HSBC Global Research

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Heat stress

More heat, more stress, more workplace regulation

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Climate Change & ESG - Global

- Rising temperatures will lead to greater numbers of people facing heat stress, especially those working outdoors
- Agriculture and construction are the sectors most affected; chronic kidney disease is one of the most severe outcomes
- Investors should be aware of tightening workplace heat regulation and ESRS requirements to disclose on H&S issues

Impact of heat stress on labour productivity will be profound.

The impact of heat stress on labour productivity is likely to be among the most serious economic consequences of climate change, with the percentage of working hours lost to it set to exceed 2% by 2030 (ILO). The agriculture and construction sectors are most affected as outdoor work is most prevalent here, and often involves high levels of physical exertion. Textiles, tourism and food delivery are other sectors at risk.

Chronic kidney disease is one of the more severe outcomes of heat stress.

Chronic kidney disease of uncertain cause (CKDu) has been well documented among sugarcane workers in Central America – predominantly healthy young males whose kidneys should not be failing. There are clear links to repeated heat stress and evidence is starting to build of CKDu emerging among other cohorts, such as migrant workers returning from manual labour in the Middle East and other hot countries.

We expect heat stress regulations will continue to proliferate and tighten.

A clear example of this is the US where, after a record hot summer in 2021, the Occupational Safety and Health Administration (OSHA) finally initiated the process of developing a federal level heat stress prevention rule following decades of pressure to do so. Elsewhere, Qatar last year extended its summer outdoor work ban period, and Costa Rica has introduced regulation specifically aimed at preventing CKDu.

Heat stress risk should be disclosed and reported under proposed ESRS.

Under the proposed EU Sustainability Reporting Standards (ESRS), where workplace heat stress is identified as a material issue, its actual and potential impacts on the workforce – **including workers within the supply chain** – should be disclosed, along with actions to prevent, mitigate or remedy it, and any targets related to reducing the negative impact.

We think companies and investors should get ahead of the heat stress curve.

We think companies should assess – in both their own operations and their supply chains – whether local laws and regulations are sufficiently protective against heat stress, and implement best-practice policies where they are deemed to fall short, or do not yet exist. In addition, we think companies should have forward-looking assessments in place to anticipate where heat stress risk is likely to increase as the planet warms, with clear plans to address it if it does.

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Heat stress impact

Range and severity of exposure*

Low (26.6-29.4˚C)

Impact: Body stressed after 45 minutes

Action: 15-minute break for each hour if working in direct sunlight. Stay hydrated

Moderate (29.4-31.1˚C)

Impact: Body stressed after 30 minutes. Heat cramps likely

Action: 30-minute break for each hour if working in direct sunlight. Drink ½ litre of water per hour

High (31.1-32.2˚C)

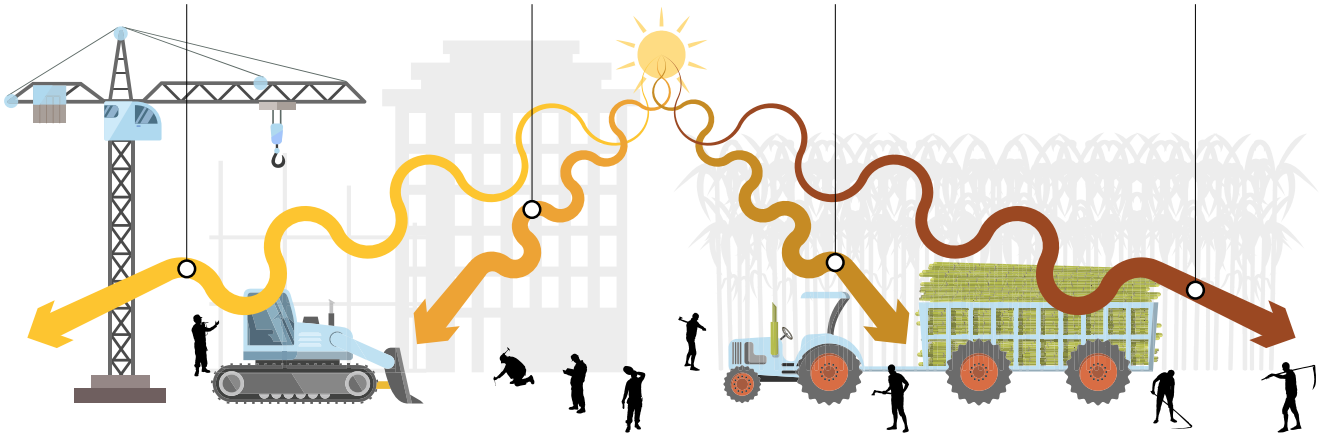
Impact: Body stressed after 20 minutes. Heat exhaustion likely

Action: 40-minute break for each hour if working in direct sunlight. Drink 1 litre of water per hour

Extreme (>32.2˚C)

Impact: Body stressed after 15 minutes. Heat stroke likely

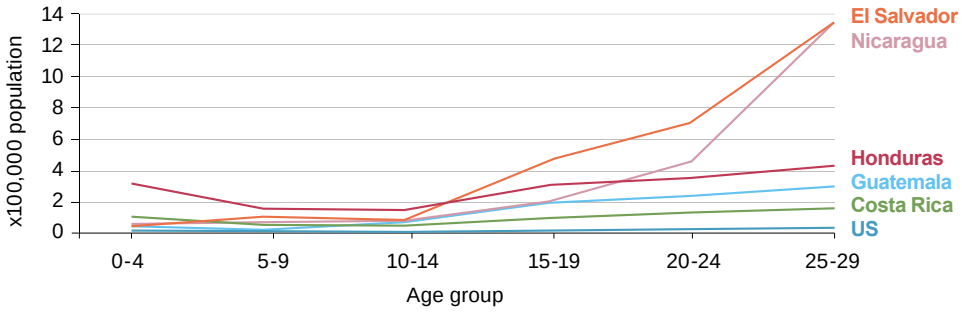
Action: 45-minute break for each hour if working in direct sunlight. Drink 1 litre of water per hour



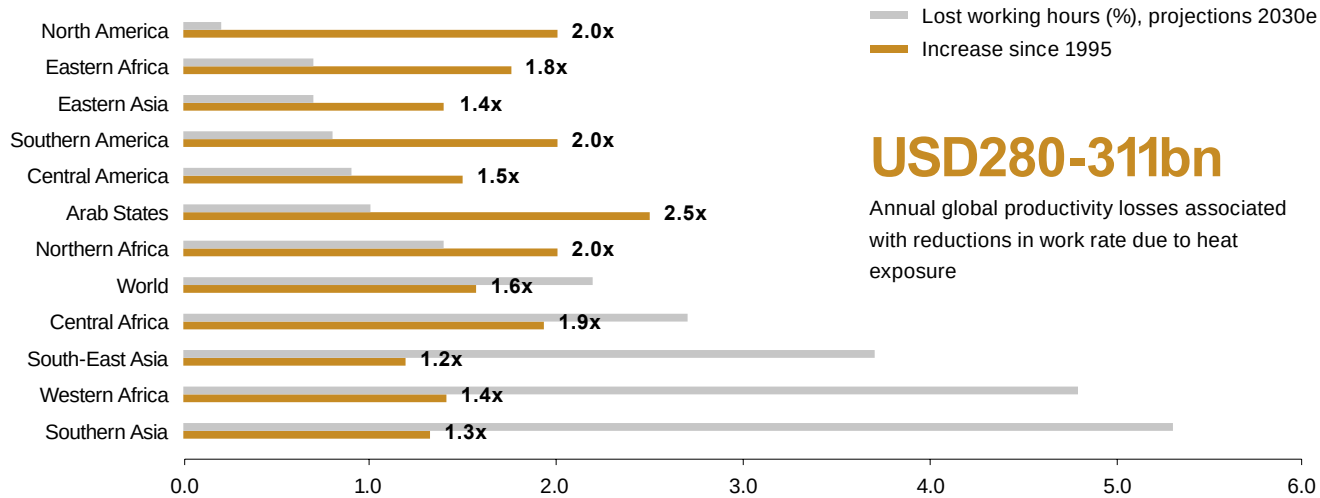
Chronic kidney disease

Chronic kidney disease (CKD) is one of the more severe outcomes of heat stress, and has been well documented among sugarcane workers in Central America, with evidence building among migrant workers returning from manual labour in the Middle East and other hot countries

Male death rate due to CKD in Central American countries vs US



Impact of heat stress on labour productivity**



USD280-311bn

Annual global productivity losses associated with reductions in work rate due to heat exposure

Note: * Heat stress conditions are best defined using the Wet-Bulb Globe Temperature (WBGT) index. The WBGT index takes into consideration humidity, solar radiation, and wind speed, as well as ambient temperature.
** Western Asia, Central Asia, Southern Africa, Southern Europe, Eastern Europe, Western Europe, and Northern Europe excluded as % of working hours lost is, and is expected to remain, 0.1% or less.
Source: ILO, National Weather Service, Pan American Health Organization, US Army, US OSHA, HSBC

More heat, less work

- Global warming will make heat stress more common; its impact on labour productivity will have serious economic consequences
- Agriculture and construction will be most affected; textiles, food delivery and tourism are other sectors to watch
- Vulnerable workers in developing countries most exposed, but migrant, older and ethnic workers in developed countries also at risk

Workplace heat stress an increasing issue as the planet warms

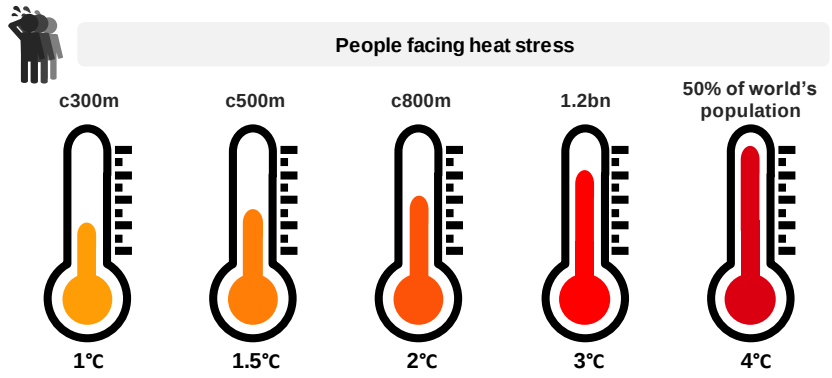
Global warming will make heat stress more common

Even at 1.5°C of warming the number of people facing heat stress will nearly double

The c1.1°C of warming above pre-industrial levels that we have already experienced has almost tripled the number of people facing heat stress conditions (at least one day per annum with Wet-Bulb Globe Temperature (WBGT) [1]exceeding 33°C, the safety threshold for humans at rest) to c300m. At 1.5°C of warming the number is projected to rise to c500m, at 2°C it could rise to c800m, and at 3°C it could hit 1.2bn – 4x the level of today (source: Rutgers University[2]). In a separate study, the UK Met Office calculated that, at 4°C of warming, half the world's population would suffer from extreme heat stress[3]. Note that the warming levels cited in this paragraph are *global average temperatures* and localised temperature increases can be much higher.

It is important to note that a WBGT reading is not directly comparable to standard temperature readings; for example, a temperature of 50°C coupled with zero humidity equates to a WBGT temperature of 32°C, as does a temperature of 26°C with 100% humidity.

Figure 1: People facing heat stress across different warming levels



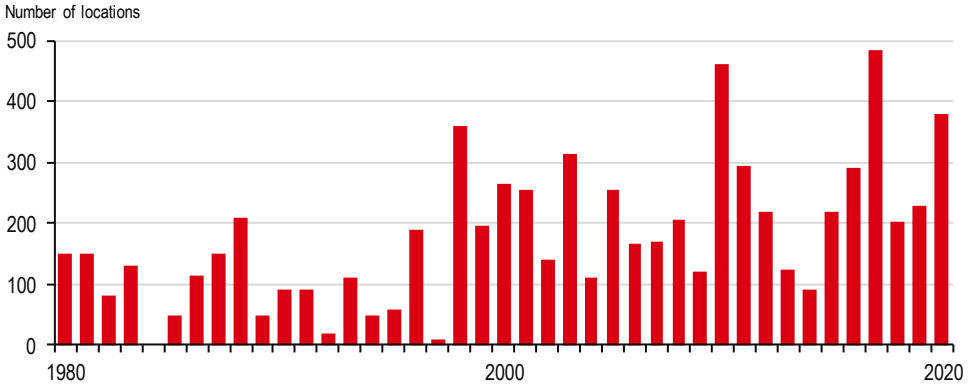
Source: Rutgers University, UK Met Office, HSBC

The number of locations experiencing 50°C is rising…

The increase in the number of people facing heat stress conditions is driven by rising numbers of locations experiencing extreme heat. As an example, more places are now seeing temperatures of 50°C.

1 In this report, all WBGT temperatures will be labelled as such; if not labelled WBGT they are standard (°Celsius or °Fahrenheit)
2 Escalating global exposure to compound heat-humidity extremes with warming, Dawei Li et al 2020 Environ. Res. Lett. 15 064003
3 Defined as a WBGT temperature of 32°C for at least 10 days a year.

Figure 2: Locations recording 50◦C



Source: BBC, HSBC

…and some parts of the world are warming more quickly than others

But, as we have already mentioned, some regions are warming more quickly than others. A BBC analysis found that, in the most recent decade, **maximum temperatures** increased on average by 0.5°C compared with the long-term averages from 1980 to 2009. But some parts of the world have suffered more than others – Eastern Europe, Southern Africa and Brazil saw some maximum temperatures rise by more than 1°C, and parts of the Arctic and Middle East recorded increases of more than 2°C.

Impact on labour productivity likely to be a serious economic consequence

Elevated temperatures pose health risks to many parts of the population, at home as well as in the workplace. For example, heatwaves in Europe in the summer of 2021 contributed to thousands of excess deaths, according to Eurostat, with those aged over 65 particularly at risk. But our focus in this paper is heat stress in the workplace, in particular.

Labour productivity is heavily impacted by heat stress

According to the ILO (International Labour Organization), the impact of heat stress on labour productivity is likely to be among the most serious economic consequences of climate change, with the effects being felt not only by individual workers but also by their families, businesses, communities, and potentially entire economies.

Temperatures above 24-26°C are associated with reduced labour productivity, and at 33-34°C a worker operating at moderate work intensity loses 50% of their work capacity[4]. Moreover, heat regulations and standards require that workers take cool-down rest breaks as temperatures rise.

Southern Asia and Western Africa likely to be most affected…

According to a Nature Communications article[5], global productivity losses associated with reductions in work rate due to heat exposure are currently running at USD280-311bn a year, most of these in low-and middle-income countries, and in the agriculture and construction sectors (where outdoor work is particularly prevalent). The ILO projects that, by 2030 (and assuming a global temperature increase of 1.3°C), the equivalent of more than 2% of total working hours worldwide will be lost every year, either because it is too hot to work or because workers have to work at a slower pace. In Southern Asia and Western Africa, the figure could reach 5% and, overall, vulnerable workers in developing countries will be most affected.

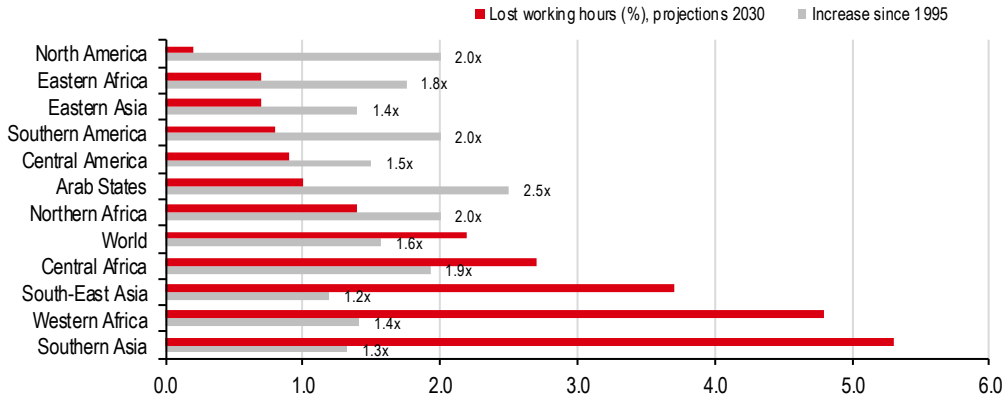
The chart below shows both the projected working hours lost to heat stress in 2030 (as a % of the total) and the increase since 1995 (x). It excludes those regions (including the whole of Europe) where the % of working hours lost is, and is expected to remain, 0.1% or less.

…but developed countries such as the US are not immune…

In terms of the projected increase, the Arab States are expected to see the greatest uplift (at 2.5x), which is unsurprising given that the Middle East is one of the fastest warming regions. What is perhaps more surprising is that North America is expected to see a doubling of hours lost, which puts it in the same bracket as South America and Northern Africa (albeit starting from a much lower base).

4 Working on a warmer planet, International Labour Organization, 2019
5 Parsons, L.A., Shindell, D., Tigchelaar, M. et al. Increased labor losses and decreased adaptation potential in a warmer world. Nat Commun 12, 7286 (2021).

Figure 3: Working hours lost to heat stress by sub region



Source: ILO, HSBC. Note: Western Asia, Central Asia, Southern Africa, Southern Europe, Eastern Europe, Western Europe and Northern Europe excluded as % of working hours lost is, and is expected to remain, 0.1% or less.

…although it is their more vulnerable populations that suffer most

Indeed, in the US specifically, the Atlantic Council6 calculates that, without action to reduce emissions and/or adapt to extreme heat, labour productivity losses due to heat could double to cUSD200bn by 2030 and reach USD500bn by 2050 (equivalent to around 1% of GDP). Moreover, losses are skewed towards Black and Hispanic workers who tend to live and work in more heat-exposed areas of the country.

In addition to economic costs, extreme heat also leads to higher rates of occupational injuries – Park et al. 2021 found that hot days increase occupational injuries for both outdoor and indoor activities. Without adaptation, they calculate that extreme heat could increase the number of heat-related occupational injuries in the US nearly four-fold, to c450,000.

Agriculture and construction top the list of sectors affected

Agriculture and construction most affected due to outdoor work and physical exertion

Agriculture and construction are the most affected sectors as outdoor work is most prevalent here. In addition, the jobs often involve high levels of physical exertion and the wearing of heavy clothing and personal protective equipment (PPE). Moreover, economies where these sectors predominate are generally located in hotter and less developed parts of the world, such as Africa and Asia. A key factor to note here is that less development means reduced ability to adapt to higher temperatures, including in the workplace.

Figure 4: Working hours lost to heat stress by sector, projections for 2030 (%)

Source: ILO, HSBC

In the full note, we take a look at implications for these two sectors, as well as textiles, food delivery, and Tourism and Leisure, where heat stress can also be a problem. For more information, please contact your HSBC representative.

6 Extreme Heat, The Economic and Social Consequences for the United States, the Adrienne-Arsht Rockefeller Foundation Resilience Center, housed at the Atlantic Council, September 2021

Chronic kidney disease

- CKDu was first described in El Salvador in the 1990s when large numbers of sugarcane workers started dying of kidney failure
- Young males are most at risk; heavy workloads and lack of regulatory oversight in the workplace are key contributing factors
- Both regulation and certification standards are beginning to address CKDu specifically, with application potentially in other sectors as well

Chronic kidney disease of uncertain cause (CKDu)

Chronic kidney disease (CKD) is a type of kidney disease where there is a gradual loss of kidney function over a long period of time. This results in the kidneys being unable to filter blood the way they should, which leads to a build-up of excess fluid and waste in the body. In advanced CKD these levels of fluids and waste become dangerous. Over time, CKD can lead to kidney failure, the only treatment for which is dialysis or a kidney transplant (both of which are expensive).

Risk factors for CKD are diabetes (the leading cause of CKD), high blood pressure, heart disease and a family history of kidney failure. The focus of this section, however, will be what is termed **CKDu – chronic kidney disease of uncertain cause.**

Sugarcane workers in Central America are particularly at risk of CKDu

CKDu was first described in El Salvador in the 1990s when large numbers of agricultural workers – in particular sugarcane workers – started dying from kidney failure.[7] It quickly became clear that the phenomenon was present in other agricultural communities in hot, humid regions. Indeed, in both Nicaragua and El Salvador, the mortality rate from CKD is 10x higher than what should be expected.[8]

There is increasing evidence that extreme heat exposure can lead to gradual kidney impairment over time, potentially resulting in CKDu. The creeping nature of the disease means that, by the time it is diagnosed, most workers are already too ill to work.[9]

Those affected typically have limited access to medical care or insurance

This is compounded by the fact that those affected typically come from disadvantaged backgrounds, with limited access to medical care or insurance. The most vulnerable of all are those who have no control over their working conditions or are incentivised to work for long hours without breaks (e.g. being paid for how much sugarcane they cut).[10]

As an indication of the speed at which the phenomenon has been developing, hospitalisations for CKD in El Salvador increased by 50% between 2005 and 2012, making CKD the leading cause of hospitalisation in the country (source: International Society of Nephrology).

Costa Rica introduced heat regulation specifically to prevent CKDu

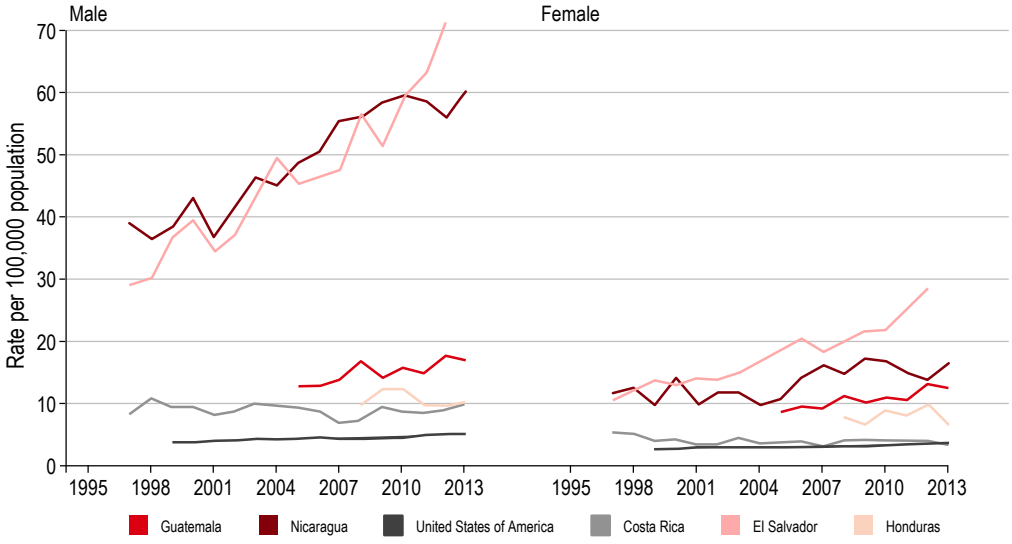
Male deaths from kidney disease have also been rising rapidly, in both Nicaragua and El Salvador, as well as surrounding countries such as Guatemala and Costa Rica. Indeed, Costa Rica introduced heat stress regulation in 2015 specifically with the aim of preventing CKDu.

7 Johnson RJ, Wesseling C, Newman LS. Chronic kidney disease of unknown cause in agricultural communities. N Engl J Med 2019;380:1843-1852.
8 In El Salvador and Nicaragua, the mortality rate from CKD is "10x higher than what we should expect". Dr Ramón García Trabanino, El Salvador's Centre of Hemodialysis (The Guardian, 21 Oct 2021)
9 Cecilia Sorensen, M.D., and Ramon Garcia-Trabanino, M.D. A New Era of Climate Medicine — Addressing Heat-Triggered Renal Disease. N Engl J Med 2019; 381:693-696
10 Global heating 'may lead to epidemic of kidney disease'. The Guardian, 21 Oct 2021

Prevalence is particularly high among young males

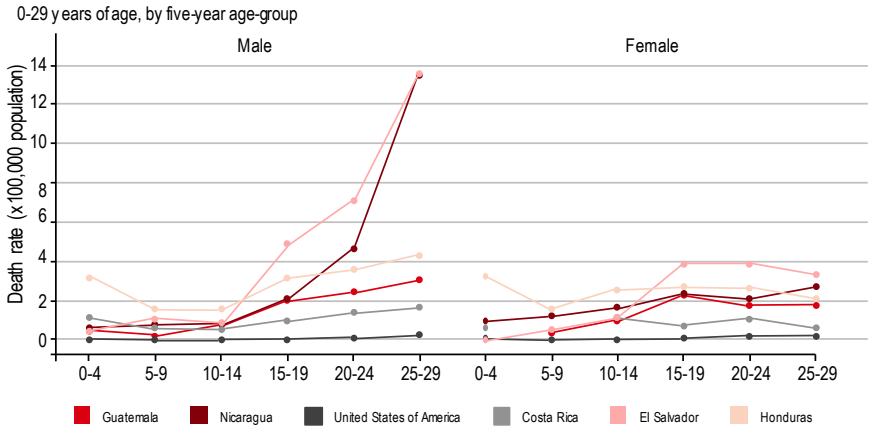
Not only does the disease strike primarily at males, but its prevalence in younger males is at levels far higher than should be expected, and these levels continue to rise at a rapid pace. Its prevalence is rising among females as well, but at a slower pace.

Figure 5: Chronic kidney disease age-standardised mortality rate trends in all ages population, by sex in Central American countries (and the US) from 1997 to 2013



Source: Regional Mortality Information System. Pan American Health Organization

Figure 6: Chronic kidney disease mortality rates in 0-29 year old population by sex and age-group in Central American countries (and the US) 2010-2012



Source: Regional Mortality Information System. Pan American Health Organization

The full note contains a look at how heavy workloads and lack of regulatory oversight are key factors in CKD, how sugar certification standards are starting to address CKDu and why migrant workers are an oft forgotten group when it comes to CKDu research and tracking. For more information, please contact your HSBC representative.

Heat regulation also rising

- As workplace heat stress becomes a growing issue regulations to address it are also on the increase…
- …as are disclosure requirements, particularly within the proposed ESRS, which extends to workers within the value chain as well
- Equally important is that workers are not discouraged in any way from taking the prescribed amounts of water, rest and shade

The regulatory temperature is rising too…

As temperatures rise, and workplace heat stress becomes a growing issue, regulations to address it are also on the increase.

The US has finally initiated a workplace heat stress rule following a summer of record temperatures…

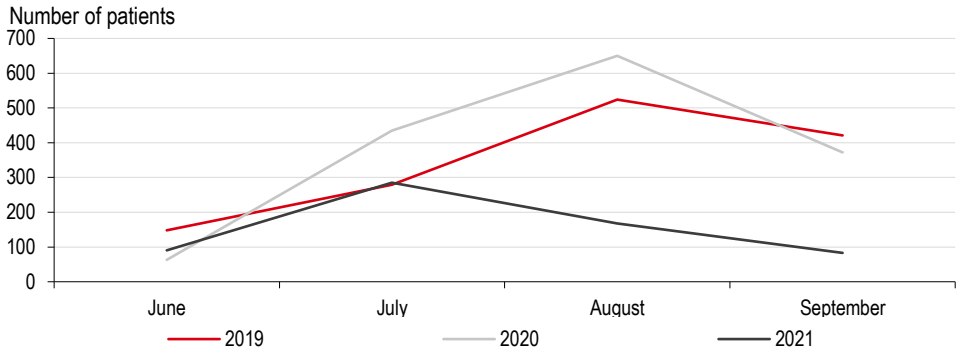
A clear example of this is the US, where the Occupational Safety and Health Administration (OSHA) has finally initiated the process of developing a federal level heat stress prevention rule following decades of pressure to do so. It initiated the rule making process in October 2021 following a summer of record temperatures (including the hottest June on record for many parts of the Northwest), although it has not yet indicated when a rule might be issued.

Meanwhile, several states (including in the Northwest) have taken matters into their own hands, either introducing new rules or upgrading those that were already in place. A particular feature of the upgrades has been the introduction of additional, higher temperature thresholds at which additional requirements kick in (e.g. 100°F in the Washington State emergency rules).

…while Qatar has extended its summer work ban period and introduced a temperature-based ban as well…

Elsewhere in the world, Qatar last year extended its summer outdoor work ban to run for 3½ months. This compares to the three-month bans elsewhere in the GCC (except for Bahrain, where the ban lasts only two months, although there have been calls to extend it to three). Qatar also extended the hours during which the ban is effective, to a total of 5½, which compares to 2½ - 5 hours in the other states. In addition, all work must stop if the WBGT rises above 32.1°C (90°F) in a particular workplace **regardless of the time of day or time of year.** The effectiveness of the new regulation coupled, importantly, with a targeted campaign by labour inspectors to enforce it, resulted in a significant decrease in heat-related disorders.

Figure 7: Number of patients with heat-related disorders in Qatar



Source: ILO

…and the EU has a project underway looking at the likely impact of heat stress on key industries

Even in the EU, which is not expected to suffer greatly from rising workplace heat stress in the near term (out to 2030), a project is underway (the Heat-Shield project) looking at the negative impacts of workplace heat stress on the health and productivity of the EU workforce. Specifically, it is analysing the impact of increasing heat levels in certain work situations due to climate change during this century, with a focus on the manufacturing, construction, transportation, tourism, and agriculture industries (which together account for 40% of EU GDP and 50% of its workforce). Currently, although some EU countries (e.g. Germany and Cyprus) have specific heat stress regulations in place there is no EU-level legislation (although assessment and management of heat stress is covered in a series of ISO standards).

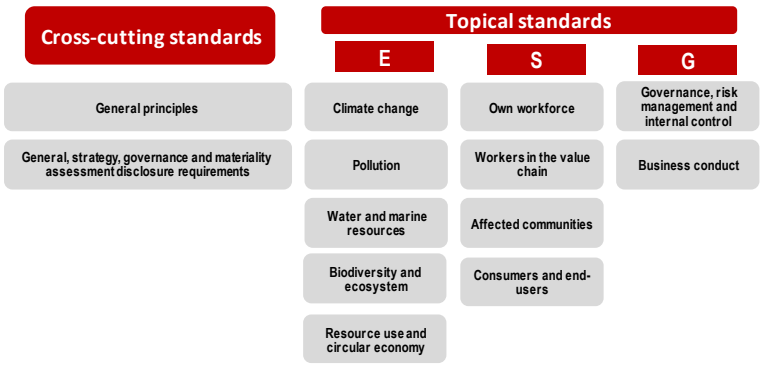
…as are disclosure requirements

EU Sustainability Reporting Standards (ESRS) expected to be adopted this year

The ESRS, expected to be adopted by the European Commission (EC) this year, set out sustainability reporting standards and standardised indictors and will apply to all large and listed companies in EU regulated markets.

The draft standards comprise two cross-cutting standards and 11 topical standards across environment, social and governance topics (see below). The cross-cutting standards are applicable to all sectors and companies, whereas companies have some choice in relation to the topical standards – companies should report against all topics that are deemed to be material to them and explain any exclusions. The topical standards set disclosure requirements such as polices, targets, action plans and performance management.

Figure 8: Overview of draft ESRS



Source: EFRAG

…should require disclosure of material workplace heat stress impacts, including when they are present in the supply chain

An extremely important point to note is that, within the Social segment of the ESRS topical standards (which includes health and safety) the requirements apply to workers within the value chain (both upstream and downstream, ESRS S2) as well as to a company's own workforce (ESRS S1).

This is particularly crucial when it comes to the topic of heat stress as this is where the risks for European companies are most likely to lie – particularly in the food and fashion supply chains.

Rate and extent of global warming make identification of 'potential impacts' key

Another crucial point in relation to workplace heat stress is that the identification of 'potential impacts' will be particularly important given the rate and extent of global warming. As there is a now a decent body of scientific evidence to help determine which countries and regions will likely suffer the most this exercise should not be overly onerous.

Where a material negative impact on the workforce has been identified (actual or potential), there is a further requirement to disclose:

- what actions are underway to prevent, mitigate or remedy the impact
- how the company assesses the effectiveness of these actions
- any outcome-related targets it may have related to reducing the negative impact

For value chain workers, there is also a requirement to provide a brief description of the types of workers impacted, including whether they work in the upstream or downstream value chain, whether they are particularly vulnerable to negative impacts (e.g. migrant workers, or women), and if so, why.

Actions taken in relation to value chain workers, may include those related to purchasing, as well as capacity-building or other forms of engagement with entities in the value chain, or collaborative action with industry peers.

The full note takes a look at what the key elements, other than regulation, are for combatting heat stress. For more information, please contact your HSBC representative.

Disclosure appendix

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