



The impact of hunger and resource scarcity on children's fairness judgments and behaviors: A developmental cross-national investigation

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ABSTRACT

This study investigated how hunger and poverty influence children's willingness to share resources with a hungry recipient, as well as how these factors interact across development. Participants included 918 children aged 5 to 8 years from Bolivia, Haiti, and Cambodia, who were recruited from neighborhoods within each country varying in socioeconomic status. Children completed sharing tasks both before and after lunch. Linear mixed model analyses revealed that neighborhood poverty and acute hunger jointly influenced children's sharing behavior towards hungry recipients, but only when both factors and age were considered. These findings illuminate the developmental integration of socioeconomic and contextual cues in shaping children's social decision-making.

Public significance statement: This study demonstrates how children consider both their own hunger and the availability of resources in their environment when deciding to share. The findings highlight the significant role that hunger plays in social cognitive development during middle childhood.

A concern for fairness is a foundational aspect of morality, exhibiting a distinct developmental trajectory in both judgments and behaviors. Around ages 3–4, children begin to judge others favorably for distributing resources equally, but their own sharing decisions remain relatively selfish, with most allocating less than half of their resources to others (Gummerum et al., 2010; Smith et al., 2013). By middle childhood, children are more likely to share their own resources equally (Fehr et al., 2008) and actively seek out opportunities to create equal distributions when possible (Shaw et al., 2014). Similarly, they also start to prefer equitable distributions, defined as distributions that rectify inequalities (merit, wealth) between recipients, over equal distributions (Huppert et al., 2019; Paulus, 2014; Rizzo et al., 2016), and such preferences for equality continue to grow throughout middle childhood. This body of findings highlights significant developmental shifts in fairness judgments and sharing decisions. Yet, there is comparatively less empirical evidence on the

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influence of environmental and cultural contributors on these processes.

Over the past two decades, cross-cultural similarities and differences in children's sharing and fairness judgments have been increasingly investigated. Most studies utilizing first-person sharing paradigms (e.g., Gummerum et al., 2010) document the aforementioned marked increase in sharing between ages 3 and 9, transitioning from relatively selfish distributions (1/3 of resources) to others, towards equal distributions. Across cultures, this age-related shift appears consistent (e.g., Rochat et al., 2009; Cowell et al., 2017), and extends to third-party equality judgments (e.g., McAuliffe et al., 2017; Huppert et al., 2020) and third-party punishments (House et al., 2020a). Despite similarities in the ontogeny of sharing across cultures, notable differences exist (Cowell et al., 2017; House et al., 2013; McAuliffe et al., 2017). For example, there are cultural variations in the development of costly sharing behavior, advantageous inequity aversion, and equity (Blake et al., 2015; House et al., 2013; Huppert et al., 2019; Rochat et al., 2009).

These cross-cultural differences often emerge around ages 5–8 years, when children become increasingly attuned to cultural norms, suggesting that variations in children's fairness preferences may be responses to the contextual features of their local environment (House et al., 2020b; House & Tomasello, 2018). Middle childhood is a crucial period during which children adjust their sharing behaviors and equity concerns in response to their environmental influences, particularly across cultures. While cross-cultural research has documented developmental similarities in sharing behaviors from early to middle childhood, these studies also underscore the potential for cultural variation in baseline sharing (e.g., Rochat et al., 2009) and in the mechanisms underlying cultural differences, such as market integration (Henrich et al., 2005). Importantly for this investigation, one key contextual factor is the GDP of the country, a rudimentary index of national poverty (Cowell et al., 2017). For example, children from nations with less robust economies have been shown to share less than those from more affluent nations, highlighting that the “rich” aspect of “Western, educated, industrialized, rich and democratic” (WEIRD; Henrich et al., 2010) may limit the generalizability of developmental research, including developmental cross-cultural studies, on sharing decisions and fairness concerns. Examining the impact of multiple sources of environmental influence on fairness judgments and behaviors in middle childhood is therefore critical for elucidating the broader role of context on fairness concerns.

A growing body of research indicates that objective and subjective measures of poverty and resource scarcity can influence sharing decisions in children and adults. One large scale analysis of data from 76 countries and over 80,000 participants suggested that household income was positively associated with adult altruism and charitable donations (Vanags et al., 2025). Most developmental research has focused on objective and subjective SES/wealth as metrics of resource availability and poverty (e.g., Peng et al., 2026; Ahl et al., 2024). In general, children with less access to resources often share differently from those with greater access (Corbit et al., 2020). Children begin to understand the relative socioeconomic status (SES) of their environment around age 5 years, and this continues throughout middle childhood and adolescence (Weinger, 2000). Early in this range, children have a rudimentary understanding of social class differences, based on wealth, but may overestimate their own SES until later childhood (Rauscher et al., 2017).

Moreover, recent investigations have linked both objective and subjective SES to fairness decisions and inequity aversion. For instance, children's SES may not directly influence their generosity; rather, their awareness of the recipient's need interacts with their own status to influence sharing behaviors (Genzel Toberman & Sabato, 2025). Older children from higher perceived SES backgrounds shared more resources *only* when they perceived greater need from the recipient. Similarly, children from high SES neighborhoods tended to share more resources than their peers from other regions (Benenson et al., 2007; Safra et al., 2016; Peretz-Lange et al., 2022). Another study found that early poverty may have long-term impacts on social decision-making, including inequity aversion and prosociality, potentially beyond immediate SES (Amir et al., 2018). This pattern can be interpreted within an uncertainty management framework, where prosociality and fairness may be adaptive strategies to reduce the costs associated with uncertainty following periods of scarcity. Another recent investigation highlights the importance of such contextual information. Ahl et al., (2024) found that reminding 6–9-year-old children of times of resource scarcity reduced their generosity compared to those reminded of resource abundance. Fewer studies have investigated such socio-context information integration into fairness concerns cross-culturally (i.e., in non-WEIRD samples), but preliminary indications suggest some cross-cultural similarity. For example: children from lower-income households have been found to donate more prizes to others than children from higher-income households in America and China (Chen et al., 2013; Miller et al., 2016).

While much of the extant developmental literature on socio-environmental cues in fairness concerns has focused on children's objective and subjective SES/wealth, some recent findings shed light on the potential influence of more internal cues, like hunger on fairness (e.g., Huppert et al., 2020). Infants reliably seek out sustenance when hungry (Harshaw, 2008) and even share resources with strangers when hungry (Barragan et al., 2020). However, children between the ages of 5 and 9 years only begin to reliably assess their internal hunger states (Bennett & Blissett, 2014). This integration of internal hunger state into the developing child's context of decision-making becomes key in fairness concerns and sharing. One preliminary study on this link suggests that similar to the findings on SES, the child's context (i.e., SES/hunger) is considered in sharing. Namely satiated children shared more resources in costly sharing games compared to their hungry peers (Huppert et al., 2020). This complex relationship is also evident in adults. Resource scarcity increases attention towards pressing needs (Shah et al., 2015), leading hungry individuals to focus more on hunger-related cues in the environment (Mogg et al., 1998). Attending to scarcity cues can motivate people to engage in welfare-improving behavior (Roux et al., 2015), which in the case of hunger, often results in seeking food. Consequently, satiated adults are more willing to part with their resources and less motivated to acquire additional resources in comparison to those with higher levels of hunger (Briers et al., 2006; Xu et al., 2015).

Taken together, the larger body of developmental research on SES and the preliminary investigations of hunger state suggest that both factors play important roles in shaping fairness concerns and sharing behaviors across development. However, the relationship between acute hunger, neighborhood resource access, and children's willingness to share proves more complex than previously assumed. Indeed, research in this area has produced conflicting and multidimensional findings, highlighting that generosity becomes

clearer only when recipient cues (i.e., need) and the giver's own state (SES and hunger) are considered in tandem (Civai et al., 2024). Past work on both children and adults demonstrates the influence of resource availability on fairness judgments and sharing behaviors. These findings show that immediate hunger and SES can exert contradictory effects on prosocial motives.

In the present study, we attempt to reconcile these conflicting findings, by examining how hunger and neighborhood SES interact to predict 5–8-year-old children's willingness to share food resources (i.e., candies) or non-food resources (i.e., stickers) with a hungry recipient in samples from countries far beyond the WEIRD-populations. Specifically, we focus on three countries, Bolivia, Cambodia, and Haiti, that, according to the World Bank, exhibit higher rates of poverty and greater income inequality. To address these questions, we recruited children from low- and high-income locations in Bolivia, Cambodia, and Haiti and invited them to participate in sharing games before and after lunch. Comparing groups between and within countries allowed us to consider a wide range of environments with varying resource and income levels. We targeted 5–8-year-olds due to the critical importance of middle childhood for the emergence of costly sharing behaviors (Litvack-Miller et al., 1997) and the orthogonal developing concepts of socio-cultural cues.

Consistent with previous literature, we expected children's sharing behavior to increase with age across countries (Cowell et al., 2017; Huppert et al., 2019; Rochat et al., 2009). Our primary focus, however, was on how hunger, income, and resource availability interact to predict both sharing behaviors and hunger-based equity preferences during middle childhood, a critical developmental period for prosociality and sensitivity to social context (Abrams et al., 2015; Fabes & Eisenberg, 1998; House et al., 2020b). Based on existing research, we formulated several predictions. First, we expect that relative satiation (i.e., having eaten lunch or not), will be associated with children's overall prosocial behavior, with satiated children expected to engage in more costly sharing with anonymous others. We hypothesized that as internal cues such as hunger become more salient across middle childhood, this effect would become more pronounced. Second, regarding neighborhood SES, we expected children from wealthier neighborhoods to share more resources than those from lower SES environments, consistent with previous cross-cultural findings. Furthermore, we predicted developmental differences in SES-related sharing, such that older children from wealthier neighborhoods would share more resources than both younger children and those from lower SES backgrounds. Third, prior literature suggests that recipient status cues (e.g.,

Table 1
Characteristics and demographics of testing locations.

Country	Cities for testing	City population	Low-income neighborhoods		High-income neighborhoods		Testing location	Language of testing
			Average Income	Average family size	Average income	Average family Size		
Bolivia	La Paz; El Alto	1,800,000 within each city	Approximately \$360.00/month	7 family members	Approximately \$670.00/month	5 family members	A mix of public and private schools participated; Testing occurred in quiet, private rooms within each school	Spanish
Cambodia	Phnom Penh City;	3,129,371 and	Approximately \$440.00/month	4.6 family members	Approximately \$624.50/month	2.1 family members	All testing took place in public schools within each neighborhood; Testing occurred in quiet, private rooms within each school	Khmer
	Kampot province	592,845						
Haiti	Port-au-Prince	3,744,077	Approximately \$70.00/month	8 family members	Approximately \$360.00/month	4 family members	All testing took place in public schools within each neighborhood; Testing occurred in quiet, private rooms within each school	Creole

need, merit) are increasingly integrated into resource-distribution decisions as children develop (Huppert et al., 2019; Paulus, 2014). Therefore, we expected older children to share more resources with hungry recipients. In addition, as children's social knowledge and perspective-taking abilities mature through middle childhood, we predicted that those who are either surrounded by poverty (living in lower-SES neighborhoods) or currently experiencing hunger themselves would be more attuned to recipients' needs, thus sharing more resources with hungry others.

Method

Participants

Nine hundred and eighteen children aged 5-to-8-years-old ($Mage = 6.51$ years, $SD = 1.12$ years, 50.4% female), were recruited from six locations in Bolivia, Cambodia, and Haiti (two locations/country). The locations were selected using household surveys from the World Bank, which provides spatial distributions of poverty within each country (see Table 1 for location information).

Countries

Children were recruited in Bolivia, Cambodia, and Haiti because of the national poverty rates in these countries and prevalence of undernourishment based on data from UNICEF, the FAO world hunger map and the World Bank, which measures undernourishment, defined as the percent of the population whose food intake is insufficient to meet dietary energy requirements continuously, as well as having high levels of income inequality. Based on the most recent data available, the poverty headcount ratio at the national poverty line is 37.2% in Bolivia in 2019, 17.7% in Cambodia as of 2012, and 58.6% in Haiti in 2012.

Exclusions

We aimed to recruit 960 total children aged 5–8 years from these six locations (i.e., 40/age group/location). In general, observations were excluded from analyses if children were absent from the second session. Other specific exclusions were made if children did not understand the study task ($n = 23$) or if recording errors led to impossible values ($n = 21$). If observations needed to be excluded from one session, they were excluded overall to ensure balanced samples. The resulting sample size used in the analyses included 918 children: 313 children in Bolivia (158 children from lower income areas, 155 from higher income areas), 292 children in Cambodia (139 children from lower income areas, 153 higher income areas), and 313 children in Haiti (154 children from lower income areas, 159 from higher incomes areas). See Table 2 for additional sample characteristics.

Materials

Hunger measures

We used time of testing around lunch as our objective hunger manipulation to minimize idiosyncratic differences in eating patterns. Meal-time patterns have been shown to influence circadian rhythms and hunger (LeSauter et al., 2011) and children's cognitive abilities have also shown to differ depending on lunch and satiation (e.g., Müller et al., 2013). Having eaten lunch or not was previously related to decision-making harshness in judicial decisions (e.g., Danziger et al., 2011), where the likelihood of leniency decreased just prior to lunch break and was higher post-lunch. This naturalistic occurrence of pre-post lunch offers a potential way to account for differences in hunger. The time of testing in the present study was randomized across participants, such that half of the children first participated in the two hours before eating lunch and the other half first participated in the two hours after eating lunch. The second session (i.e., before or after lunch) occurred a few months after the first session. We used this method to observe naturalistic differences in acute hunger state that could be related to social decision-making. To our knowledge, a comparable manipulation has

Table 2

Sample characteristics by country.

Variable	Bolivia ($n = 313$)	Cambodia ($n = 292$)	Haiti ($n = 313$)
Age, mean (SD)	6.51 (1.12)	6.54 (1.13)	6.49 (1.11)
Age, n (%)			
5 years	78 (24.9)	70 (24)	78 (24.9)
6 years	77 (24.6)	73 (25)	80 (25.6)
7 years	79 (25.2)	70 (24)	80 (25.6)
8 years	79 (25.2)	79 (27.1)	75 (24)
Gender, n (%)			
Boy	158 (50.5)	139 (47.6)	158 (50.5)
Girl	155 (49.5)	153 (52.4)	155 (49.5)
Income, n (%)			
High	155 (49.5)	153 (52.4)	159 (50.8)
Low	158 (50.5)	139 (47.6)	154 (49.2)

Note. SD = Standard deviation.

not previously been employed with children across several countries. To confirm this manipulation was effective and as a secondary source of hunger state, we assessed self-reported hunger using a child-friendly scale that included pictures of faces corresponding to being “very hungry” or “not at all hungry” (1 = *not at all hungry* to 6 = *very hungry*; see [Supplemental Materials](#)). Similar visual analog scales have been used to assess hunger with children even younger than those in our sample (Bennett & Blissett, 2014; Huppert et al., 2020).

Sharing measures

Children participated in sharing tasks with two different resources during each session: sharing with stickers and with candy before eating lunch and sharing with stickers and with candy after eating lunch.

In the candy version of the task, children were given six candy resources chosen by the local experimenters in each area to ensure that the type of candy was popular and highly desired. In the sticker version of the task, children chose their favorite 6 stickers from an assortment of 20 stickers to play with during the task. The experimenter verbally confirmed with each child that they liked the resources. The order in which the games were played (i.e., stickers vs. candy) was randomized and counterbalanced across participants.

In each game, children were told that they could keep all six resources if desired, but the experimenter would not have time to play the game with every student in the school. The child could choose to share some or all the resources with other classmates who would not get to play the game. The experimenter described two potential recipients to the child: a hungry and a full recipient. Each recipient was also symbolized by a cardboard stick figure, in order to assist in age-and-culture related clarity in the needs and current states of the characters. The hungry recipient looked very skinny and was described as hungry, whereas the “full” recipient looked round and was described as having just eaten a full meal. To ensure that children were mapping the symbolic stick figures with hungry versus full recipients, they were asked to identify which of the figures was hungry and which had just eaten, and reiterations of the descriptors were given if incorrect identification occurred. The same stick figure representations were used across locations.

The experimenter emphasized that the decision to keep or share resources was private and anonymous. The child could keep or share as many resources as they wanted, placing the resources among three different envelopes. Any resources for the hungry recipient were to go in an envelope in front of the skinny stick figure, any resources for the full recipient in an envelope in front of the round stick figure, and any resources that the child wanted to take home went into their own envelope (i.e., they could not actually eat candy/use stickers during the session). The child also had to correctly verify which envelope belonged to each recipient to play the game. The child distributed the resources among the envelopes privately (see [Supplemental Materials](#) for full script).

Procedure

All testing procedures were approved at each Institutional Review Board of the researchers’ home institute in Bolivia, Cambodia, and Haiti and the Institutional Review Board at [blinded for peer review]. All children provided assent before participating. This study was not pre-registered.

Researchers from the US, Bolivia, Cambodia, and Haiti aligned on procedures during Skype sessions in English to ensure that the assent documents, task materials, and instructions were consistent across countries (see [Supplemental Materials](#)). One member of the organizational team visited each country before the start of the project to check the training of local research assistants, school locations, translations, and ecological validity of the study materials. As part of a larger study, which included cognitive and affective measures as well, the child played two relevant games in each session, both resource distribution games. In these games (one with stickers and one with candy) two choices were made: 1) the choice of how many resources to share, if any and 2) of the shared resources, how many resources were allocated to the hungry recipient. Children participated in two testing sessions at school, spaced a few months apart, to reduce issues with repeat testing. One session occurred before lunch, and one session occurred after lunch to account for an objective measure of time since last meal (i.e., hunger).

Statistical analyses

A series of linear mixed models (LMMs) were conducted to examine the association between self-reported hunger, testing time (i.e., before or after lunch), income (i.e., low or high), resource (i.e., candy or stickers), age, and country on (1) sharing (i.e., the number of resources shared overall) and (2) sharing with a hungry child (i.e., recipient distribution). To note, the study included two variables to assess participants’ hunger: self-reported hunger and testing time, as discussed in the Methods section. Only one of the two variables measuring hunger were included in each LMM.

All the predictor variables were fixed effects, and given the multifaceted nature of this research, two- and three-way interactions were also included as fixed effects. To account for the repeated measures (i.e., testing time and session), the ID variable was included as a Subject/Grouping variable, and a random intercept was requested to account for participants’ different baseline measures. By including ID as a subject (i.e., a random effect), the statistical program treats the variable as a grouping variable (i.e., multiple measurements per participant), but it is not a specific variable of interest. Rather, it is an identifier in the models. Furthermore, session (i.e., session 1 and session 2) was included in the models as a covariate, which allowed us to control for variability that may affect the association between the predictors and the outcome. In the context of our research aims, including “session” as a covariate is appropriate given that it is not a key variable of interest (i.e., we are not interested in examining change over time), but it may be associated with the other variables included in the LMMs.

Following a hierarchical regression framework, three separate LMMs were conducted in a sequential order: Model A, Model B, and Model C. Model A included 7 fixed effects, Model B included the Model A fixed effects and 6 additional fixed effects, and Model C

included the Model B fixed effects along with 2 additional fixed effects. Given the two variables for hunger level (i.e., self-reported hunger and testing time) and the two outcome variables (i.e., numeric sharing and recipient distribution), four series of models (i.e., Model A, B, and C) were ran, which totaled twelve models overall. The Model A, Model B, and Model C fixed effects are detailed in Table S1 in the Supplemental Materials.

All descriptive statistics and analyses were calculated using SPSS (IBM SPSS Statistics for Windows, Version 29). All the LMMs were estimated using the Maximum Likelihood (ML) method, and the Akaike information criterion (AIC) was utilized to examine model fit across the series of models (i.e., Model A, B, and C). A lower AIC indicates a better model fit. Pairwise comparisons were examined when an effect was significant to better understand the association. For a significant interaction effect, a simple slopes analysis was conducted using Andrew Hayes' PROCESS macro in SPSS (e.g., Hayes, 2017), providing additional information on the effects at each level of the interaction.

Results

For an initial understanding of the associations between variables, correlations were generated. Of note, testing time was negatively correlated with self-reported hunger ($r = -.48, p < .001$), which indicates that an after-lunch testing time was associated with a lower reported hunger level. Self-reported hunger was negatively associated with income ($r = -.06, p < .001$), and income was positively associated with recipient distribution ($r = .04, p < .05$). Correlation coefficients for resource indicate that children shared more candy (i.e., numeric sharing; $r = -.06, p < .001$) and were more likely to share candy with a hungry child (i.e., recipient distribution; $r = -.03, p < .05$). For age, an increase in numeric sharing ($r = .12, p < .001$) and the likelihood of sharing with a hungry child (i.e., recipient distribution; $r = .12, p < .001$) were related to older participant age.

Table 3
LMMs examining self-reported hunger and other predictors of numeric sharing.

Model	Predictors	Fixed Effects	F	p	AIC
A	Hunger x income x resource	Hunger	1.637	.147	14,979
		Income	1.110	.292	
		Resource	8.836	.003	
		Hunger × Income	1.380	.229	
		Hunger × Resource	.577	.718	
		Income × Resource	1.525	.217	
		Hunger × Income × Resource	.550	.739	
		Session	105.096	<.001	
B	Hunger x income x resource + age	Hunger	1.993	.076	14,992
		Income	1.074	.300	
		Resource	9.053	.003	
		Age	6.118	<.001	
		Hunger × Income	1.249	.283	
		Hunger × Resource	.587	.710	
		Income × Resource	1.659	.198	
		Age × Hunger	1.396	.139	
		Age × Income	2.493	.059	
		Age × Resource	.488	.690	
		Hunger × Income × Resource	.573	.721	
		Age × Resource × Hunger	.689	.798	
		Age × Income × Hunger	2.066	.009	
		Session	100.459	<.001	
C	Hunger x income x resource + age + country	Hunger	1.871	.096	14,822
		Income	1.074	.300	
		Resource	89.053	.003	
		Age	6.411	<.001	
		Country1 (Bolivia v. Haiti)	162.387	<.001	
		Country2 (Cambodia v. Haiti)	117.372	<.001	
		Hunger × Income	1.251	.283	
		Hunger × Resource	.587	.710	
		Income × Resource	1.659	.198	
		Age × Hunger	1.633	.058	
		Age × Income	3.285	.020	
		Age × Resource	.488	.690	
		Hunger × Income × Resource	.573	.721	
		Age × Resource × Hunger	.689	.798	
		Age × Income × Hunger	2.105	.008	
		Session	117.372	<.001	

Numeric sharing

Self-Reported hunger

In a hierarchical fashion, Model A (AIC = 14979) was first conducted, followed by Model B (AIC = 14992), and, lastly, followed by Model C (AIC = 14822). Model C provided the best model fit in comparison to the previous two models (i.e., Model A and Model B). See Table 3 for the LMM output of the three models.

Model C was overall significant, $F(1, 3408.03) = 1115.86, p < .001$. The effect for resource was significant, $F(1, 2754) = 9.05, p < .01$, indicating that participants shared significantly more candy ($M = 2.71$) than they did stickers ($M = 2.55$). Age, $F(1, 1083.88) = 6.41, p < .001$, also emerged as a significant effect, such that younger children ($M = 2.25$) shared significantly less than did the middle childhood-aged and older children ($M = 2.67$ – 2.84). Lastly, when looking at country effects, Bolivia, $F(1, 963.70) = 162.39, p < .001$, and Cambodia, $F(1, 956.86) = 117.37, p < .001$, showed significant effects, which indicates that child participants in Bolivia ($M = 3.40$) and Cambodia ($M = 3.29$) shared significantly more than did child participants in Haiti.

Testing time

The three models were run in a hierarchical fashion. Model C (AIC = 14783) provided the best model fit given it resulted in the lowest AIC score compared to Model A (AIC = 14964) and Model B (AIC = 14950). As such, the Model C effects are discussed below. Table 4 provides the LMM output for Model A, B, and C.

The overall model for Model C was significant, $F(1, 3371.89) = 1211.22, p < .001$. A significant effect of resource emerged, $F(1, 2754) = 8.45, p < .01$, which indicates that participants shared significantly more candy ($M = 2.70$) than stickers ($M = 2.55$). Age was also found to be significant, $F(3, 918) = 9.09, p < .001$, with pairwise comparisons showing that younger participants ($M = 2.21$) shared significantly less than did the middle childhood-aged and older children ($M = 2.63$ – 2.88). Significant country effects also emerged for Bolivia, $F(1, 918) = 154.85, p < .001$, and Cambodia, $F(1, 918) = 122.63, p < .001$. With Haiti utilized as the reference,

Table 4
LMMs examining testing time and other predictors of numeric sharing.

Model	Predictors	Fixed effects	<i>F</i>	<i>p</i>	AIC
A	Testing time x income x resource	Testing time	.185	.668	14,964
		Income	.357	.550	
		Resource	8.409	.004	
		Testing time × Income	3.488	.062	
		Testing time × Resource	.166	.683	
		Income × Resource	.883	.348	
		Testing time × Income × Resource	1.009	.315	
		Session	113.769	<.001	
B	Testing time x income x resource + age	Testing time	.196	.658	14,950
		Income	.291	.590	
		Resource	8.454	.004	
		Age	7.972	<.001	
		Testing time × Income	3.654	.056	
		Testing time × Resource	.175	.676	
		Income × Resource	.883	.347	
		Age × Testing time	1.831	.139	
		Age × Income	2.759	.041	
		Age × Resource	.190	.903	
		Testing time × Income × Resource	1.029	.310	
		Age × Resource × Testing time	.659	.577	
		Age × Income × Testing time	3.375	.018	
		Session	107.152	<.001	
C	Testing time x income x resource + age + country	Testing time	.196	.658	14,783
		Income	.365	.546	
		Resource	8.454	.004	
		Age	9.085	<.001	
		Country1 (Bolivia v. Haiti)	154.845	<.001	
		Country2 (Cambodia v. Haiti)	122.634	<.001	
		Testing time × Income	3.654	.056	
		Testing time × Resource	.175	.676	
		Income × Resource	.883	.347	
		Age × Testing time	1.831	.139	
		Age × Income	3.687	.012	
		Age × Resource	.190	.903	
		Testing time × Income × Resource	1.029	.310	
		Age × Resource × Testing time	.659	.577	
		Age × Income × Testing time	3.375	.018	
		Session	105.827	<.001	

these findings indicate that participants in Bolivia ($M = 3.37$) and Cambodia ($M = 3.30$) shared significantly more than participants in Haiti.

Interactions

The age $\times$ income interaction was significant in the self-reported hunger model, $F(3, 1082.88) = 3.29, p < .05$, and the testing time model, $F(3, 918) = 3.69, p < .05$. A simple slopes analysis was conducted with Model 1 of Hayes' PROCESS macro in SPSS, with age being a mean-centered predictor variable, income included as a dichotomous moderator, and session added as a covariate. The output indicates that in a lower income area ($b = .16, SE = .04, p < .01$) and higher income area ($b = .30, SE = .04, p < .001$), age is associated with an increase in sharing.

Additionally, age $\times$ income $\times$ hunger was found to be significant in both the self-reported hunger model, $F(1, 3371.89) = 1211.22, p < .001$, and the testing time model, $F(3, 2754) = 3.38, p < .05$. To better understand this three-way interaction, Hayes' PROCESS macro Model 3 for moderation was fitted. First, we conducted the simple slopes analysis with the self-reported hunger variable. Sharing behavior was relatively similar for younger and middle childhood-aged children regardless of income and hunger level. Older children from a higher income area who had a low-to-moderate level of hunger were more likely to share compared to younger children, those from a lower income area, and very hungry children. Second, we examined the simple slopes output with testing time. Younger children from a lower income area who participated after lunch shared more than younger children from a higher income area who participated after lunch. With participants aged 6–7 years, sharing behavior after lunch was very similar. Older children from a lower income area who participated after lunch shared less than older children from a higher income area after lunch.

Table 5
LMMs examining self-reported hunger and other predictors of recipient distribution.

Model	Predictors	Fixed effects	<i>F</i>	<i>p</i>	AIC
A	Hunger x income x resource	Hunger	2.540	.027	13,446
		Income	4.516	.034	
		Resource	19.950	<.001	
		Hunger $\times$ Income	1.795	.110	
		Hunger $\times$ Resource	.573	.721	
		Income $\times$ Resource	1.744	.187	
		Hunger $\times$ Income $\times$ Resource	.669	.647	
		Session	48.175	<.001	
B	Hunger x income x resource + age	Hunger	2.728	.018	13,476
		Income	4.318	.038	
		Resource	18.831	<.001	
		Age	7.413	<.001	
		Hunger $\times$ Income	1.572	.164	
		Hunger $\times$ Resource	.616	.688	
		Income $\times$ Resource	1.957	.162	
		Age $\times$ Hunger	1.154	.302	
		Age $\times$ Income	3.084	.027	
		Age $\times$ Resource	.276	.843	
		Hunger $\times$ Income $\times$ Resource	.685	.634	
		Age $\times$ Resource $\times$ Hunger	.616	.864	
		Age $\times$ Income $\times$ Hunger	.936	.523	
		Session	47.167	<.001	
C	Hunger x income x resource + age + country	Hunger	2.291	.043	13,354
		Income	4.401	.036	
		Resource	18.826	<.001	
		Age	7.576	<.001	
		Country1 (Bolivia v. Haiti)	111.506	<.001	
		Country2 (Cambodia v. Haiti)	87.698	<.001	
		Hunger $\times$ Income	1.604	.155	
		Hunger $\times$ Resource	.616	.688	
		Income $\times$ Resource	1.957	.162	
		Age $\times$ Hunger	1.356	.160	
		Age $\times$ Income	3.689	.012	
		Age $\times$ Resource	.276	.843	
		Hunger $\times$ Income $\times$ Resource	.685	.635	
		Age $\times$ Resource $\times$ Hunger	.616	.864	
		Age $\times$ Income $\times$ Hunger	.965	.490	
		Session	45.165	<.001	

Recipient distribution

Self-reported hunger

Model A, B, and C were run in a hierarchical fashion. In comparison to Model A (AIC = 13446) and B (AIC = 13476), Model C (AIC = 13354) provided the best model fit based on the AIC. See Table 5 for Model A, B, and C output.

Model C was overall significant, $F(1, 3591) = 665.79, p < .001$. The effect of self-reported hunger was overall significant, $F(5, 3591) = 2.291, p = .04$. To note, the pairwise comparisons did not indicate that participants reporting a certain level of hunger were more likely to share with a hungry child. Income also emerged as significant, $F(1, 1087.44) = 4.40, p < .05$, such that participants from a higher income ($M = 1.76$) were significantly more likely to share with a hungry child compared to participants from a lower income ($M = 1.59$). Resource, $F(1, 2731.82) = 18.83, p < .001$, and age, $F(3, 1085.91) = 7.58, p < .001$, was also found to have significant effects. Pairwise comparisons indicate that participants were significantly more likely to share candy ($M = 2.70$) than stickers ($M = 2.55$) with a hungry child. The pairwise comparisons for age showed that younger participants ($M = 1.37$) were significantly less likely to share with a hungry child than middle childhood-aged and older children ($M = 1.71$ – 1.82). Significant effects were found for Bolivia, $F(1, 950.17) = 111.51, p < .001$, and Cambodia, $F(1, 941.05) = 87.70, p < .001$. Pairwise comparison output showed that participants from Bolivia ($M = 2.14$) and Cambodia ($M = 2.10$) were more likely to share with a hungry child than were participants from Haiti.

Testing time

Model A, then B, and, lastly, C were run in a sequential order again. Model C was found to have the lowest AIC (AIC = 13307) in comparison to Model A (AIC = 13439) and B (AIC = 13428). Table 6 provides the output of these three LMMs.

The overall model was significant, $F(1, 3598.36) = 723.29, p < .001$. A significant effect emerged for resource, $F(1, 2754) = 21.71, p < .001$, with participants being significantly more likely to share candy ($M = 1.77$) with a hungry child in comparison to stickers (M

Table 6
LMMs examining testing time and other predictors of recipient distribution.

Model	Predictors	Fixed effects	<i>F</i>	<i>p</i>	AIC
A	Testing time x income x resource	Testing time	.006	.941	13,439
		Income	2.534	.112	
		Resource	21.696	<.001	
		Testing time × Income	2.984	.084	
		Testing time × Resource	.017	.896	
		Income × Resource	2.293	.130	
		Testing time × Income × Resource	.024	.876	
		Session	52.747	<.001	
B	Testing time x income x resource + age	Testing time	.006	.941	13,428
		Income	2.405	.121	
		Resource	21.710	<.001	
		Age	9.566	<.001	
		Testing time × Income	3.070	.080	
		Testing time × Resource	.018	.893	
		Income × Resource	2.324	.128	
		Age × Testing time	1.366	.251	
		Age × Income	3.645	.012	
		Age × Resource	.145	.933	
		Testing time × Income × Resource	.024	.876	
		Age × Resource × Testing time	.071	.975	
		Age × Income × Testing time	.871	.455	
		Session	49.813	<.001	
C	Testing time x income x resource + age + country	Testing time	.006	.941	13,307
		Income	2.755	.097	
		Resource	21.710	<.001	
		Age	10.576	<.001	
		Country1 (Bolivia v. Haiti)	106.680	<.001	
		Country2 (Cambodia v. Haiti)	92.543	<.001	
		Testing time × Income	3.070	.080	
		Testing time × Resource	.018	.893	
		Income × Resource	2.324	.128	
		Age × Testing time	1.366	.251	
		Age × Income	4.428	.004	
		Age × Resource	.145	.933	
		Testing time × Income × Resource	.024	.876	
		Age × Resource × Testing time	.071	.975	
		Age × Income × Testing time	.871	.455	
		Session	49.813	<.001	

= 1.57). Next, age was significant, $F(1, 918) = 10.58, p < .001$, and pairwise comparisons indicated that younger participants ($M = 1.33$) were significantly less likely to share with a hungry child in comparison to middle childhood-aged and older children ($M = 1.69$ – 1.84). The effect for Bolivia, $F(1, 918) = 106.68, p < .001$, and for Cambodia, $F(1, 918) = 92.54, p < .001$, were also found to be significant. Participants in Bolivia ($M = 2.12$) and Cambodia ($M = 2.10$) were significantly more likely to share with a hungry child compared to participants in Haiti.

Interactions

The age $\times$ income interaction was significant in the self-reported hunger model, $F(1, 1084.67) = 3.69, p < .05$, and the testing time model, $F(3, 918) = 4.43, p < .01$. A simple slopes analysis was conducted with Hayes' PROCESS macro Model 1, with age being a mean-centered predictor variable, income included as a dichotomous moderator, and session added as covariate. The output indicates that in both a lower income area ($b = .11, SE = .03, p < .01$) and a higher income area ($b = .23, SE = .03, p < .001$), age was associated with an increased likelihood of sharing with a hungry child. As children from both income areas get older, they are more likely to share with a hungry child in comparison to younger-aged children. Additionally, there is a greater increase in sharing with a hungry child among older children from a higher income area.

Discussion

Our study was designed to assess the extent to which children's current hunger state, rather than a general environmental context of poverty, relates to sharing behavior across several countries. The existing literature presents two competing theories regarding the relationship between hunger state and sharing/fairness. One line of research suggests that lived experiences in poverty or hunger increase prosocial behaviors like sharing (Piff et al., 2010; Robinson & Piff, 2017), potentially through uncertainty management frameworks (e.g., Amir et al., 2018). Alternatively, other research demonstrates that some types of prosocial behavior, particularly resource sharing, are more likely to occur in environments where resources are abundant (Nettle et al., 2011), or where acute hunger is absent (Huppert et al., 2020). This latter perspective is especially relevant in a developmental context, as children's understanding of their environmental context becomes more sophisticated with age (Safra et al., 2016). To directly juxtapose these factors, the present study measured acute hunger both objectively (by testing before vs. after lunch) and subjectively (via self-report hunger scales), while neighborhood poverty indexed chronic resource scarcity. By examining both hunger and poverty simultaneously, we aimed to disentangle their individual and interactive contributions on children's fairness concerns and sharing behaviors across development. Our findings indicate that the impact of hunger state and neighborhood poverty on sharing are more nuanced than previously anticipated.

Our first aim was to investigate the impact of acute hunger on fairness concerns. More specifically, we sought to determine if children's acute hunger would impact their willingness to share resources with others, and whether this willingness, given their present hunger, would shift across middle and late childhood. Interestingly, and contrary to our hypotheses, children did not differ in their sharing (i.e., number of resources shared regardless of resource type) before or after lunch, nor was this related to their subjective hunger state. We anticipated that, consistent with some previous studies (e.g., Huppert et al., 2020), children in a state of satiation would more readily share resources and that this would be more impactful when considering food-based resources (i.e., candy) with others. Despite the non-significant effect of hunger, the interaction between hunger and age indicates that sharing behaviors may shift based on development. Indeed, as children exited younger childhood and entered older childhood, a marginal finding indicated that resource sharing increased when at a lower subjective hunger. This finding may align with recent research suggesting that satiated children tend to engage in costly sharing with others more than in a state of acute hunger (Huppert et al., 2020). In contrast, a series of experiments did not find that acute hunger consistently impaired adult prosocial behaviors robustly (i.e., in cases where an effect was found, it was quite small; Häusser et al., 2019). These findings, considered alongside our own results, suggest a developmental shift in the influence of internal hunger state on sharing behaviors. By later childhood, immediate hunger is less relevant to resource distribution decisions, indicating that the impact of acute hunger diminishes as children's social and cognitive capacities mature.

A second aim of the study was to investigate the extent to which chronic neighborhood resource deprivation influences children's sharing behavior, and if this changes across development. A clear pattern emerged: older children, especially those from a higher income area, were more likely to share with a hungry child. This finding demonstrates that in a higher-income area, the impact of age on sharing is stronger in comparison to a lower-income area. These findings extend the current literature, suggesting that children's sharing is partially influenced by the relative or perceived availability of resources in their environment (e.g., Safra et al., 2016; Corbit et al., 2020), and further indicate that this relationship occurs throughout childhood. One earlier investigation identified a similar pattern, wherein 9-year-old children from high-SES schools shared more resources than those from low-SES schools, but 4- and 6-year-old children did not show such differences (Benenson et al., 2007). Research with adolescents has suggested that such differences in fairness and resource allocative behaviors (i.e., of which sharing is usually included) were related to perceived neighborhood resource availability and social status (Lenzi et al., 2012). Taken together, one potential, though untested, mechanism for these developmental differences may be the emergence, during middle and late childhood of some understanding of their own and their neighborhoods' socioeconomic standing and resource availability (Rauscher et al., 2017). Recent findings further highlight the importance of understanding one's resource availability in influencing sharing. For example, children who were reminded of times of resource scarcity demonstrated lower levels of prosocial action (Ahl et al., 2024). This evidence adds to a growing recognition that, beyond objective SES, a developing understanding of perceived resource scarcity can fundamentally alter children's sharing behaviors.

Interestingly, the two aims above are further explained by the interaction between acute hunger and chronic neighborhood resource access. Older children from high-SES neighborhoods shared more of their own resources overall (numerical sharing). One

explanation for this may be that older children are more aware of their own need (As argued in one review on hunger (Faber & Häusser, 2022). Previous research on hunger, income, and prosocial behavior might have produced inconclusive results because of idiosyncrasies in the broader social context of these decisions, as well as potential developmental changes in the integration of these contexts.

While not a primary aim of this study, cross-cultural differences in children's sharing were observed, consistent with the findings of numerous developmental cross-cultural studies (Blake et al., 2015; Cowell et al., 2017; Huppert et al., 2019). Children in Bolivia and Cambodia showed greater willingness to share, whereas children in Haiti did exhibit lower levels of sharing. Accumulating evidence from non-WEIRD samples suggests the importance of considering a diverse range of cultures that differ across multiple elements of the WEIRD criteria. The present findings exemplify exactly this approach, as Bolivia, Cambodia, and Haiti each represent contexts characterized by lower economic wealth, education, and industrialization, while also varying in their degrees of Western and Democratic status. Specifically, Bolivia is a Western democracy, Haiti is a Western non-democratic society, and Cambodia is neither Western nor democratic. Despite all children coming from countries with higher relative poverty, children in Haiti generally face more severe poverty (see Table 1). As previously mentioned, objective and subjective concepts of resource availability appear to influence prosociality (e.g., Ahl et al., 2024; Peretz-Lange et al., 2022). Here, country-level effects might be indexing effects of more chronic resource shortage, which could contribute to decreased sharing. A key question for future research is whether chronic resource scarcity and environmental harshness broadly influence domain-general developmental abilities (such as cognitive or executive functioning), or if their effects are confined to social cognitive decisions and behaviors like prosociality. If chronic adversity reduces sharing, we might anticipate poorer performance on executive functioning, as past research demonstrated a link between harsh environments, lower delay-of-gratification, and greater present-orientation (Pepper & Nettle, 2017). However, social and cultural factors associated with environmental adversity also contribute to reduced sharing. For example, expectations around resource distribution may differ in contexts of extreme poverty, potentially altering fairness norms. Likewise, it is possible that Haiti's history of natural disasters may also uniquely shape children's conceptions of fairness and sharing (Brown et al., 2014). Our findings suggest that poverty does not unilaterally influence sharing in a bimodal manner, as all participants came from impoverished populations. Nevertheless, children from the most disadvantaged contexts (here, Haiti) may share less sharing compared to peers from less impoverished countries.

Across all countries, children gave more candy-based resources to the hungry recipient compared to stickers, illustrating greater willingness to deviate from equality-norms in sharing when resources were relevant to the pre-existing inequality. This pattern was consistent across countries; yet the extent to which children from Haiti shared with the hungry recipient was lower relative to children from Bolivia and Cambodia. Children from Haiti, the poorest country in our sample, exhibited less sharing towards the hungry recipient. It is possible that the overall wealth of these countries influences views of the need of the recipient such as a recipient being "full," if being full in a poorer country has a different connotation than in a wealthier country. For example, children from Bolivia and Cambodia may be more concerned about the hungry recipient, if the character associations are viewed as indicative of general food access, making them especially motivated to share more with the hungry. Some have argued that knowing the objective distributions of children is not synonymous with understanding their reasoning (Amir et al., 2023). Future investigations would benefit from more explicitly asking children about their decisions (e.g., Blake and McAuliffe, 2011).

While this study highlights the role of recipient need and resource type in predicting sharing and fairness preferences, there are also limitations to what we can conclude. Children may have shared more candies than stickers because they prioritized offsetting the hungry recipient's need, as we have argued. But it is also possible children just valued the candies less than stickers. Several previous studies have highlighted the importance of resource value in influencing sharing decisions, where children are far more likely to share non-preferred stickers than preferred (Blake & Rand, 2010). In the present study, the experimenters in each country confirmed liking of the resources with a binary question, but since children said they liked both resources, we cannot directly compare liking levels of the two resources. A methodological difference may also account for the observed preference to share candies over stickers. In children's resource allocation tasks, it is common practice to allow participants to select their "favorites" from a larger pool of stickers (e.g., Cowell et al., 2017), which can influence their attachment and perceived value of the resources. In this study, children selected their 6 favorite stickers, while they were given six identical desirable candies. This selection process may have introduced differences in the desirability of the resources, leading to greater sharing of the less-preferred items. Alternatively, developmental behavioral economics research suggests the endowment effect may also be at play, wherein children are more likely to keep resources they perceive as "their own" (Da Silva et al., 2014). Thus, the tendency to share more candies than stickers could be explained by greater perceived ownership of the chosen stickers compared to the candies. Future studies should quantify resource value in a more fine-grained manner and examine how resource value influences sharing behavior with needy recipients.

Similarly, while children expressed an understanding of the mapping of hungry and full participants with the stick figures, it is possible they were engaged in a preference for certain body shapes, simply preferring to give to the hungry stick figure due to a preference for one body shape (e.g., Staffieri, 1967; Davidson et al., 2002). This potential issue was introduced by the methodological efforts in each country to ensure understanding of the symbolic mapping between hungry and full recipients in each country and the stick figures. It should be noted that studies on body shape preference and relevant adjective association show positive adjectives associated with mesomorphs as compared to both ecto and endomorphic body shapes (those represented in our study) (Staffieri, 1967), but other previous studies have found that 5-to-7-year-old children prefer to be friends and associate with skinny confederates (Palmer & Rutland, 2011). Thus, our methods do not allow us to rule out this alternative. Future studies would benefit from a mixed-methods approach, asking for qualitative explanations of children's choices of sharing, rather than only quantitative.

One limitation of our study is that we measured resource availability at the neighborhood rather than the individual level. A wide body of empirical findings has documented the importance of one's neighborhood and resources in fundamentally shaping health, wealth, and academic achievement (Brooks-Gunn et al., 1993). However, this extends far beyond the larger picture of academic achievement; the neighborhood context of poverty can influence children's developing social and interpersonal behaviors (Evans,

2004). Future studies would benefit from the measurement of both family and neighborhood poverty, as both have been observed to influence children's social and cognitive development, even after accounting for each other (Duncan et al., 1994).

Despite these outstanding questions for future research, our findings provide critical new insight into theoretical debates and superficially contradictory results regarding the role of resource scarcity in predicting fairness decisions. By highlighting the differential effects of poverty and acute hunger on children's willingness to share, we demonstrate that chronic poverty shapes fairness preferences through specific cognitive routes, whereas acute hunger is less consequential for resource-sharing decisions. Understanding the distinct pathways through which several types of scarcity influence children's social decision making is essential for advancing knowledge of fairness development across environments, and for informing interventions aimed at promoting cooperation and altruism among groups. Importantly, this study represents a substantial shift from traditional WEIRD developmental research populations to a multi-Non-WEIRD sample that captures differences both within and across countries. Our findings contribute to a growing body of empirical work on how immediate hunger and chronic neighborhood poverty shape children's sharing decisions across development and diverse cultures. In the current study, although not found in all models, factors such as country of origin, neighborhood poverty, and hunger notably influenced children's willingness to share, particularly when examined in combination and with a needy recipient. Older children from higher-SES neighborhoods were less affected by their current hunger state when making costly sharing decisions than both younger children and those from lower-SES neighborhoods. Collectively, these findings illustrate that the development of cross-cultural fairness behaviors depends on resource scarcity, internal bodily states, and recipient need.

CRedit authorship contribution statement

Jason M. Cowell: Writing – review & editing, Writing – original draft, Visualization, Software, Project administration, Methodology, Investigation, Conceptualization. **Abigail Nehrkorn-Bailey:** Writing – review & editing, Formal analysis, Data curation. **Varun Gauri:** Writing – review & editing, Project administration, Methodology, Investigation. **Julian C. Jamison:** Writing – review & editing, Project administration, Methodology, Investigation. **Midas Millien:** Writing – review & editing, Project administration, Methodology, Investigation. **Eric Roth:** Writing – review & editing, Project administration, Methodology, Investigation. **Sisokhom Sek:** Writing – review & editing, Project administration, Methodology, Investigation. **Jean Decety:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jecp.2026.106640>.

Data availability

Data will be made available on request.

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