Editorial

Perspectives on Climate Change and Human Health : An Editorial Introduction

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The effects of climate change on a wide range of ecosystems have been observed in most of the world's regions, in reaction to global mean temperature increase since pre-industrial times (Rosenzweig et al. 2007; Solomon et al. 2007; Warren et al., 2011). Climate variability has a substantial impact on social, economic and environmental systems and their interactions, and thereby on food, water and health security (Paz et al., 2010). Some of the effects of climate change are likely to include extreme weather events such as heat waves, heavy precipitation, flooding, droughts and air pollution. Each of these changes has the potential to negatively affect human health, impacting our basic needs - clean air, safe drinking water, sufficient food and secure shelter (CDC, 2011; WHO, 2010).

Many prevalent human diseases are linked to climate fluctuations. The main impacts of climate change on human health include:

- Increased mortality and morbidity as a result of exposure to extreme heat. Extremely high air temperatures contribute directly to deaths from cardiovascular and respiratory disease, particularly among elderly people. For example, in the heat wave of summer 2003 in Europe, in excess than 70,000 deaths were recorded (WHO, 2010);
- Increased diseases, injuries and deaths due to more frequent and intense extreme weather events such as floods, windstorms or droughts (Portier et al., 2010);
- Increased diarrhoeal diseases and other food- and water-related diseases;
- Changed geographical distribution of plants and disease-carrying vectors (e.g. rodents, mosquitoes, ticks, etc.) and associated diseases (e.g. malaria, West Nile fever, dengue fever), since many infectious agents, vector organisms, non-human reservoir species and pathogen replication rates are particularly sensitive to climatic conditions (ECDC, n.d.);
- Increased frequency of cardio-respiratory diseases due to higher concentrations of ground level air pollution (ozone, NOx, CO, etc) related to heat through chemical reactions (McMichael, 2003);

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- Increased frequency of asthma, respiratory allergies and airway disease resulting in more severe and frequent disease exacerbations (Portier et al., 2010).

Human health vulnerability to changing climate can be defined as a function of sensitivity level, exposure to a climate-related hazard, as well as adaptation measures and actions that aim to reduce the burden of the health outcome (Ebi et al., 2006).

While climate change and global warming are recognized as global issues, their effects vary across local geographic regions and populations via pathways of varying complexity, scale and timing. Over time, regional populations adapt to the local prevailing climate via physiological, behavioral, cultural and technological responses. However, extreme events tend to stress populations beyond these adaptation limits.

Therefore, the current special issue of Geography Research Forum aims to add more perspectives on the possible impacts of climate change on human health, at both the global and local scales.

The opening paper of the current issue by Stanaway and Mayer focuses on Malaria, which is tightly connected to weather fluctuations, especially of temperature, rainfall and humidity. By looking at the impacts of El-Niño conditions on disease transmission as a short term natural experiment, the authors use this analogy in studying the effects of climate change on malaria incidence. In their paper, Stanaway and Mayer review observational studies and prediction models of possible impacts of climatic changes on the disease and its vectors in South America, Asia and Africa. The authors show that although climate change has a clear influence on Malaria incidence and distribution, the ability to predict the exact degree of change is complex. Their findings call for better modeling of both malaria and climate conditions for enhanced prediction and preparedness.

The second paper, written by Helfman, Waisel and Kutiel, is related to the increased risk of allergies, and deals also with morbidity factors and their linkage with climatic fluctuations. Since many respiratory allergic diseases are seasonal with climate sensitive components, climate change may increase the incidence and exacerbation of such allergic diseases (Portier et al., 2010). Daily airborne pollen and fungal spores were collected and identified by the authors over a period of one year in Haifa (northern Israel). In addition, a daily record of meteorological parameters was gathered. The main aim of the study was to find correlations between airborne pollen/spores and meteorological parameters. Their results show that high counts of airborne pollen and spores were highly and positively correlated with air temperature. Another finding was that a decrease of relative humidity or atmospheric pressure often results in an increase of airborne pollen and spore count. These results are important especially given the current trend of increasing temperatures detected throughout the region.

The next two papers refer to emergency department visits as a result of climatic/atmospheric conditions. The paper by Portnov, Paz and Linn, deals with the linkage between air pollution (mainly dust) and weather factors. There is still lack of knowledge about the linkage between temperature increase and rising frequency of

dust storms and their impacts on human health. In light of this, Portnov et al. investigated the linkage between average daily PM10 concentrations and the number of patients arriving at the emergency department of the largest medical center in Haifa Bay ("Rambam"). The visits were correlated with temperatures, humidity, day of the week and season. The analysis revealed a strong association between daily number of patient visits and outdoor atmospheric conditions, measured by heat stress and PM10 air pollution. The relationship emerged statistically strong for auto-regression lags. Yet, the association between meteorological conditions and daily number of visits showed that the same extreme atmospheric conditions may generate different health responses from different population groups.

The next paper by Gershunov, Johnston, Margolis and Guirguis, analyzes the unprecedented heat wave in California in July 2006. The authors indicate that heat waves in this Mediterranean-type climate area are becoming more humid and therefore increase the health impact of heat waves, especially regarding nighttime minimum temperatures. In their research, Gershunov et al. identified the effects of this extreme event on morbidity in California at the county level. Using Canonical Correlation Analysis, they summarized space-time relationships between temperature and humidity and daily emergency department visits. The results demonstrate the spatial patterns of public health impacts of heat and humidity that can be potentially modulated by demographics, adaptation and acclimatization factors. These factors may be related to the access level to air conditioning. In general, the health outcomes were found to be more sensitive to extreme heat and humidity in coastal counties than in the inland areas.

The last paper, by Grobman and Amster, discusses the medical and public health aspects of building design and materials. The paper reviews the possible implications of building design on human health and climate change in general, with specific attention to the situation in Israel. Although environmental factors were initially the main focus of the discourse on green building, in recent years there has been a growing interest in other important aspects of green building, including their ability to minimize the negative effect that buildings contribute to global warming and its impact on human health. Grobman and Amster review the growing fields of green building and green neighborhood design and their implications on human health and climate change, in both global and local (Israeli) contexts.

Most of the above papers refer to climate change impacts on health in Mediterranean climate type regions. Indeed, one of the most sensitive areas to climatic changes is the Mediterranean Basin which is a 'natural laboratory' enabling researchers to evaluate climate variability and predict forthcoming ones (Plan Blue, 2008; Paz et al., 2010). Yet, the "Mediterranean climate" is found in several other regions around the world (e.g. California, parts of Australia, South Africa) and therefore, a wider context is considered.

Each of the papers in this special issue contributes a unique perspective to the topic of climate change impacts on health. Although most of the papers focus on

local case studies, together they offer a diverse spectrum of knowledge and insight into these issues on a regional and global scale.

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