January 26, 2022

VIA ELECTRONIC FILING

Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue NW
Washington, DC 20210

Re: Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings, RIN 1218–AD39, Docket No. OSHA–2021–0009

To Whom It May Concern:

Environmental Defense Fund ("EDF") and the Institute for Policy Integrity at NYU School of Law ("Policy Integrity")[1] respectfully submit the following comments to the Department of Labor's Occupational Safety and Health Administration ("OSHA") in response to its advance notice of proposed rulemaking *Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings*, published on October 27, 2021 (the "ANPRM").[2]

EDF is a non-partisan, non-governmental environmental organization representing over two million members and supporters nationwide. Since 1967, EDF has linked law, policy, science, and economics to create innovative and cost-effective solutions to today's most pressing environmental problems. Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy.

EDF and Policy Integrity support the ANPRM as an important step in OSHA's efforts to develop strong heat stress protections for workers. Heat stress is a critical environmental justice and workers' rights issue. It already poses serious threats to workers – disproportionately affecting those from marginalized communities and with health vulnerabilities – and will only grow in severity as climate change progresses. EDF and Policy Integrity recommend that OSHA proceed expeditiously from this ANPRM to a rulemaking establishing a standard on measures workplaces must take to protect workers from occupational heat risks ("heat standard"), and that the agency

[1] These comments do not necessarily reflect the views of NYU School of Law, if any.
[2] Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings, 86 Fed. Reg. 59,309 (Oct. 27, 2021) [hereinafter ANPRM].

also pursue complementary research, education, and enforcement initiatives, as authorized by Congress. We offer the following recommendations to help inform that process:[3]

I. OSHA should develop a heat standard that will be robust to climate change impacts. (Questions #22-25)

II. OSHA should consider data from existing state-level heat standards, including on high-risk industries, in developing a federal standard. (Questions #19-20, 30-34)

III. OSHA's assessment of economic impacts of a heat standard should include consideration of co-benefits, distributional consequences, and cost minimization by regulated parties. (Questions #19-20, 98)

   A. OSHA's economic analysis for a heat standard should consider not only direct health benefits, which are critical and sizeable, but also the important co-benefits of increased worker productivity and quality of life. (Question #98)

   B. OSHA's analysis should account for the distributional consequences of a heat standard. (Questions #19-20, 98)

   C. OSHA's analysis should assume that regulated parties will minimize costs through adaptation and innovation. (Question #98)

IV. OSHA should use other facets of its statutory authority, including its ability to gather, analyze, and publicize information, to complement its rulemaking efforts. (Questions #28, 60)

V. OSHA should consider comprehensive data relevant to addressing heat-related occupational risks, including data on climate change and distributional inequities. (Questions #2-5)

I. OSHA should develop a heat standard that will be robust to climate change impacts. (Questions #22-25)

Climate change has myriad effects on weather systems, including increasing average temperatures. As the globe's average temperatures increase, the frequency and severity of extreme heat events are likewise increasing. With these changes, past risk profiles are not necessarily predictive of future risk profiles.[4] As OSHA works to develop a heat standard, it should take into account foreseeable future increases in average temperatures, as well as

[3] In parentheses beside each heading, we note the ANPRM question(s) to which the section is most relevant. All ANPRM questions addressed in these comments are listed in Appendix 1 for reference.

[4] Because of this non-stationarity in climate, an over-reliance on historical climate patterns can hinder estimations of future events. *See, e.g.*, Jan Kyselý et al., *Estimating Extremes in Climate Change Simulations Using the Peaks-Over-Threshold Method with a Non-Stationary Threshold*, 72 GLOB. & PLANETARY CHANGE 55 (2010); Daniel Burillo et al., *Electricity Demand Planning Forecasts Should Consider Climate Non-Stationarity to Maintain Reserve Margins During Heat Waves*, 206 APPLIED ENERGY 267 (2017); P.C.D. Milly et. al, *Stationarity Is Dead: Whither Water Management?* 319 SCIENCE 573, 573–74 (Feb. 2008).

expected increases in the frequency and severity of heat waves, in order to craft a standard that will be robust to the heightened risk profile expected in the future.

As OSHA noted in its ANPRM, human physiological impacts from heat stress are most affected by the wet bulb globe temperature (WBGT).[5] WBGT is a metric that takes into account both humidity—which limits the human body's ability to cool itself—and temperature, in order to better capture the physiological impact of the heat.[6] High WBGTs can be deadly; a WBGT of 35°C is lethal even to healthy, fully-hydrated individuals sitting in the shade.[7] Scientists predict that such events will occur regularly in South Asia and the Middle East by mid-century.[8] Meanwhile, WBGTs below the 35°C threshold can still be lethal. The 2003 European heat wave led to the deaths of over 70,000 people although the WBGT did not exceed 28°C.[9] Instances of extreme humid heat are likely to worsen in the coming decades: over the past forty years, such events have doubled and the growth is predicted to continue.[10] In addition to increasing the frequency of high WBGT, climate change will also increase the frequency and severity of heat waves in the United States.[11] Heat waves lead to greater mortality than individual hot days.[12] In June 2021, the Pacific Northwest faced record-shattering heat. The week-long heat wave, associated with 600 excess deaths, is estimated to be a one-in-a-thousand year event under today's climate, however, under an additional 0.8°C of warming (2°C of total warming, compared to pre-industrial temperatures), the region may expect to see such events every five to ten years.[13]

Heat exposure already poses dangers to workers. As climate change exacerbates temperatures, humidity, and the frequency and severity of heat waves, these dangers will increase. OSHA is charged with providing all workers with a "safe and healthful working environment"[14] and has an obligation to craft a heat standard that not only considers the heat events that are common today, but will also protect workers against the high WBGT scenarios and heat waves that will grow only more common in the future. For example, OSHA may consider whether a maximum allowable WBGT workplace temperature is needed, and to what extent access to air conditioning can sufficiently protect workers' health and well-being. Similarly, OSHA could consider whether

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[5] Colin Raymond et al., *The Emergence of Heat and Humidity Too Severe for Human Tolerance*, 6 SCI. ADVANCES eaaw1838-1, 01 (2020).
[6] *Id.*
[7] *Id.*
[8] *Id.*
[9] *Id.*; Jean-Marie Robine et al, *Death Toll Exceeded 70,000 in Europe During the Summer of 2003*, 331 COMPTES RENDUS BIO. 171 (2008).
[10] Raymond et al., *supra* note 5, at 1.
[11] Gerald A. Meehl & Claudia Tebaldi, *More Intense, More Frequent, and Longer Lasting Heat Waves in the 21st Century*, 305 SCIENCE 994 (2004).
[12] Brooke Anderson & Michelle Belle, *Weather-Related Mortality, How Heat, Cold, and Heat Waves Affect Mortality in the United States*, 20 EPIDEMIOLOGY 205 (2009).
[13] Quirin Schiermeier, *Climate Change Made North America's Deadly Heatwave 150 Times More Likely*, NATURE NEWS (July 8, 2021), https://www.nature.com/articles/d41586-021-01869-0; Sjoukje Philip et al., *Rapid Attribution Analysis of the Extraordinary Heatwave on the Pacific Northwest of the U.S. and Canada June 2021* (unpublished manuscript), https://www.worldweatherattribution.org/wp-content/uploads/NW-US-extreme-heat-2021-scientific-report-WWA.pdf; Nadja Popovich & Winston Choi-Schagrin, *Hidden Toll of the Northwest Heat Wave: Hundreds of Extra Deaths*, N.Y. TIMES (Aug. 11, 2021), https://www.nytimes.com/interactive/2021/08/11/climate/deaths-pacific-northwest-heat-wave.html.
[14] 29 U.S.C. § 651.

a different heat standard should apply during heat waves, when workers are more vulnerable to heat-related illness.

II. OSHA should consider data from existing state-level heat standards, including on high-risk industries, in developing a federal standard. (Questions #19-20, 30-34)

As noted in the ANPRM, four states have promulgated permanent or temporary workplace heat standards.[15] Though state standards vary in scope and coverage, they provide information on the effectiveness and feasibility of various heat stress protections for indoor and outdoor workers. In crafting a federal standard that reflects health-based recommendations and effectively protects all workers, OSHA should incorporate relevant data on health outcomes, implementation strategies, and equity considerations across industries. Although state standards have not been consistent with the National Institute for Occupational Safety and Health's ("NIOSH") recommendations, analysis of existing regulations offers critical data on the effectiveness and feasibility of various heat protection measures as well as strategies for implementation at the federal level. OSHA should review research that has been conducted on these state standards, as well as consider consulting with officials, worker representatives, or other stakeholders from these states for further input on best practices and lessons learned.

Data from a study of the California Division of Occupational Safety and Health ("Cal/OSHA") standards for farmworkers found that the state's existing requirements were insufficient to fully protect workers from heat illness, suggesting that federal standards should incorporate additional measures. In a cross-sectional study of Latino farmworkers conducted during the summers of 2014 and 2015, researchers found that, despite adherence to Cal/OSHA regulations, worker training and hydration rates[16] were insufficient to eliminate risk.[17] Agricultural workers' risk for heat-related illness was exacerbated by work rate and environmental temperatures, with workers performing slower paced and less physically demanding tasks at lower risk.[18] Despite compliance with state standards, 8 percent of workers were at risk of heat-related illness due to high core body temperature and 6.5 percent were at risk due to rate of increase in body temperature.[19] Nearly 12 percent were dehydrated, over 12 percent suffered reversible acute kidney injury, and 50 percent experienced a symptom of heat illness during the workday.[20] On high-heat days, 10.7 percent of workers experienced elevated core body temperature compared to

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[15] MINN. R. 5205.0110 (2022); WASH. ADMIN. CODE § 296-62-09510 et seq.; CAL. CODE REGS. tit. 8 § 3395 (2021); OR. ADMIN. R. 437-002-0155 (2021).

[16] California regulations require provision of one quart per employee per hour of pure, suitably cool water and require effective training before employees begin work on topics including heat illness, risk factors, and employer obligations to provide water, shade, and breaks. CAL. CODE REGS. tit. 8 §§ 3395(c), 3395(h).

[17] Chelsea Eastman Langer et al., *Are Cal/OSHA Regulations Protecting Farmworkers in California from Heat-Related Illness?* 63 J. OCCUPATIONAL & ENV'T MED. 532 (2021); Diane Mitchell et al. *Recruitment, Methods and Descriptive Results of a Physiologic Assessment of Latino Farmworkers: the California Heat Illness Prevention Study (CHIPS)*, 59 J. OCCUPATIONAL & ENV'T MED. 649 (2017) [hereinafter Mitchell et al., *Recruitment*]; Diane Mitchell et al., *Physical Activity and Common Tasks of California Farmworkers: California Heat Illness Prevention Study (CHIPS)*, 15 J. OCCUPATIONAL & ENV'T HYGIENE 857 (2018) [hereinafter Mitchell et al., *Physical Activity*].

[18] Langer et al., *supra* note 17, at 536.

[19] *Id.*; Mitchell et al., *Recruitment*, *supra* note 17, at 649; Diane Mitchell & Chelsea Eastman Langer, *California Heat Illness Prevention Study Findings*, UC DAVIS (March 15, 2019), https://aghealth.ucdavis.edu/news/chips-findings.

[20] Langer et al., *supra* note 17, at 537; Sally Moyce et al., *Heat Strain, Volume Depletion and Kidney Function in California Agricultural Workers*, 74 J. OCCUP. ENV'T MED. 402, 404; Mitchell & Langer, *supra* note 19.

5 percent on cooler days. This doubled risk underscores the need for additional worker protections on high-heat days.[21]

More broadly, this research on adverse outcomes for farmworkers under the Cal/OSHA heat standard indicates that development of effective worker protections at the federal level should include addressing distributional impacts of workplace heat hazards and identifying opportunities for targeted industry approaches. As discussed in Section III.B. and in OSHA's ANPRM, certain industries are at particularly high risk for heat-related illness. Agricultural workers are among the populations most vulnerable to heat-related illness, and climate change will further exacerbate this risk.[22] Unlike industries like firefighting, military, and mining, agriculture has not benefited from extensive monitoring and assessment of workplace heat-related illness risks and standardized workplace practices.[23] Researchers have noted the need for additional research focusing on the conditions of agricultural labor, which is conducted overwhelmingly by immigrant workers, and in which conditions vary tremendously by region, worksite, and tasks performed.[24] In crafting a federal heat standard, OSHA should consider specific protections for agricultural work and other high-risk industries tailored to the demands and realities of daily working conditions. Suggestions from researchers for agricultural work standards include limiting the types of tasks performed on extremely hot days, tailoring training and educational approaches to the workforce, practical adjustments to work and rest breaks targeting specific tasks, and designating supervisors to model essential behaviors.[25]

Data gathered as part of the California Heat Illness Prevention Study also suggests that to be effective, any training programs required by a federal standard should incorporate input from workers, be culturally responsive, and ensure materials are accessible in terms of languages and delivery methods. In addition to physiological monitoring, researchers held focus groups to solicit feedback on heat stress regulations and used responses to identify more targeted training protocols. Workers participating in focus groups suggested training take place at the work site and in an interactive fashion to increase effectiveness.[26] Based on behavioral and physiological results of the study, new training programs were produced and piloted at a variety of farms in California with positive responses from workers.[27] Training and education programs have been incorporated in some form by every state that has established heat standards.[28] Particularly for vulnerable workers, who may be more likely to ignore or decline to report heat-related illness symptoms for fear of retaliation or loss of wages, training and modeling behavior by supervisors plays a vital role in reducing risk, promoting self-care decisions, and counteracting pressure to

[21] Langer et al., *supra* note 17, at 537. Additional high heat protections went into effect in 2015 but were not assessed for this study.
[22] Michelle Tigchelaar et al., *Work Adaptations Insufficient to Address Growing Heat Risk for U.S. Agricultural Workers*, 15 ENV'T RSCH. LETTERS 9 (2020).
[23] Mitchell et al., *Recruitment*, *supra* note 17.
[24] *Id.; see also* Mitchell et al., *Physical Activity*, *supra* note 17.
[25] Langer et al., *supra* note 17, at 538. *See also* John Luque et al., *Knowledge and Practices to Avoid Heat-Related Illness Among Hispanic Farmworkers Along the Florida-Georgia Line*, 25 J. AGROMEDICINE 190 (2020).
[26] Mitchell & Langer, *supra* note 19.
[27] *Id.*
[28] MINN. R. 5205.0110 (2022); WASH. ADMIN. CODE §§ 296-62-095 to -09560; CAL. CODE REGS. tit. 8 § 3395 (2021); OR. ADMIN. R. 437-002-0155 (2021).

maximize output.[29] Additionally, for agricultural workers being paid piece-rate rather than hourly, fear of reduced productivity may discourage workers from pausing to hydrate and take shaded breaks even if made available by employers.[30] Training programs play a critical role in existing heat protection standards, and training programs under a federal standard should incorporate worker feedback and accessibility considerations to maximize effectiveness.

A recent regulation issued by Oregon OSHA highlights the importance of providing protection from heat not just in the workplace itself but also in employer-provided housing. As OSHA noted in its ANPRM, lower wage workers are more likely to experience greater exposure to hazardous heat in the workplace and more likely to have limited access to air-conditioned spaces at home or elsewhere to recover from excessive heat exposure. For workers in employer-provided housing, lack of access to relief from heat can further inhibit the body's ability to regulate heat and can magnify the risk of heat-related illness. In August, Oregon OSHA announced an emergency rule addressing heat in employer-provided labor housing.[31] The provisions kick in when the heat index reaches 80 degrees and require that housing for which indoor temperatures cannot be kept below 78 degrees must include common areas that provide relief from the heat.[32] Employers also must furnish housing with thermometers and fans available for use and ensure windows can be shaded.[33] The rule also requires additional training on heat illness and access to emergency services.[34] Federal standards should address disproportionate exposure of workers to extreme heat and integrate measures, such as Oregon's employer housing standards, that ensure workers have access to relief from heat.

III. OSHA's assessment of economic impacts of a heat standard should include consideration of co-benefits, distributional consequences, and cost minimization by regulated parties. (Questions #19-20, 98)

In its ANPRM, OSHA requests further information on the potential economic benefits and costs of implementing a heat standard.[35] In weighing these impacts to develop the optimal heat standard, OSHA should consider not only the direct health benefits, but also important co-benefits of improved worker productivity and quality of life. While many benefits are quantifiable, non-quantifiable benefits should also be given weight and consideration in the analysis. The distributional consequences of a heat standard are a particularly important unquantified effect; in evaluating potential standards, OSHA should consider to whom the benefits and costs are accruing and whether there are desirable distributional impacts. Finally, in weighting costs, it is important to recognize industry's incentive to learn and adapt, which will likely lower compliance costs.

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[29] Mitchell et al., *Physical Activity*, *supra* note 17; Gail Wadsworth et al., *Pay, Power, and Health: HRI and the Agricultural Conundrum* 43 LAB. STUDIES J. 1 (2019).
[30] Wadsworth et al., *supra* note 29.
[31] Oregon OSHA, Amendment of OAR 437-004-1120 to Address High Ambient Temperatures in Labor Housing (Aug. 2, 2021), https://osha.oregon.gov/OSHARules/adopted/2021/ao8-2021-letter-temp-alh-heat.pdf.
[32] *Id.*
[33] *Id.*
[34] *Id.*
[35] ANPRM, *supra* note 2, at 59,322.

A. OSHA's economic analysis for a heat standard should consider not only direct health benefits, which are critical and sizeable, but also the important co-benefits of increased worker productivity and quality of life. (Question #98)

In weighing the economic benefits of a heat standard, OSHA should consider not only the essential direct health benefits of a heat standard, but also important co-benefits of improved worker productivity and quality of life. Furthermore, OSHA should quantify both direct benefits and co-benefits wherever possible. Where quantification is not feasible with available data, the agency should qualitatively assess these effects.

Repeated exposure to extreme heat results in a litany of negative health impacts, ranging from long-term kidney damage,[36] to heat exhaustion, to loss of life.[37] A heat standard would help mitigate these damages by reducing occupational exposure to high temperature and high WBGT scenarios.

Beyond heat-related illness, such as heat stroke, extreme heat is also correlated with traumatic workplace injuries, such as falls from ladders. One study, for example, found a 10 to 15 percent increase in total workplace injuries on days with temperatures above 100°F.[38] This statistic includes indoor workplaces, which face smaller, but still material, increases in injuries.[39] Another study examined pilot-caused helicopter accidents and incidents to uncover that helicopter pilots make more errors when exposed to heat stress.[40] Accordingly, in assessing the benefits of a heat standard, OSHA should consider whether and to what extent the standard would decrease rates of general traumatic injury.

In addition to the direct health and safety impacts from a heat standard, a heat standard would provide important co-benefits that should be considered. First, a heat standard would benefit workers by providing a more comfortable, dignified, and humane working environment.[41] Employees receive increased utility from these improved working conditions under a heat standard. Circular A-4 calls on agencies to consider "discomfort . . . costs or benefits," while President Obama's Executive Order on *Improving Regulatory Review* called for consideration of

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[36] Fabiana Nerbass et al., *Occupational Heat Stress and Kidney Health: From Farms to Factories*, 2 KIDNEY INT'L REP. 998 (2017).

[37] In quantifying health impacts, OSHA may consider hospitalization costs. A study examining heat-related illness from 2001-2010 found the average heat-related hospitalization cost $8965. Michael Schmeltz et al., *Economic Burden of Hospitalizations for Heat-Related Illnesses in the United States, 2001-2010*, 13 INT'L J. ENV'T RES. PUB. HEALTH 894 (2016). Another study, which restricted its view only to heat stroke, estimated the median cost of a hospital stay to be $17,372. Wisit Kaewput et al., *Inpatient Burden and Mortality of Heatstroke in the United States*, INT'L J. OF CLINICAL PRACTICE (Nov. 17, 2020).

[38] R. Jisung Park et al., *Temperature, Workplace Safety, and Labor Market Inequality* 2 (IZA Inst. of Labor Econ. Discussion Paper Series, 2021). Other studies have made similar findings regarding traumatic injuries and heat exposure. *See, e.g.*, June Spector et al., *A Case-Crossover Study of Heat Exposure and Injury Risk in Outdoor Agricultural Workers* PLOS ONE (Oct. 7, 2016); Ximena Garzon-Villalba et al., *Exertional Heat Illness and Acute Injury Related to Ambient Wet Bulb Globe Temperature*, 59 AM. J. IND. MED. 1169 (2016).

[39] Park, *supra* note 38, at 3.

[40] Paul Froom et al., *Heat Stress and Helicopter Pilot Errors*, 35 J. OCCUPATIONAL MED. 720 (1993).

[41] Although not included in the economic analysis of that rule, OSHA has previously recognized the value of comfort and dignity. *See e.g.*, General Working Conditions in Shipyard Employment, 76 Fed. Reg. 24,576, 24,615 (May 2, 2011) (noting that a provision to improve privacy in changing rooms was "necessary for workers' health and well-being, as well as personal comfort and dignity"); *id.* at 24613 (noting that venting in portable toilets "is necessary for employee comfort, health, and well-being.").

human dignity.[42] While such benefits may be challenging to quantify, they should nonetheless be factored into decisionmaking.

Second, regulated entities gain a co-benefit from increased worker productivity. Extensive academic literature concludes that worker productivity declines with temperature.[43] In manufacturing, an increase in outside temperature of 1°C, was correlated with a 2 percent decrease in textile manufacturing productivity.[44] On the other hand, access to climate control resulted in decreased productivity losses.[45] These decreases hold even in non-physical labor contexts, such as call centers.[46] In other words, mitigating exposure to heat would reduce heat-related productivity losses.

OSHA should quantify the above and other benefits from a heat standard wherever possible. Where it is not possible to quantify benefits, OSHA should still weigh and list the unquantified benefits. While there may be factors that limit the agency's ability to quantify certain types of effects, nonmonetized impacts should nonetheless be considered. Indeed, *Circular A-4* calls upon agencies to do precisely this, noting that "[a] complete regulatory analysis includes a discussion of non-quantified as well as quantified benefits and costs" and that decisionmakers should "identify [non-monetary benefits] in [their] analysis so policymakers can compare them with the monetary benefits and costs."[47] When unquantifiable costs and benefits are involved, it may be the case that the most efficient rule is not the one with the "largest quantified and monetized net-benefit estimate."[48]

A heat standard has the capacity to reduce heat-related illness and general traumatic workplace injury in both indoor and outdoor environments, increase worker productivity, and improve the quality of life for workers. OSHA should consider all of these benefits when assessing the impacts of a heat standard.

B. OSHA's analysis should account for the distributional consequences of a heat standard. (Questions #19-20, 98)

As we discuss in Sections II and V, and as OSHA points out in its ANPRM, low-income communities and communities of color may stand to benefit the most from a heat standard.[49] As such, in deciding whether or how stringent to make a heat standard, OSHA should consider any desirable distributional consequences associated with such a rule.

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[42] OFFICE OF MGMT. & BUDGET, CIRCULAR A-4, REGULATORY IMPACT ANALYSIS 37 (2003) [hereinafter Circular A-4] ("You should include these effects in your analysis and provide estimates of their monetary values when they are significant . . . discomfort or inconvenience costs and benefits"); Exec. Order 13,563 § 1(c), 76 Fed. Reg. 3821, 3821 (Jan. 18, 2011) ("each agency may consider (and discuss qualitatively) values that are difficult or impossible to quantify, including . . . human dignity").

[43] *See* Tamma A. Carleton & Solomon M. Hsiang, *Social and Economic Impacts of Climate*, 353 SCIENCE 1112 (2016).

[44] E. Somanathan et al., *The Impact of Temperature on Productivity and Labor Supply: Evidence from Indian Manufacturing*, 129 J. POL. ECON. 1797 (2021).

[45] *Id.*

[46] Raimo Niemela et al., *The Effect of Air Temperature on Labour Productivity in Call Centres—A Case Study*, 34 ENERGY & BUILDINGS 759 (2002).

[47] Circular A-4, *supra* note 42, at 3.

[48] *Id*. at 2.

[49] ANPRM, *supra* note 2, at 59,313.

For example, farmworkers are a group at particular risk of excess heat exposure. Less than a third of farmworkers are non-Hispanic white and nearly half do not have a high school diploma.[50] In contrast, 59 percent of the U.S. workforce, as a whole, is non-Hispanic white, and only 9 percent lack a high school diploma.[51] Similarly, while 90 percent of U.S. private sector workers are U.S. citizens, only 53 percent of farm laborers are U.S. citizens.[52] Beyond these disparities in workforce composition, the average farm wage is only 59 percent of the average nonfarm wage.[53] These statistics are specific to the agricultural sector—which employs only a portion of the workers that would benefit from a heat standard. They nevertheless highlight how marginalized communities may benefit most from a heat standard.

OSHA can identify the differing distributional effects of available regulatory alternatives by providing disaggregated cost and benefit totals for specified subpopulations.[54] In choosing among alternatives, the agency could treat the relative distributional desirability of an option as an unquantified benefit.[55]

C. OSHA's analysis should assume that regulated parties will minimize costs through adaptation and innovation. (Question #98)

Regulated parties have an economic incentive to innovate in order to reduce the costs of compliance as much as possible. In considering the economic costs of a heat standard, OSHA should assume that regulated parties will act in an efficient and rational manner and take the least cost approach to comply with OSHA's rule.[56] Furthermore, OSHA should recognize the capacity of industry to innovate—both in terms of technological and non-technological solutions—in the face of regulation. For example, it is conceivable that if a heat standard would forbid work during certain hours of a particularly warm day, rather than losing a day of productivity, industry may shift work to cooler hours of the day. Similarly, in industries that are not tied to seasonal production, work may shift away from summer to winter and the shoulder seasons. If a heat standard included certain requirements for lengthened breaks in the face of extreme heat, industry may choose to stagger shifts to maintain an even workflow. Generally, it is important for OSHA to recognize that the costs of regulatory compliance tend to be overestimated, rather than underestimated, and that industry will innovate to meet the standard.[57]

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[50] Econ. Res. Serv., *Farm Labor*, U.S. DEP'T OF AGRICULTURE, (last visited Jan. 3, 2022), https://www.ers.usda.gov/topics/farm-economy/farm-labor/#demographic.
[51] *Id.*
[52] *Id.*
[53] *Id.*
[54] *See* JACK LIENKE ET AL., INST. FOR POL'Y INTEGRITY, MAKING REGULATIONS FAIR: HOW COST-BENEFIT ANALYSIS CAN PROMOTE EQUITY AND ADVANCE ENVIRONMENTAL JUSTICE 14–15 (2021); *see also* Richard L. Revesz & Samantha P. Yi, *Distributional Consequences and Regulatory Analysis*, 52 ENV'T L. (forthcoming 2022) (manuscript at 26–29), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3927277.
[55] *See* LIENKE ET AL., *supra* note 54, at 15.
[56] *See* Circular A-4, *supra* note 42, at 37; *see also* RICHARD L. REVESZ & MICHAEL L. LIVERMORE, RETAKING RATIONALITY: HOW COST-BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH 137–38 (2008) (describing how innovation leads to decreased compliance costs).
[57] *See* REVESZ & LIVERMORE, *supra* note 56, at 139–41 (2008) (describing how regulatory compliance costs are more likely to be overestimated than underestimated).

IV. OSHA should use other facets of its statutory authority, including its ability to gather, analyze, and publicize information, to complement its rulemaking efforts. (Questions #28, 60)

Congress explicitly gave OSHA the responsibility and authority to address occupational risks like heat-related hazards through rulemaking and other actions, in furtherance of the OSH Act aim of assuring "so far as possible . . . safe and healthful working conditions" for "every working man and woman in the Nation."[58] OSHA can and should use the multiple facets of authority conferred specifically on it by Congress to address the climate change-amplified risks of workplace heat exposure.

While a heat standard, which OSHA is clearly authorized to issue,[59] similar to its longstanding regulations on other hazardous workplace conditions, is essential to address work-related heat dangers, OSHA also has authority to inform and strengthen workplace heat protections through additional initiatives. Other key aspects of OSHA's statutory mandate relevant to identifying and addressing occupational heat risks include research,[60] innovation,[61] and publication of reports and other information.[62] As OSHA proceeds with its multi-pronged approach of a heat standard and complementary actions, we recommend that it consider the following steps.

As detailed throughout these comments, OSHA should gather and analyze multiple types of data and information to develop a robust understanding of workplace heat harms and solutions. Research on health science, climate science, and issues relating to labor, race, and immigration is all relevant to forming an accurate picture of the heat harms workers face today and will face in the future. Information from other jurisdictions that have implemented heat standards, such as some states, can provide useful indications of which approaches are effective, as explained in Section II.

OSHA should participate in development and coordination of best practices on climate risk assessment and resilience planning with other federal agencies addressing related issues.[63] Structures for such collaboration include interagency working groups and technical expertise panels. OSHA should ensure that key stakeholders – including representatives of workers from industries and communities disproportionately affected by heat hazards – can meaningfully participate in these processes. The collection, analysis, and public disclosure of high-quality data on heat stress, informed by the latest climate science, health science, and affected community expertise, would further OSHA's research and education missions.

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[58] 29 U.S.C. § 651.
[59] *See* 29 U.S.C. §§ 651(b), 655(b), (c); *see also* Public Citizen et al., Petition to OSHA for a Heat Standard (July 17, 2018), https://citizenvox.org/wp-content/uploads/2018/07/180717_Petition-to-OSHA-on-Heat-Stress-Signed_FINAL.pdf; Public Citizen et al., Petition to OSHA for an Emergency Temporary Standard on Heat in the Workplace (Aug. 4, 2021), https://www.citizen.org/wp-content/uploads/Public-Citizen-Petition-to-OSHA-for-Heat-ETS-8.4.2021.pdf.
[60] 29 U.S.C. § 651(b)(5).
[61] *Id.*
[62] 29 U.S.C. § 657(g).
[63] *See* Inst. for Pol'y Integrity, Comments in Response to Request for Information: AHRQ's Role in Climate Change and Environmental Justice 5–6 (Dec. 13, 2021), https://policyintegrity.org/documents/Policy_Integrity_Comments_AHRQ_RFI.pdf.

One specific component of resilience planning that OSHA should adopt is avoidance of maladaptive measures – answers to a problem that ultimately worsen its underlying causes. In the climate context, this means considering how actions may increase or decrease greenhouse gas emissions, thereby amplifying or mitigating the extent of climate change. Additionally, OSHA should consider the resilience of contemplated measures to climate change impacts. For example, energy efficiency measures may improve cost-effectiveness of heat protections, while also reducing emissions, thereby reducing the need for or cost of further heat protections in the future.

OSHA can and should use its statutory authority to gather, analyze, and share the multiple categories of information relevant to effective and resilient action on protecting workers from heat harms.

V. OSHA should consider comprehensive data relevant to addressing heat-related occupational risks, including data on climate change and distributional inequities. (Questions #2-5)

In addition to the sources already cited in the ANPRM, we emphasize the importance of data on climate change and distributional inequities for evaluating heat risks. OSHA should consider the sources cited in these comments and other reliable sources of data on these topics provided by other commenters.

First, OSHA should ensure it considers data on how climate change is expected to exacerbate heat harms.[64] Specifically, OSHA should consider reliable, up-to-date projections of future temperatures and humidity, in terms of both averages and extremes, across the relevant regions and timescales for this action. The importance of this type of data for workplace health and safety protections is discussed in further detail in Section I, above.

Second, OSHA should consider data on distributional inequities of heat exposure and vulnerability, including information people offer based on their lived experiences. Various

[64] *See* Inst. for Pol'y Integrity, Comments in Response to Request for Information: AHRQ's Role in Climate Change and Environmental Justice 5–6 (Dec. 13, 2021), https://policyintegrity.org/documents/Policy_Integrity_Comments_AHRQ_RFI.pdf (citing NOAA NAT'L CTRS. FOR ENV'T INFO., https://www.ncei.noaa.gov/; *Climate Data Online: Dataset Discovery*, NOAA NAT'L CTRS. FOR ENV'T INFO., https://www.ncdc.noaa.gov/cdo-web/datasets; *U.S. Billion-Dollar Weather and Climate Disasters*, NOAA NAT'L CTRS. FOR ENV'T INFO., https://www.ncdc.noaa.gov/billions/time-series; *OpenFEMA Datasets*, FED. EMERGENCY MGMT. AGENCY, https://www.fema.gov/about/openfema/data-sets; TEXAS ADV. COMM. TO THE U.S. COMM'N ON CIVIL RIGHTS, GOVERNMENT RESPONSE TO HURRICANE DISASTERS: AN ADVISORY MEMORANDUM OF THE TEXAS ADVISORY COMMITTEE TO THE U.S. COMMISSION ON CIVIL RIGHTS 10 (Mar. 2021), https://www.usccr.gov/files/2021/05-19-TX-SAC-GovernmentResponse-to-Hurricane-Disasters-in-Texas.pdf; *Mission and Overview*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/about/mission_overview.php; CTRS. FOR MEDICARE & MEDICAID SERVS., *Nation's Health Dollar: Where It Came From, Where It Went*, CTRS. FOR MEDICARE & MEDICAID SERVS., https://www.cms.gov/files/document/nations-health-dollar-where-itcame-where-it-went.pdf; *National Environmental Public Health Tracking: Climate Change*, CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/nceh/tracking/topics/ClimateChange.htm; *CDC's Climate and Health Program,* CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/climateandhealth/; *EJSCREEN: Environmental Justice Screening and Mapping Tool, What is EJScreen?*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ejscreen/what-ejscreen; https://www.epa.gov/ejscreen/environmental-justiceindexes-ejscreen).

groups are disproportionately exposed to heat stress,[65] including outdoor workers,[66] lower-income people,[67] people of color,[68] and people lacking immigration status.[69] Furthermore, some people have heightened vulnerability to adverse outcomes from heat,[70] including people with chronic health conditions or disabilities,[71] people with inadequate access to healthcare,[72] elderly people,[73] and pregnant people.[74] OSHA should thoroughly consider information on how such distributional inequities affect heat exposure and vulnerability in order to devise a standard that sufficiently protects all workers. The importance of this type of data is discussed further in Sections II and III, above.

The ANPRM recognizes the significance of climate change and distributional inequities for a comprehensive understanding of the risks heat stress poses to workers.[75] OSHA should follow through on this recognition by incorporating thorough and reliable information on these factors into its development of a heat standard and its other occupational heat risk mitigation efforts.

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[65] *See* Marina Romanello et al., *The 2021 Report of the Lancet Countdown on Health and Climate Change: Code Red for a Healthy Future*, 398 THE LANCET 1619 (2021), https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01787-6/fulltext; Rachel Morello-Frosch et al., *The Climate Gap: Inequalities in How Climate Change Hurts Americans & How to Close the Gap* (2009), https://dornsife.usc.edu/assets/sites/242/docs/ClimateGapReport_full_report_web.pdf.

[66] *See* KRISTINA DAHL & RACHEL LICKER, UNION OF CONCERNED SCIENTISTS, TOO HOT TO WORK (2021), https://www.ucsusa.org/resources/too-hot-to-work; Jeff Goodell, *Sebastian Perez Did Not Have to Die*, ROLLING STONE (Aug. 17, 2021), https://www.rollingstone.com/politics/politics-features/heat-wave-2021-oregon-deaths-sebastian-perez-1211258/.

[67] *See* Karin Lundgren et al., *Effects of Heat Stress on Working Populations When Facing Climate Change*, 51 INDUSTRIAL HEALTH 3 (2013), https://www.jstage.jst.go.jp/article/indhealth/51/1/51_2012-0089/_pdf/-char/en

[68] *See* DAHL & LICKER, *supra* note 66; *2021 New York City Heat-Related Mortality Report*, N.Y.C. DEP'T OF HEALTH, (last visited Jan. 15, 2022), https://nyccas.cityofnewyork.us/nyccas2021v9/report/1.

[69] *See* Goodell, *supra* note 66.

[70] *See* Romanello et al., *supra* note 65.

[71] *See 2021 New York City Heat-Related Mortality Report*, *supra* note 68.

[72] *See id*.

[73] *See* Lundgren et al., *supra* note 67.

[74] *See id.*; Inst. for Pol'y Integrity, *supra* note 64, at 13 (citing Juanita Chinn et al., *Maternal Mortality in the United States: Research, Gaps, Opportunities, and Priorities*, 225 AM. J. OBSTETRICS & GYNECOLOGY 486, 489 (2020) (explaining that maternal mortality disparities are "closely linked with social, economic and/or environmental disadvantage"); Jacqueline Moya et al., *A Review of Physiological and Behavioral Changes During Pregnancy and Lactation: Potential Exposure Factors and Data Gaps*, 24 J. OF EXPOSURE SCI. & ENV'T EPIDEMIOLOGY 449, 451–55 (2014); Osub Ahmed, *5 Ways To Improve Maternal Health by Addressing the Climate Crisis*, CTR. AM. PROGRESS (2021), https://americanprogress.org/article/5-ways-improve-maternal-health-addressing-climate-crisis/; Rebecca Pass Philipsborn et al., *Climate Change and the Practice of Medicine: Essentials for Resident Education*, 96 ACAD. MED. 355, 356 (2021); Bruce Bekker et al., *Association of Air Pollution and Heat Exposure with Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review*, 3 JAMA NETWORK OPEN 1 (2020).

[75] ANPRM, *supra* note 2, at 59,313.

We thank OSHA for its attention to these crucial issues and its consideration of these comments.

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Appendix 1

ANPRM Questions Addressed:

Data relevant to heat-related illnesses, injuries, and fatalities

- (2) What sources of data are important to consider when evaluating occupational heat-related illnesses, injuries, and fatalities?
- (3) Beyond the studies discussed in this ANPRM, are there other data that provide more information about the scope and magnitude of injuries, illnesses, and fatalities related to occupational heat exposure?
- (4) Are there quantitative estimates of the magnitude of occupational illnesses, injuries, and fatalities related to hazardous heat, beyond what is described in this ANPRM?
- (5) Are there quantitative estimates or other quantitative or non-quantitative examinations of the magnitude of underreporting of occupational illnesses, injuries, and fatalities related to hazardous heat?

Inequities in heat exposure and health outcomes

- (19) Are there specific populations facing disproportionate exposure to or outcomes from hazardous heat in indoor or outdoor work settings? Please provide examples and data.
- (20) Are there data sources available to assess inequalities in exposure to or outcomes from hazardous heat in indoor or outdoor work settings?

Climate change

- (22) Are there data sources available to assess how climate change is altering hazardous heat exposure in outdoor and indoor work environments?
- (23) How will climate change affect existing inequities in occupational heat exposure and related health outcomes? Please provide relevant data.
- (24) How will climate change affect the risk of occupational heat-related illness and mortality in the different regions of the United States?
- (25) How should climate change be factored into an OSHA heat illness and injury prevention standard?

Existing OSHA efforts

- (28) What additional efforts or improvements should be undertaken by OSHA to protect workers from hazardous heat in indoor and outdoor work settings?

Existing state efforts

- (30) What are the most effective aspects of existing state standards aimed at preventing occupational heat-related illness?
- (31) What are the challenges with the implementation of existing state standards aimed at preventing occupational heat-related illness?
- (32) Of the existing state standards, have any been more effective or challenging in their implementation than others? Why?
- (33) What components of a state standard or program should be included in Federal guidance or regulatory efforts on heat-related illness prevention?

- (34) Would any of the elements of the state standards not be feasible to include at the Federal level?

Energy efficiency

- (60) Are there data that demonstrate the role of facility energy efficiency in maintaining optimal thermal conditions, optimizing worker performance, and cost-effectiveness of cooling strategies?

Economic impacts

- (98) What are the potential economic impacts associated with the promulgation of a standard specific to the risk of heat-related injury and illness? Describe these impacts in terms of benefits, including reduction of incidents; effects on costs, revenue, and profit; and any other relevant impact measurements.