000, increasing climate variability was reported to be responsible for over 150,000 deaths worldwide. Almost 90% of this increase

in the disease burden fell upon children. Based on IPCC projections, these numbers are likely to increase as climatic shifts become more severe and more become susceptible to their effects. Although a precautionary approach would lead one to take these trends seriously, admittedly, there is a lack of conclusive evidence to support an alarmist attitude (Rohr et al., 2011).

The UK released its assessment of the health threats related to climate change in 2008 (Kovats, 2008). The perceived greatest threats to the UK include heat waves, flooding, drinking water contamination, increased ground level ozone, and UV radiation. The noted effect of increased heat on water-, food-, and vector-borne diseases is less daunting.

Likely motivated in no small part by the UK's unique susceptibility as an island nation (Ebi et al., 2006), the UK Climate Change Act of 2008 was passed as "...the first legislation of its kind in the world, establishing a long-term legal framework to underpin the UK's contribution to tackling climate change" (Kovats, 2008, p.). This Act established the Committee on Climate Change. A report by this committee in 2010, *How well prepared is the UK for climate change*, found that while information capacity is high, its translation into action has been minimal, and failing to act was noted throughout as detrimental to human health. The report also touched on the scale of interventions to combat climate change, concluding that climate change mitigation and adaptation should be primarily a local function with national governments playing a supporting role. The London climate plans are an example of a local government—and a very significant one on a global scale—is planning for actions that will ultimately have local, global, and both immediate and long-term influences on human health.

Although there have been analyses on the potential threats to health of global climate change, there has been little, if any, attention given to how health is approached in our plans to mitigate and adapt to climate variability. More specifically, how health is approached in the plans that

guide the development of cities and the actions which exacerbate climate change. This paper hopes to begin to address this by examining how health is framed in the spatial development and climate change strategies of a world city. As the first major world city to produce a Climate Change Adaptation Strategy and as the birthplace of contemporary planning and public health collaboration, the London case holds great promise in guiding plan formation across the globe and in exposing new areas of research.

Data and Methods

Under the rules of the Greater London Authority Act of 1999, the Mayor of London is required to produce a Spatial Development Strategy for the 32 boroughs and the Corporation of the City of London. The first London Plan was published in 2004. This plan typically operates with a 20 year horizon, and is the Mayor of London's comprehensive planning document for the greater London metropolitan area. Local development documents have to be in general conformity with this plan, and any planning decisions within London are legally required to take the plan into account. The plan must also conform to EU legislation including the European Spatial Development Perspective.

A conceptual content analysis of the July 2011 version of *The London Plan: Spatial Development Strategy for Greater London* was performed to determine the prominence and context of human health throughout the plan and with particular attention to London's planned response to climate change. Content analysis is often used to "reveal the focus of individual, group, institutional, or societal attention" (Weber, 1985). The 317 page document is organized into eight chapters: 1) Context and Strategy, 2) London's Places, 3) London's People, 4) London's Economy, 5) London's Response to Climate Change, 6) London's Transport, 7) London's Living Places and Spaces, and 8) Implementation Monitoring and Review. Preceding

these eight chapters are the Mayor's Foreword and Overview and Introduction. These chapters were also included in the analysis.

The entire portable document format (pdf) plan was digitally searched to determine the prevalence and context of the keyword "health." The number of occurrences of the keyword "health" was summed for each section. The context of each occurrence of the keyword was evaluated to determine how health was framed within the plan. A number of frames were created after determining the similarities and discrepancies in the context surrounding health. The category coding was performed solely by the author. Therefore, threats to reliability due to varied interpretations by multiple coders were eliminated. The validity of the frames is similarly robust. Unlike content analysis which seeks to organize text around various constructs that are prone to varied interpretations, the health frames were almost exclusively created using explicit language from the plan itself. Very little subjective interpretation of the context in which the keyword "health" was found was required.

The Response to Climate Change chapter was examined in great detail. The categories in this chapter were compared to the current climate change and health literature to determine if there was evidence to support how health is used in The London Plan and how The Plan might inform future research needs. The occurrence of "health" in the 22 policies in this chapter was examined to determine which policies considered health outcomes. The policies are listed in Table 2.

Results

There were a total of 176 instances of the keyword "health" throughout The London Plan. The coding of the 317 page London Plan resulted in eight distinct health frames. Table 3 displays the distribution of the health frames per plan chapter. It also reveals that the health

inequality and healthy environment frames are distributed throughout most of the plan chapters. Other frames are not as consistently distributed. Figures 1 and 2 display the distribution of the health frames by plan chapter in a bar graph diagram (Appendix A).

Table 2. Policies within the Response to Climate Change chapter of The London Plan

Policy	Title	Policy	Title
5.1	Climate Change Mitigation	5.12	Flood Risk Management
5.2	Minimizing Carbon Dioxide Emissions	5.13	Sustainable Drainage
5.3	Sustainable Design and Construction	5.14	Water Quality and Wastewater Infrastructure
5.4	Retrofitting	5.15	Water Use and Supplies
5.5	Decentralised Energy Networks	5.16	Waste Self-Sufficiency
5.6	Decentralised Energy in Development Proposals	5.17	Waste Capacity
5.7	Renewable Energy	5.18	Construction, Excavation, and Demolition Waste
5.8	Innovative Energy Technologies	5.19	Hazardous Waste
5.9	Overheating and Cooling	5.20	Aggregates
5.10	Urban Greening	5.21	Contaminated Land
5.11	Green Roofs and Development Site Environs	5.22	Hazardous Substances and Installations

Table 3. Frequency of health frames per plan chapter

Frame	Chapter									TOTAL
	0	1	2	3	4	5	6	7	8	
Health Inequalities (HI)	2	3	4	24	1	1	0	0	1	36
Healthy environments (HEnv)	0	1	3	11	1	10	3	5	0	34
General health promotion (H)	1	1	2	26	0	0	0	1	0	31
Health facilities infrastructure (HF)	0	2	1	20	1	0	1	0	2	27
Health policies (HP)	0	0	0	17	0	0	0	0	0	17
Health and green space (G)	0	2	2	1	0	1	0	5	0	11
Health impact assessment (HIA)	1	1	3	4	2	0	0	0	0	11
Health and economy (HE)	1	3	2	2	1	0	0	0	0	9
TOTAL	5	13	17	105	6	12	4	11	3	176

Note: Chapter 0 is the Foreword, Overview and Introduction to the plan.

The *health inequality* frame was prevalent throughout the London Plan with particular, and expected, prominence in Policy 3.2, Improving Health and Addressing Health Inequalities. In line with the Mayor’s Health Inequalities Strategy, reducing economic and racial disparities in health outcomes and access to care was integral to the plan. The *healthy environments* frame was also quite prevalent. In line with the London Plan being a spatial development strategy, this frame encompassed elements of the built environment that influence health. Improved housing, brownfield redevelopment, the reduction of air pollution, and the promotion of non-motorized forms of transport were all seen as ways to improve the health of London residents. *General health promotion* captured all instances where improving the health of Londoners was mentioned in general terms. Within this frame were Policy 3.2 and mentions of mental health and the health of children. *Health facilities* captured not only the infrastructure of health care centers but also the health care delivery services. Among the health policies recommended to guide health promotion among Londoners were the *Mayor’s Best Practice Guidance on Health Issues in Planning*; *Healthy Lives, Healthy People: Our Strategy for Public Health in England*; and the *Health and Social Care Bill*. There was also mention of the need for coordinated planning among planning with environmental and climate change policies. There was a clearly stated connection between the conservation of green space and the health of city residents. The green belt designed to curb sprawl was also held up as necessary to supporting health. Green spaces were also integral to London becoming a city that “delights the senses.” A *health impact assessment* is a tool used to evaluate environmental threats health and this term was often used in conjunction with “health checks” performed in local communities. Finally, the *health and economy* frame included mention of not only maintaining the overall health of the economy but also the role of the health sector jobs and research in supporting a robust economy.

In addition to “health” there were also five instances of the term “well-being” and six instances of the term “welfare.” Four out of the five of the instances of “well-being” were found in conjunction with “health.” The remaining instance was used in conjunction with “prosperity.” All instances of “welfare” were found in conjunction with “health” in phrases such as “...improving Londoners’ health, welfare, and development” (p. 210).

A focus on the local health benefits of climate change mitigation and adaptation

London is explicitly striving to become a “...world leader in improving the environment locally and globally, taking the lead in tackling climate change, reducing pollution, developing a low carbon economy, consuming fewer resources and using them more effectively” (p. 137). With this stated goal, London recognizes its global influence not only in its contribution to the emissions that exacerbate climate change but in its station as an exemplar of world city planning. London has a recognized contribution to the global market and biophysical processes, but their spatial development and climate action strategies are very much localized.

Although London is aware of its influence on larger global climate phenomena, it is looking to its own vulnerability to flooding, higher average temperatures, and drought caused by sea level rise, heavier winter rainfall, higher tidal surges, hotter summers, and less summer rainfall. The latest UK Climate Projections support these trends (Department of Environment, Food and Rural Affairs, 2009). The conditions with formidable health effects covered in the plan are consistent with London’s 2010 Climate Adaptation Strategy foci on heat, flooding, and drought.

Health is recognized in seven of the 22 policies listed in the climate change chapter of the plan (full list of policies listed in Table 2). In general terms, the climate change chapter of the plan recognized that “the effects of climate change could seriously harm Londoners’ quality of life, particularly the health and social and economic welfare of vulnerable people” (p. 138).

Looking more specifically at the seven policies, the “sustainable design and construction” of buildings is intended to ensure that they are “healthy and adaptable” (Policy 5.3, p. 143). This policy recognizes that structures are important for both climate change mitigation and adaptation. Reducing emissions and the use of natural resources will aid in mitigating future climate change while reducing the urban heat island effect and impacts from natural hazards such as flooding are adaptation strategies. Heat and flooding carry with them recognized health hazards.

The use of green infrastructure to reduce the deleterious effects of the urban heat island (Policy 5.10, p. 153) is not only an adaptation to increasing temperatures, but also a mitigation strategy. Green infrastructure reduces temperatures through evapotranspiration and also traps the airborne greenhouse gases that may exacerbate future climate variability (Gill, Handley, Ennos, & Pauleit, 2007).

Maintaining a sustainable water supply in the face of drought (Policy 5.15, p. 157) is a public health issue with severe consequences, especially in dense urban environments where the city system is the sole source of potable water.

The most unique connection between health and climate change found in the plan deals with waste management. Waste is addressed in the climate change chapter due to its potential as an energy source and the promotion of recycling and recovery. In addition to encouraging the minimization of waste, the plan states that waste processing facilities should take into account the health and safety of those working within them and also that of adjoining neighbors (Policy 5.17, p. 168). A more direct threat is hazardous waste, but the plan does not deal with the health threats associated with exposure to hazardous waste but rather the public concern over health and environmental impacts (Policy 5.19, p. 169) of the facilities that handle the waste.

Another unique aspect of the climate change strategies chapter of the plan is that it confronts

brownfield remediation (Policies 5.21, p.171). Preventing environmental and health threats from contaminated brownfield sites is how health and brownfields are connected in the plan, but brownfield remediation also has indirect climate change mitigation benefits in that scarce urban land unusable with brownfield status can be used for development upon remediation of contaminants. This may alleviate pressure for greenfield development that consumes green infrastructure and creates the need to consume fuels to reach development at greater distances from existing goods and services.

Lastly, health is addressed in Policy 5.22 (p. 171), but only in the title of a directive that should be taken into account when there is exposure to hazardous substances and installations.

There is at least one health impact of climatic change *not* noted in The London Plan policies but supported in the literature. An increase in mean temperatures and the subsequent increase in suitable habitat for the vectors that carry infectious disease (eg. mosquitos, ticks) has been put forward as a serious health concern (Table 1). Countries where a colder climate has kept diseases like malaria at bay could eventually have a climate that could harbor infectious diseases once confined to tropical regions. One explanation for the omission of vector-borne disease in the plan is a belief since the UK eradicated malaria once through increased standards of living, it is unlikely to reemerge (Kovats, 2008).

Conclusions

There are at least three conclusions that can be drawn from the analysis to answer the research question: How is the local co-benefit of human health portrayed in a world class spatial development strategy and how is health tied to climate change mitigation and adaptation goals and actions?

First, the threats to health, and proposed actions to address these threats, are truly localized,

but there is a greater, albeit superficial, recognition of London's influence on the global environment. The health and health inequalities experienced by Londoners are addressed throughout the plan, and the climate actions proposed will undoubtedly have an effect on these conditions beyond the borders of the UK.

Second, the climate change policies that address health acknowledge the health benefits derived from a balance of adaptation and mitigation strategies. London's climate change mitigation strategies are its global contribution to improving health and welfare beyond the UK, but its adaptation strategies have more immediate and local health benefits. Current estimates reveal that even with serious mitigation efforts, the next 100 years of climate change will be determined by an atmospheric composition that cannot be changed (London Plan, 2011, p. 138). Therefore, London appears resolved to adapt to what is to come over the next century but most likely beyond considering concerted global mitigation efforts have been slow in coming. The most notable policies that explicitly tie health to adaptation and mitigation are those which address building design and construction and green infrastructure conservation. These policies will protect London residents from the risks associated with rising temperatures and flooding by adapting to these projected conditions in the near term and mitigating against their increased severity and frequency in the longer term.

Third, addressing health inequality and the creation of healthy urban environments are cross cutting issues throughout The London Plan. As opposed to a specific health condition, it was health inequalities and increased susceptibility that was granted the most attention. It is recognized that the health and welfare of the those that are already bear the burden of the poorest health will be at the greatest increased risk of injury and disease from climatic events (). Policy 3.2, Improving Health and Addressing Health Inequalities, was the only policy specifically

devoted to improving health. The analysis revealed that health language appeared throughout the document, but it typically appeared as one among many benefits of a prescribed action.

Although there exists a commendable recognition of health as an outcome of changes to the built, social, and economic environment, health certainly did not crowd out other important outcomes. Health remained broad and undefined and tended to appear alongside other lofty outcomes such as education, welfare, development, and “quality of life.” Similar to much of the health and climate change literature, the London Plan contains no quantifiable projections of the negative health effects of climate change strategies, only general talk about health outcomes and inequalities. There is no attempt at quantifying the suffering and poor health outcomes that will be avoided if the preventive measures in the plan are heeded.

Research needs uncovered by content analysis

In answering the second research question pertaining to the plan’s ability to elucidate research gaps in the health and climate change literature, most of the health outcomes recognized in London’s climate change policies are supported by the nascent public health literature. The one policy yet to be examined closely for its health effects, and with significant potential to affect both mitigation and adaptation responses to climate change, is brownfield reclamation. Exposure to the toxins that define a brownfield can certainly be detrimental to health, but reusing brownfield sites can contribute to climate change induced health outcomes in at least two other ways. First, reclaiming brownfields allows infill and greater urban density. Greater density creates shorter distances between trip origins and destinations and lower greenhouse emissions expended in travel. This would help to mitigate future climate variability. Second, the conversion to brownfields to greenfields could reduce the urban heat island effect and help in adapting to increasing temperatures. There is great potential in a research agenda which

elucidates the efficacy of the geoengineering of various land uses scenarios and their subsequent influence on climate change adaptation and mitigation. The reclamation of brownfields could be one of these techniques.

Additional research needs could also be addressed by extending the study performed in this paper. A larger comparative study between The London Plan and the comprehensive plans of other cities could reveal the prevalence of health as a global theme, its ubiquity in lofty goals or measurable objectives, its potential usefulness in justifying contentious action, and whether health is more often associated with either climate change adaptation or mitigation strategies.

Discussion

Some important questions remain as to the role of health in spatial development and climate change plans. First, can the immediacy and localness of health benefits be used as a vehicle to make sustainable development efforts more politically tolerable? It may be easier to “sell” concepts such as fuel efficiency, waste reduction, and reduced consumption if they are connected to health outcomes and not solely framed as beneficial for the “Environment.” This could possibly be what is driving the increased prevalence of health language in sustainability/climate action plans in the US (APA report). There could be a growing acceptance of the health and environment connection or it could be that health is taking its rightful place as a motivation for protecting the environment our welfare is dependent upon.

The question remains as to how national-level climate threats made their way into the localized planning of London’s future. There has been progressive national leadership on the issue in the UK, but this is not the case elsewhere. The proliferation of climate change plans around the globe and in places with rather weak national leadership suggests that this national level leadership is not necessary to spur local governments to take action. The US has no

national policy recognizing the health effects of climate change, but the latest Global Climate Change Impacts in the US report released in 2009 includes an abundance of health language (US Global Change Research Program, 2009). This national leadership may be important to guide local efforts and encourage the inclusion of outcomes such as health to be considered uniformly. It could be that the mission of federal government to protect the health and welfare of its citizens becomes the impetus to drive a national strategy.

References

- American Planning Association. (2011). Comprehensive planning for public health. Planning and Community Health Research Center. Retrieved on August 21, 2011 from <http://www.planning.org/research/publichealth/index.htm>.
- Ashton, J., & Ubido, B., 1991. The healthy city and the ecologic idea. *Journal of the Society for the Social History of Medicine*, 41, 173-80.
- Confalonieri, U., B. Menne, R. Akhtar, K.L. Ebi, M. Hauengue, R.S. Kovats, B. Revich and A. Woodward, 2007: Human health. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 391-431.
- Coutts, C. (2010). Public health ecology. *Journal of Environmental Health*, 72(6), 53-55.
- Department of Environment, Food and Rural Affairs (2009). UK climate projections 2009.
- Ebi, K. (2010). Climate briefing series. American Meteorological Society. Retrieved on November 23, 2011 from <http://www.ametsoc.org/atmospolicy/climatebriefing/ebi.html>.
- Gill, S.E., Handley, J.F., Ennos, A.R., & Pauleit, S. (2007). Adapting cities for climate change: The role of the green infrastructure. *Built Environment*, 33(1), 115–133.
- Hebbert, M. (1999). A city in good shape: Town planning and public health. *Town Planning Review*, 70(4), 433-453.
- Kovats et al (2005) *Climate change and human health in Europe*
- Kovats, S. (2008). *The health effects of climate change in the UK 2008*. Retrieved on August 25, 2011 from www.ukcip.org.uk/wordpress/wp-content/PDFs/Health_effects2008.pdf.
- McMichael AJ, Campbell-Lendrum DH, Kovats RS, Edwards S, Wilkinson P, Wilson T, et al. 2004. Global climate change. In: Comparative Quantification of Health Risks: Global and Regional Burden of Disease due to Selected Major Risk Factors (Ezzati M, Lopez A, Rodgers A, Murray C, eds). Geneva:World Health Organization, 1543–1649.
- Rosenzweig, C. (2011, August). All climate is local: How mayors fight global warming. *Scientific American*. Retrieved from November 23, 2011 from <http://www.scientificamerican.com/article.cfm?id=all-climate-is-local>.
- Shilling, J., & Linton, L. (2005). The public health roots of zoning: In search of active living's legal genealogy. *American Journal of Preventive Medicine*, 28(2S2), 96-104.

US Global Change Research Program. (2009). Global Climate Change Impacts in the US. Retrieved on February 8, 2012 from <http://globalchange.gov/publications/reports/scientific-assessments/us-impacts/download-the-report>.

Weber, R. (1985). Basic content analysis. Beverly Hills, CA: Sage Publications.

WHO (2003). *Climate change and human health: Risks and responses*. Chapter 7: How much disease could climate change cause? Retrieved on August 18, 2011 from <http://www.who.int/globalchange/publications/cchhbook/en/>.

APPENDIX A

Chapter 3 is isolated in a separate figure because its range of values were much greater than that of other chapters. Including it with other chapters hindered the interpretability of the y-axis scale. The legends in both figures are ordered identical to Table 3 in that they are descending in the overall prevalence throughout the document.

- Health Inequalities (HI)
- Healthy environments (HEnv)
- General health promotion (H)
- Health facilities infrastructure (HF)
- Health policies (HP)
- Health and green space (G)
- Health impact assessment (HIA)
- Health and economy (HE)

