



# Effects of environmental stressors on daily governance

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**Human workers ensure the functioning of governments around the world. The efficacy of human workers, in turn, is linked to the climatic conditions they face. Here we show that the same weather that amplifies human health hazards also reduces street-level government workers' oversight of these hazards. To do so, we employ US data from over 70 million regulatory police stops between 2000 and 2017, from over 500,000 fatal vehicular crashes between 2001 and 2015, and from nearly 13 million food safety violations across over 4 million inspections between 2012 and 2016. We find that cold and hot temperatures increase fatal crash risk and incidence of food safety violations while also decreasing police stops and food safety inspections. Added precipitation increases fatal crash risk while also decreasing police stops. We examine downscaled general circulation model output to highlight the possible day-to-day governance impacts of climate change by 2050 and 2099. Future warming may augment regulatory oversight during cooler seasons. During hotter seasons, however, warming may diminish regulatory oversight while simultaneously amplifying the hazards government workers are tasked with overseeing.**

climate | governance | political science | regulation | temperature

**D**ay-to-day regulatory governance supports the functioning of society (1). Insufficient government oversight can worsen health outcomes (2), amplify environmental degradation (3), diminish public safety (4), and hamper government performance (5). Critically, regulatory governance cannot occur without those who enforce the rules (6). Street-level government workers, using their own discretion (7, 8), enforce government rules and policies in their communities (9). These government workers have physiological and psychological limitations (1), political biases (6, 10), and personal strategic goals (11). They are—in short—human.

Government workers—like other workers (12, 13)—likely experience the productivity-diminishing physiological (14) and psychological (15) effects of environmental stress. Adverse climatic conditions harm human well-being (16). Hot temperatures undermine cognitive performance (17), reduce hours worked (18), and diminish overall output (19, 20). If realized, weather-related reductions in government worker efficacy will likely occur simultaneously with increased demand for their social services. Climate change is also likely to worsen general societal well-being (16) by amplifying the occurrence of violent crime and interpersonal conflict (21) and by worsening the public health risks faced by citizens (14, 22).

These facts combine to suggest that the same environmental stressors likely to increase the citizenry's need for effective governance may also reduce the ability of government workers to respond to those needs. To investigate this possibility, we measure the effect of meteorological conditions on US regulatory enforcement across over 70 million police stops between 2000 and 2017 and across over 4 million food safety inspections between 2012 and 2016. We also examine the effect of the weather on vehicular crashes and food safety compliance, hazards these government inspectors are tasked with overseeing. (Our publicly available data and replication materials are available on Harvard University's Dataverse at <https://doi.org/10.7910/DVN/G1B8M18>. The proprietary food safety data can be obtained from the firm Hazel Analytics.) Using these data, we examine three questions.

First, does adverse weather induce fewer regulatory stops by police officers at the same time as it amplifies the public health risks from vehicular accidents and violent crime? Second, does adverse weather reduce the probability of food safety inspections at the same time as it increases the risk of food-borne illness? Finally, might future warming alter the ability of government workers to respond to the public health and safety risks posed by climate change?

## Results

**Police Stops.** To investigate whether outside weather conditions alter police officers' behavior, we use daily police stops in the United States between 2000 and 2017 (23) (Fig. 1A). We include data from counties with fewer than 30 days of zero stops in total from all states that report county and date of stop [our results are robust to the inclusion of those counties with infrequent recording of stops as well (*SI Appendix, Tables S1–S8*)]. These data increase in size over time due to amplified rates of police department stop reporting (23). The counties included in the data cover approximately 56% of the current US population.

We combine these policing outcome data—marked by day and geolocated to the county level—with meteorological data from two sources. The PRISM Climate Group provides gridded (at ~4 km) daily maximum and minimum temperatures (in degrees Celsius) as well as daily sum-total precipitation (in millimeters) for the continental United States (24). The second source, the National Centers for Environmental Prediction

## Significance

**Public servants are often first responders to disasters, and the day-to-day completion of their jobs aids public health and safety. However, with respect to their individual psychological and physiological responses to environmental stressors, public sector workers may be harmed in much the same way as other citizens in society. We find that exposure to hotter temperatures reduces the activity of two groups of regulators—police officers and food safety inspectors—at times that the risks they are tasked with overseeing are highest. Given that we observe these effects in a country with high political institutionalization, our findings may have implications for the impacts of climate change on the functioning of regulatory governance in countries with lower political and economic development.**

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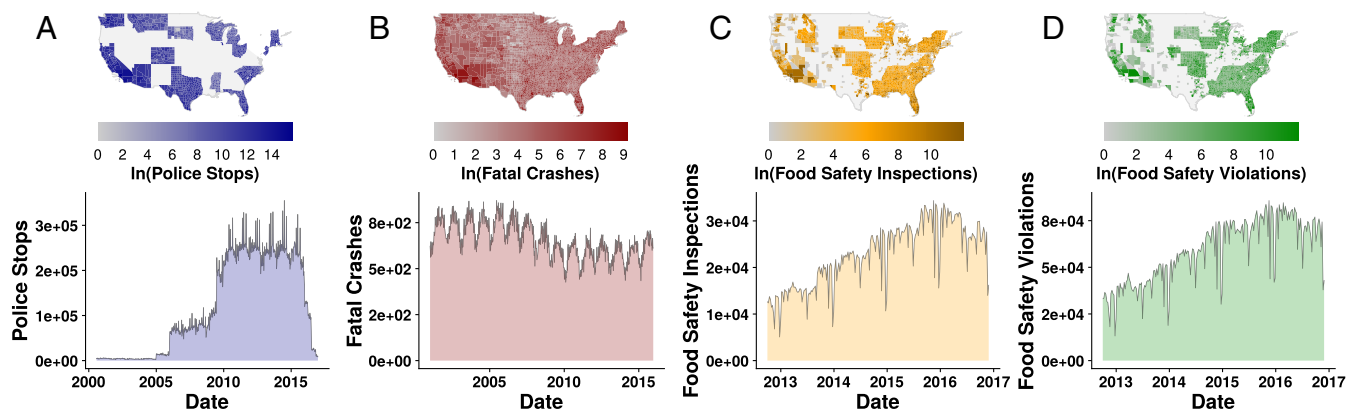
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Data deposition: The data reported in this paper have been deposited in Harvard University's Dataverse at <https://doi.org/10.7910/DVN/G1B8M18>.

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**Fig. 1.** Spatial and temporal variation. Shown are the US counties covered by each of our data sources as well as the weekly variation in each series. *A* plots the county locations of the over 70 million police stops in our data and illustrates that our police stops occur mostly between 2010 and 2015. *B* displays the full US coverage of the more than 500,000 fatal crashes in our data and illustrates the seasonal trends in fatal crashes. *C* shows the county distribution of the over 750,000 unique facilities across over 4 million inspections in our food safety data between 2012 and 2016. *D* shows the same county distribution as *C* and highlights the fact that there are nearly three food safety violations per inspection on average in our data.

(NCEP) Reanalysis II project, provides gridded daily average cloud cover, average relative humidity, and average wind speed over the same period (25). Of note, measurement error may exist between gridded weather observations and the weather individuals actually experienced, possibly attenuating the magnitude of our estimates (26).

Our theoretical relationship of interest is the effect of weather conditions on the number of police stops in a given county on a given day. We empirically model this relationship as

$$Y_{ijts} = f(TMAX_{ijts}) + g(PRECIP_{ijts}) + \mathbf{Z}\eta + \alpha_i + \mu_t + \nu_{js} + \epsilon_{ijts}. \quad [1]$$

In this time-series cross-sectional model, *i* indexes counties, *j* indexes states, *t* indexes calendar days, and *s* indexes calendar months. Our dependent variable  $Y_{ijts}$  represents the log number of police stops in county *i* in state *j* on calendar day *t* within calendar month *s*. Our independent variables of interest are maximum daily temperature,  $TMAX_{ijts}$ , and daily precipitation,  $PRECIP_{ijts}$ . We also control for temperature range, percentage of cloud cover, relative humidity, and average wind speed, represented via  $\mathbf{Z}\eta$ , as failure to do so may bias our estimates of the effect of maximum temperatures and precipitation on our outcome measure (27).

Observable and unobservable unit-specific, geographic, or temporal factors may influence our outcome measures in a way that correlates with the weather. For example, officers might encounter higher rates of legal infractions in counties with warmer average temperatures for reasons unrelated to those warmer average temperatures. To ensure that these unit-specific factors do not bias our estimates of the effect of weather on policing outcomes, we include  $\alpha_i$ —representing county indicator variables—in Eq. 1. These variables control for all time-invariant unobserved characteristics for each county (28). Further, there may be unobserved daily considerations or state-specific seasonal or secular trends influencing our policing outcomes that could spuriously correlate with the weather. To control for these potential confounds we include  $\mu_t$  and  $\nu_{js}$  in Eq. 1, representing calendar date and state-by-calendar month indicator variables, respectively.

Our empirical identifying assumption, consistent with the climate econometrics literature (18, 19, 27), is that the remaining variation in daily maximum temperature and precipitation is as good as random after conditioning on these fixed effects (see *SI Appendix, Deconvolved Temperature* for a depiction of this process). The estimated model coefficients from  $f(TMAX_{ijts})$  and  $g(PRECIP_{ijts})$  can thus be interpreted as the causal effects

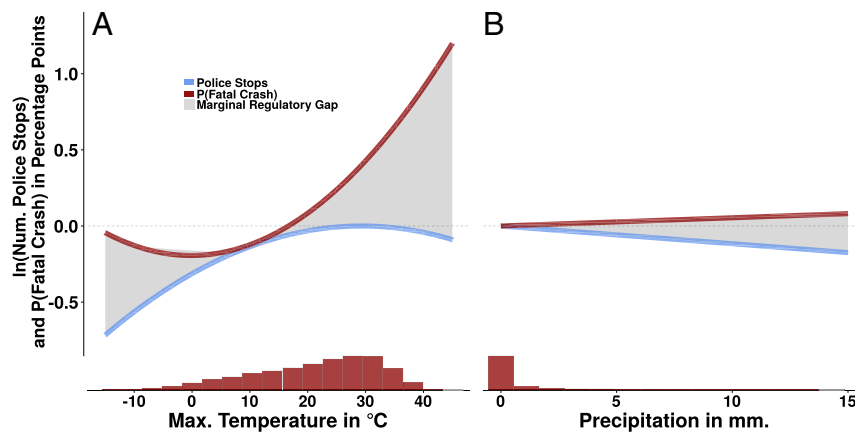
of maximum temperature and precipitation on the number of police stops in a county day (16).

We estimate Eq. 1 using ordinary least squares and adjust for possible spatial and serial correlation in  $\epsilon_{ijts}$  by employing heteroskedasticity-robust SEs clustered at the state level (28). We omit nonclimatic control variables from Eq. 1 because of their potential to generate bias in our parameters of interest (21, 27, 29). Finally, our results are similar across the substitution of the National Weather Service (NWS) Heat Index (30)—a measure of heat stress—for maximum temperature and humidity. See *SI Appendix, Tables S1–S8* for results.

To engage in regulatory stops and inspections, government workers must expose themselves to ambient environmental conditions. Because of nonlinear human preferences for physical activity (31) and supply of labor (18) as a function of maximum temperatures, we adopt a nonlinear functional form estimated via a quadratic fit,  $f()$ , for the effect of maximum temperature on daily police stops. Similarly, due to the linear effect of added precipitation on physical activity rates (31), we model the relationship between precipitation and police stops,  $g()$ , linearly (we provide further support for our parametric modeling choices and justify our parametric assumptions in *SI Appendix, Flexible Functional Forms*).

Of note, the marginal regulatory gaps we present highlight the divergence in the slopes of the marginal effects curves we estimate via Eq. 1 for each outcome. Because of the fixed effects we employ in our analysis, the intercepts of these curves are arbitrary. We are unable to estimate the absolute magnitude or direction of the enforcement gap. The diverging slopes of the curves, not the absolute magnitude of the gap, are our analytic focus. As a result, we set the marginal effects curves in Figs. 2 and 3 tangent to one another for ease of inspection of the divergence of their slopes.

The results of estimating Eq. 1 for the effect of maximum temperatures on police stops indicate that temperature nonlinearly relates to the log number of police stops on a given county day. Stops increase up to their maximum at 29 °C and decline past that point (Fig. 2A,  $P < 0.001$ ,  $n = 938,273$ ). This closely mirrors the functional form observed between maximum temperatures and participation in physical activity among a representative sample of the US population (31). Fig. 2B displays that stops decline linearly with increases in daily precipitation (coefficient  $-0.012$ ,  $P < 0.001$ ). See *SI Appendix, Tables S1–S8* and *SI Appendix, Marginal Effects* for additional estimation results. Putting scale to the magnitude of our estimated relationship, a +10 °C shift from a maximum temperature of 30 °C to 40 °C produces a reduction in stops that represents an approximately 1.5% reduction in



**Fig. 2.** Marginal effects of temperature and precipitation on number of police stops and fatal vehicular crashes. *A* depicts the relationship between county-level daily maximum temperatures and the log daily number of police stops in blue and between county-level daily maximum temperatures and probability of fatal vehicular crashes in percentage points in red. We draw from the estimation of Eq. 1 and plot the predicted change in each outcome across the maximum temperature range within the data. *B* also draws on the estimation of Eq. 1 and depicts the effect of daily precipitation levels on our outcome variables. Due to the fixed effects in our analysis, the placement of these marginal effects curves on the y axis is arbitrary; we set the curves tangent to one another for ease of inspection of the divergence of their slopes. Gray shaded areas depict the gap in marginal regulatory effort created by the divergence of these relationships under more extreme meteorological conditions. See *SI Appendix, Marginal Effects* and *SI Appendix, Tables S1–S8* for depiction of the 95% confidence intervals associated with the marginal effects of these estimates.

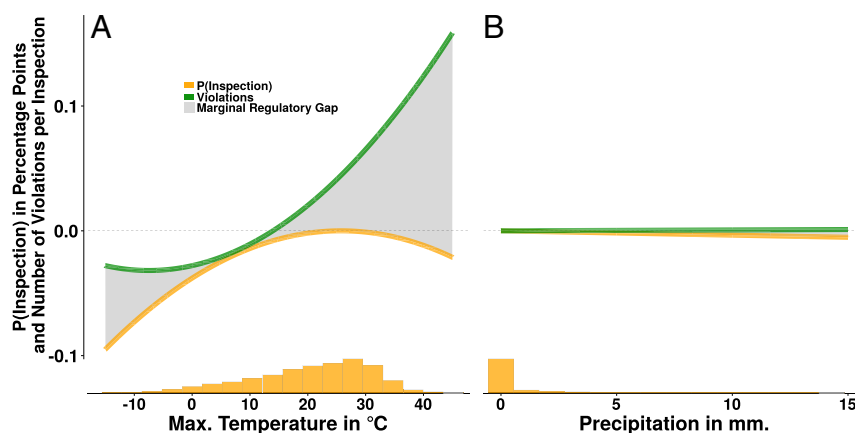
log number of stops compared with their mean value in our sample.

Adverse temperatures and precipitation reduce the number of regulatory police stops in our sample. Do these meteorological conditions simultaneously amplify the public health risks officers are tasked with overseeing, like violent crime and vehicular crashes? Previous studies have found a predominantly linear relationship between higher temperatures and increases in violent crime (21, 32). Extrapolating from that literature indicates the possible existence of a regulatory gap between marginal officer effort and the marginal added occurrence of violent crime at high temperatures.

**Fatal Vehicular Crashes.** Similarly, in some settings vehicular crashes have been linked to adverse weather conditions (33, 34), possibly resulting from the impacts of higher temperatures on driver fatigue (35, 36). To the extent that erratic driving behavior

is observable before a crash (37), added officer oversight might be able to diminish crash hazards (38). To examine the nature of the potential marginal regulatory effort gap between officer stops and added crash hazard, we use county-level daily incidence of fatal crashes between 2001 and 2015 from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System (Fig. 1*B*). The counties included in these data cover 100% of the current continental US population. We combine these crash outcome data with our meteorological data and estimate Eq. 1 as a linear probability model of the effects of maximum temperatures and precipitation on the probability of fatal crash occurrence.

Our estimates indicate that temperature nonlinearly relates to the probability of a fatal crash on a given county day. The marginal effect of maximum temperatures on fatal crash risk decreases to a minimum at 0 °C and increases beyond that point (Fig. 2*B*,  $P < 0.001$ ,  $n = 17,022,516$ ). Fig. 2*B* displays



**Fig. 3.** Marginal effects of temperature and precipitation on food safety inspections and violations. *A* depicts the relationship between daily maximum temperatures and the percentage point probability of facility-level food safety inspections in gold and between daily maximum temperatures and the number of food safety violations per facility-level inspection in green. It draws from the estimation of Eq. 1 and plots the predicted change in each outcome across the maximum temperature range within the data. *B* also draws on the estimation of Eq. 1 and depicts the effect of daily precipitation levels on our outcome variables. Due to the fixed effects in our analysis, the placement of these marginal effects curves on the y axis is arbitrary; we set the curves tangent to one another for ease of inspection of the divergence of their slopes. Gray shaded areas depict the gap in marginal regulatory effort created by the divergence of these relationships. See *SI Appendix, Marginal Effects* and *SI Appendix, Tables S1–S8* for the 95% confidence intervals associated with the marginal effects of these estimates.



that crash risk increases linearly with added daily precipitation (coefficient 0.005,  $P < 0.001$ ). See *SI Appendix, Tables S1–S8* and *SI Appendix, Marginal Effects* for additional results. These effect sizes mean that a +10 °C shift from a maximum temperature of 30 °C to 40 °C produces an amplified risk of fatal crash of half a percentage point, an increase that represents an approximately 17% increase compared with their mean in our sample.

Absent any changes in police officer productivity due to hot temperatures, we should observe that stops increase with the risks officers are tasked with overseeing. Under ideal regulatory effort, our stops line in Fig. 2A should look similar in shape to the line representing vehicular risk. That we observe decreasing stops due to high temperatures—despite the expectation that stops should be higher due to increasing numbers of violations—leaves the conclusion that officer productivity is the likely reason for the reduction in stops we observe.

Thus, our results indicate that the meteorological conditions that produce the highest risk of crime and vehicular crashes also reduce police oversight of these risks. Yet police officers are only one category of street-level bureaucrat tasked with overseeing citizens' well-being. Health inspectors represent another group of government workers assigned to daily enforcement of public safety regulations. Might their work also be affected by adverse weather conditions?

**Food Safety Inspections.** Food-borne illness represents a substantial source of morbidity and mortality in the United States (39). Further, higher ambient temperatures systematically increase the risk of food-borne illness from pathogenic *Escherichia coli*, *Campylobacter*, and *Salmonella* via amplified rates of pathogenic cell division (40, 41). To investigate whether the weather reduces health inspectors' oversight of food safety at points of maximum public risk, we use daily incidence of food safety inspections between 2012 and 2016 from the firm Hazel Analytics (Fig. 1C). The counties included in our food safety data cover approximately 86% of the current US population.

We combine inspection incidence with our meteorological data and estimate Eq. 1 as a linear probability model of the effects of maximum temperatures and precipitation on food safety inspection probability [results are robust to aggregation to the county level (*SI Appendix, Tables S1–S8*)]. As this model is at the facility-day unit of analysis, we replace county-level effects with facility-level effects (represented by  $\alpha_i$ ). Our estimation strategy otherwise remains the same. As with police stops, we nonlinearly parameterize the relationship between inspection probability and maximum temperatures as inspectors must experience ambient environmental conditions to complete their inspections (31).

The resulting estimates indicate that, as for regulatory police stops, temperature nonlinearly relates to the probability of a food safety inspection on a given facility day. Inspection probability increases to a maximum at 26 °C and decreases beyond that point (Fig. 3A,  $P < 0.001$ ,  $n = 1,176,731,121$ ). Fig. 3B displays that probability of inspection decreases linearly with added daily precipitation (coefficient  $-0.0003$ ,  $P = 0.002$ ). See *SI Appendix, Tables S1–S3* and *SI Appendix, Marginal Effects* for additional estimation results. Holding other things constant, a +10 °C shift from a maximum temperature of 30 °C to 40 °C, scaled across the over 750,000 facilities in our sample, would translate into approximately 8,000 fewer facilities inspected per day.

**Food Safety Violations.** Previous studies have found a relationship between reported cases of food poisoning and higher ambient temperatures (41), suggesting the highest food-borne illness morbidity risk occurs at portions of the temperature distribution where inspection probability declines. Do actual citations for improper food safety procedures also increase with ambient temperature? To investigate this question, we examine the effect of meteorological conditions on the number of food safety violations given per inspection.

We again estimate Eq. 1 at the facility-day unit of analysis, with the number of inspections per violation as our outcome measure [results are robust to dichotomizing our outcome variable and running a linear probability model as well as aggregation to the county level (*SI Appendix, Tables S1–S8*)]. Increasing temperatures nonlinearly increase the number of food safety violations per inspection, with largest marginal effects at the hotter portions of the temperature distribution. Our estimates of the marginal effects of maximum temperature on number of violations have high statistical uncertainty over the colder part of the temperature distribution (see Fig. 3A,  $P = 0.009$ ,  $n = 4,101,987$  and *SI Appendix, Tables S1–S8* and *SI Appendix, Marginal Effects* for additional estimation results). Fig. 3B displays the insignificant relationship between added daily precipitation and number of food safety violations (coefficient 0.0003,  $P = 0.334$ ). Putting scale to these effects, a +10 °C shift from a maximum temperature of 30 °C to 40 °C would represent a 3% increase in number of violations compared with the mean number of violations per inspection in our sample.

As for police stops and vehicular risks, under ideal regulatory effort, our inspections line in Fig. 3A should be similar in shape to the line representing food safety violation risk. That we observe decreasing probability of inspection due to high temperatures—despite the expectation that inspections should increase due to amplified risk of violations—suggests that lowered health inspector productivity is responsible for the reduction in probability of inspection we observe.

Thus, across two separate public safety domains we observe decreases in government worker oversight at portions of meteorological distributions associated with peak public safety risk. Climate change is likely to shift the distribution of future daily temperatures. Might these shifts alter the needs of citizens at the same time as they alter the ability of government workers to respond to citizens in their time of need?

**Potential Climate Change Impacts.** To examine this question, we use NASA Earth Exchange's (NEX-Global Daily Downscaled Projections) bias-corrected, statistically downscaled (to 25 km × 25 km), daily maximum temperature projections for 2010, 2050, and 2099 (42) drawn from 21 of the Coupled Model Intercomparison Project Phase 5 (CMIP5) models (43) run on the Representative Concentration Pathways high-emissions scenario (RCP8.5) (44) (we repeat our projections using the RCP4.5 scenario in *SI Appendix, Climate Impact Projections*). Using these data, we project the impacts of climatic changes by 2050 and 2099 on each of our regulatory and public safety outcomes, respectively.

We calculate our projection of the change in our outcome measures by 2050 due to climate change ( $\Delta Y_{2050}$ ) as

$$\Delta Y_{g2050} = \overline{f(TMAX_{kgt2050})} - \overline{f(TMAX_{kgt2010})} \quad [2]$$

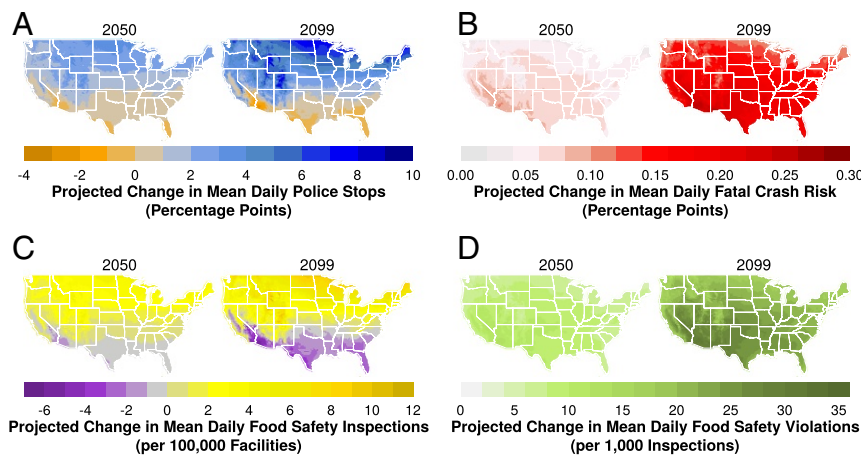
and for the effect from 2010 to 2099 ( $\Delta Y_{2099}$ ) as

$$\Delta Y_{g2099} = \overline{f(TMAX_{kgt2099})} - \overline{f(TMAX_{kgt2010})}, \quad [3]$$

where  $k$  indexes the 21 specific climate models,  $g$  indexes grid cells, and  $t$  indexes the day of year. Further,  $TMAX_{kgt}$  represents projected maximum temperature and  $f()$  represents the fitted maximum temperature quadratic function from the estimation of Eq. 1 across our historical outcome measures. This estimation procedure allows us to smooth across the uncertainty regarding underlying global circulation model projections (45). (Of note, while smoothing across the CMIP5 model ensemble likely adjusts for the majority of idiosyncratic interannual natural variability contained within any single global circulation model, our projections for 2050 may be subject to loss in precision due to remaining idiosyncratic interannual variability. This should be considered when evaluating projection results.)

Fig. 4 displays the results of this procedure across each of our four regulatory outcomes. On average, we project police officer stops (Fig. 4A) to decrease in the South and increase in the North





**Fig. 4.** Projected change in regulatory behaviors and outcomes in the United States due to future warming. Shown are the 25-km  $\times$  25-km grid cell projections of the effects of warming in the United States over this century on the regulatory outcomes examined in this study. Projections are calculated using downscaled climatic model data from NASA's NEX under the RCP8.5 high-emissions scenario across the mean of the 21 CMIP5 models in the ensemble. We couple these climate model data with the estimates from our historical statistical models to project the mean effects of climate change on each outcome. *A* depicts projected changes to police stops, *B* depicts projected changes to fatal crash risk, *C* depicts projected changes to food safety inspections, and *D* depicts projected changes to food safety violations. Annual averages smooth the seasonal variation in these outcomes (see *SI Appendix, Climate Impact Projections* for by-season projections).

of the United States at the same time as we project fatal crash risk (Fig. 4*B*) to increase most in the US South. Further, we project food safety inspections (Fig. 4*C*) to decline in the South and increase in the North of the United States while we project food safety violations to increase most in the US South. Thus, we project the US South may experience greater regulatory stressors due to future climatic changes than we project for the northern portions of the country.

However, these annualized projections mask the temporal heterogeneity associated with our seasonal projections. We plot our projections for each outcome, across both RCP4.5 and RCP8.5, for each month in the years 2050 and 2099 in *SI Appendix, Climate Impact Projections*. We project future winter months may see the largest increases in regulator activity and smallest increases in health hazards, while future summer months may see net decreases in regulator activity while simultaneously experiencing the largest increase in human health hazards. Ultimately, we project that future warming may improve regulatory capacity during colder seasons and worsen it during hotter seasons.

## Discussion

Adverse meteorological conditions worsen human physiological and psychological well-being (16), and historical data indicate government workers are no exception. Our analyses demonstrate a robust link between temperature and precipitation and the regulatory behavior of US street-level government workers. Cold and hot temperatures and added precipitation significantly reduce the number of police stops and diminish the probability of a visit from a health inspector. Further, such adverse meteorological conditions also worsen the risks—car crashes and food safety violations—these regulators are tasked with overseeing. Historical weather conditions that increased social need for government oversight reduced the supply of these regulatory services. Finally, our projections using global circulation model output suggest that warming over this century may reduce cold-season regulatory inefficiencies and may increase inefficiencies during hotter seasons when the added public health risks from climate change may be most acute (22).

Several considerations are important to the interpretation of our results. First, while we have data from millions of regulatory stops and inspections across two broad areas of government oversight, ideal data would also measure effort and output from other types of government workers (e.g., politicians, financial

regulators, soldiers, government researchers, etc.) to enable estimating the total effect of adverse weather on the efficiency of governance. Moreover, observed output is only one measure of government worker performance. Additional desirable measures include the demeanor and attentiveness with which they conduct their duties (7).

Second, our data do not enable precisely measuring substitution or targeting of regulatory effort. Police officers may respond more to violent crime than to vehicular infractions on particularly hot days. An ideal dataset would allow us to measure potential substitution in officer effort. Further, food safety inspectors might choose to inspect smaller numbers of the worst violating facilities in hotter temperatures instead of larger numbers of lower-risk facilities. In *SI Appendix, Examination of Potential Targeting* we examine whether targeting is occurring in our food safety data. Our findings suggest that regulators are not engaging in significant amounts of targeting at high temperatures and that—as a result—targeting is not likely driving our results. Importantly, even in the face of attempts at strategic reallocation of regulatory resources, marginal regulation of vehicular and food safety risks declines in the hot temperatures that amplify these risks overall, leaving a gap in regulatory effort in two important public safety domains.

Third, our data are restricted to observations from a rich, highly institutionalized country with a temperate climate and substantial public sector resources. It is critical to repeat this analysis where possible in poorer countries with warmer average climates (46), lower levels of public sector institutionalization and resources (47), and higher levels of street-level bureaucratic discretion (5) as such countries may experience markedly larger effects of meteorological conditions on government worker output (48).

Fourth, historically observed effects may not persist into the future. Humans may adapt technologically and physiologically to warmer climates (49, 50). Political systems that can afford to do so may assign added budgetary resources to street-level enforcement. The future of work may be quite different from what it is today (51), and regulatory governance may be conducted in manners less susceptible to environmental stressors. Certain health hazards produced by environmental stressors—like added risk of fatal crash—may also be diminished in the future through technological advances (52). When coupled with the uncertainties inherent in the projections of future climate, these points

illustrate that our projections should be interpreted with caution. The future is likely to be markedly different from the present in ways that are difficult to project with precision.

However, our historical data indicate that even a rich country like the United States has not yet fully optimized regulatory response in the face of environmental stress. Future capacity for adaptation may also be challenged by relatively slower economic growth due to climatic stressors (19, 53, 54) that could diminish the public service budgets needed to address the environmental stressors such as drought, floods, tropical cyclones, severe heatwaves, and sea-level rise that are likely to be exacerbated by a changing climate (55–58).

Scholars of politics have thus far primarily examined the potential for climate change to produce extreme political consequences such as protest, civil conflict, and state failure (21, 59). Extreme political disruption, however, is a rare occurrence that

results from a complex chain of prior stressors. Regular, day-to-day effects of exposure to more extreme climates—and the failure of governance to adequately respond—can both prove independently costly and causally set the stage (60) for more marked societal disruption. Ultimately, if observed relationships from the recent past persist, further climate change may increase the gap between government oversight and citizen need during hotter times of the year, diminishing adaptation capacity and possibly magnifying the severity of the social impacts of climate change.

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