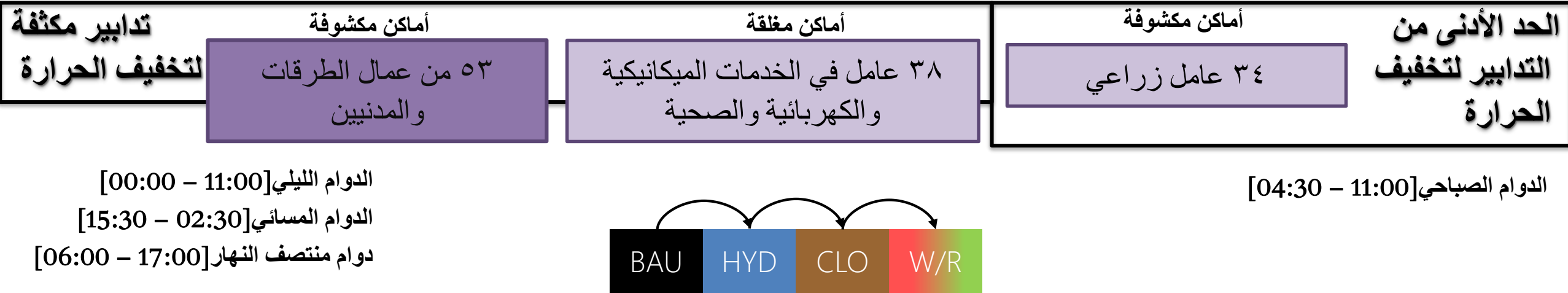


البحث الذي أجرته قطر لجمع الأدلة اللازمة للتصدي للإجهاد الحراري المهني

الدكتور أندرياس فلوريس
مختبر Fame Lab، جامعة ثيساليا، اليونان



رصد أكثر من ٥٥٠٠ ساعة عمل



بيانات عن الفسيولوجيا والصحة والعمل والمناخ

Metabolic Rate

second by second time-motion analysis or real-time analysis

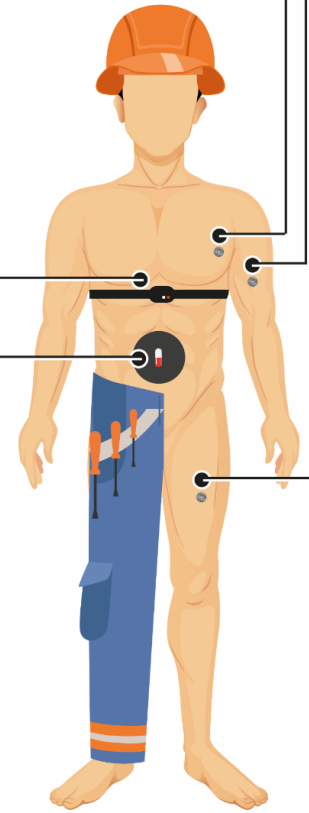


Heart Rate

beat by beat heart rate data using heart rate monitors

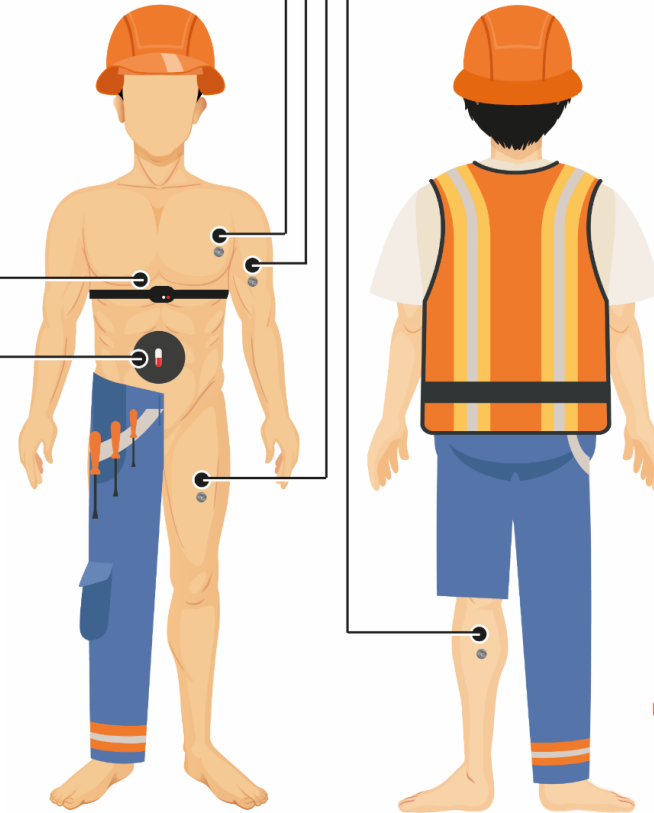
Core Temperature

continuous core temperature data using telemetric capsules



Mean Skin Temperature

continuous skin temperature from four sites using wireless thermistors

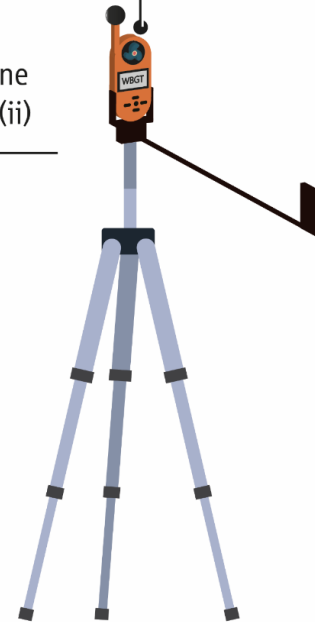
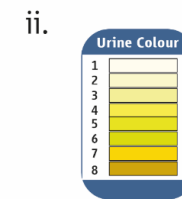


Occupational Heat Stress

continuous environmental data using a portable weather station

Hydration State

pre and post evaluation of urine specific gravity (i) and colour (ii)

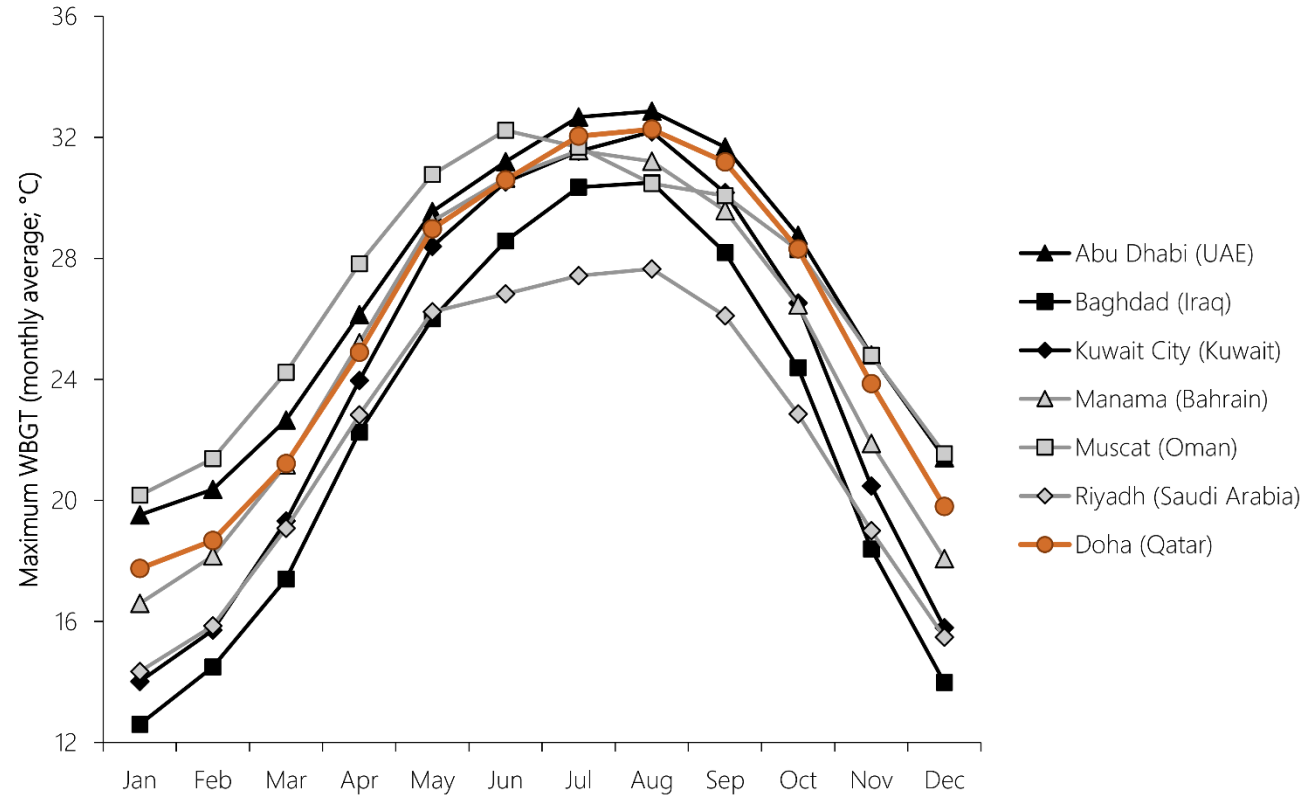


البيانات المناخية الحالية والتوقعات المستقبلية

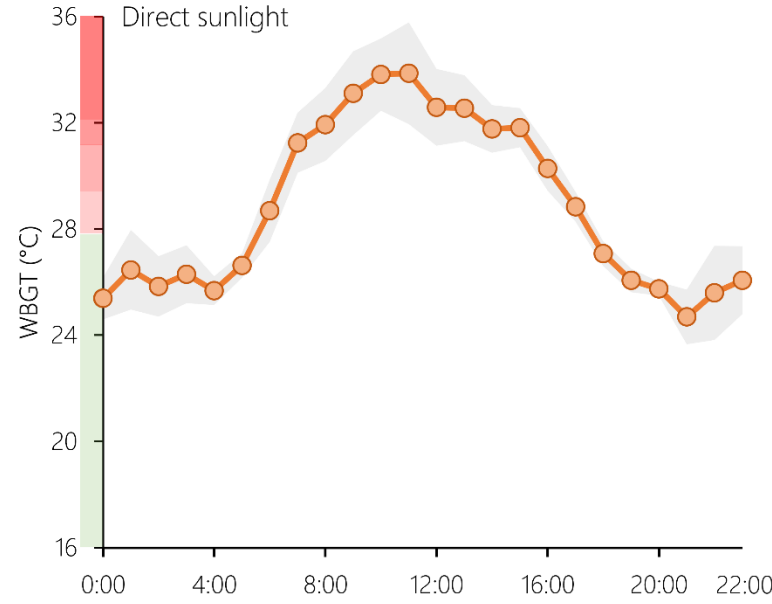
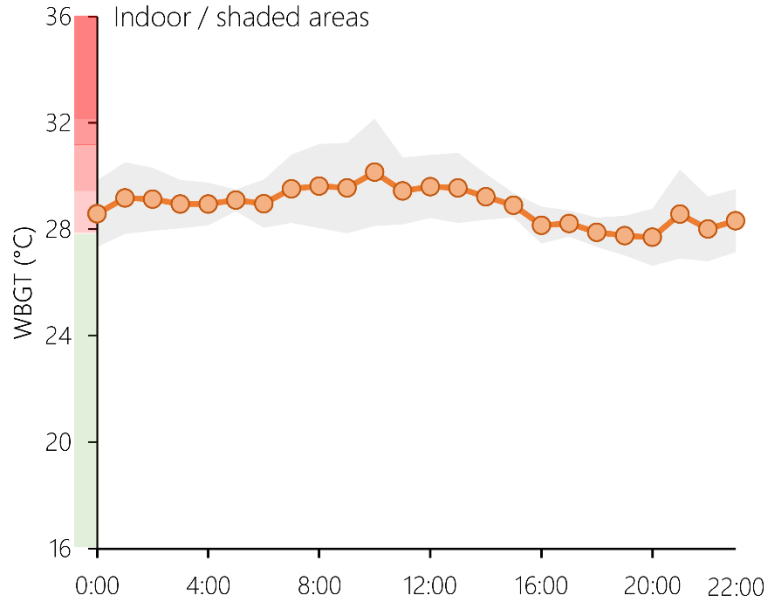
﴿ قطر واحدة من أكثر البلدان حرارةً في منطقة الخليج

﴿ إذا توفرت استراتيجيات التخفيف، تنخفض نسبة الإعياء الحراري

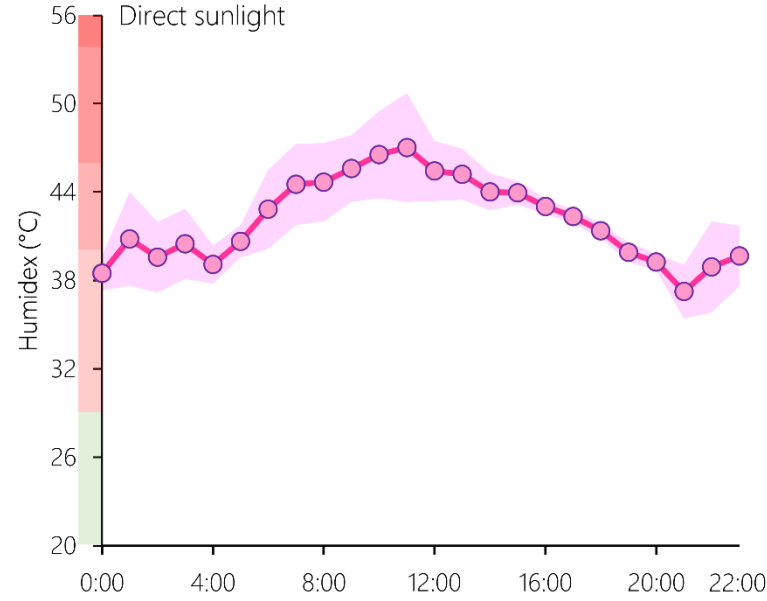
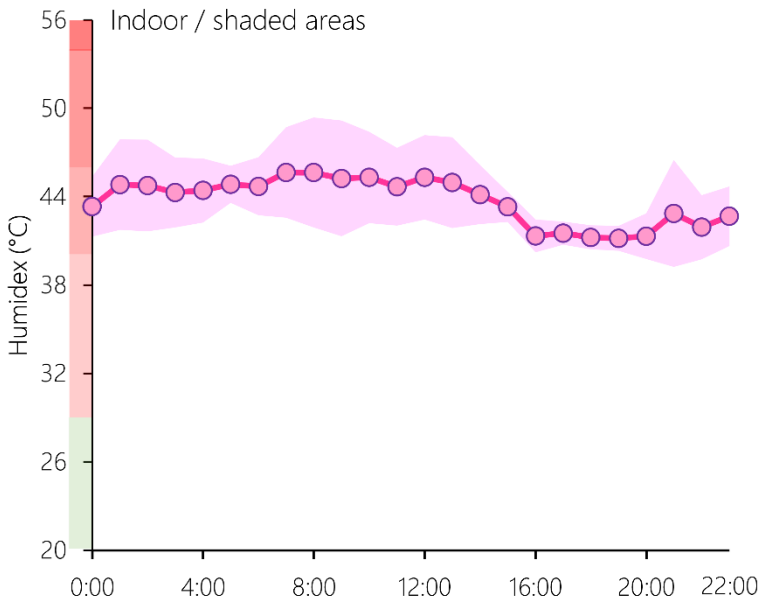
– مماثلة أو أقل خطورة من تلك التي سجّلت في دراسات العديد من الدول



الإجهاد الحراري المهني مرتفع تحت أشعة الشمس



الإجهاد الحراري المهني
– منخفض في أماكن الظل/المغلقة
– مرتفع في الأماكن تحت أشعة الشمس خلال منتصف النهار



لا يعكس HUMIDEX الفرق
بين العمل في أماكن الظل/المغلقة
والعمل تحت أشعة الشمس بشكلٍ
كامل

الإجهاد الحراري المهني مرتفع تحت أشعة الشمس

– الإجهاد الحراري المهني

– منخفض في أماكن الظل/المغلقة

– مرتفع في الأماكن تحت أشعة الشمس خلال منتصف النهار

WBGT heat stress risk →	None (<27.8 °C)	Low (27.8 - 29.4 °C)	Moderate (29.5 - 31.0 °C)	High (31.1 - 32.1 °C)	Extreme (>32.1 °C)
Indoor / shaded areas	13 %	57 %	18 %	11 %	1 %
In direct sunlight	19 %	9 %	17 %	22 %	33 %

0-9 10-29 30-59 60-79 80-100

معدل الاستراحة والعمل

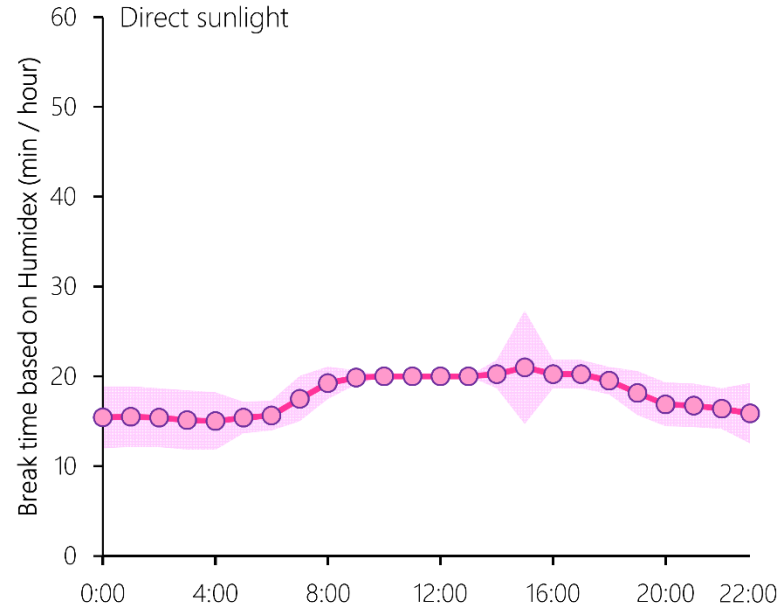
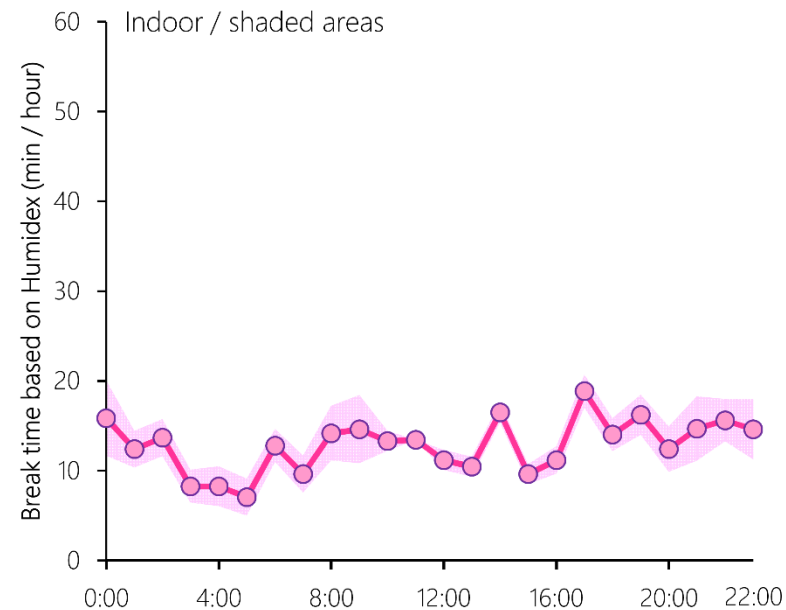
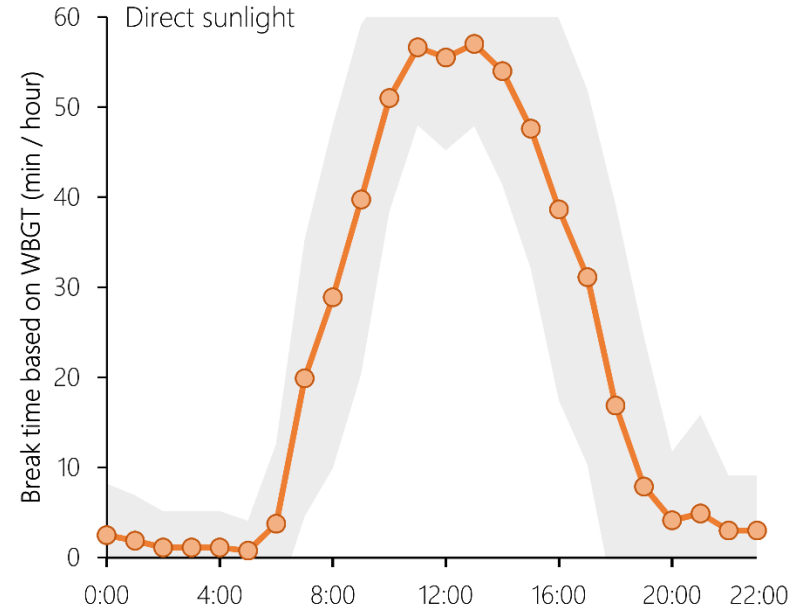
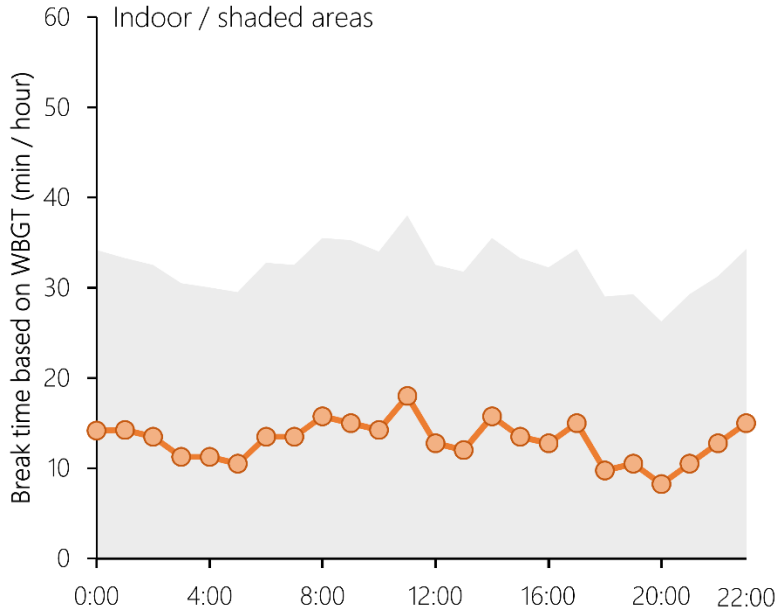
← الأفراد العاملين

– يمكنهم العمل بشكل متواصل في أماكن الظل/المغلقة مع الاستراحة لمدة ١٥ دقيقة كل ساعة

– أكثر عرضة لخطر الإجهاد الحراري تحت أشعة الشمس بين الساعة ١٠:٠٠ صباحًا و ١٥:٠٠ من بعد الظهر، وفقاً لدرجة الحرارة بمقياس ذي بصيلة مخضّلة

← Humidex

لا تعتبر التوصيات بشأن العمل-الاستراحة إجراءات آمنة



الإجهاد الحراري المهني مرتفع خلال النهار

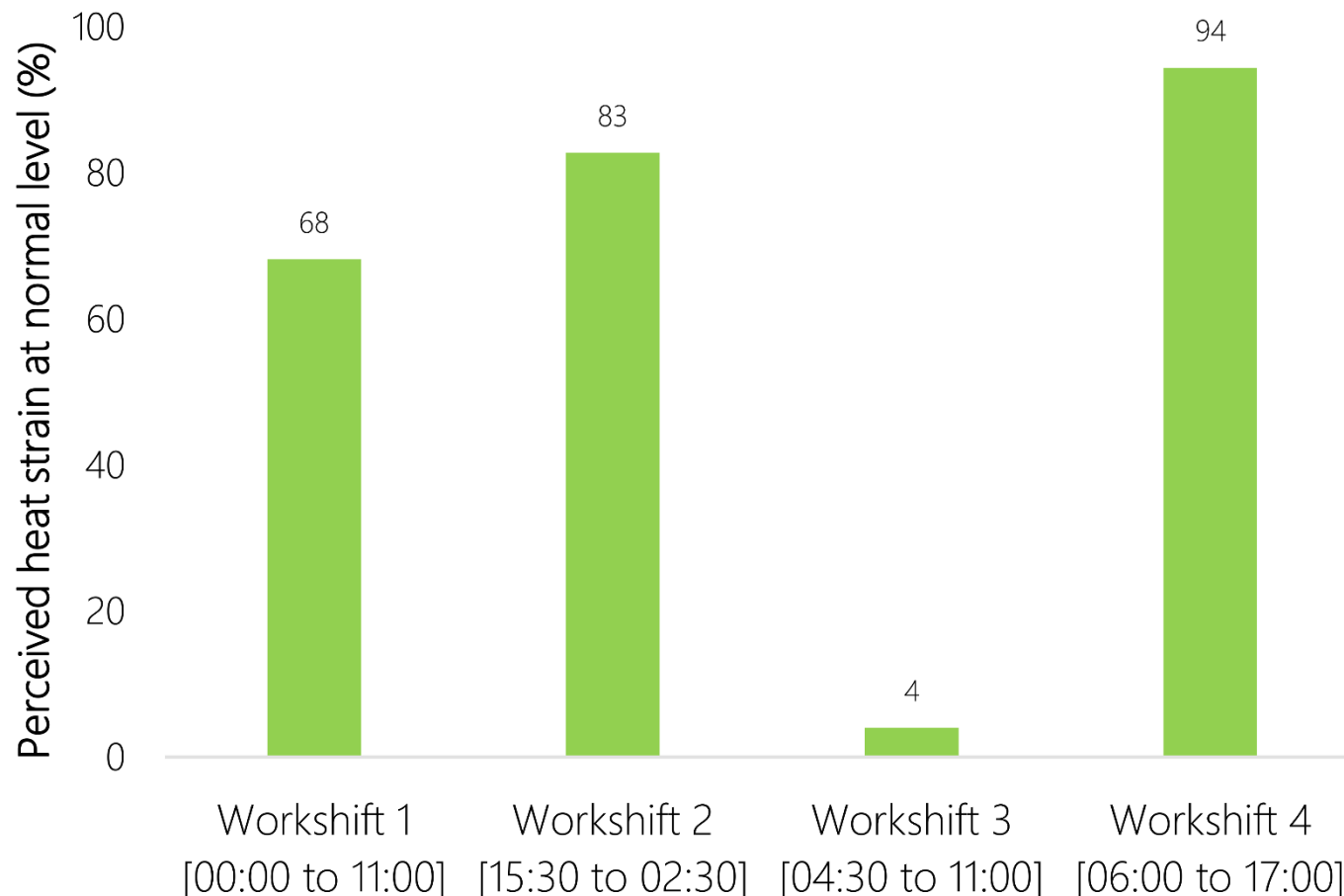
– الدوامات الليلية تُقلّل من تعرض العمال لمستويات مرتفعة من الإجهاد الحراري المهني

WBGT heat stress risk →	None (<27.8 °C)	Low (27.8 - 29.4 °C)	Moderate (29.5 - 31.0 °C)	High (31.1 - 32.1 °C)	Extreme (>32.1 °C)
Day (04:54 - 18:25)	17 %	23 %	29 %	13 %	18 %
Night (18:26 - 04:53)	80 %	16 %	4 %	0 %	0 %

0-9 10-29 30-59 60-79 80-100

يُعتبر الإعياء الحراري مرتفع خلال الليل

- ... ومع ذلك، ثمة مخاطر مرتبطة بعدم حصول العمال على قسط كافٍ من النوم
- شعر عمال البناء بأمان أكثر عند العمل من الساعة ١٥:٣٠ من بعد الظهر حتى ٠٢:٣٠ فجراً



– يقدم دوام العمل هذا أفضل مزيج
يجمع بين انخفاض الإجهاد
الحراري في العمل وتقليل خطر
نقص النوم

لدى العديد من العمال قدرة ضعيفة على تحمل الحر

معظم العمال هم من الرجال الرشيقين في أوائل الثلاثينيات من العمر - الفئة السكانية الأكثر مقاومة للحرارة. ومع ذلك، يعاني ثلثهم من أعراض أو أمراض تزيد من احتمال تعرضهم للأمراض الناجمة عن الحرارة عند العمل تحت ضغط الإجهاد الحراري المهني

	Construction workers	Agriculture workers	All workers tested
Do you have a history of...			
Urinary lithiasis (kidney stones)	0 %	0 %	0 %
High cholesterol	2 %	0 %	2 %
Diabetes mellitus	2 %	3 %	2 %
Hypertension	3 %	6 %	4 %
While working in a hot environment, have you ever experienced...			
Heat stroke	3 %	0 %	2 %
Heat exhaustion	5 %	15 %	8 %
Dizziness, confusion or fainting	1 %	26 %	8 %
Wheezing	2 %	0 %	2 %
Occurrence of symptoms			
Workers negative in all symptoms	79 %	50 %	71 %
Workers positive in one symptom	21 %	35 %	25 %
Workers positive in two symptoms	0 %	15 %	4 %

العوامل التي تؤثر على العمل في الحر

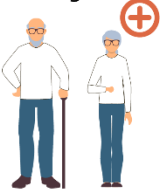
Inter-individual

Intra-individual

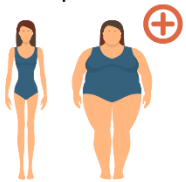
← تاريخ الأمراض المرتبطة بالحر

+

Age



Anthropometrics



Acclimatization



Clothing



Consecutive Shifts



Drugs & Addictions



Disabilities



Environmental Conditions



Heat Mitigation



Metabolic Demands



Cultural Habits



Ethnicity



Nutritional Diet



Physical Fitness



Sleep Deprivation



Medical Conditions



Sex



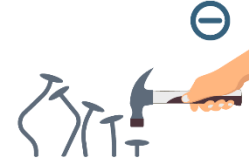
Water Consumption



Work Duration



Work Experience



– درجة حرارة الجسم الأساسية عند المستويات الطبيعية (٣٧,٣ درجة مئوية) أثناء العمل

– مع ذلك، عانى واحداً من كل ثلاثة عمال من انخفاض حرارة الجسم (درجة حرارة الجسم الأساسية ≤ 38 درجة مئوية)

– يعد هذا التعرض لفترات مطولة في غاية الخطورة

Work shifts currently in place			Piloted work shift	TOTAL
Work shift 1: 00:00 to 11:00 (construction)	Work shift 2: 15:30 to 02:30 (construction)	Work shift 3: 04:30 to 11:00 (agriculture)	Work shift 4: 06:00 to 17:00 (construction)	
42 %	41 %	39 %	11 %	33 %

– المدة الزمنية التي تجاوزت خلالها درجة حرارة الجسم الأساسية للعمال عتبة السلامة، أي ٣٨ درجة مئوية، كانت قصيرة جداً

– صفر إلى ٣ في المائة في موقع البناء (وفقاً لدوام العمل)

– ٨ في المائة في المزرعة

Strategy	Hyperthermia levels based on core temperature			
	Normothermia (36.5 - 37.4 °C)	Borderline hyperthermia (37.4 - 37.9 °C)	Hyperthermia (38.0 - 38.4 °C)	Elevated hyperthermia (≥38.5 °C)
BAU	60 %	35 %	5 %	0 %
HYD	71 %	27 %	2 %	0 %
CLO	60 %	38 %	3 %	0 %
W-R	63 %	35 %	2 %	0 %

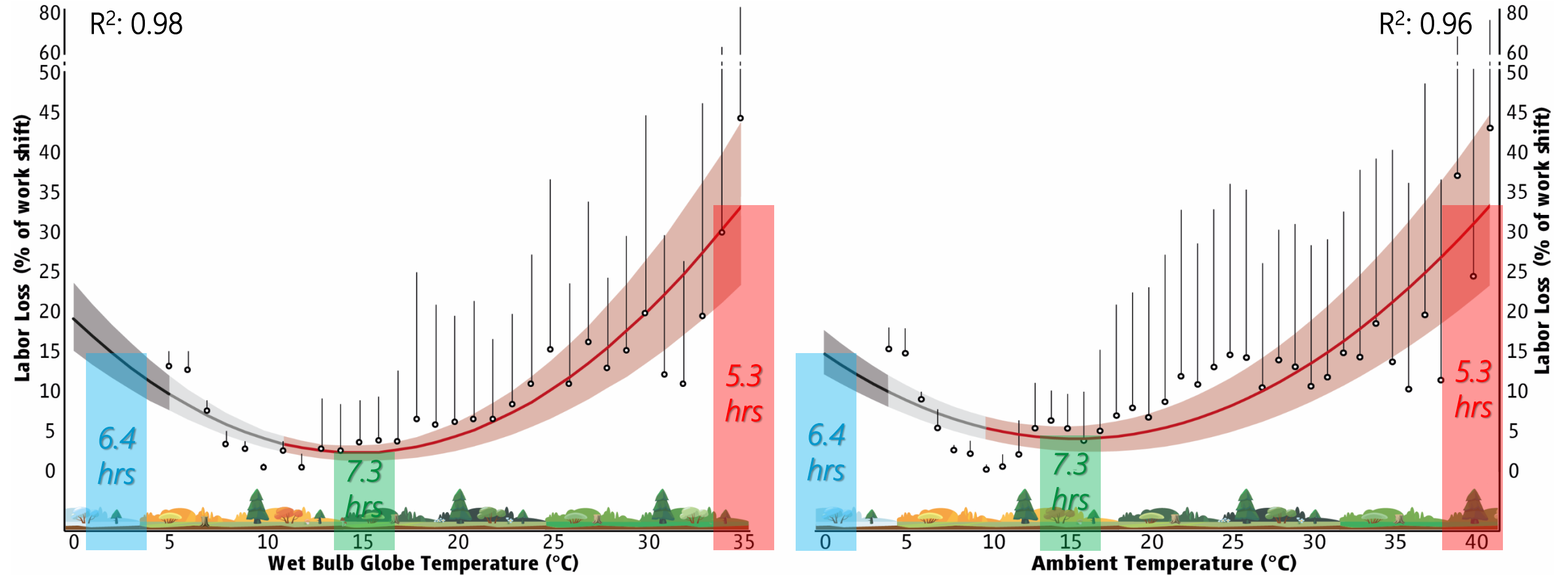
0-9 10-29 30-59 60-79 80-100

← أنجز العمال عملهم بوتيرة منخفضة خلال كافة دوامات العمل بسبب ارتفاع الإجهاد الحراري

		Work effort levels			
		Work break (0 W / m ²)	Low-intensity work (0.1 - 1.4 W / m ²)	Moderate-intensity work (1.5 - 15.4 W / m ²)	High-intensity work (>15.4 W / m ²)
Currently in place work shifts	Work shift 1: 00:00 - 11:00 (construction)	61 %	32 %	5 %	1 %
	Work shift 2: 15:30 - 02:30 (construction)	62 %	31 %	5 %	1 %
	Work shift 3: 04:30 - 11:00 (agriculture)	23 %	67 %	10 %	0 %
Piloted shift	Work shift 4: 06:00 - 17:00 (construction)	42 %	40 %	18 %	0 %

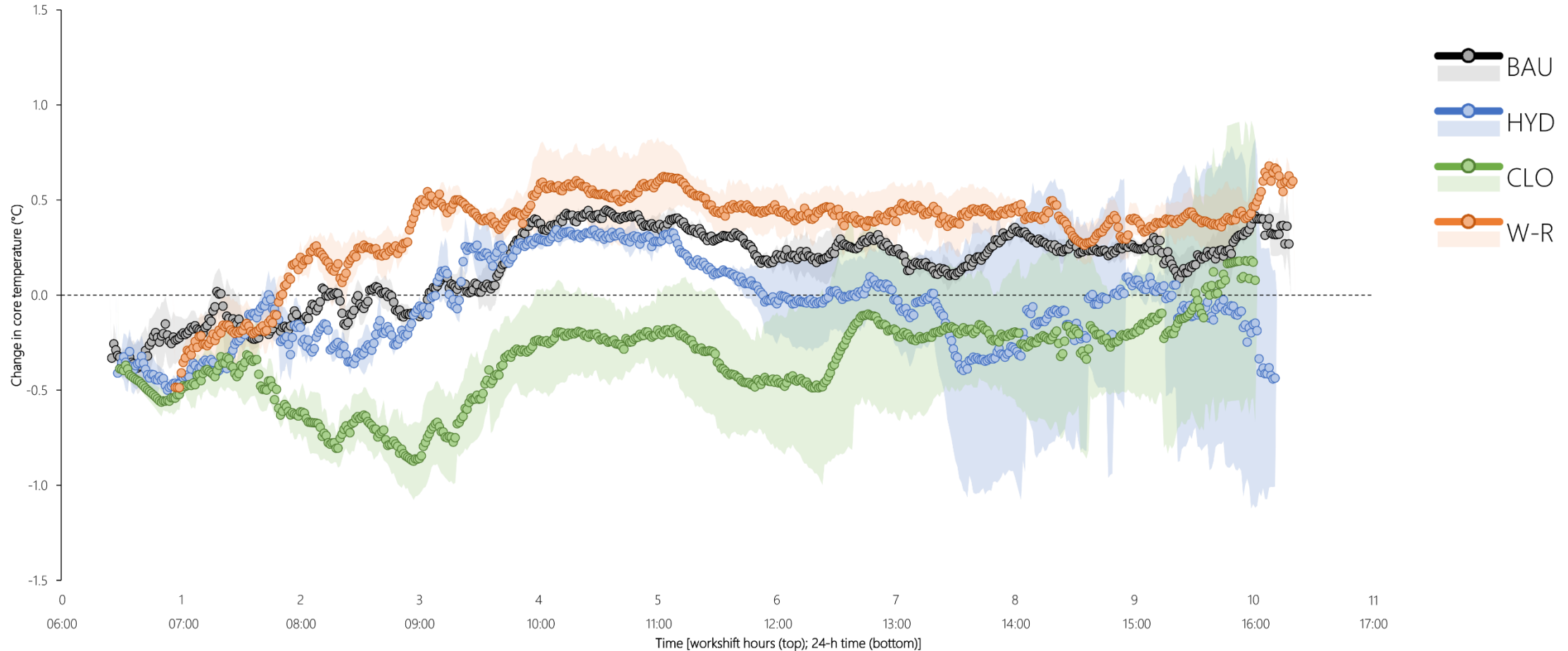
معالجة الإجهاد الحراري لتحسين الإنتاجية (البيانات الدولية)

دوام عمل لمدة ٨ ساعات



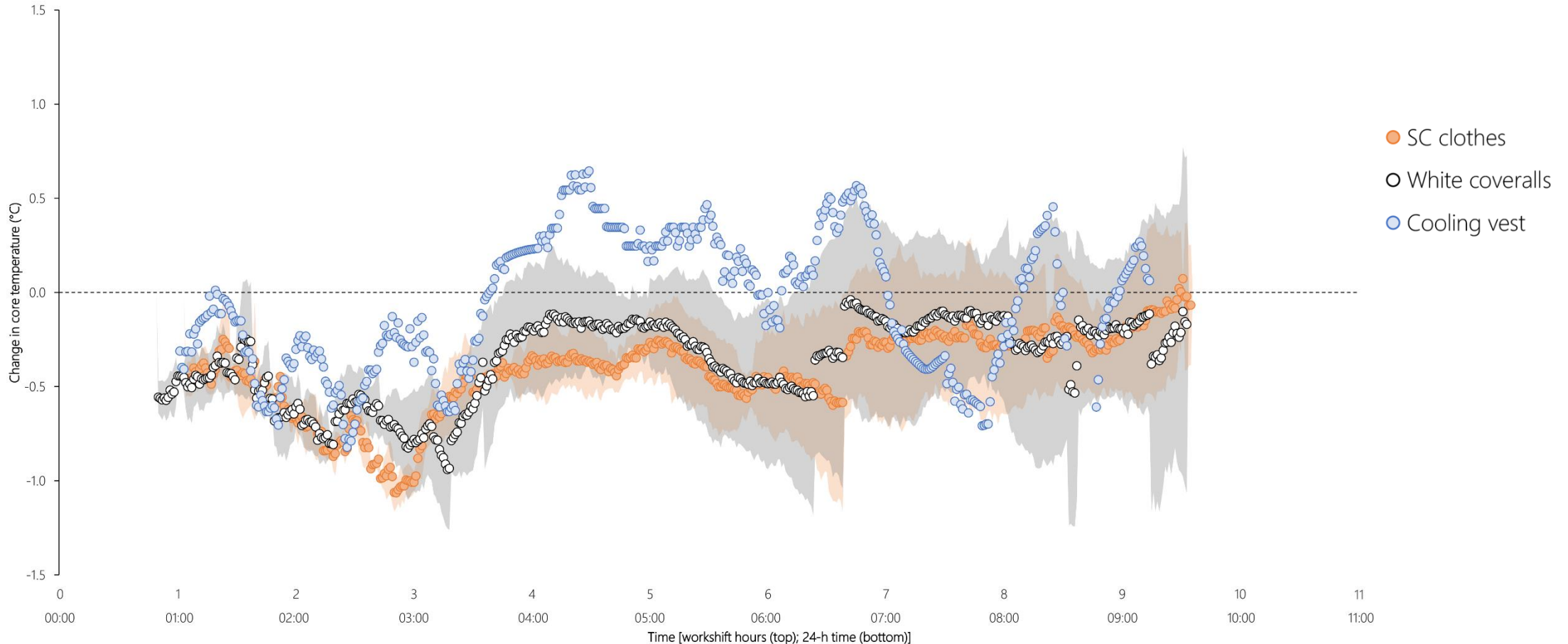
الإعياء الحراري: مقارنة الاستراتيجيات

بعد مراعاة كافة العوامل ذات الصلة، تبين أن الملابس والترطيب من أكثر الاستراتيجيات فعالية للتخفيف من الإعياء الحراري



الإعياء الحراري: إستراتيجية الملابس

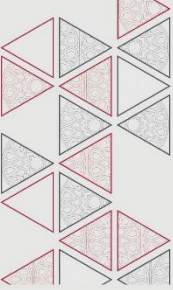
←... وشكلت البدلة التي أعدتها اللجنة العليا والمآزر البيضاء أكثر استراتيجيات الملابس فعالية للتخفيف من الإجهاد الحراري



- ـ ثلث العمال عانوا من **التجفاف** في بداية دوامهم، وارتفعت هذه النسبة إلى ٤١ في المائة خلال الدوام
- ـ التجفاف كان
- ـ أكثر تواتراً في المزرعة
- ـ أقل تواتراً في موقع البناء

	Work shifts currently in place						Piloted work shift		TOTAL	
	Work shift 1:		Work shift 2:		Work shift 3:		Work shift 4:			
	00:00 to 11:00		15:30 to 02:30		04:30 to 11:00		06:00 to 17:00			
	(construction)		(construction)		(agriculture)		(construction)			
	Start	End	Start	End	Start	End	Start	End	Start	End
BAU	15 %	19 %	10 %	7 %	56 %	79 %	6%	6 %	30 %	41 %
HYD	7 %	4 %	16 %	10 %	55 %	53 %	6 %	0 %	23 %	19 %

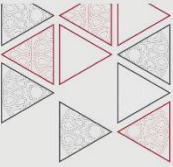
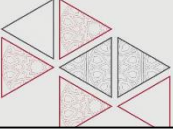
0-9 10-29 30-59 60-79 80-100




May 2021 Heat Stress Legislation in Qatar

A GUIDE FOR EMPLOYERS

Ministry of Administrative Development,
Labour and Social Affairs (ADLSA)

Unofficial Translation

Decision of the Minister of Administrative Development, Labour and Social Affairs No. (17) for the year 2021 specifying measures to protect workers from heat stress

The Minister of Administrative Development, Labour and Social Affairs,

After perusal of the Labour Law promulgated by Law No. 14 of 2004 and its amending laws, Emir Decision No. 29 of 1996 on the decisions of the Council of Ministers and submitted to the Emir for approval and issuance;

Minister of Civil Service Affairs and Housing Decision No. 16 of 2007 specifying working hours in outdoor places during summer time;

And on the adoption by the Council of Ministers of this Draft Law during its regular meeting (40) of 2020 held on 21/10/2020

Decided the following:

Article (1)

In the implementation of the provisions of this decision, the following words shall have the respective meaning assigned to them unless the context requires otherwise:

Heat Stress: occurs when the body fails to maintain its normal temperature in response to physical effort made while exposed to high temperatures combined with humidity. This may occur under direct sunlight, in shaded areas or indoor and could lead to illness due to the malfunction of the parts in charge of regulating body temperature, resulting in a number of health problems.

Workplaces: places where workers need to be or go to by reason of their work.

Outdoor workplaces: workplaces where workers are exposed to weather conditions such as solar radiation, heat and humidity.

Shaded and ventilated workplaces: covers outdoor workplaces where there is a sufficient and suitable system of artificial ventilation, where workers are not exposed to solar radiation, and where there is no exposure to heat from operating machines.

Wet Bulb Globe Temperature (WBGT) index: A system used to assess the ambient temperature of a work environment. It measures the combined proportional effect of dry bulb temperature (DB), globe temperature (GT) and wet bulb (WB), using specific devices.

Heat Stress Index: the WBGT temperature announced by the Ministry or recorded by the company in the workplace using approved WBGT devices.

1

**Heat Stress is dangerous,
but it can be managed!**

FAQs for workers

If you perform physical work in a hot environment, your body may overheat. This can be dangerous.

In May 2021, the Ministry of Administrative Development, Labour and Social Affairs (ADLSA) introduced a new Ministerial Decision to protect workers during the hottest months of the year, particularly outdoor workers who are exposed to the heat, humidity and the sun.



1. What are the new prohibited working hours?

From 1 June to 15 September, work cannot be performed in outdoor workplaces between 10 am and 3:30 pm. Outdoor workplaces are those in which workers are exposed to weather conditions: the heat, humidity and the sun.

2. Is any outdoor work allowed during these hours?

Workers cannot work outdoors when they are exposed to weather conditions (such as solar radiation, humidity and heat).

3. Is it safe to work before 10am or after 3pm during the summer?

Yes, it can be safe, provided that your employer has adopted certain control measures and that you also do your part by taking precautions. Drink enough water and take breaks whenever you need to. Set up a "buddy system" with your colleagues so that you can look out for each other. You must tell your supervisor or colleagues if you feel unwell and stop working.

4. Is it safe to work at night?

Night shifts can reduce the risk of heat stress. But be careful! High temperatures and humidity can still pose a risk. Drink enough water and take rests when needed. Moreover, night shifts can have a negative effect on your safety and health if you do not get enough sleep. Showing up to work tired can lead to mistakes, and can put you and your colleagues in danger.

5. How much water should I be drinking?

Drinking enough water is one of the best ways to protect yourself from heat stress. There is a simple way to check if you are drinking enough - check the colour of your urine! Pale is good, and dark is a warning sign.

It is important to remember to drink water before and after going to work. Many workers show up at work already dehydrated. When you are working outdoors, you should drink 2-3 glasses of water before starting work. Then, during the day, you should drink 3 glasses of water per hour. During the night, keep hydrated by drinking sufficient water to quench your thirst.

You may be advised to add some salt to your water. You should discuss this with safety and medical professionals as it depends on your personal situation.

**Heat Stress is dangerous,
but it can be managed!**

FAQs for employers

1. What is heat stress?

When a person performs hard physical work, the body produces high amounts of heat which must be relieved to the environment to maintain a stable body temperature. It does this mainly by producing sweat on the skin so that it can be evaporated, and by sending more blood to areas that are cooler, such as the skin, the arms, and the legs. If the person is performing work in a hot environment, it is a lot more difficult to get rid of the heat that is being produced internally. If the body cannot get rid of excess heat, its core temperature rises and the heart rate increases. As the body continues to store heat, the person begins to lose concentration and has difficulty focusing on a task, may become irritable or sick, and often loses the desire to drink water. The next stage is most often fainting and even death if the person is not rapidly cooled down.



2. Can heat-related illnesses be prevented?

YES! The best ways to reduce the risk of heat-related illnesses include work practices such as allowing acclimatisation, drinking water often, wearing appropriate clothing, making the work environment cooler through air conditioning and ventilation, providing shaded rest areas and performing regular health check-ups.

3. Is the employer responsible for protecting the health of workers?

YES! Employers are responsible for providing healthy and safe workplaces. Employers should identify hazards and take measures to remedy problems before they cause an accident or disease. Employers should include all prevention actions in their risk assessment. (Labour Law, Articles 99 to 107 and Ministerial Decision No. 17 of 2021, Article 4)

4. When is work in outdoor workplaces prohibited?

Work cannot be performed in outdoor workplaces where workers are exposed to weather conditions, such as solar radiation, humidity and heat from 10 am to 3:30 pm. (Ministerial Decision No. 17 of 2021, Article 2)

5. How is "outdoor workplace" defined?

Outdoor workplaces are defined as workplaces where workers are exposed to weather conditions (such as solar radiation, humidity and heat). (Ministerial Decision No. 17 of 2021, Article 1)

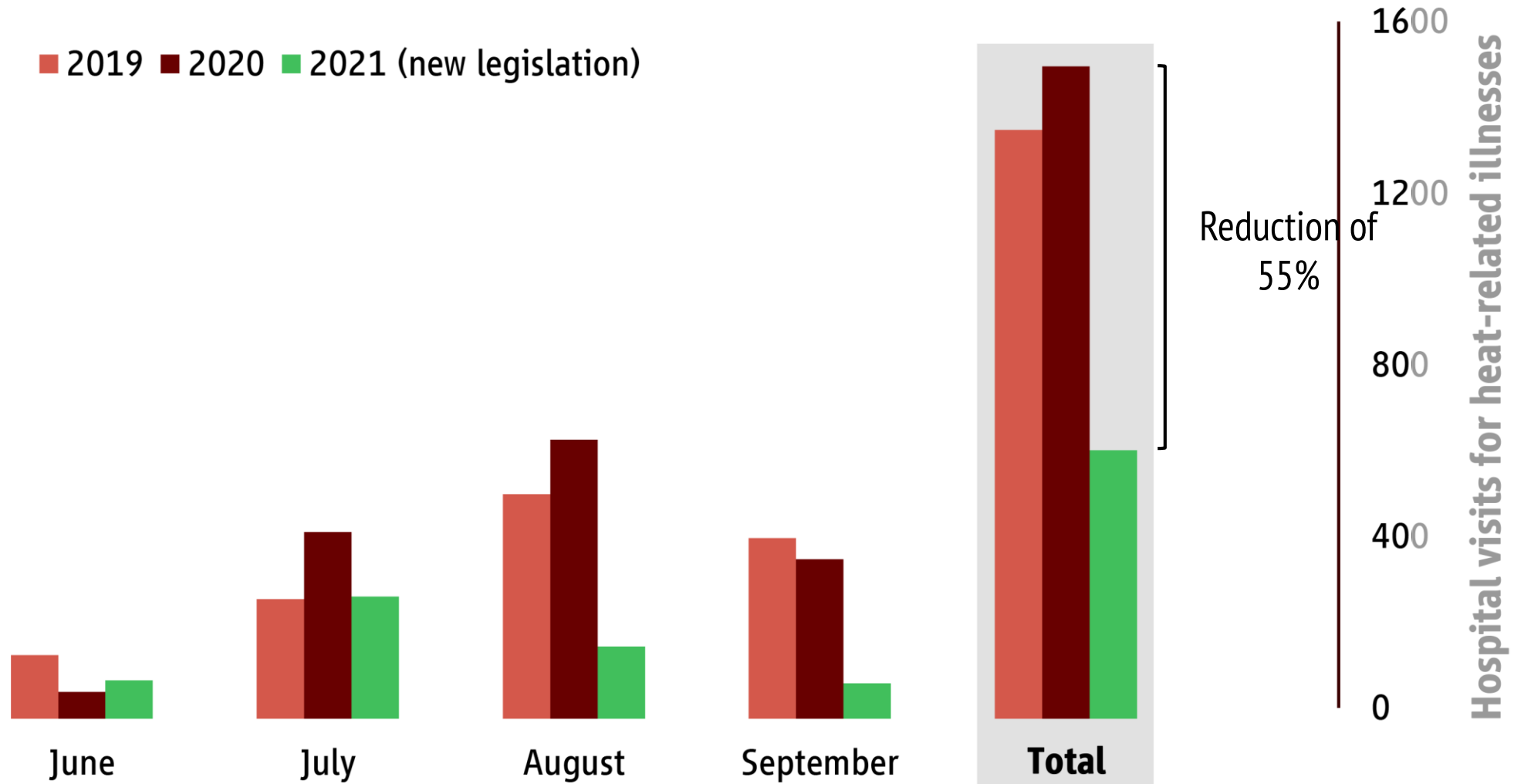
6. Can work be performed in a shaded and ventilated workplace that is outdoors?

Yes! If work is performed exclusively in shaded and ventilated workplaces, work can be performed outdoors, provided that the wet-bulb globe temperature (WBGT) index, used to assess the level of occupational heat stress, is below 28.1 °C.

7. How are "shaded and ventilated workplaces" defined?

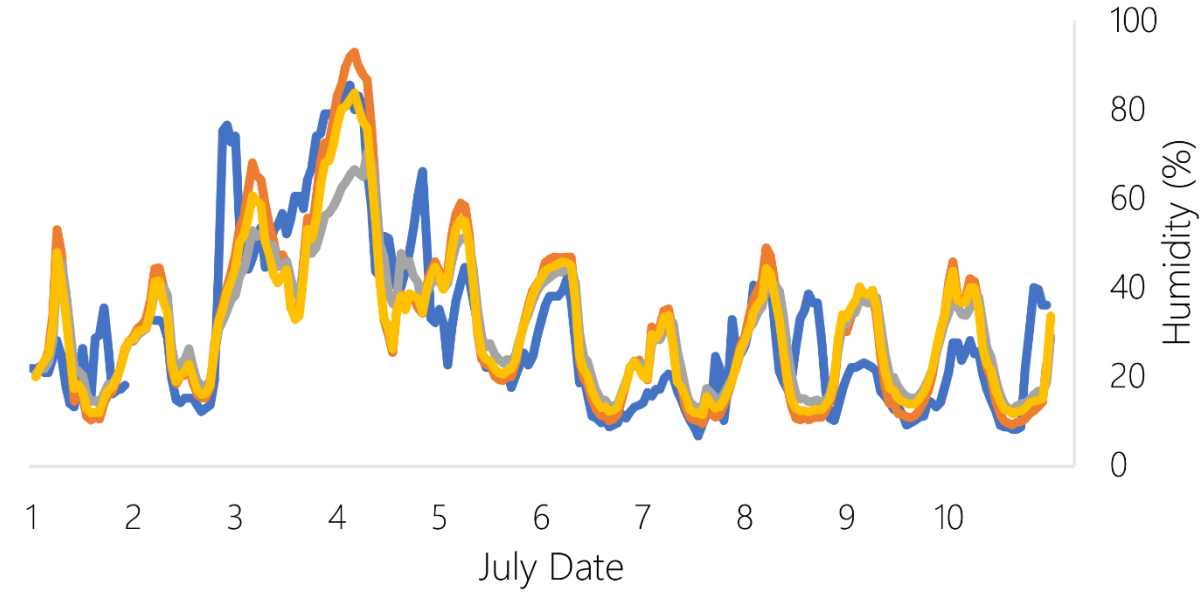
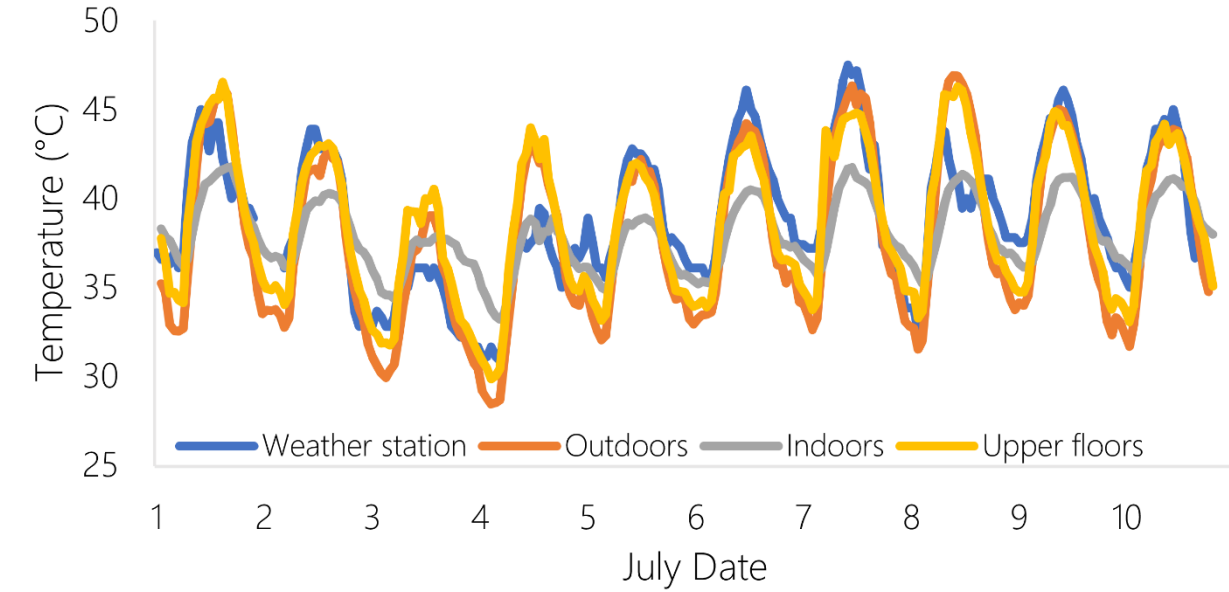
These cover outdoor workplaces where there is a sufficient and suitable system of artificial ventilation (fans and/or air-conditioning), where workers are not exposed to solar radiation, or where there is no exposure to heat from operating machines and other sources. (Ministerial Decision No. 17 of 2021, Article 1)

التشريعات المحدثة تقلل زيارات المستشفى



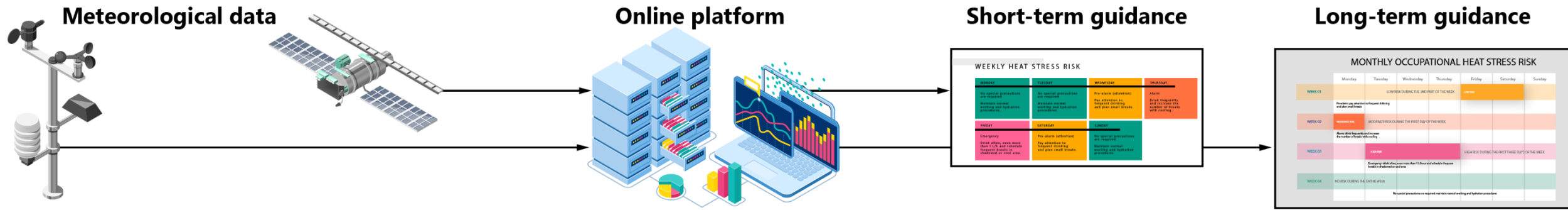
بيانات محطات الأرصاد الجوية تعكس ظروف العمل

الاختلافات كانت ضئيلة بين بيانات القياسات المحلية في مواقع العمل وبيانات أقرب محطات الأرصاد الجوية



منصة لتوجيه العامل / صاحب العمل / أصحاب المصلحة

يمكن للمنصة الإلكترونية/تطبيق الهاتف الذكي الذي يستخدم الذكاء الاصطناعي/التعلم الآلي حماية العمال بشكل فعال وتوفير التوجيه لأصحاب العمل وأصحاب المصلحة



تاريخ الأمراض المرتبطة بالحرارة
العوامل الفردية وبين الأفراد

البحث الذي أجرته قطر لجمع الأدلة اللازمة للتصدي للإجهاد الحراري المهني

الدكتور أندرياس فلوريس

مختبر Fame Lab، جامعة ثيساليا، اليونان

