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Of Heat & Arctic Blasts - The Risks to Human Health

Complicated by Inequalities and Migration

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Abstract

The run-up to the FIFIA World Cup football tournament in Qatar and the significant rise in fuel costs has focussed the world's attention on the environmental impact of climate change on human health. While it is true that the health impact of working outdoors in extreme heat is indeed injurious to human health and leads in increase mortality, what has been less in the news is (1) that the impact of even moderately cold environmental temperatures is by far much larger (9:1) on environmental determinants of mortality for vulnerable sections of the population, even in high-income countries such as UK or USA, and (2) that multi-factorial deprivation, fuelled by a legacy of imperialism, racism, oppression of migrants and socio-cultural exclusion in all societies vastly amplifies the adverse impact on health.

Considerable attention has focused on institutional racism but less on how the intersection of cultural values, frameworks, and meanings shapes institutional policies and practices. [1] This article explores the impact of environmental temperatures on human health, the influence of socio-cultural inequalities, the current interventions and the case for a policy approach that includes the voice of professional and voluntary groups representing minority groups.

Keywords
Environmental temperature and human health; health inequalities;

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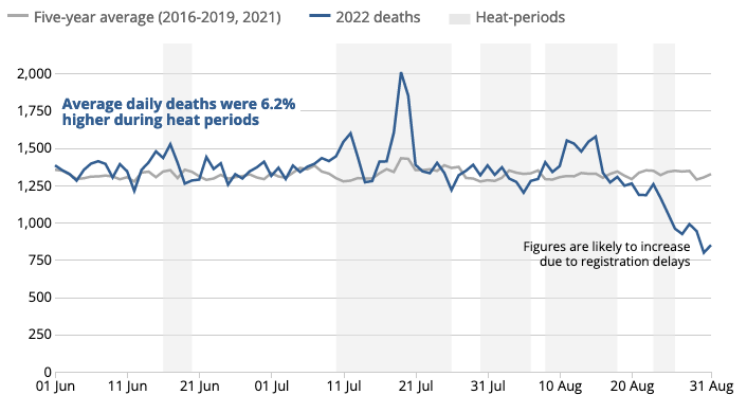
Background

The UK Office for National Statistics reports excess deaths during the heat in the summer months in figure 1, demonstrating the trend of rising numbers over the last 5-year period with rising environmental temperatures. [2] From 2016 to 2021, deaths were above the five-year average in every heat-period, with over 12.5 thousand excess deaths (9.3% above average, 119 average excess deaths per day). The rates are far higher in people over the age of 70 years. Even for a temperate country like the UK, situated so close to the Arctic circle and protected by the Gulf stream from climate extremes, this over 6% excess trend is indeed significant. While dementia, chronic respiratory disorders, gastrointestinal malignancies, and 'undetermined' causes top the list for all deaths irrespective of environmental temperature - the top 4 causes of excess deaths in the UK during the heat-periods were; cardiac arrhythmias, Parkinson's disease, diabetes and chronic lower respiratory disorders (11-17% excess compared to non-heat periods).

Number of daily death occurrences, five-year average and heat-period days, 1 June to 31 August 2022, England and Wales



Source: Office for National Statistics

Globally, over 5 million deaths were associated with non-optimal temperatures per year, accounting for 9·4% of all deaths. Of these, the vast majority, 8.5%, are cold-related, and less than 1% are due to excess heat, accounting for a mortality rate of 74 temperature-related excess deaths per 100 000 residents. The mortality burden varies geographically. Eastern Europe has the highest heat-related excess death rate, and Sub-Saharan Africa has the highest cold-related excess death rate. From early 2000–03 to 2016–19, the global cold-related excess death ratio dropped by −0·51 percentage points, and the global heat-related excess death ratio increased by 0·21 percentage points. [3]

The World Health Organisation reports that population exposure to heat is increasing due to climate change. Extreme temperature events are increasing in frequency, duration, and magnitude. Between 2000 and 2016, the number of people exposed to heatwaves increased by 125 million.[4] Global mean temperatures are expected to increase by as much as 5.5°C by the end of this century [5], which is, in turn, expected to increase the intensity of heat waves around the world, with the most significant relative effect on summer temperatures in regions, of Africa, South America, Middle East, and South Asia.

A study analysing changes in summer temperatures, the frequency, severity, and duration of heat waves, and heat-related mortality in India between 1960 and 2009 (using data from the India Meteorological Department) demonstrated those mean temperatures across India have risen by more than 0.5°C over this period, with significant increases in heat waves, modelled to a 146% increase in the probability of heat-related mortality events each of more than a 100 people, occurring. [6]

The FIFA 2022 World Cup Football tournament is ongoing in Qatar, bringing the world's focus to this country. Qatar has a migrant labour force of over 2 million people, who comprise approximately 95 per cent of its total labour force. Approximately 1 million workers are employed in construction, while another 100,000 are domestic workers. The kafala system governing the employment of migrant workers gives employers excessive control over them, including the power to prevent them from changing jobs, escaping abusive labour situations, and, for some workers, leaving the country. [7] According to International Labour Organisation (ILO) global estimates on international migrant workers, the number of migrant workers in 12 Arab States amounted to 24.1 million persons in 2019, representing 14 per cent of all migrant workers worldwide. Notably, the region has the highest global share of migrant workers as a proportion of the total workforce, reaching 41.4 per cent in 2019 compared to the global average of just 5 per cent. [8]

Migrant Health

Migrant workers are generally younger and healthier than the native population and are expected to have lower mortality, except when this is impacted by working and living conditions. In 2015, approximately 244 million people were transnational migrants, approximately half of whom were workers, often engaged in jobs that are hazardous to their health. They work for less pay, longer hours, and in worse conditions than nonmigrants and are often subject to human rights violations, abuse, human trafficking, and violence. Worldwide, immigrant workers have higher rates of adverse occupational exposures and working conditions, which lead to poor health outcomes, workplace injuries, and occupational fatalities. Health disparities of immigrant workers are related to environmental and occupational exposures. They result from language/cultural barriers, access to health care, documentation status, and the political climate of the host country. [9] Low socioeconomic status and poor access to health care also contribute to existing health problems in this population. [10] In the USA, a study examining the proportionate mortality of 26,148 subjects who were identified as farmworkers on death certificates from 24 US states during 1984–1993 found that farmworkers had significantly elevated proportionate mortality from injuries, tuberculosis, mental disorders, cerebrovascular disease, respiratory diseases, ulcers, hypertension, and cirrhosis. While there was significantly reduced mortality from infectious diseases (other than tuberculosis), endocrine disorders, nervous system diseases, pneumoconioses, arteriosclerotic heart disease, and all cancers combined. [11] Migrant workers also account for a disproportionate occupational injury morbidity and mortality burden, e.g. in China. [12] A systematic review which included occupational health outcomes for over 12 000 international migrant workers employed in 13 countries and territories, primarily in unskilled manual labour - found that migrant workers (originating from 25 low-income and middle-income countries) and working in agriculture, domestic, retail, and service sectors; construction and trade; and manufacturing and processing had various psychiatric or physical morbidities (47%) and over 1 in 5 encountered workplace accidents or injuries (22%). [13]

Impact of Heat on Health

The impact of heat waves on human and natural systems includes decreased air quality, diminished crop yields, increased energy consumption, increased evapo-transpiration, intensification of droughts, and—perhaps most concerning—direct effects on human health. Heat stress during high temperatures may also exacerbate health problems, such as cardiovascular and respiratory diseases, and cause life-threatening crises. Specific segments of the population, such as the young, the elderly, and those who are economically deprived, may be especially susceptible to this health impact due to existing health conditions and lack of essential resources, such as clean drinking water, shelter, air conditioning and health care. Populations without central air conditioning tend to have higher heat-related mortality rates. Occupational heat stress on migrant workers in constructing the public metro railway was explored in a study in Southern India, showing the adverse impact on health, productivity losses, and social lives. [14]

Mortality among migrant workers is often not investigated or recorded, leading to a poor understanding of causes or contributors. A recent analysis of causes of death of Nepali migrant workers in Qatar showed that there was a strong correlation between average monthly afternoon heat and humidity levels and cardiovascular mortality. Compared to approximately 15% of deaths in the age group 25–35 years globally are attributable to cardiovascular causes, in this migrant population, the figures were 22% during the cool season and 58% during the hot season. [15,16]

Impact of Cold Temperatures

Although the vast majority of the mortality attributable to extreme environmental temperatures is due to cold, the effect of days of extreme temperature was substantially less than that attributable to milder but non-optimum weather.[17] In a population study from China, extreme cold was responsible for 25% of the total death burden. In the stratification analyses, attributable risk due to cold was higher for cardiovascular than respiratory disease.[18] In India, the moderately cold temperature was estimated to have higher attributable risks for all medical deaths, 27% for stroke, 10% for heart disease, and 7% for respiratory diseases) than extremely cold, moderately hot, and extremely hot temperatures. In a population between 30-69 years, this is 12- and 42-fold higher than totals from extremely cold and extremely hot temperatures, respectively. [19] In populations over the age of 65 years, a one °C temperature rise increased cardiovascular (3.44%, 95% CI 3.10-3.78), respiratory (3.60%, 3.18-4.02), and cerebrovascular (1.40%, 0.06-2.75) mortality. A 1°C temperature reduction increased respiratory (2.90%, 1.84-3.97) and cardiovascular (1.66%, 1.19-2.14) mortality. The most significant risk was associated with cold-induced pneumonia (6.89%, 20-12.99) and respiratory morbidity (4.93%, 1.54-8.44). [20]

Challenges and solutions

The run-up to the winter of 2022 has led to a renewed focus on the extremes of climate impact on human and migrant health. While the world has focussed and learnt from the impact of extreme heat on migrants in Qatar, not so much in building football stadiums but in the associated less-regulated construction industry. At the same time, the cost of living crisis and the phenomenal rise in oil and gas-dependent heating costs in Europe and many parts of the world leads to fuel poverty, posing a considerable risk of increasing cold-related mortality.

Winter fuel supplements

In the UK, the cold weather plan uses an algorithm to automatically trigger supplemental resources for the populace on benefits or the elderly every time the mercury falls below a predetermined minimum, which is extreme. Many studies on the cost-effectiveness of such public health initiatives often find weak evidence to support such payments unless they are specifically targeted at those at extreme risk.[21] While the introduction of the CWP has reduced cold-related mortality in those under 65 years, there was significant geographical variation based on markers of poverty/ deprivation, and mortality increased significantly among those aged 75+ and for respiratory conditions. [22] The evidence does suggest that the morbidity and mortality burden of moderate cold snaps are much more significant and impact a much wider proportion of the population.

Indoor environment

Substantial housing energy efficiency investments through a managed upgrade programme may result in better social and health outcomes, and the size of the improvements is proportionate to the number of measures installed and the amount invested.[23] Home energy efficiency measures installed in England in 2002–10 have had a modest impact on improving the indoor environment. The gains in winter temperatures (around +0.09 °C on a day with a maximum outdoor temperature of 5 °C) are associated with an estimated annual reduction of ≈280 cold-related deaths in England (an eventual maximum annual impact of 4000 life-years gained). Residents aged ≥ 60 years living in homes in which electrical systems were upgraded associated with 39% fewer admissions than those in homes in which they were not. [24]

Still, these impacts may be appreciably smaller than those of changes in indoor air quality. Modelling studies indicate the potential importance of HEE measures' medium- and longer-term impacts on health, which are not observable in short-term studies. Evidence highlights the complex relationships between health and housing, showing that while energy efficiency measures can improve health outcomes (especially when targeting those with chronic respiratory illness), reduced household ventilation rates can impact indoor air quality, for example, and increase the risk of diseases such as asthma. [25]

The best available evidence indicates that housing which is an appropriate size for the householders and is affordable to heat is linked to improved health and may promote improved mental health and social relationships within and beyond the household.[26] To be sustainable, household energy efficiency policies and resulting interventions must account for whole-house approaches (i.e. consideration of the whole house and occupant lifestyles). These must consider alternative 'greener' and more sustainable measures, which can account for variable lifestyles and the need for adequate heating and ventilation. [25] They also suggest that household energy-efficiency improvements of similar annualised cost to current cold weather payments would achieve more significant improvements in health while reducing (rather than increasing) carbon dioxide emissions. [27]

Similarly, the increase in demand for cooling in Africa is non-uniform, and that tropical countries are exposed to higher heat stress than higher latitude countries. Evaporative coolers are less effective in tropical regions than in extratropics, and both low and high-efficiency coolers are sufficient to return Africa to current levels of heat stress under climate change.[28]

Systemic Inequalities

Structural racism is the historical and ongoing reinforcement of racism within society due to discriminatory systems and inequitable distribution of crucial resources. Racism is embedded within institutional structures, processes, and values that perpetuate historical injustices and restrict access to structural factors that directly impact health, such as housing, education and employment. Due to the complex and pervasive nature of structural racism, interventions that act at the structural level rather than the individual level are necessary to improve racial health equity. A systematic review of interventions such as supplemental income programs, minimum wage policies, nutrition safeguard programs, immigration-related policies, and reproductive and family-based policies. The findings of studies were largely mixed, although there were clear benefits to policies that improve socioeconomic status and opportunities. [29]

The real-time emergence of COVID-19 disparities has heightened the public and scientific discourse about structural inequities contributing to the greater risk of morbidity and mortality among racial and ethnic minority populations and other underserved groups. A key aspect of assuring health equity is addressing social determinants that lead to adverse health outcomes among minoritised groups. [30]

Conclusion

Overall, research on the effects of structural-level interventions to address health inequities still needs to be done. The evidence base would benefit from well-designed studies on upstream policy interventions that affect the structural determinants of health and health inequities and improve daily living conditions. There is a need to provide early childhood development resources, implement policies to reduce childhood poverty, provide work and income support opportunities for adults, and ensure healthy housing and neighbourhood conditions. [31]

Within the healthcare system, there needs to be an emphasis on ensuring access to high-quality care for all, strengthening preventive healthcare approaches, addressing patients' social needs as part of healthcare delivery, and diversifying the healthcare workforce to more closely reflect the demographic composition of the patient population. To achieve this, governmental organisations must develop an understanding and insight into the cultural and racial barriers to health. Building a culture of health and achieving health equity requires that we assess cultural racism in a more meaningful way.[32] Build meaningful partnerships with the voluntary sector and professional bodies representing the minoritised groups and break down barriers to access and improve trust.

Finally, new research is needed to identify the optimal strategies to build political will and support to address social inequities in health. This will include initiatives to raise awareness levels of the pervasiveness of inequities in health, build empathy and support for addressing inequities, enhance the capacity of individuals and communities to participate in intervention efforts actively and implement large-scale efforts to reduce racial prejudice, ideologies, and stereotypes in the larger culture that undergird policy preferences that initiate and sustain inequities.

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