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High Temperatures and Violent Child Punishment at Home: Evidence From Six Countries

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Objective: Research links high ambient temperatures to aggressive behavior, and recent work suggests that heat may increase violence against children in the home, including violent punishment against children. However, evidence on the effects of high temperature on parental punishment and discipline is limited. This study examines the acute effects of high temperatures on the parental use of violent punishment and nonviolent discipline across six countries. ***Method:*** We merged geolocated data from six Multiple Indicator Cluster Surveys with climatic data from the European Reanalysis 5-Land. The sample included 19,607 mother–child dyads (children aged 36–59 months) in 3,646 sampling clusters. Using natural temperature variation, we assessed the acute effects of higher-than-typical regional and seasonal temperatures on subsequent physical punishment, severe physical punishment, psychological aggression, and nonviolent discipline. ***Results:*** Linear regression models and alternative binned specifications accounting for baseline climate conditions and other covariates showed that a 1 standard deviation increase in recent mean maximum temperature was associated with a 4- to 8-percentage-point increase in severe physical punishment and a 3- to 4-percentage-point increase in psychological aggression. No consistent associations emerged for milder physical punishment or nonviolent discipline. Effects were consistent across child and household characteristics. ***Conclusions:*** Findings suggest that atypically high temperatures heighten the risk of violent punishment against young children. Further research should explore mechanisms and moderators to inform policies and programs to promote positive parenting and child protection in a warming world.

Public Significance Statement

This study finds that higher-than-usual ambient temperatures are linked to increased use of severe physical punishment and psychological aggression toward young children across six low- and middle-income countries. By combining geolocated household survey data with high-resolution climate data, the research offers some of the first empirical evidence connecting climate-related heat exposure to violent parenting behaviors. These findings highlight the importance of addressing climate change as a risk factor for family violence and investing in interventions that support caregivers under environmental stress.

Keywords: ambient temperature, heat, violence against children, violent punishment, child discipline

Supplemental materials: https://doi.org/10.1037/vio0000651.supp

It is now well established that climate change-related hazards, including high temperatures and extreme weather events, not only negatively affect physical health but also have significant psychosocial and behavioral consequences. For example, an umbrella review of 32 meta-analyses encompassing 284 individual studies found strong associations between climate-related hazards, primarily rising temperatures, with mental health disorders and suicidal ideation (Radua et al., 2024). Likewise, there is increasing evidence that rising temperatures may contribute to greater aggression and a higher frequency of interpersonal violence (Hsiang et al., 2013; Miles-Novelo & Anderson, 2019). Rapid global warming can intensify aggression both directly, through neurophysiological effects that heighten irritability, and indirectly, by limiting recreational opportunities, reducing protective factors, and increasing contextual stressors, ultimately overwhelming individuals (G. W. Evans, 2019; Miles-Novelo & Anderson, 2019, 2022).

In this broader context, violence against children is a specific behavioral consequence of rising temperatures that has been discussed in conceptual work but has rarely been examined empirically (Cuartas, Bhatia, et al., 2025; Datzberger et al., 2024). Given that violence against children has significant negative implications for individuals and societies (United Nations Children's Fund [UNICEF], 2017;

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World Health Organization, 2016), understanding whether rising temperatures contribute to an increase in such violence remains critical. In this article we address these gaps in the literature by examining the potential acute effects of higher-than-usual ambient temperatures on a specific, widely prevalent, and socially accepted form of violence against young children: violent punishment (Cuartas et al., 2019; UNICEF, 2017). We assess whether recent higher-than-usual temperatures are associated with an increased likelihood of parents using physical punishment or psychological aggression to punish or "correct" their child's behavior. Additionally, we examine whether high temperatures also influence other nonviolent disciplinary practices.

Child Discipline, Punishment, and Development

Parents and other adult caregivers use a variety of disciplinary tactics with the intention of correcting or punishing children's behavior. These tactics range from nonviolent disciplinary approaches to violent punishment, such as physical punishment and psychological aggression. Prevalence estimates for low- and middle-income countries indicate that approximately 83.9% of young children are exposed to nonviolent discipline, whereas 62.5% endure physical punishment and 65.4% psychological aggression (Cuartas et al., 2019). Prevalence rates vary significantly across regions, with the highest rates of violent punishment observed in the Middle East, North Africa, and Sub-Saharan Africa.

Physical punishment refers to the use of physical force, regardless of intensity, to cause pain or discomfort to correct or punish a child's behavior (United Nations Committee on the Rights of the Child, 2007). This includes actions commonly considered "mild" forms of physical punishment, such as spanking, slapping, or shaking a child, as well as more severe physical punishment, like hitting children with objects; hitting them in the arms, legs, or face; or repeatedly hitting a child. The United Nations Committee on the Rights of the Child (2007) recognizes physical punishment as a violation of children's rights. In addition, extensive evidence from reviews of the evidence from high-income (e.g., Gershoff & Grogan-Kaylor, 2016; Heilmann et al., 2021) and low- and middle-income countries (e.g., Cuartas, Gershoff, et al., 2025) provide robust evidence for associations between physical punishment and negative mental health, social and emotional, academic, and behavioral outcomes in childhood, adolescence, and adulthood. The evidence also indicates that more severe physical punishment leads to worse consequences than "milder" forms of physical punishment (Cuartas, Gershoff, et al., 2025).

Psychological aggression is another form of violent punishment that inflicts psychological or emotional harm on children (Kairys & Johnson, 2002). It includes behaviors like shaming, ridiculing, or humiliating children, such as calling them offensive names or making them feel unsafe or worthless, for example, by telling them they are dumb or useless. A recent review of the literature showed that parents tend to be among the most common perpetrators of psychological aggression and that such practice tends to be associated with internalizing and externalizing behavior problems in children (Dube et al., 2023).

Finally, nonviolent discipline encompasses strategies that help guide children's emotional and behavioral regulation, addressing behavior problems or dysregulation while promoting positive behavior (Quail & Ward, 2022; UNICEF, 2014). It includes behaviors such as distraction (or redirecting the child's attention), modeling expected behaviors, feedback on behavior (e.g., explaining why certain behaviors are "wrong"), collective problem solving, extinction (or selective ignoring of "bad" behavior), and the use of logical consequences. Reviews of the literature indicate that these nonviolent discipline techniques are associated to positive child behavioral outcomes (Cuartas, Gershoff, et al., 2025; Grogan-Kaylor et al., 2021; Quail & Ward, 2022). Therefore, nonviolent discipline, and its potential benefits to child behavior, can help reduce violent punishment by breaking coercive cycles between parents and children (Patterson, 2002; Quail & Ward, 2022).

Gaps in the Literature

Conceptually, high ambient temperatures can lead to maladaptive parenting behaviors, including heightened violent punishment and reduced nonviolent discipline, directly and indirectly through multiple mechanisms. Directly, evidence from experimental and observational studies suggests that temperatures above thermal comfort levels can heighten aggressive thoughts, emotions, and behaviors, likely due to increased irritability and impulsivity, where even minor provocations may be perceived as significant or trigger an aggressive response (Allen et al., 2018; G. W. Evans, 2019; Miles-Novelo & Anderson, 2019). Indirectly, high ambient temperatures are associated with resource scarcity (e.g., crop failures), extreme weather events, poverty, eco-migration, social conflict, heightened mental health challenges, and reduced opportunities for outdoor recreation and socialization, all of which can contribute to increased irritability and aggressive behavior (Miles-Novelo & Anderson, 2019). Empirical research largely supports these perspectives, indicating that a 1 standard deviation (SD) increase in temperature is associated with a 4% rise in interpersonal violence and a 14% increase in intergroup conflict (Burke et al., 2015; Hsiang et al., 2013). Additionally, a cumulative stress perspective suggests that these effects are likely to be more pronounced in disadvantaged settings, where individuals are already experiencing significant adversity and economic pressures (G. W. Evans & Kim, 2013; McLaughlin et al., 2021).

Despite this rationale and evidence, fewer studies have assessed potential links between high ambient temperatures and child discipline and punishment. Indeed, a literature review concluded that research on the relation between ambient heat and violence against children remains limited, even though studies on extreme weather events, such as flooding and drought, have shown associations between climate events and increased violence against children (Datzberger et al., 2024). An exception is a recent study using geolocated administrative data and short-term weather variation in the United States, which found that cases of violence against children, particularly neglect, increased during periods of high temperatures (M. F. Evans et al., 2025). Specifically, the study found that each additional day with temperatures above 35 °C led to a 0.5% increase in substantiated maltreatment compared with days with maximum temperatures between 15 °C and 20 °C.

The limited evidence on the relations between ambient temperature with violent punishment and discipline may be due to data and methodological constraints. There is a scarcity of geolocated household data with information on child discipline and punishment, which would enable spatial integration with ambient temperature information (G. W. Evans, 2019). Similarly, disciplines that

commonly study child discipline and punishment, such as developmental psychology and social work, have historically relied less on large secondary data sets, such as administrative or spatial data, compared with fields like public health (Davis-Kean & Jager, 2017; Milne et al., 2022). Finally, it is only in recent years that these fields have more frequently adopted quasi-experimental approaches aimed at leveraging naturally occurring variation to establish causal effects under nonexperimental conditions, an approach that has been more prevalent in economics and biostatistics (Bailey et al., 2024; Foster, 2010; Miller et al., 2016).

Objective and Hypothesis

This study aimed to address these gaps in the literature by examining the potential effects of high ambient temperatures on parental use of violent punishment and nonviolent discipline. To achieve this, we integrated data sets and methodological approaches that have been largely overlooked in related research to explore the following research questions (RQ):

> *RQ1*: What are the acute effects of higher-than-usual ambient temperatures on parental use of physical punishment, severe physical punishment, psychological aggression, and nonviolent discipline with young children?
>
> *RQ2*: How do these effects vary based on sociodemographic factors, including child sex, child age, maternal education, household wealth, and area of residence?

Based on the conceptual considerations outlined above and existing research, we hypothesized that (H1) higher-than-usual ambient temperatures may subsequently increase violent punishment, including physical punishment, severe physical punishment, and psychological aggression, while reducing nonviolent discipline. The second RQ is more exploratory, and therefore we did not have specific directional hypotheses, except for the expectation that the effects may be stronger in poorer households compared with wealthier ones, due to potential cumulative stress (H2).

Method

Sample and Geocoding

This study integrated two data sources to examine the links between ambient temperature and child discipline and punishment. The first data set is the Multiple Indicator Cluster Surveys (MICS), a globally standardized household survey program developed by the United Nations Children's Fund to collect nationally representative data on women and children. MICS employs a multistage sampling design, selecting clusters, often corresponding to census enumeration areas and households within these clusters. For this study, we compiled data from six countries, namely, Georgia (2018), The Gambia (2018), the State of Palestine (2019–2020), Madagascar (2018), Malawi (2019–2020), and Sierra Leone (2017), which included geospatial coordinates (latitude and longitude) for sampling clusters. These spatial identifiers enabled us to spatially combine MICS data with temperature measures.

The second dataset is the the European Reanalysis 5 (ERA5)-Land Monthly Aggregated Climate Dataset (Hersbach et al., 2020), developed by the European Centre for Medium-Range Weather Forecasts under the Copernicus Climate Change Service. ERA5-Land provides high-resolution (0.1°) data on land surface variables, including ambient temperature at 10 m from the surface, originally generated hourly but aggregated at monthly intervals. The data set is constructed using satellite remote sensing, in situ measurements, and numerical weather modeling, offering detailed estimates of historical and near-real-time climate conditions. By leveraging ERA5-Land, we captured localized climatic variations with high spatial and temporal precision.

To merge these data, we used Google Earth Engine to overlay the spatial coordinates of MICS sampling clusters with ERA5-Land climate variables, extracting monthly climate averages corresponding to each participant's cluster and survey date (see Figure 1). This approach enables a time-sensitive analysis of climate conditions during specific time windows. Our sample was restricted to mothers with children between 36 and 59 months, comprising 19,607 mother–child dyads nested within 3,646 sampling clusters (see Table 1 for descriptive statistics).

Measures

Child Discipline and Punishment

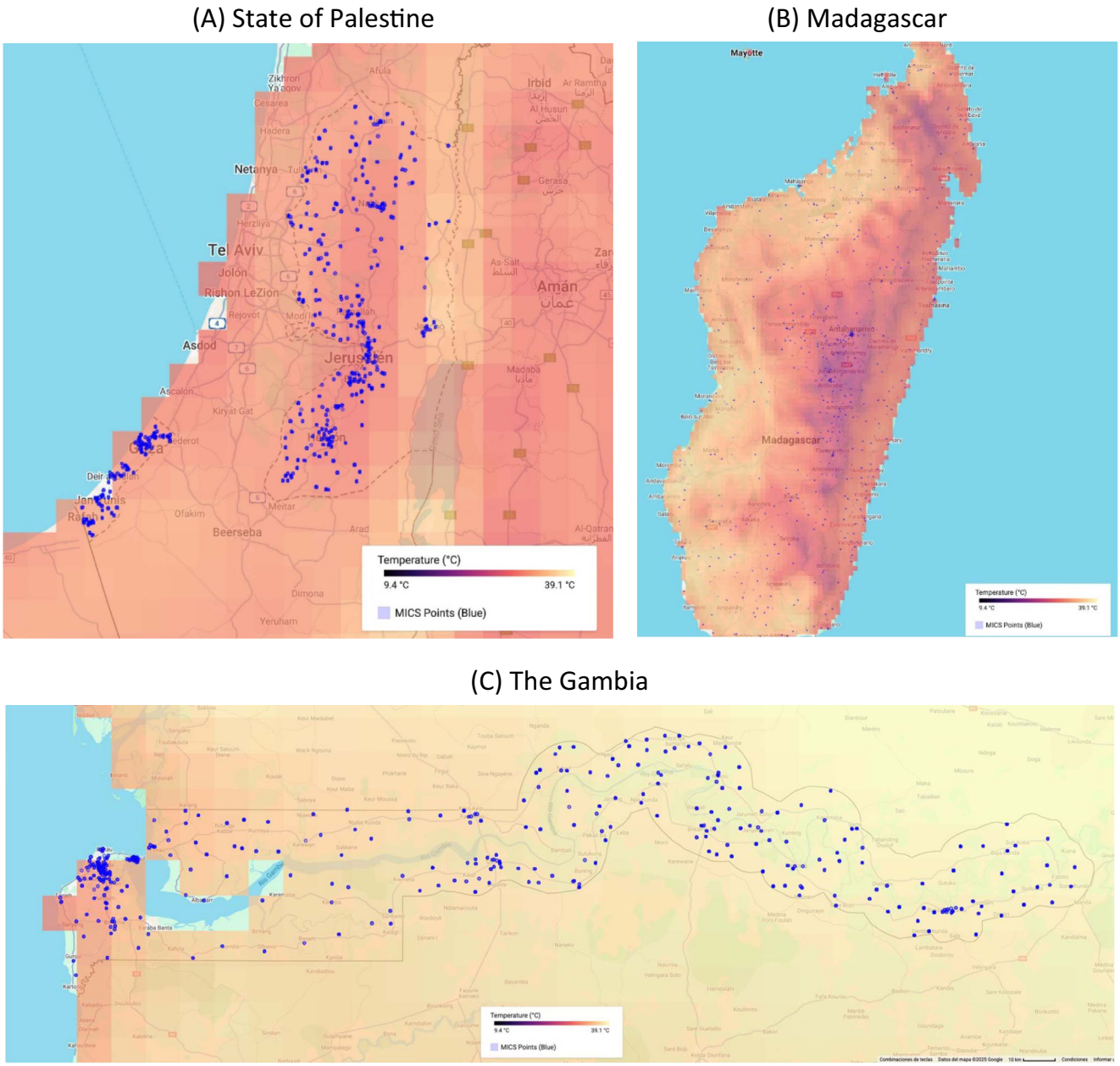
The MICS included a module adapted from the Conflict Tactics Scale (Straus et al., 1998) to characterize 11 disciplinary and punishment practices. Specifically, the MICS asked the respondent whether they or anyone in the household used any discipline or punishment method with the target child in the past month. We followed UNICEF (2017) and prior research (e.g., Grogan-Kaylor et al., 2021) to organize these practices into four categories. First, "shook him/her" and "spanked, hit, slapped on bottom with bare hand" were categorized as physical punishment. Second, "hit with belt, hairbrush, stick, or other hard object," "hit/slapped on the face, head or ears," "hit/slapped on hand, arm of leg," and "beat up, hit over and over as hard were said to be severe physical punishment." Third, "shouted, yelled, screamed" and "called dumb, lazy, or another name" were categorized as psychological aggression. Finally, "took away privileges," "explained wrong behavior," and "gave something else to do" were said to be nonviolent discipline.

In the current sample, 63.56% of children were exposed to physical punishment, 56.26% to severe physical punishment, 80.02% to psychological aggression, and 88.11% to nonviolent discipline in the month preceding the MICS (Table 1). There was substantial variation in children's exposure to these different practices across the six countries included in the study (Figure 2).

Ambient Temperature

We defined a 5-km exposure buffer around each MICS cluster to account for the random displacement of 5–10 km applied by MICS to ensure respondents' privacy. Using the exact interview date, we computed the average maximum ambient temperature for each mother–child dyad within their cluster over the 6 months preceding the interview as a measure of recent ambient temperature exposure. The mean maximum temperature for the sample was 31.58 °C (SD = 3.92), with substantial variation between countries (Figure 3). We also computed the mean maximum temperature for both the interview

Figure 1
MICS Clusters and Average Temperature in Three Countries



Note. We present these three examples to illustrate how the geolocated household and climate data are overlaid. The blue dots represent approximate cluster locations from the MICS. MICS = Multiple Indicator Cluster Surveys. See the online article for the color version of this figure.

month and the month preceding the interview as alternative time windows for analysis.

Contextual Characteristics

We extracted additional variables from the MICS to serve as control variables and for the moderation analyses, including children's sex (0 = female, 1 = male), child age, maternal education (0 = none, 1 = primary, 2 = secondary or more), an indicator for area of residence (0 = rural, 1 = urban), and a wealth index estimated by the MICS by applying principal component analysis to indicators of dwelling characteristics and household assets.

Analysis

Main Effects (RQ1)

We began by visually inspecting the data using binned scatterplots (Cattaneo et al., 2024) to flexibly assess the relation between

Table 1
Descriptive Statistics

Variable	*M* (*SD*) or %
Average maximum temperature in °C, 6 months (*SD*)	31.58 (3.92)
Physical punishment	63.56%
Severe physical punishment	56.26%
Psychological aggression	80.02%
Nonviolent discipline	88.11%
Child age	45.89 (6.08)
Child sex (=1 male)	49.74%
Mom education = none	36.11%
Mom education = primary	40.04%
Mom education = secondary or more	23.85%
Household wealth index	−0.14 (0.85)
Area (=1 if rural)	71.35%

Note. $n = 19.607$.

ambient temperature and each outcome variable, including all covariates. This approach divides the data into bins (or intervals) and computes the average value of the dependent variable within each bin using nonparametric regression estimates, thereby avoiding the imposition of a linear relation.

Subsequently, we estimated the linear regression model in Equation 1 to assess the links between the mean maximum ambient temperature and disciplinary and punishment practices in the current sample. In this model, Y_{ict} represented the outcome variable (i.e., binary indicator for physical punishment, severe physical punishment, psychological aggression, or nonviolent discipline) for child i in cluster c at time of interview t. Temp_{ict} represented the mean maximum temperature during the 6 months preceding the survey, standardized to have a mean of zero and an *SD* of 1 to aid interpretation. X_i was the vector of contextual characteristics, included as control variables, and μ_{ict} represented unobserved residual variation:

$$Y_{\text{ict}} = \alpha\text{Temp}_{\text{ict}} + X_i\theta + \mu_{\text{ict}}. \quad (1)$$

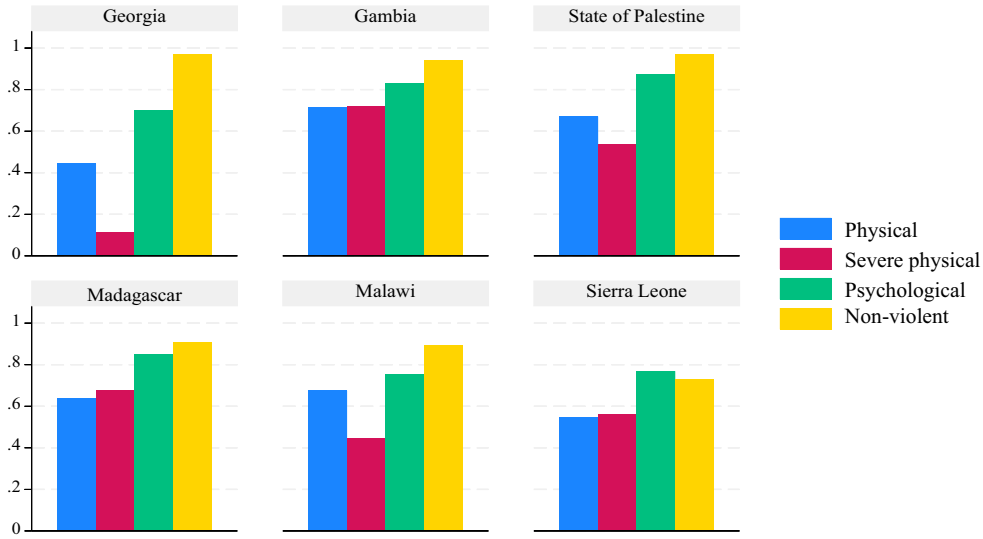
The coefficient of interest in this model (α) represented the association between the average maximum temperature and each outcome variable. Although we included control variables, unobserved factors may introduce selection bias, making it unlikely that α can be interpreted as a causal effect. For example, our initial descriptive model would likely compare child–mother dyads from warmer settings (e.g., Malawi) with those from cooler regions (e.g., Georgia). However, these settings may differ in characteristics beyond temperature alone, potentially confounding the associations. Similarly, this model may compare child–mother dyads who were assessed in the summer versus the winter, therefore potentially capturing other factors that may differ between seasons other than temperature.

To mitigate potential selection issues, we estimated the model presented in Equation 2, where we leveraged the time-stamped and geocoded nature of data by including τ_c, representing geographic (regions within countries) fixed effects, and φ_t, which are temporal (month-year) fixed effects:

$$Y_{\text{ict}} = \beta\text{Temp}_{\text{ict}} + X_i\theta + \tau_c + \varphi_t + \in_{\text{ict}}. \quad (2)$$

The geographic fixed effects allowed us to control for baseline or the "typical" temperature within each region in each country, whereas the temporal fixed effects account for the typical temperature in different seasons or time periods. Consequently, the model enabled us to account for potential confounders and mitigate selection bias by examining the effect of higher-than-usual recent temperatures (over the past 6 months) on caregivers' recent use (over the past month) of various discipline and punishment practices. The rationale for this strategy, which has been used in economic research on the effects of excessive heat (e.g., Adhvaryu et al., 2024), is that deviations in ambient temperature from the typical level for a given region and season within a country are exogenous (i.e., uncorrelated

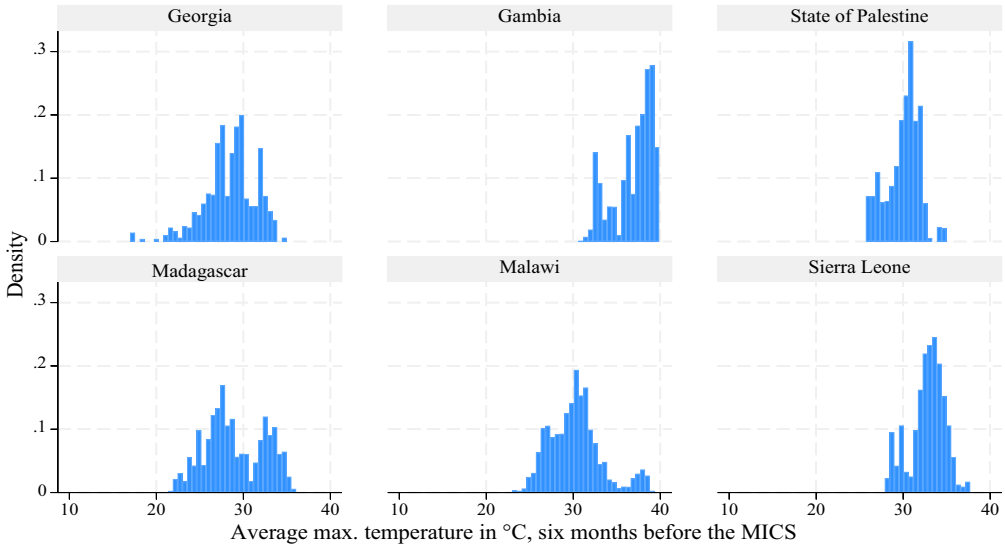
Figure 2
Prevalence of Different Disciplinary and Punishment Methods by Country



Note. See the online article for the color version of this figure.

Figure 3

Average Maximum Temperature in Degree Celsius by Country



Note. MICS = Multiple Indicator Cluster Surveys; max. = maximum. See the online article for the color version of this figure.

with residual variation). As a result, these deviations can be used to assess the impact of ambient temperature on disciplinary and punishment practices.

Sensitivity Checks and Moderation (RQ2)

We conducted three sensitivity checks to assess the validity of our estimates. First, we used alternative ambient temperature exposure windows, during the same month the interview took place and the month before the interview month. Second, we used a binned approach (Deschenes, 2014) that allowed us to estimate potential nonlinear associations between temperature and disciplinary and punishment practices. Third, given concerns raised by some authors that controlling for seasonality may partial out part of the true heat effect, potentially resulting in overcontrol (Anderson et al., 2000), we conducted additional analyses using models similar to those in Equation 2 but excluding seasonality fixed effects. Finally, we conducted a series of moderation analyses with interaction terms to examine potential variations in the observed effects across wealth quartiles, residential area, child sex, maternal education, and child age. We conducted data analysis in Stata/SE 18.5.

Results

A visual inspection of predicted values, the fitted regression line, and confidence intervals from the binned scatterplot reveals a strong positive association between temperature and severe physical punishment (Figure 4, Panel B) as well as psychological aggression (Panel C), which appear to be linear. By contrast, wide confidence intervals and flatter fitted regression lines suggest no association between temperature and physical punishment (Panel A) or nonviolent discipline (Panel D). The results remain consistent in a sensitivity analysis excluding seasonality fixed effects from the model (Supplemental Figure S1).

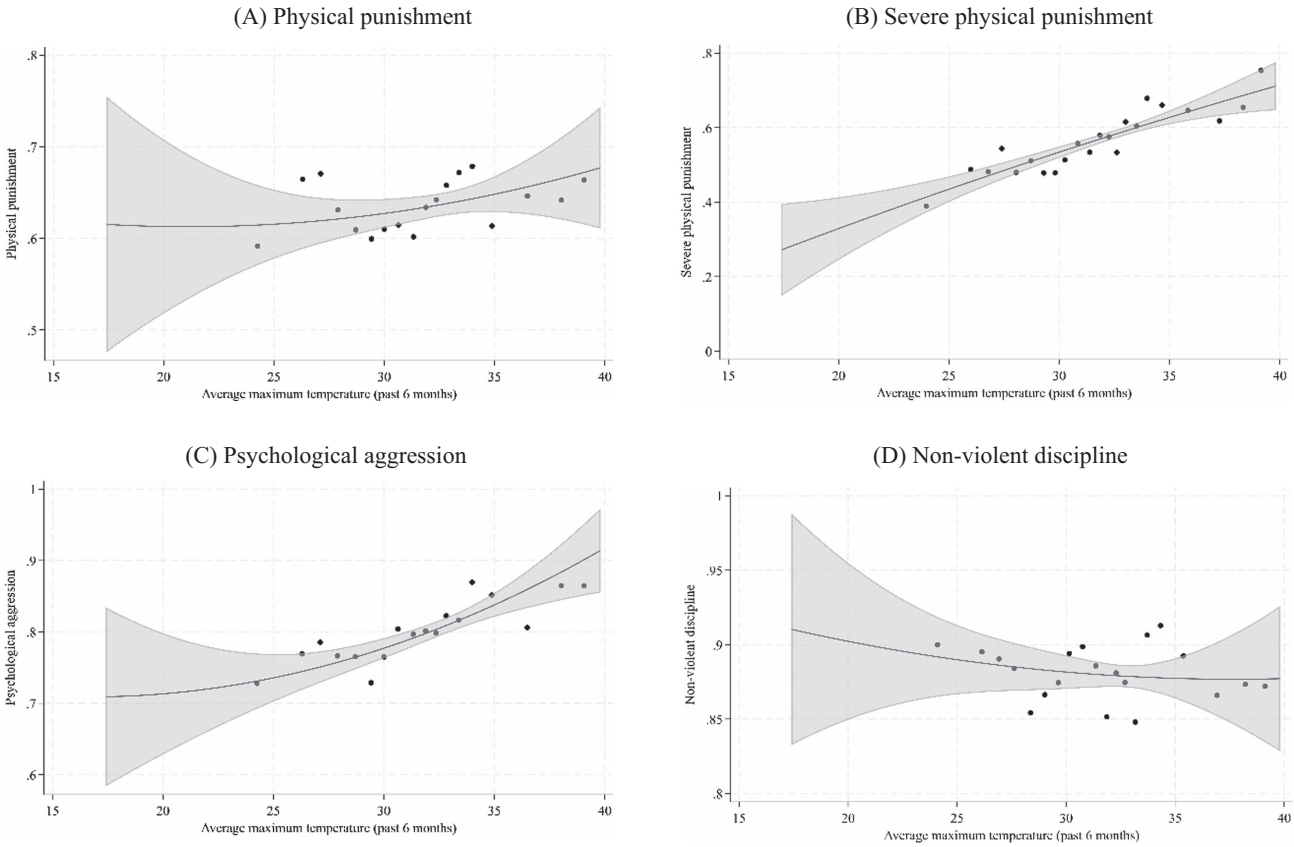
Table 2 presents estimated coefficients from the model presented in Equation 1. Findings suggest that a 1 *SD* (i.e., 3.9 °C) increase in mean maximum temperature is associated with a 3.2% point increased probability of physical punishment ($SE = 0.005$, $p < .001$), 5.3 point increase in severe physical punishment ($SE = 0.005$, $p < .001$), and 1.2% point increased likelihood of psychological aggression ($SE = 0.004$, $p < .01$). We found no statistically significant associations between mean maximum temperatures and nonviolent discipline.

We present estimates from our preferred model, including geographic and temporal fixed effects in addition to the other covariates (i.e., Equation 2) in Table 3. These results indicate that a 1 *SD* increase in mean maximum temperature is associated with a 7.6-point increase in the probability of severe physical punishment ($SE = 0.013$, $p < .001$) and 4.2% point increase in the likelihood of psychological aggression ($SE = 0.011$, $p < .001$). Using this arguably more conservative model, we found no significant associations between mean average temperature and either physical punishment or nonviolent discipline. The sensitivity check presented in Supplemental Table S1, which excludes seasonality fixed effects, shows smaller magnitude but statistically significant effects on harsh physical punishment ($\beta = 0.053$, $SE = 0.006$, $p < .01$) and marginally significant effects on nonviolent discipline ($\beta = -0.011$, $SE = 0.006$, $p < .01$).

Figure 5 presents estimates for the linear association between mean maximum temperatures and outcome variables across different time windows for temperature exposure (see also Supplemental Tables S2 and S3 for details). Overall, the estimated coefficients for severe physical punishment and psychological aggression are slightly smaller in magnitude but remain statistically significant when exposure is defined as the temperature in the same survey month ($\beta = 0.039$, $SE = 0.011$, $p < .001$ and $\beta = 0.034$, $SE = 0.010$,

Figure 4

Binned Scatterplot for the Association Between Average Maximum Temperature and Disciplinary and Punishment Practices



Note. Predicted margins and the fitted regression line from a binscatter analysis estimated with fixed effects for child sex, child age, maternal education, wealth quartiles, residential area, seasonality, and region.

$p < .01$) or the month before the survey ($\beta = 0.046$, $SE = 0.011$, $p < .001$ and $\beta = 0.034$, $SE = 0.010$, $p < .001$). We found no statistically significant associations between temperature in these alternative time windows and either physical punishment or nonviolent discipline.

We show the results from an alternative binned specification estimated using a linear probability model in Table 4. Overall, the findings are consistent with results from our main model. First, the probability of severe physical punishment and psychological aggression monotonically increases as temperature rises, with increases superior to 11% points in severe physical punishment and 6% points for psychological aggression with temperatures above 30 °C relative to the baseline of less than 26 °C. The more nuanced binned specification also reveals statistically significant associations between temperatures of 26 °C, 27 °C, and 33 °C and an increased likelihood of physical punishment, as well as between

Table 2

Linear Association Between Mean Maximum Temperature and Outcome Variables

Variable	(1) Physical punishment	(2) Severe physical punishment	(3) Psychological aggression	(4) Nonviolent discipline
Average maximum temperature, 6 months (*SD*)	0.032*** (0.005)	0.053*** (0.005)	0.012** (0.004)	0.003 (0.003)
Constant	0.640*** (0.004)	0.569*** (0.005)	0.802*** (0.004)	0.881*** (0.003)
Observations	19,607	19,607	19,607	19,607
R^2	0.007	0.023	0.005	0.022

Note. Estimates from linear probability models for the association between mean maximum temperature and disciplinary and punishment practices. All models included fixed effects for child sex, child age, maternal education, wealth quartiles, and residential area. Standardized βs are reported, with clustered standard errors in parentheses.
** $p < .01$. *** $p < .001$.

Table 3

Preferred Estimates for the Association Between Mean Maximum Temperature and Outcome Variables Using Geographic and Temporal Fixed Effects

Variable	(1) Physical punishment	(2) Severe physical punishment	(3) Psychological aggression	(4) Nonviolent discipline
Average maximum temperature, 6 months (*SD*)	0.014 (0.013)	0.076*** (0.013)	0.042*** (0.011)	−0.005 (0.008)
Constant	0.637*** (0.004)	0.572*** (0.004)	0.806*** (0.004)	0.880*** (0.003)
Observations	19,607	19,607	19,607	19,607
R^2	0.043	0.119	0.045	0.098

Note. Estimates from linear probability models for the association between mean maximum temperature and disciplinary and punishment practices. All models included fixed effects for child sex, child age, maternal education, wealth quartiles, residential area, seasonality, and region. Standardized βs are reported, with clustered standard errors in parentheses.
*** $p < .001$.

temperatures of 26 °C, 27 °C, and 28 °C and a decreased probability of nonviolent discipline. Findings remain largely consistent in a sensitivity analysis excluding seasonality fixed effects (see Supplemental Table S4).

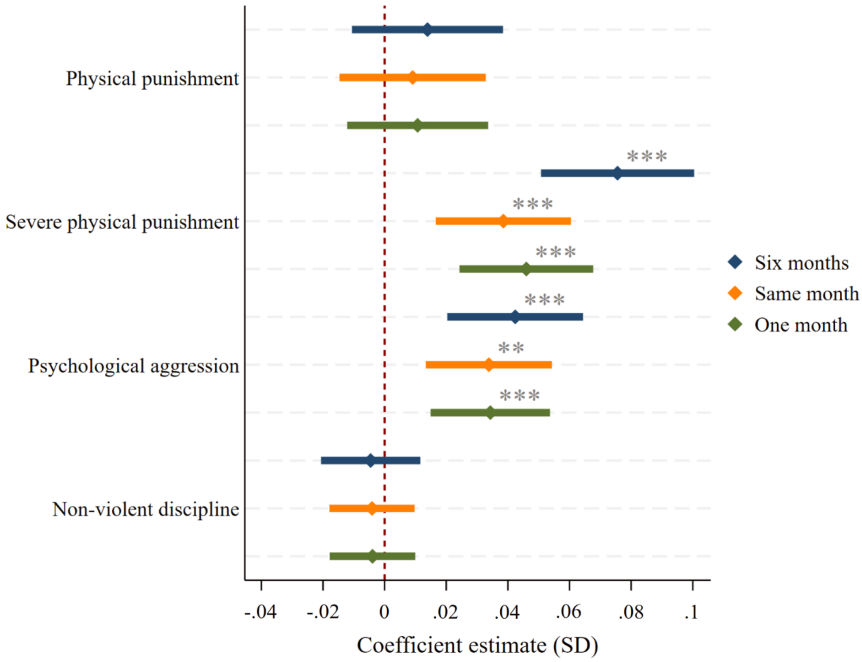
Finally, the results from the moderation analyses (reported in the Supplemental Material) provide little evidence of differential effects of mean maximum temperatures on the use of various disciplinary and punishment practices. Specifically, we found no evidence of moderation effects from wealth, area of residence, child sex, maternal education, or child age on the association between mean maximum temperature and physical punishment (Supplemental Table S5), severe physical punishment (Supplemental Table S6), psychological aggression (Supplemental Table S5), or nonviolent discipline (Supplemental Table S7).

Discussion

This study aimed to evaluate the acute effects of high ambient temperature on parental use of physical punishment, severe physical punishment, psychological aggression, and nonviolent discipline. We achieved this by integrating large-scale geolocated household survey data, capturing parents' disciplinary responses to their young

Figure 5

Linear Association Between Mean Maximum Temperature and Outcome Variables Across Different Time Windows for Temperature Exposure



Note. Estimates from linear probability models for the association between mean maximum temperature and disciplinary and punishment practices. All models included fixed effects for child sex, child age, maternal education, wealth quartiles, residential area, seasonality, and region. See the online article for the color version of this figure.
** $p < .01$. *** $p < .001$.

Table 4

Association Between Mean Maximum Temperature and Outcome Variables Using a Binned Specification and Including Geographic and Temporal Fixed Effects

Temperature bin	(1) Physical punishment	(2) Severe physical punishment	(3) Psychological aggression	(4) Nonviolent discipline
Reference: Less than 26 °C				
26 °C	0.052* (0.025)	0.087*** (0.026)	0.041† (0.023)	−0.024† (0.015)
27 °C	0.061* (0.027)	0.121*** (0.028)	0.050* (0.023)	−0.028† (0.015)
28 °C	0.014 (0.027)	0.075** (0.029)	0.026 (0.024)	−0.057*** (0.017)
29 °C	0.001 (0.028)	0.059* (0.030)	−0.002 (0.025)	−0.034* (0.016)
30 °C	0.012 (0.030)	0.106*** (0.032)	0.059* (0.026)	−0.009 (0.017)
31 °C	0.014 (0.032)	0.131*** (0.034)	0.067* (0.028)	−0.029 (0.019)
32 °C	0.047 (0.034)	0.142*** (0.036)	0.065* (0.029)	−0.038† (0.020)
33 °C	0.071* (0.035)	0.206*** (0.037)	0.092** (0.029)	−0.023 (0.022)
34 °C	0.001 (0.038)	0.235*** (0.040)	0.100** (0.033)	0.002 (0.025)
35 °C	0.053 (0.040)	0.224*** (0.043)	0.133*** (0.035)	−0.036 (0.028)
Constant	0.602*** (0.026)	0.424*** (0.028)	0.734*** (0.023)	0.908*** (0.015)
Observations	19,607	19,607	19,607	19,607
R^2	0.044	0.121	0.046	0.099

Note. Estimates from linear probability models for the association between mean maximum temperature bins and disciplinary and punishment practices. All models included fixed effects for child sex, child age, maternal education, wealth quartiles, residential area, seasonality, and region. Standardized βs are reported, with clustered standard errors in parentheses.
† $p < .1$. * $p < .05$. ** $p < .01$. *** $p < .001$.

children's behavior, with geospatial data on ambient temperature. To our knowledge, this is one of the first studies to combine objective temperature measures with survey data to examine how ambient heat may acutely influence violent punishment and discipline behaviors across culturally and socioeconomically diverse countries.

Findings from linear models, which accounted for baseline climate conditions, seasonality, and other sociodemographic characteristics, indicated that a 1 *SD* increase in recent mean maximum temperature was associated with a 4- to 8-percentage-point increase in the probability of severe physical punishment and a 3- to 4-percentage-point increase in the likelihood of psychological aggression. Relative to the sample mean of the outcome variables, these effects correspond to increases of approximately 7.11%–14.22% in severe physical punishment and 3.74%–5.00% in psychological aggression per *SD* increase in temperature (approximately 3.92 °C). At the same time, we did not find statistically significant associations between ambient temperature and "milder" forms of physical punishment or nonviolent disciplinary approaches. Sensitivity analyses using a binned specification further supported our main findings, revealing a monotonic relationship in which higher temperatures were consistently linked to greater likelihoods of severe physical punishment and psychological aggression. These results broadly support our hypothesis (H1) that elevated ambient temperatures may contribute to increased parental violent punishment.

Our analysis was motivated by and provides further support for the documented associations between temperature, aggressive behavior, and violence (Burke et al., 2015; G. W. Evans, 2019; Hsiang et al., 2013). The results align with a recent study showing increased official reports of child maltreatment on hotter days while noting that the effects on less severe forms of violence that often do not require medical attention, such as violent punishment, may be more difficult to detect (M. F. Evans et al., 2025). The general aggression model (Allen et al., 2018) and temperature-aggression and routine activity theories (Cohn, 1990; Hipp et al., 2004) suggest that high ambient temperatures may provoke aggressive behavior by increasing discomfort, impulsivity, and irritability while also altering routine activities (e.g., staying indoors) in ways that foster interpersonal conflict. Additionally, high temperatures can influence broader societal, community, and family dynamics, exacerbating contextual stressors and further contributing to aggressive behaviors, including violent punishment (Miles-Novelo & Anderson, 2019). Finally, the limited evidence supporting the idea that high temperatures reduce nonviolent discipline suggests that violent punishment and nonviolent discipline coexist (Cuartas et al., 2019; UNICEF, 2017), but the effects of heat are specifically focused on violent punishment.

Moderation analyses indicated that the effects of high ambient temperatures on violent punishment did not differ based on child sex, age, maternal education, household wealth, or area of residence. The finding that the effects of ambient heat on violent punishment are not moderated by socioeconomic characteristics contrasts with our cumulative stress hypothesis (H2), which posited that heat would have stronger effects in poorer households compared with wealthier ones. However, it aligns with studies indicating that physiological and psychological responses to heat-induced stress can override individual differences in risk and protective factors, suggesting that environmental stressors may impact individual behavior regardless of sociodemographic and economic characteristics (Allen et al., 2018; Li et al., 2023; Palinkas & Wong, 2020). In fact, empirical findings show associations between heat and aggression across a broad spectrum of individuals, communities, and settings, suggesting that the environmental stressor of high temperatures may overwhelm individual coping mechanisms often associated with education or financial resources (G. W. Evans, 2019; Hsiang et al., 2013; Miles-Novelo & Anderson, 2022; Ranson, 2014).

Limitations

This study has limitations that can inform future research. First, our empirical strategy only identifies the effect of acute heat,

preventing us from assessing the impact of chronic exposure to high ambient temperatures or long-term global warming. Second, while we leverage temporal and spatial variation to exploit (arguably) exogenous changes in temperature, the cross-sectional nature of the data limits our ability to conduct sensitivity checks, such as within-person comparisons to determine whether the same parent administers more or less violent punishment in hotter periods. Third, the six MICS surveys used in this study measure physical punishment, severe physical punishment, psychological aggression, and nonviolent discipline through parent-reported items, which may be subject to desirability bias. If underreporting of violent punishment occurs, this could lead to an underestimation of the true effect of heat on violent punishment, biasing results against our hypothesis and thus not posing a major threat to internal validity. Fourth, the discipline measures are general and do not capture variations in the severity or frequency of punishment. Fifth, although a strength of our study is the use of objective temperature measures, we lack data on parents' subjective experiences with heat or mitigating behaviors (e.g., air conditioning use), which could be important moderators of the observed effects. Finally, we lacked data to examine potential mediating pathways for the observed effects, such as parental irritability or stress levels.

Future Directions for Research

Future research can build on this study's findings and deepen our understanding of the links between ambient temperature and parental discipline in several ways. First, future studies should continue applying quasi-experimental approaches that leverage high-resolution spatial temperature data alongside secondary geolocated survey data, particularly from cohort and longitudinal studies, to better capture both the acute and chronic effects of heat on parental behavior. Additionally, research should incorporate more granular measures of parental discipline and punishment, as well as detailed information on antecedents of parental behavior (e.g., emotional state, irritability), to elucidate mechanisms of transmission discussed in related literature (e.g., G. W. Evans, 2019; Miles-Novelo & Anderson, 2019) and identify potential intervention targets for preventing environmentally induced violent punishment.

Further exploration of moderating factors, such as access to air conditioning and other resources that mitigate excessive heat, is also needed to inform prevention and intervention strategies. Finally, as research on climate change and parenting is still emerging, additional studies are necessary to strengthen internal and external validity, clarify the balance between universal and context-specific effects, and further examine the broader implications of climate hazards on parenting practices, child well-being, and development.

Prevention and Policy Implications

To our knowledge, this study is among the first to show that high ambient temperatures, specifically temperatures higher than the seasonal and regional average, can lead to increased aggressive parenting behaviors, such as severe physical punishment (e.g., hitting children with objects) and psychological aggression (e.g., yelling at children). These findings, alongside prior research (e.g., M. F. Evans et al., 2025; Hsiang et al., 2013), highlight how environmental and climatic factors can significantly influence human development and behavior, particularly parenting, which is a crucial predictor of child development (Bornstein, 2015). As the planet warms, it is essential to invest in further research and strategies to better understand and address these environmental risk factors, as well as the mechanisms and moderating factors that can inform targeted interventions. Meanwhile, there is an urgent need for policy and programmatic efforts to expand access to evidence-based interventions, such as parenting programs (e.g., Backhaus et al., 2023, 2025; Jeong et al., 2021), cash transfers (e.g., Nores et al., 2024; World Health Organization, 2016), and other strategies that support parental well-being and promote positive parenting. Scaling these efforts is critical to fostering resilience in families and ensuring not only positive parenting but also healthy development for future generations.

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