

Written evidence submitted by Dr Laurence Wainwright, EAC [Call for Evidence](#) on Heat Resilience and Sustainable Cooling

Heat and Mental Health

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Overview

As anthropogenic-climate change disrupts and alters weather and climatic patterns globally, the impact of heat on human health is becoming more pronounced. Evidence shows that over the past five decades, heat wave frequency, duration, and intensity have significantly increased.² Many countries – including the United Kingdom – have experienced hotter, longer, and earlier summers, as well as more frequent and severe heatwaves. Scientific modelling indicates that these phenomena will worsen in the years ahead.^{3,4} The relationship between heat and health is complex; while overall, humans are resilient and tolerant of a fairly wide range of climatic conditions, evidence indicates that extreme levels of heat, coupled with a lack of appropriate support structures to manage it – such as localised heat-health warnings based on thresholds that account for the vulnerabilities of different populations, can be highly problematic for health.⁵ This is especially true for subsets of a population, such as the elderly, outdoor workers, or those with a mental health disorder.⁶

This submission addresses key questions in the consultation to highlight a heavily under-represented yet important policy area in relation to the impact of extreme heat – that on mental health.

It focuses on drawing together evidence on a subset of 'invisible' mental health impacts that are associated with long-term economic costs to the UK economy and to citizens' welfare. It recommends that UK policymakers adopt policy interventions targeted at 'sensitive intervention points' in mitigating the impact of heat on human health, which explicitly addresses mental health risks in addition to physical health impacts.

1. What evidence exists on the relationship between heat and human health (mortality and morbidity), and which communities are worst affected?

1.1. The impacts of heat on mental health

"Mental health" is a broad term that encompasses a variety of components related to the overall psychological wellbeing of an individual and the degree to which they are able to achieve and maintain a

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² Yin, C., Yang, Y., Chen, X. et al. (2022). 'Changes in global heat waves and its socioeconomic exposure in a warmer future'. *Climate Risk Management*, Volume 38, 100459. <https://doi.org/10.1016/j.crm.2022.100459>

³ Patterson, M. (2023). 'North-West Europe hottest days are warming twice as fast as mean summer days.' *Geophysical Research Letters*, 50, e2023GL102757. <https://doi.org/10.1029/2023GL102757>

⁴ Miranda, N.D., Lizana, J., Sparrow, S.N. et al. (2023). 'Change in cooling degree days with global mean temperature rise increasing from 1.5 °C to 2.0 °C.' *Nat Sustain.* <https://doi.org/10.1038/s41893-023-01155-z>

⁵ Guirguis, K., Gershunov, A., Tardy, A., Basu, R. (2014). 'The impact of recent heat waves on human health in California.' *Journal of Applied Meteorology and Climatology*, 53(1), 3-19. <https://doi.org/10.1175/JAMC-D-13-0130.1>

⁶ Liu, J., Varghese, B. M., Hansen, A., Xiang, J., Zhang, Y., Dear, K. et al. (2021). 'Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis.' *Environment international*, 153, 106533. <https://doi.org/10.1016/j.envint.2021.106533>

state of emotional, cognitive, social and behavioural wellness and functioning conducive with their day-to-day demands and overall life ambitions.

Mental health problems may account for around 16% of the total global burden of disease (measured in disability-adjusted life years or DALYs);⁷ the World Health Organisation estimates that by 2030 mental health problems (particularly depression) will be the leading cause of mortality and morbidity globally.⁸ Poor mental health is correlated with a series of negative health, economic and social outcomes, ranging from higher rates of unemployment to increased risk of suicide.⁹ Similarly, good mental health in a population is correlated with improved rates of productivity, increased life expectancy, better physical health and a significant reduction in health expenditure.¹⁰

A particular subset of the population suffers from mental health disorders – also known as psychiatric illnesses – which in the most severe instances can have a debilitating and devastating impact on the health and overall functioning of an individual, comparable to the most serious physical health conditions. In the UK, around one in five people will experience a mental disorder over their lifetime.¹¹ Whether Bipolar Disorder, affecting just under 2% of the UK's population, Generalised Anxiety Disorder with its global lifetime prevalence of 3.7%, or Major Depressive Disorder impacting around one in fifteen adults globally (see Box 1), mental health disorders are common, costly and can be difficult to treat.

Box 1: Mental health disorders

Major Depressive Disorder is characterised by on-and-off phases of impaired psychological and physical functioning, with symptoms during these phases including “depressed mood most of the day, nearly every day...markedly diminished interest or pleasure in all, or most activities...and feelings of worthlessness.” During a moderate to severe depressive phase, an individual has significant difficulty in finding the energy and motivation to conduct basic tasks required for daily living.

Bipolar Disorder is a severe, cyclical mood disorder that affects around 1.5% of the population globally. It is characterized by transitions between “lows” (depression) “highs” (mania, the more extreme high, or hypomania, the slightly lesser high) and “asymptomatic” (normal) moods. During the depressive phases of Bipolar Disorder, the functional consequences are similar to those experienced in MDD. Manic and hypomanic episodes, which typically run for between 4 – 10 days non-stop, are characterized by “abnormally elevated mood...increased goal-directed activity and energy...inflated self-esteem, decreased need for sleep, more talkative than usual...and distractibility.”

Generalised Anxiety Disorder is a condition characterised by persistent and excessive worry that interferes with daily activities.

Source¹²

Extreme heat exacerbates mental health disorders, resulting in adverse consequences for the proportion of a population that already suffers from poor mental health. Further, the impacts are worse for a range of sub-sets of a population; for instance, individuals from a low socio-economic status, adolescents, the elderly, those with co-morbidities (either a second mental health condition, or a physical one), and individuals with inadequate housing.¹³

⁷ Arias, D., Saxena, S. and Verguet, S. (2022). ‘Quantifying the global burden of mental disorders and their economic value.’ *eClinicalMedicine – The Lancet*, Vol. 54, 101675.

[https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370\(22\)00405-9/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(22)00405-9/fulltext)

⁸ WHO. (2011). Global burden of mental disorders and the need for a comprehensive, coordinated response from health and social sectors at the country level: Report by the Secretariat. https://apps.who.int/gb/ebwha/pdf_files/EB130/B130_9-en.pdf

⁹ Marwaha, S., Durrani, A., & Singh, S. (2013). ‘Employment outcomes in people with bipolar disorder: a systematic review.’ *Acta Psychiatrica Scandinavica*, 128(3), 179-193.

¹⁰ Editorial (2020). ‘Mental Health Matters’, *The Lancet Global Health*, 8(11), E1352.

[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(20\)30432-0/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30432-0/fulltext)

¹¹ Baker, C and Kirk-Wade, E. (2023). ‘Mental health statistics: prevalence, services and funding in England.’ Research Briefing UK Parliament. <https://commonslibrary.parliament.uk/research-briefings/sn06988/>

¹² American Psychiatric Association.

There is a nascent but growing body of evidence on the link between heat and worsening mental health for those with specific existing mental disorders. Taking Bipolar Disorder, for instance, there are many unknowns about both the condition itself and the impact of climate and weather. However, what is known is that two climate/weather variables – evaporation and temperature – may account for annual fluctuations in mania.¹⁴ Mania is a problematic and dangerous phase of the condition, and in its most severe forms can manifest as psychosis and increase risk of suicide. It is very reasonable to hypothesise that an increase in the prevalence of heatwaves and generally drier, hotter and longer summers as a direct result of climate change may serve as a trigger into a manic phase. Similarly, in Major Depressive Disorder (MDD), heatwaves have been shown to worsen symptoms, act as a ‘trigger’ for a relapse into a depressive phase, and exacerbate side effects of commonly used medications. Heatwaves can expose pre-existing psychological vulnerabilities, triggering a first episode of MDD in those who have heightened susceptibility to the condition but have never received a diagnosis or experienced a depressive phase.

Studies suggest that there may also be a causal relationship between extreme weather events and suicide attempts and completion in those with an underlying psychiatric condition – especially after events. In terms of heatwaves, Heo, Lee and Bell (2021)¹⁵ find “...Significant and positive associations between daily high temperature and suicide”. Burke et al. (2018) find that a 0.7% and 2% increase in suicide rates was reported in US counties and Mexican municipalities, respectively, in association with a 1 degree increase in monthly temperature.¹⁶ Across all of the above-mentioned psychiatric conditions, rates of psychiatric disorder-related emergency department visits also tend to increase during and after heatwaves. For example, Vida et al (2012) find that during heatwaves – and even moderate increases in temperatures, mental health visits increased between 5–10% at higher temperatures (i.e., 25°C as opposed to 20°C) in Québec, Canada.¹⁷

1.2 Impacts of heat on mental health – evidence from the UK

For the approximately 16% of the population in the UK who live with a mental health condition, the most prevalent impacts of more frequent and intense periods of extreme heat are as follows:^{18 19 20}

- Worsening of side effects of many commonly prescribed psychiatric medications;
- Worsening of existing symptoms;
- Manifestation of new symptoms;
- In some conditions, excessive heat can occasionally act as a trigger to switch into a certain phase of a condition – for instance, mania in Bipolar Disorder;
- Increased rates of presentation and admission to hospital;
- Increased rates of suicide and suicide attempts;
- Increased rates of overall mortality;
- Increased susceptibility to a heat-related illness (such as heat stroke);
- A minor impact on the effectiveness of select psychiatric medications;
- A decline in cognitive function (processing speed, attention, memory) and associated productivity;
- An assortment of outcomes that are individually fairly small, but collectively are problematic. For example, poorer quality sleep; increased rates of dehydration.

¹³ Ding, N., Berry, H. L., & Bennett, C. M. (2016). ‘The importance of humidity in the relationship between heat and population mental health: evidence from Australia’. *PloS one*, 11(10), e0164190. <https://pubmed.ncbi.nlm.nih.gov/27727320/>

¹⁴ Parker GB, Hadzi-Pavlovic D, Graham RK. (2017). ‘Examining for any impact of climate change on the association between seasonality and hospitalization for mania’. *J Affect Disord*. Jan 15; 208:431-435. doi: 10.1016/j.jad.2016.11.006

¹⁵ Heo, S., Lee, W. and Bell, M. L. (2021). ‘Suicide and Associations with Air Pollution and Ambient Temperature: A Systematic Review and Meta-Analysis.’ *Int. J. Environ. Res. Public Health* 2021, 18(14), 7699; <https://doi.org/10.3390/ijerph18147699>

¹⁶ Burke, M., González, F., Baylis, P. et al (2018). ‘Higher temperatures increase suicide rates in the United States and Mexico.’ *Nature Clim Change* 8, 723–729 (2018). <https://www.nature.com/articles/s41558-018-0222-x>

¹⁷ S. Vida, M. Durocher, T.B. Ouarda, et al. (2012). ‘Relationship between ambient temperature and humidity and visits to mental health emergency departments in Québec.’ *Psychiatr. Serv.*, 63 (2012), pp. 1150-1153. <https://www.sciencedirect.com/science/article/pii/S0160412021001586#b0510>

¹⁸ Cedeño Laurent, J. G., Williams, A., Oulhote, Y., Zanobetti, A., Allen, J. G., & Spengler, J. D. (2018). ‘Reduced cognitive function during a heat wave among residents of non-air-conditioned buildings: An observational study of young adults in the summer of 2016.’ *PLoS medicine*, 15(7), e1002605. <https://pubmed.ncbi.nlm.nih.gov/29990359/>

¹⁹ Martin-Latry, K., Goumy, M. P., Latry, P., Gabinski, C., Bégaud, B., Faure, I., & Verdoux, H. (2007). ‘Psychotropic drugs use and risk of heat-related hospitalisation.’ *European Psychiatry*, 22(6), 335-338. <https://pubmed.ncbi.nlm.nih.gov/17513091/>

²⁰ Florido Ngu, F., Kelman, I., Chambers, J., & Ayeb-Karlsson, S. (2021). ‘Correlating heatwaves and relative humidity with suicide (fatal intentional self-harm).’ *Scientific reports*, 11(1), 22175. <https://www.nature.com/articles/s41598-021-01448-3>

For the remaining 84% of the British population who do not live with a mental health condition, extreme heat can pose a range of minor to moderate challenges. These fall into six main categories: ^{21 22 23}

- Increased rates of suicide and suicide attempts;
- A decline in cognitive function (processing speed, attention, memory) and associated productivity;
- Increased levels of irritability;
- Increased levels of anxiety and stress;
- Higher rates of aggression, and some forms of violent crime;
- An assortment of outcomes that are individually fairly small, but collectively are problematic. For example, poorer quality sleep; increased rates of dehydration.

In both populations, it is difficult to isolate variables in terms of what causes what. The impacts of heat on mental health are a complex set of interactions between eight key factors and phenomena.^{24 25} First, biological factors, such as a person's sex, weight, ethnicity, and overall health. Second, any diagnosed health conditions which they have – whether physical or mental. Third, any medications taken, the mechanisms of action of these medications and the side effects they have. Fourth, socio-economic forces, such as whether an individual is able to afford access to air conditioning or whether income levels allow for preventative actions to be taken to stay cool. Fifth, psychological and behavioural factors, such as someone's configuration of personality traits and overall temperament, and their current emotional state. Sixth, the intensity and duration of the heat and corresponding humidity. Seventh, social support mechanisms in place. Finally, a range of variables relating to individual wellbeing such as how hydrated someone is, and how much sleep they have had.

1.3 The costs: productivity and the economy

The impacts of heat and adverse mental health outcomes, in terms of their wider costs, can be assessed in terms of two connected factors: cognitive function, and wider economic impacts.

Cognitive function is reflected in lower productivity per person (e.g. per worker), resulting from negative changes to the functional environment brought about by high temperatures, which are not addressed or mitigated by organisations or employers. For example, a 2018 US study hypothesizes that cognitive function deficits resulting from indoor thermal conditions during heatwaves extend beyond vulnerable populations; students in Boston in rooms without air conditioning during a heatwave performed 13% worse than their peers in cognitive tests and had 13% slower reaction time.²⁶ Given that 35% of office space in the UK doesn't have air conditioning or sustainable cooling alternatives, it is not unreasonable to hypothesise that the UK could face similar sorts of impacts in terms of not just educational attainment but also economic productivity. The ONS found that in 2022, around 8% of sickness absence from the workplace was attributable to mental health conditions (including stress, depression, anxiety and serious mental health problems).²⁷

²¹ Miles-Novelo, A., & Anderson, C. A. (2019). Climate change and psychology: Effects of rapid global warming on violence and aggression. *Current Climate Change Reports*, 5, 36-46. <https://link.springer.com/article/10.1007/s40641-019-00121-2>

²² Cedeño Laurent et al. (2018). 'Reduced cognitive function during a heat wave among residents of non-air-conditioned buildings: An observational study of young adults in the summer of 2016.' *PLoS medicine*, 15(7), e1002605. <https://pubmed.ncbi.nlm.nih.gov/29990359/>

²³ Hansen, A., Bi, P., Nitschke, M., Ryan, P., Pisaniello, D., & Tucker, G. (2008). The effect of heat waves on mental health in a temperate Australian city. *Environmental health perspectives*, 116(10), 1369-1375. <https://ehp.niehs.nih.gov/doi/10.1289/ehp.11339#:~:text=Above%20a%20threshold%20of%2026.7,by%207.3%25%20during%20heat%20waves>.

²⁴ Thompson, R., Hornigold, R., Page, L., & Waite, T. (2018). Associations between high ambient temperatures and heat waves with mental health outcomes: a systematic review. *Public health*, 161, 171-191.

²⁵ Alonso, L., & Renard, F. (2020). A comparative study of the physiological and socio-economic vulnerabilities to heat waves of the population of the metropolis of Lyon (France) in a climate change context. *International journal of environmental research and public health*, 17(3), 1004.

²⁶ Cedeño Laurent et al. (2018). Reduced cognitive function during a heat wave among residents of non-air-conditioned buildings: An observational study of young adults in the summer of 2016.' *PLoS medicine*, 15(7), e1002605. <https://pubmed.ncbi.nlm.nih.gov/29990359/>

²⁷ ONS (2022). Sickness absence in the UK labour market: 2022.

<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/articles/sicknessabsenceinthelabourmarket/2022>

Economic impacts are reflected in the wider costs of mental health problems to the UK economy, which various studies have consistently estimated at around 5% of GDP or around £100 billion per year. For instance, the Chief Medical Officer's Report in 2013 estimated this at 4.5% of GDP, or between £70-100 billion/year.²⁸ A 2010 study by the Centre for Mental Health estimated a similar number - £105 billion per year.²⁹ This number was unchanged in a more recent 2019 study – at £118 billion (5% of 2019 GDP).³⁰ In contrast, the monetary costs of the NHS in England in 2019/20 were £150 billion, whilst the cost of the furlough scheme to protect the income of workers during the COVID pandemic was approximately £70 billion.³¹ If anything, scientific evidence climate and heat-health impacts suggest that the costs would escalate, absent policy intervention, with the risk that these could disproportionately impact upon on the lower-income deciles of the UK population.

2. To what extent do the Government's Climate Change Risk Assessment and National Adaptation Programme (as well as other related strategies such as the Net Zero Strategy and Heat and Buildings Strategy) identify and address the risks from extreme heat?

Mental health is a major gap and an unaddressed risk in the current UK climate policy and health landscape. The second UK Climate Change Risk Assessment contains no explicit mention of "mental health" in relation to heat.³² The Heatwave Plan published by Public Health England is signposted as a key policy intervention – but it is targeted mainly at physical health risks. First published in 2011, it is dominated by the physical health impacts and management strategies, with sparse, superficial coverage of mental health and no coverage of specific conditions. The third National Adaptation Programme (NAP) does not adequately cover mental health risks from heat; interestingly, both the CCRA and NAP recognise that flood impacts and the displacement of people from, or loss of, their homes, are mental health risks to be addressed through appropriate flood defence planning.³³ There is no equivalent conclusion on heat and mental health. Measures in the Net Zero Strategy and Heat and Buildings Strategy that seek to mitigate the impact of rising temperatures would by extension address some of the adverse outcomes that we have identified in Section 1.

3. What actions can be taken to protect those most vulnerable to the impacts of extreme heat?

3.1 Action #1: Reframing public policy messaging on climate and mental health

The prelude to tangible action on the mental health impacts of heatwaves is reframing the nature of the problem within policymaking, and using **appropriate and effective public policy messaging**.

Addressing the interrelated challenges of heatwaves and mental health – and the problematic interplay between them – will require a multi-faceted approach that brings together a variety of different stakeholders and institutions, including researchers, medical practitioners, public and private healthcare systems, and the public. As we learn more about the impact of heatwaves on mental health, health policy must be reoriented to incorporate this improved understanding; and proactive, evidenced-based approaches must be implemented into public and private healthcare systems alike.

- **A holistic view to health should be taken by the British Government, where mental and physical health are viewed as existing interdependently and intrinsically inseparable.** The first necessary policy reframe is in relation to the extent to which the physical health impacts of heat have dominated conversation, policy and progress. While this is understandable to an extent given that net-impacts of heat-caused physical health problems are greater than mental health problems,

²⁸ Department of Health. (2014). Annual Report of the Chief Medical Officer 2013: Public Mental Health Priorities: Investing in the Evidence. Retrieved from <https://www.gov.uk/government/publications/chief-medical-officer-cmo-annual-report-public-mental-health>

²⁹ Centre for Mental Health. (2010). The Economic and Social Costs of Mental Health Problems in 2009/10. Centre for Mental Health. Retrieved from <https://www.centreformentalhealth.org.uk/publications/economic-and-social-costs-mental-health-problems-200910>

³⁰ LSE-Mental Health Foundation (2019) <https://www.mentalhealth.org.uk/sites/default/files/2022-06/MHF-Investing-in-Prevention-Full-Report.pdf>

³¹ Ibid.

³² UK Climate Change Risk Assessment (2017)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf

³³ National Adaptation Programme (2023) <https://www.gov.uk/government/publications/third-national-adaptation-programme-nap3>

it is nonetheless problematic as it neglects an important part of the picture and subset of the population. An analysis of 100 British newspaper articles between July 2022 and July 2023 with mention of the health impacts heatwaves found that only 4 mentioned mental health.³⁴ Not only is significantly more coverage of the impacts of heat on mental health necessary, but its position in discussion also needs reframing – policymakers can play a major role in shaping this narrative.

- **The second policy reframe is to produce public policy messaging that recognises that the heat impacts of mental health are not a standalone, singular problem.** Heat and mental health affect, and are affected by, a plethora of interdependent cross-cutting social, economic, health and technological factors. It is vital that actions are embedded in this reality. By this we mean taking a holistic perspective that considers not just the first-order impacts of a decision but the second and third order consequences. For example, a heatwave warning from the Met office may be useful in the sense that it gives some prior warning to someone with a severe mental disorder like Schizophrenia of what is to come. But this warning, and subsequent public health messaging from the NHS advising people to ‘stay cool and hydrated’, may be of little help if an individual does not have access to air conditioning or sustainable cooling technologies, has not been told of how heat will worsen the side effects of their medication, or lacks social care and support networks.
- **The third policy reframe is to challenge and change the prevailing orthodox attitudes and language pertaining to the heat-heat nexus.** These have traditionally been grounded in a mindset of ‘surviving’ and ‘getting by’, whereas the overarching objective should be more ambitious: thriving, and even flourishing. This is not to downplay the very real issues for mental health that arise during extreme heat; rather, it is to challenge the low bar which has been set and propose that with the right support systems in place, mental health can be supported during extreme heat and individuals can function well.

In combination – a reframing of public policy messaging could both direct attention to and increase awareness within the populations most vulnerable to the impacts of extreme heat on mental health.

3.2 Action #2: Leveraging Sensitive Intervention Points (SIPs) in policymaking on heat and health

Most failures in policymaking can be attributed to the lack of accounting for interdependencies between different sectors, agents and stakeholders in an economy and society. Policies to address heat and mental health are susceptible to the same obstacle, yet policymakers have to balance the concerns of the individual (or groups of) constituent(s) against a desire to move the ‘system’ forward as a whole. Academics have emphasised a ‘systems’ approach – put simply, one in which policy intervention in one part of a ‘system’ (e.g. an economy) does not lead to negative outcomes in another part. This has proved challenging to follow in practice.³⁵

Farmer et al. (2019)³⁶ address this challenge by making a case for prioritising policy interventions which concentrate action on areas that can make the greatest real difference, catalyse positive feedback loops, and coordinate across ‘systems’ to bring about the scale of change that is necessary for achieving net zero. This approach is based on ‘Sensitive Intervention Points’. We propose applying this approach to interventions in the heat and health space. The table below outlines some proposed actions that would improve support for the mental health of the British public during periods of extreme heat, and mitigate adverse health and socioeconomic outcomes in the long-term.

³⁴ Author.

³⁵ OECD (2018) https://oecd-opsi.org/wp-content/uploads/2018/07/Systems-Approaches-to-Public-Sector-Challenges_Working-with-Change.pdf

³⁶ Farmer, J.D., Hepburn, C., Ives, M.C., Hale, T., Wetzler, T., Mealy, P., Rafaty, R., Srivastav, S., Way, R. (2019). Sensitive intervention points in the post-Carbon transition, *Science*, Vol 364, Issue 6436. <https://www.science.org/doi/abs/10.1126/science.aaw7287>

Table 1: Proposed actions to improve support for mental health during periods of extreme heat

Description of Sensitive Intervention Point	Structure	Dynamics			Outcomes		Tangible Actions
	When is the system ripe for change? System criticality/ window of opportunity?	How can you change the system? Kick (positive feedback) or shift (underlying rule change)?	What barriers to change exist? Resistance and negative feedbacks?	What prevents the system from changing back?	Size of impact?	Speed of impact?	Who can trigger the change? What needs to be done?
Multi-faceted approach bringing together researchers, medical practitioners, public and private healthcare systems, and the public. As we learn more about the impact of heatwaves on mental health, health policy must be reoriented to incorporate improved understanding; and proactive, evidenced-based approaches must be implemented into public and private healthcare systems alike.	2023-2030	Shift	Entrenched systems, resistance to change existing ways of doing things.	Appropriate lock ins and momentum shift.	Moderate to Large	Medium to longer term results	Update England Heatwave Plan to include significantly more coverage of mental health impacts and support strategies. NHS Trusts to share best practice. Institute multi-stakeholder steering group to guide implementation
Working more closely with academia through translational research	2023-2026	Kick	Demystifying potentially high-impact science and academic work to policy audiences; negative feedback from abstruse or 'unusable' results.	Reinforcement of policy implementation, backed by evidence-based science.	Moderate	Short-term results if translational processes are coherent and rapid, and reach the right policy audiences.	Dedicate position(s) in POST or government bodies to coordinating evidence-based research on extreme heat impacts across geographies and demographics, and collate actionable solutions.

Improved access to sustainable cooling technologies	2023-2030	Shift & Kick	Entrenched systems and infrastructure, resistance to change existing ways of doing things	Multiplier effects and co-benefits to public health, of access to sustainable cooling.	Moderate to Large	Medium to longer term results	Health authorities and local authorities should build a better understanding of population vulnerabilities in relation to heat and health, in UK regions, and their sustainable cooling needs.
Effective public policy messaging on heat and mental health	2023-2026	Kick	Entrenched systems - prevailing orthodox attitudes and language pertaining to the heath-heat nexus	Continuously challenge old orthodoxies and emphasise preparedness.	Moderate to Large	Short-term results	Working groups with stakeholders from the media, public health authorities, and government, to periodically share information on extreme heat preparedness, based on thresholds that account for the vulnerabilities of different populations.
Occupational and organisational heat resilience	2023-26	Shift & Kick	Entrenched systems, resistance to change existing ways of doing things.	Co-benefits to organisational productivity.	Moderate to Large	Medium term results	Mandate occupational and organisational heat resilience assessments and strategies.