Journal of Physical Activity and Health, 2013, 10, 765-768

JOURNAL OF
Physical Activity & Health
Official Journal of ISPAH
www.JPAH-Journal.com
COMMENTARY

The Influence of Global Heating on Discretionary Physical Activity: An Important and Overlooked Consequence of Climate Change

Emmanuel Stamatakis, Kelechi Nnoaham, Charlie Foster, and Peter Scarborough

Climate change has been described as one of the greatest threats to the environment and to human health.[1] One of the key consequences of climate change is a rapid increase in global temperatures, resulting in rising sea levels and an increased frequency of acute heat waves. Globally, it has been estimated that by 2100 the average ambient temperature will go up by 1.8°C to more than 4.0°C.[1] The population health risks linked to such temperature change include increased morbidity and mortality due to infectious disease outbreaks and exposures to air pollution.[2] The impact of climate change on lifestyle behaviors and noncommunicable (ie, chronic) disease risk has not been characterized at the population level, however, and this is especially so for habitual levels of physical activity. Physical inactivity is one of the leading risk factor for global disease burden[3] and is responsible for 5.3 million premature deaths a year worldwide, a figure comparable to that of smoking and obesity.[4]

Physical exercise creates internal heat that needs to be transferred outside to avoid hazardous internal overheating. A hot and/or humid environment exacerbates physical exertion and increases core body temperature. Sweating is not always sufficient to maintain temperature homeostasis during physical activity to avoid heat strain and heat stroke.[5] In addition to sweat rate, other climatic factors (eg, humidity and wind) influence the effects of heat on core body temperature during both rest and working conditions.

Wet bulb global temperature (WBGT) is a meteorological index that incorporates not only temperature but humidity, wind speed, and solar radiation. It is a weighted combination of measurements from a wet bulb thermometer (a standard thermometer with a bulb wrapped in wet cotton, allowing for continuous evaporative cooling of the bulb), a black globe thermometer (a standard thermometer with a bulb contained in a black globe to account for solar radiation and wind) and a standard thermometer measuring air temperature in the shade. Depending on the degree of one's acclimatization, the risk of heat stress starts at a WBGT of 22.5°C–26°C.[6,7] Physical activity capacity starts to decline at WBGT values of more than 26°C, while at values more than 40°C it is very difficult to carry out any physical activity.[8]

Thus, rising ambient temperature will have a considerable impact on physical activity patterns and choices, as people spend more time indoors under controlled climate conditions.[9] Whether more time indoors translates into greater levels of sedentary behavior has not been investigated, even though there is now some evidence that time spent sitting is associated with cardiovascular disease risk[10] and overall mortality[11,12] independent—to some extent—of time spent exercising. A systematic review by Tucker & Gilliland[13] examined the effects of season and the weather on physical activity levels but focused their conclusions mainly on the negative impact of cold, rather than hot temperatures upon physical activity levels.

The physical activity behavior-related consequences of increased outdoor temperatures will vary geographically and will be more of a concern in areas where temperatures are in the zone of compromised physical capacity (ie, WBGT ≥ 26°C–30°C) for a substantial part of the year. Such areas include south Europe, West and Minor Asia (eg, Turkey, Israel), North Africa, South Asia, Central America, and Australia. Figure 1 shows the WGBT trend in the recent decades, as well as linear projections to 2040 in various locations around the world. Assuming a linear trend, the number of days with a maximum WBGT > 26°C will increase in Saltillo (Mexico) from 0.4 days in the 1980–1989 decade to more than 9 days in the 2030–2039 decade (a 2191% increase). Other locations showing comparable percent increases include Tehran (3997%), Istanbul (1030%), and Heraklion (910%). Although the absolute number of days per year having a maximum WBGT > 26°C appears modest in many of these places, the relative increases are large and will occur over a very short period of time in environmental terms.

Physical activity levels are already low around the developed and parts of the developing world.[14] For example, less than 10% of people in the European Union report that they regularly exercise or participate in sport,

Stamatakis is with the Physical Activity Research Group, Population Health Domain, University College London; the Research Dept of Epidemiology and Public Health, University College London, United Kingdom; and the Prevention Research Collaboration, School of Public Health, University of Sydney, Australia. Nnoaham, Foster, and Scarborough are with the British Heart Foundation, Health Promotion Research Group, Dept of Public Health, University of Oxford, United Kingdom.

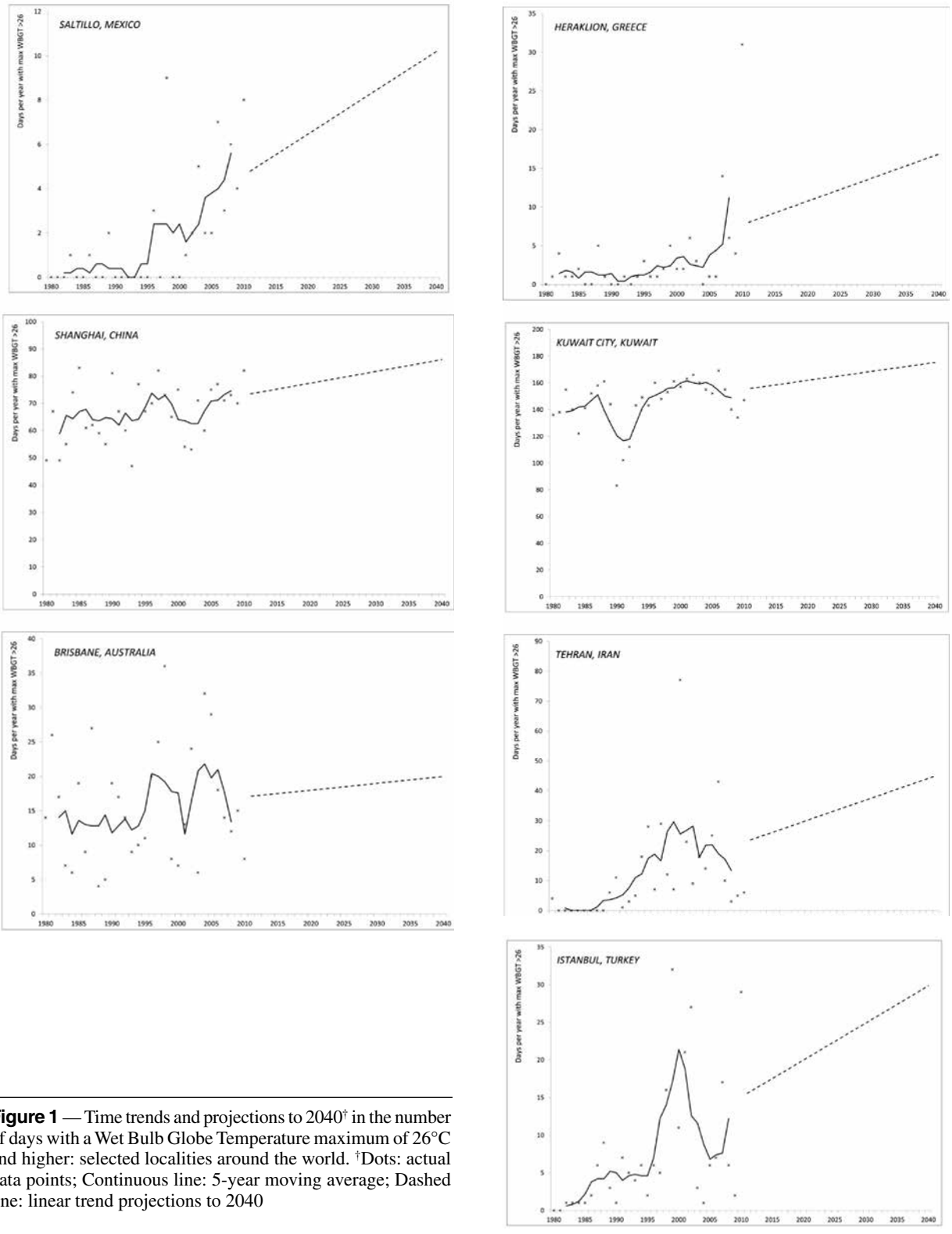

Figure 1 — Time trends and projections to 2040† in the number of days with a Wet Bulb Globe Temperature maximum of 26°C and higher: selected localities around the world. †Dots: actual data points; Continuous line: 5-year moving average; Dashed line: linear trend projections to 2040