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Achieving Sustainable and Equitable Consumption of Wild Meat

Do cultural taboos regulate hunting in transitioning Indigenous communities? The case of the Idu Mishmi of Northeast India

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Abstract

1. There is rising recognition of resource-use rights of Indigenous Peoples and Local Communities (IPLCs) within wildlife conservation. Historically, sociocultural institutions ensured wildlife sustainability in many IPLC areas. However, the future viability of such institutions is uncertain as IPLCs change in response to external pressures and internal aspirations, potentially rendering many traditional institutions weak and open to exploitation. This is particularly true for wildlife hunting, which remains a central sociocultural and economic activity for many IPLCs.
2. We empirically examined the role of cultural norms, especially hunting taboos, in shaping hunting practices among the rapidly changing Indigenous Idu Mishmi people of Northeast India. Idus harvest large mammals and pheasants under strict taboos linked to ideas of cosmic retribution. Monthly data were gathered on wildmeat consumption, hunting and taboo adherence with a representative sample of 90 households from January to September 2015. These variables were modelled as a function of household wealth, gender, education, rural–urban-ness, ethnicity, religion and seasonality using a mixed-effects framework.
3. Results show that wealthy non-locals and the wealthiest among the Idu consumed considerably more wildmeat than other categories. Rather than hunt themselves, wealthier Idus bought meat from the less wealthy, thereby using their wealth to transfer the burden of taboo observance over to the poorer.
4. Taboo adherence was the lowest for Christian converts. Taboos continue to effectively regulate wildmeat consumption as considerably less wildmeat was consumed across all wealth categories during taboo periods.
5. *Synthesis and applications*. We emphasise the importance and resilience of cultural norms in governing hunting in IPLCs despite historical and ongoing colonisation, market capitalism, religious and sociocultural change.
6. *Policy implications*. We call for strengthening IPLC rights while arguing for better understanding of how the complex process of sociocultural change reconfigures relationships with non-human animals and their conservation.

KEYWORDS
Arunachal Pradesh, hunting, Idu Mishmi, Indigenous People, Northeast India, taboos, wildmeat

1 | INTRODUCTION

Wildlife conservation is gradually seeing a discursive shift from 'fortress' to more inclusive, rights-based approaches, particularly in the context of Indigenous Peoples and Local Communities (IPLCs) (Barletti et al., 2023). This trend is due in part to increasing evidence that IPLC-managed lands are at least as effective as government-protected areas at reducing deforestation rates (Sze et al., 2022) and providing critical habitat to many endangered species (O'Bryan et al., 2021; Schuster et al., 2019). IPLC-managed territories cover nearly a third of the planet's terrestrial surface and represent 40% of all ecologically intact land, making them crucial for biodiversity conservation (Garnett et al., 2018). Over the past decade, despite reluctance by many governments, significant progress has been made towards legal recognition of IPLC tenure and management rights over their lands (Tauli-Corpuz et al., 2020). In these landscapes, communities have complex sociocultural mechanisms and informal and formal institutions to manage sustainable relations with nonhuman nature (Dawson et al., 2024; Homewood, 2010). As IPLCs gain legal rights over their traditional lands, there is now an expectation that their traditional and customary institutions will continue to deliver sustainable outcomes for biodiversity conservation, despite significantly altered conditions (Garnett et al., 2018; Renwick et al., 2017).

Hunting is an integral part of many IPLCs' lives, important not only as a source of food and cash (Coad et al., 2019), but also fundamental to establishing and maintaining social roles, group identities, and moral and reciprocal relations with the non-human world (Valeri, 2000). Commercial and organised hunting is also one of the leading causes of global declines in tropical wildlife and, as such, has been the focus of law enforcement (Ingram, 2020). Subsistence hunting by IPLCs has also been outlawed in most countries (Aiyadurai & Banerjee, 2022), despite the prevalence of extensive rituals and taboos in such communities that impose restraint on hunting and wildmeat consumption (Colding & Folke, 2001). Species-specific taboos may directly contribute to species conservation across many communities (Alexander et al., 2017; Anania et al., 2018; Landim et al., 2023; Nijman & Nekaris, 2014; Saj et al., 2006), reducing the pressure exerted on certain species by up to 80% as taboos reduce the number of users (Begossi et al., 2004). However, unlike formal conservation mechanisms, taboos are based in ideas of cosmological retribution, relying on self-monitoring and self-enforcement, all of which is embedded within the larger cultural context (Colding & Folke, 2001; Lingard et al., 2003; Oommen, 2022).

IPLCs, their cultural practices, lived realities and connected livelihood practices are changing in response to internal and external factors. Population growth (Robinson & Bennett, 2004), market integration (Lu, 2007), infrastructure development (Suárez et al., 2009), modern technology (Levi et al., 2009), extractive industries (Orta-Martínez & Finer, 2010), formal education (Luz et al., 2017), conservation interventions and dispossession (West et al., 2006), influx of migrants (Alexander et al., 2017; Golden & Comaroff, 2015) and changes in belief systems (Lingard et al., 2003; Luz et al., 2015) are impacting IPLCs, their worldviews and institutions that manage hunting and relations with wildlife in complex ways.

Among these factors, the association between hunting, wildmeat consumption and market integration leading to changes in wealth and economic status has been of special interest as IPLC lands undergo rapid economic development. However, this relationship is particularly complicated and context-specific. While some authors have found that wildlife consumption increased with household wealth (de Merode et al., 2004; Godoy et al., 2010), others found that improved economic conditions led to decreased wildmeat consumption as wealthier households switched to other meats or devoted less time to hunting (Vasco & Sirén, 2016). Others have found no relationship between wealth and wildmeat consumption (Brashares et al., 2011; Luz et al., 2017). Furthermore, some studies have found that wildmeat consumption is higher among the poorest in rural areas and also among wealthier households in urban areas (Brashares et al., 2011; East et al., 2005). Standardised formal education, another key driver of change in Indigenous worldviews and livelihoods, has been found to reduce both hunting and wildmeat consumption (Foerster et al., 2012; Luz et al., 2017).

While the impact of these drivers on hunting and wildmeat consumption has been investigated, their interactive effect on cultural institutions, such as taboos that regulate hunting, has received little attention. Some authors have noted the impact of Christianity in weakening and, in some cases, the complete abandonment of traditional hunting taboos (Alexander et al., 2017; Knoop et al., 2020; van Amstel et al., 2022). Golden and Comaroff (2015) investigated the effect of social change on the stability of taboos in northeastern Madagascar and found complex patterns, even with religious change. In an indigenous community in Ghana with extensive taboos on killing large cats and bongos, Emieaboe and Ahorsu (2014) found that 97% of the hunters were prepared to pay the fines and undergo purification rituals because the profits from the sale of these animals far exceeded any fines, and the rituals brought increased respect as celebrated hunters in the community. Fundamentally, we lack a comprehensive understanding of how cultural change and individual agency impact the stability of taboos, hunting and wildmeat consumption over time (Golden & Comaroff, 2015).

We conducted an empirical investigation to understand how sociocultural change impacts hunting, wildmeat consumption and adherence to wildmeat taboos in the Idu Mishmi community of the northeast Indian state of Arunachal Pradesh. Unlike the rest of India where government agencies administer forests, most forests are

owned and/or managed by Indigenous communities across the hill regions of Northeast India. Here, traditional cultural institutions play a significant role in regulating hunting and other forest use (Datta-Roy, 2023). Therefore, despite its illegality under Indian wildlife laws, hunting is widely practiced in Northeast India and has attracted considerable attention from conservation researchers (Aiyadurai & Banerjee, 2022). However, most regional studies on hunting have been preliminary, recording species profiles, hunting patterns, and, in some cases, drivers (Aiyadurai et al., 2010; Bhupathy et al., 2013; Hilaluddin & Ghose, 2005). Furthermore, while several authors have suggested the role of cultural preferences and restrictions, including taboos, as significant determinants of wildmeat consumption regionally (Aiyadurai, 2011; Velho & Laurance, 2013), all research on taboos has been descriptive (Janaki et al., 2021; Sharma et al., 2021). More broadly, few have empirically assessed the role of taboos in regulating wildmeat consumption while factoring in drivers of socio-economic change (but see Golden & Comaroff, 2015; Jones et al., 2008; Tengö et al., 2007). Consequently, most conservationists remain sceptical of the value of taboos in the conservation of endangered species as IPLCs undergo rapid cultural change (Jones et al., 2008; Luz et al., 2015).

The Idu Mishmi have an expansive system of taboos that permeate all aspects of life. We have ethnographically described Idu hunting, cultural meanings of wild animals and cosmological underpinnings of Idu taboos in a previous article (Nijhawan & Mihu, 2020). In this article, we analyse the relationship between hunting and temporal shamanic taboos, called *iyu-ena* (*ena* hereafter), observed in a ritual period, *anga*, that follows personally, socially and spiritually important events, including hunting and consumption of certain wild animals, childbirth, wedding, funeral, healing and many other shamanic rituals. *Ena* applies to a class of large mammals (larger than barking deer) whose hunting and consumption is allowed for men only, and pheasants (both men and women). We refer to these large mammals and birds collectively as 'tabooed' animals. Consumption of mammalian predators, most birds of prey and most reptiles is strictly forbidden and spiritually dangerous. Civets, rodents, squirrels, porcupines, birds, fish, some frogs and some insects are eaten by both genders without any restrictions (see Nijhawan & Mihu, 2020: 158 for details of Idu animal classifications). Importantly, hunting and consumption of tabooed animals is prohibited during *anga* emerging from non-forest-related socio-spiritual events.

The Northeastern region and its Indigenous communities, including the Idu, are undergoing rapid change due to special government policies aimed at large-infrastructure construction, commercial agriculture and industrial growth, with associated in-migration, religious conversion, and educational and economic transformation (Nijhawan, 2018; Thomas & Freddy, 2024).

In this study, we use a hypothesis-driven approach to address three questions: (a) How do socio-economic factors, particularly wealth, education and rural–urban dynamics, affect hunting, wildmeat consumption and sharing patterns in the Idu and in-migrant communities? (b) Do Idu taboos regulate wildmeat consumption? (c) How does socio-economic change, particularly conversion to Christianity, formal education and wealth, impact the adherence to taboos? We answer these questions through a multivariate regression analysis of the socio-demographic correlates of wildmeat consumption and taboo adherence. We limit our data and analysis to tabooed species in order to understand shifts in adherence to cultural norms. Furthermore, most tabooed species are large-bodied mammals which are typically most vulnerable to overextraction (Ripple et al., 2016). Wildmeat, hereafter, refers to tabooed species only. Based on published literature, we hypothesise that wildmeat consumption should be higher for wealthier Idus and in-migrants in urban areas. We also expect taboo adherence to be lower among Christian converts.

Most authors of this article are Idu who self-identify as Indigenous (United Nations Permanent Forum on Indigenous Issues, 2006) and are listed in the Indian Constitution as a 'Scheduled tribe' (like most local communities in the hill regions of Northeast India), which affords special safeguards and protections. Our study is therefore situated within—and contributes to—the discourse around IPLC issues and wildlife conservation. Furthermore, there is a tendency in academia to validate Indigenous knowledge and, eventually, 'subsume' it into the mainstream of Western science (Reid et al., 2021). Since the latter is thought to be quantitative, factual, analytical and generalisable, it is often considered more legitimate than the former, which is assumed to be qualitative, anecdotal, intuitive and oral (Mistry & Berardi, 2016). While the two certainly have distinct characteristics that give them individual strengths in specific contexts, we do not believe that the dominant knowledge system should serve as the external validator (Reid et al., 2021). Therefore, our motivation here is to understand patterns of correlation and, to a limited extent, causality, between cultural institutions, wildmeat consumption behaviour and socio-economic change. This is where statistical methods can offer useful insights.

2 | MATERIALS AND METHODS

2.1 | Study area

The Dibang river basin in the state of Arunachal Pradesh is the ancestral home of approximately 13,000 Idu Mishmi people, one of the state's 26 major recognised Indigenous groups ('Scheduled tribes'). The Idu are traditional animists who believe that traits typically considered uniquely human—such as consciousness, intentionality and mortality—are shared by all beings, including animals and spirits (Nijhawan & Mihu, 2020). Idu shamans (*igu*) negotiate between the human and non-human worlds through a host of spirits, the most powerful of whom is *Gõlõ—the* spirit master of all wild animals. They lead rituals around childbirth, marriage, house construction, hunting, funerals, curing the cursed and sick, and often intervening to protect those who transgress ancestral rules. Christianity and Hinduism are slowly taking hold in the Idu community, particularly in the lower hills. Idu villages are tightly knit, typically composed of related families belonging to the same clan.

All village kin attend shamanic rituals and other social events in any village household and observe associated taboos.

This study was based in two rural and one semi-urban areas in Dibang Valley district, a 9129 km^2 administrative unit in the northern Dibang basin. The district has a population of around 8000, 70% of which are Idu (Census of India, 2011). The first rural site comprised five longhouses clustered in two villages located 4–5 h walk from the nearest road. Many families from these villages have migrated to a satellite settlement (27 households) on the main arterial road in the district, about 75 km from its headquarters. Most people regularly move between their native villages and the satellite settlement to access government schemes, forest resources and swidden farming. Most here belong to the lowest wealth category (see Methods).

The second rural site comprised six villages (42 households) in a river valley connected to the district headquarters by a single-lane all-season road. The river valley has an army camp, a primary and middle school, a labour camp and a cluster of administrative offices. Most households have at least one member in permanent employment with the local government. Like the other rural site, many people have migrated to the district headquarters, but people and goods frequently move between rural and urban areas. Most people here belong to the second lowest wealth category.

The final site was the semi-urban district headquarters (528 households) composed of both educated Idus—working as teachers, administrative employees or business owners—and non-literate Idus. All have settled here from different villages across the district and represent the full range of wealth categories. The headquarters hosts a sizeable minority of individuals from other ethnic groups in Arunachal Pradesh, who are generally better qualified and hold higher level administrative ranks (hereafter, 'non-Idus'). It is also home to diverse non-tribal people (hereafter, 'non-tribals') from various parts of India and Nepal, primarily of Hindu or Muslim faiths. The majority of non-tribals work as daily wage labourers, although a few operate small businesses or hold lower level administrative jobs. Compared to both Idus and non-Idus, non-tribals tend to have lower levels of education and are among the least economically well-off in the study area.

2.2 | Idu *ena*

A key motivation of Idu *ena* is to create and maintain vital distinctions–between humans and animals, men and women, and the living and the dead. It ensures that people understand that human prosperity is contingent upon morally appropriate interactions with the non-human world. The incompatibility between forest and human life is so fundamental to the Idu worldview that reproductively active women are forbidden from coming into contact with the meat of large mammals. Idu *ena* is not an isolated cultural element, but a fundamental practice that shapes and sustains the Idu society (see Nijhawan & Mihu, 2020).

In everyday life, *ena* operates by restricting the use of forest and wildlife during important life events. Conversely, those who have consumed wildmeat cannot participate in socio-spiritual events. The most common *ena* restrictions observed during *angə* include prohibitions on eating 'unclean' forest herbs, sexual contact, accepting food/water from menstruating women, weaving yarn, working in swidden plots and wringing/washing clothes. Anyone who has hunted/consumed tabooed wildmeat cannot attend or eat food from funerals, weddings, childbirth or any other shamanic ceremonies. The duration and the nature of *ena* restrictions vary depending on the type of event and the individual's social relationship with the person or object that is the focus of *angə*. For example, in the case of a spouse's untimely death, the entire village observes *ena* for five nights; the surviving spouse, however, remains in *angə* for 10 months under stricter restrictions. A hunter observes *ena* for five nights after a hunt, whereas anyone who eats a tabooed animal that they themselves have not hunted observes the same set of restrictions for only one night (see Nijhawan & Mihu, 2020).

2.3 | Methodology

This study was conducted as part of Nijhawan's doctoral research in Dibang Valley over 22 months in 2013–2015. Multiple data collection methods including participant observation, qualitative and quantitative interviews, and ecological surveys were built into an ethnographic and embodied learning approach. Detailed fieldnotes documenting everyday observations were maintained throughout fieldwork.

2.3.1 | Household census

Following informed consent, a census survey of all households in the urban and rural sites in January–March 2015 recorded the following for each member: gender, age, educational qualifications, sources of income and religious affiliation, whether they consumed wildmeat, and if so, which types of wildmeat had been consumed during the month of the interview. This gave a snapshot of wildmeat consumption for the entire urban population during winter when most wildmeat is consumed in Dibang Valley (Nijhawan, 2018).

In Idu households, we also asked about family history, the number of Mithun owned (a semi-domesticated bovine signifying status, ritual and economic capital), whether each member observed *ena* and whether adult women consumed any tabooed wild animals. The type of house and vehicle ownership was also recorded. In total, 600 households were surveyed, 526 in the urban and the remaining in rural sites.

2.3.2 | Sample selection for longitudinal surveys

Based on the census data, households were categorised as Idu, non-Idu or non-tribal. Next, a focus group determined five wealth categories using a combination of traditional and modern wealth

indicators: the occupations of the household head and other members (a measure of wage income), type of house, mithun ownership, car ownership and family history (see Sections S1 and S2 for details of wealth categories and correlation with these indicators). Idu households were then assigned to one of the wealth categories. They were further split based on the household head's level of education and religion (traditional animism/Christianity). Five per cent of Idu individuals surveyed identified as Christians, who typically do not observe traditional taboos, bury their dead according to traditional Idu rituals or recognise shamanic spiritual authority.

We excluded households who did not consume wildmeat either due to self-reported allergies (among Idus) or other religious beliefs (among non-Idu and non-tribal). From the remainder, we conducted a random selection such that the sample's ethnic and wealth composition was proportionally representative of the overall population (see Figure S4). We sought verbal consent from each household before starting the surveys. If a household declined to participate, a replacement was randomly selected from the same ethnic and wealth category. Twenty households were dropped after the first 3 months because of repeated unresponsiveness or prolonged absence. The final sample of 90 households (representing 20% of the censused population) was surveyed monthly from January until September 2015 by the first three authors, using the households' preferred language: Idu and Hindi for Idus; Hindi, Nepali or Assamese for non-Idus and non-tribals.

In traditional animistic Idu households, we asked whether any taboos had been observed in the previous month and the reasons for doing so. For each taboo event relating to hunting or wildmeat consumption, we collected details on the species, how the meat was obtained (hunted, bought or received as a gift), whether the meat was shared with others and the specific proscriptions followed during the taboo period. If no wildmeat had been consumed, we asked for the reasons. For taboo events related to shamanic rituals, we inquired about the type of ritual, the duration of *angə* and the specific proscriptions observed. A monthly recall period was chosen because it aligns with the traditional *ena* prohibition on washing clothes for an entire lunar month following contact with wildmeat. For Idu Christian converts, non-Idu and non-tribal households, we asked whether any tabooed wildmeat had been hunted or consumed. For each consumption event, we recorded the species and how it was obtained. Surveys could not be conducted in some rural villages during September 2015 due to logistical constraints.

2.3.3 | Predictor variables and correlations

We checked for correlations between all sets of predictor variables using Cramer's *V* coefficient (see Table S1). Wealth, ethnicity and location were highly correlated as certain groups within the Idu, especially administrative employees and businessmen, and most in-migrants only lived in urban areas. We combined these to create a locale-specific ethno-wealth variable. Ethno-wealth categories were correlated with household head education; therefore, the two were never included in the same models.

2.3.4 | Model building

We used mixed-effects models to account for pseudoreplication due to repeated surveys with the same households (Crawley, 2013). Furthermore, Idus, especially those living in villages, widely share wildmeat with their kin. Given how the consumption data were recorded, all households that shared meat received a non-zero value for consumption—even though only one animal was hunted—resulting in non-independent data. To account for this, we used a random effects structure, nesting households within groups representing social units or clusters of households that shared meat. Although meat sharing is less common in urban areas compared to rural villages, it does occur, particularly among neighbours and close kin. Over time, we developed a contextual understanding of meat-sharing patterns in the urban area and assigned urban households to meaningful sharing groups.

First, to examine the influence of socio-economic and ethnic variables on wildmeat consumption and sharing patterns, we fitted the frequencies of wildmeat consumed, bought or received as gifts (hereafter, obtained) and hunted as functions of the combined ethno-wealth-location variable and season. Second, to assess the impact of taboos on wildmeat consumption, we exclusively selected Idu households to model the frequency of consumption as a function of the combined ethno-wealth-location variable, season, number of children under the age of three, whether all the *ena* proscriptions were correctly observed, whether any adult women in the household consumed wildmeat (most do not, though a minority do) and whether shamanic taboos were reported as the reason for not consuming meat in a given month (Table 1). These models were fitted using a Poisson distribution or a negative binomial distribution in cases of over-dispersion (Harrison, 2014). The number of young children in a household was included as a covariate because several women reported not permitting wildmeat in the house because the taboo would not allow them to wash their younger children's clothes as frequently as needed (Table S2).

Finally, to explore factors that impact taboo adherence, the census data asked 1205 Idu adults the specifics of wildmeat taboos observed. Responses were coded as a binary variable, 'yes' if the respondent observed all the traditional proscriptions and 'no' if some or all the restrictions were not followed (Table 1). The response variable was modelled with a binomial distribution as a function of religion, gender and formal education, which was correlated with household wealth. Family size was used as a control in all models.

2.3.5 | Research ethics

We followed University College London's ethics protocols to obtain free, prior and informed consent (UCL Data Protection Registration

TABLE 1 Predictor and response variables used in mixed-effects models.

Variable names	Explanation (all per month per household)	Variable type
Response variables		
Consumed_total	Overall frequency of wildmeat consumption (obtained + hunted)	Count
Animals_obtained	Frequency of wildmeat obtained (received as gift or bought from the market)	Count
Animals_hunted	Frequency of wildmeat hunted	Counts
Taboo_full	'1' when all taboo proscriptions were strictly observed, '0' if some or all of proscriptions were violated	Binary (1/0)
Predictor variables—Fixed effects		
House_head_edu	Educational qualification of the household head: Graduate, high school, primary-middle, non-literate	Categorical, 4 levels
Wealth_rurban	Wealth combined with location for Idu only (1–5 represent decreasing order of wealth): Idu-Cat1, Idu-Cat2, Idu-Cat3, Idu-Cat4-urban, Idu-Cat4-rural, Idu-Cat5-urban, and Idu-Cat5-rural	Categorical, 7 levels
Wealth_ethnic_rurban	Wealth combined with ethnicity and location: Idu wealth categories above + non-tribal and non-Idu	Categorical, 9 levels
Season	Winter (January–April), Summer (May–August) and September, which was separated because: (a) it is seasonally different from the rainy summer months and has the most retaliatory killing of crop depredating animals, (b) had a large number of missing records	Categorical, 3 levels
Fam_size	Number of members in a household	Counts
Women_meat	'1' when at least one adult woman in the household ate wildmeat, '0' if none	Binary (1/0)
Religion	Idu traditional animists ('Idu'), Idu Christian converts ('Idu_christian') and other (various other religions observed by non-Idus and non-tribals)	Categorical, 3 levels
Children_3	Number of children under the age of 3	Counts
Education	Education of household member (graduate, high school, primary-middle and non-literate)	Categorical, 4 levels
Gender	Gender of household member	Binary (M/F)
Ena	'1' if shamanic taboo was reported as the reason for not consuming wildmeat, '0' in all other cases	Binary (1/0)
Random effects		
Village	Social units within which wildmeat is typically shared	Categorical, 9 levels
House_ID	Unique ID given to each household	Categorical, 90 levels

No. Z6364106/2013/11/24, section 19). Since a large majority of respondents could not read or write, we obtained consent orally prior to conducting and recording interviews. We shared copies of final reports at the conclusion of the research and manuscript drafts prior to publication with members of the Idu community for feedback.

3 | RESULTS

3.1 | Wildmeat procurement and sharing

A greater number of non-Idu households consumed wildmeat, and they did so more frequently than Idu or non-tribal households (Table 2). Idus procured wildmeat either through hunting or by receiving it as gifts (Figure 1). Non-Idus received more wildmeat as gifts than non-tribals who primarily purchased it. Non-tribals typically did not share wildmeat with others, often buying small portions for personal consumption. In contrast, non-Idus, frequently bought entire animals and shared it with other non-Idus during social gatherings, which might have increased the proportion of wildmeat received as gifts. Although the data are confined to the winter months, the patterns hold more broadly as wildmeat consumption in Dibang Valley predominantly occurs in winter, peaking in February–March (Nijhawan, 2018).

TABLE 2 Rates of wildmeat consumption by ethnicity in the urban area in January–March 2015.

	Households surveyed	% wildmeat consumed[a]	Consumption rate[b]
Idu	282	31.21	0.47
Non-Idu	38	***47.37***	***0.71***
Non-tribal	171	17.54	0.19

Note: Highest values in each category in bold.

[a]Percentage of households that consumed wildmeat in the survey month.

[b]Frequency of wildmeat consumed per household per month.

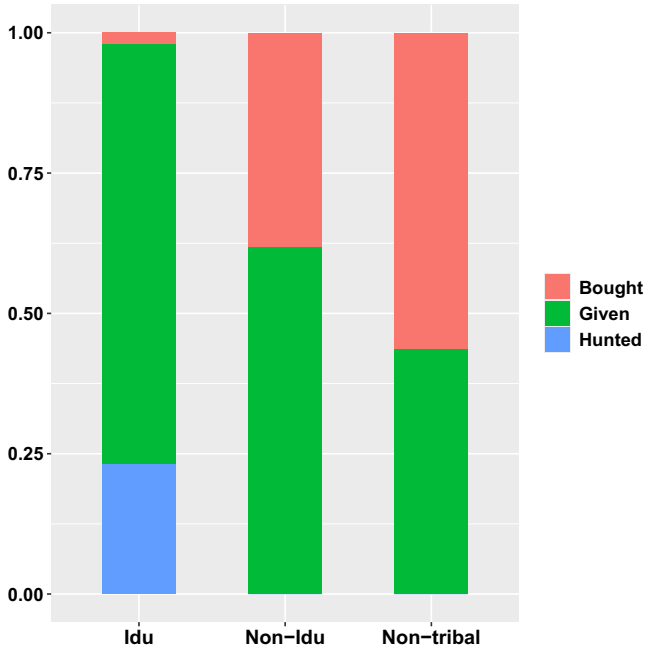

FIGURE 1 Sources of wildmeat in the urban area during January–March 2015.

3.2 | Who was consuming, buying and hunting wildmeat?

The wealthiest among the Idu and the non-Idus consumed wildmeat significantly more frequently than other groups (Table S3; Figure 2a). Overall, meat consumption was more frequent in rural areas and during winter. The wealthiest Idus and non-Idus obtained wildmeat–through purchase, or as gifts—significantly more frequently than other groups (Figure 2b). Finally, Idus in the two least wealthy categories, in both rural and urban areas, hunted significantly more frequently than the rest (Figure 2c).

The frequency of hunting was not influenced by the observance of taboos or by whether adult women in the household consumed large mammals (Table S3).

3.3 | Do taboos regulate wildmeat consumption?

The household census revealed that 42% of Idu, 7% of non-Idu and 35% of non-tribal individuals did not consume wildmeat due to cultural or religious restrictions. Among the Idu, non-consumers were primarily adult women, though a small number of adult men also abstained, citing allergies to mammal meat. Most non-tribals reported their Hindu faith as the reason for not eating meat. Among the few non-Idus who did not consume wildmeat, all identified as Buddhist who followed religious dietary restrictions. No other non-Idus in Dibang Valley observed taboos comparable to the Idu *ena*.

Among the Idu, the observance of shamanic taboo was associated with an 88% reduction in the frequency of wildmeat consumption across all wealth categories (Table S3; Figure 3). The presence of adult women who consumed meat, the correct observance of taboos and the number of young children under the age of 3 had no statistically significant impact on the frequency of wildmeat consumption.

3.4 | Who follows meat taboos?

Location (rural/urban), wealth, age and family size had no significant effect on the likelihood of taboo adherence (Table 3). Religion was the strongest predictor, with only 24% of the Idu converts to Christianity reporting observance of traditional taboos. Education had a limited influence: Idus with graduate diplomas or middle school education were less likely to observe taboos compared to non-literate individuals and those with high school diploma.

4 | DISCUSSION

Our results bring us to three main conclusions. First, wealthier people in the urbanising areas of Arunachal consume more wildmeat than the less wealthy, who, especially in rural areas, hunt both for self-consumption and to supply the wealthier. Second, temporal taboos have an impact in regulating wildmeat consumption. Third, adherence to taboos appears to be most strongly influenced by conversion to Christianity. There is also some indication that formal education affects both taboo adherence and wildmeat consumption; however, this relationship appears complex and relatively weak.

The cultural obligation to share meat in Idu society means that many eat while only a few hunt. A hunter passes the taboo along with wildmeat to the recipient, binding them in a shared commune and identity (Nijhawan & Mihu, 2020). However, the ethic of meat sharing is being significantly affected by sociocultural change in Dibang Valley, as some hunters have begun to sell meat to outsiders and wealthier Idus. Elders regularly bemoan that the younger generation has become 'selfish' and culturally disconnected, as they no longer bring them meat.

While previous studies have drawn causal relations between taboos that permanently ban hunting of certain species and conservation outcomes (Landim et al., 2023), the impact of the most prevalent class of taboos–temporal/period taboos (Colding & Folke, 2001), such as shamanic taboos, *ena*, for the Idu–in shaping conservation behaviour and outcomes remains less understood (Alexander et al., 2017). We showed that Idu respondents reportedly consumed wildmeat substantially (88%) less frequently during months when they observed temporal shamanic taboos. Because such taboos restrict key aspects of daily life, including sexual activity, travel, diet and participation in social and ritual events, consuming wildmeat becomes a negotiation between eating and the freedom to engage in everyday activities. As one Idu man explained, '*Ena is really bad because these days we have very busy lives, we have to travel for work, and we can't really do that freely when you are in angə*'. Importantly, as we have reported elsewhere, this interconnected web of relations between the Idu and the nonhuman world, mediated by *ena*,

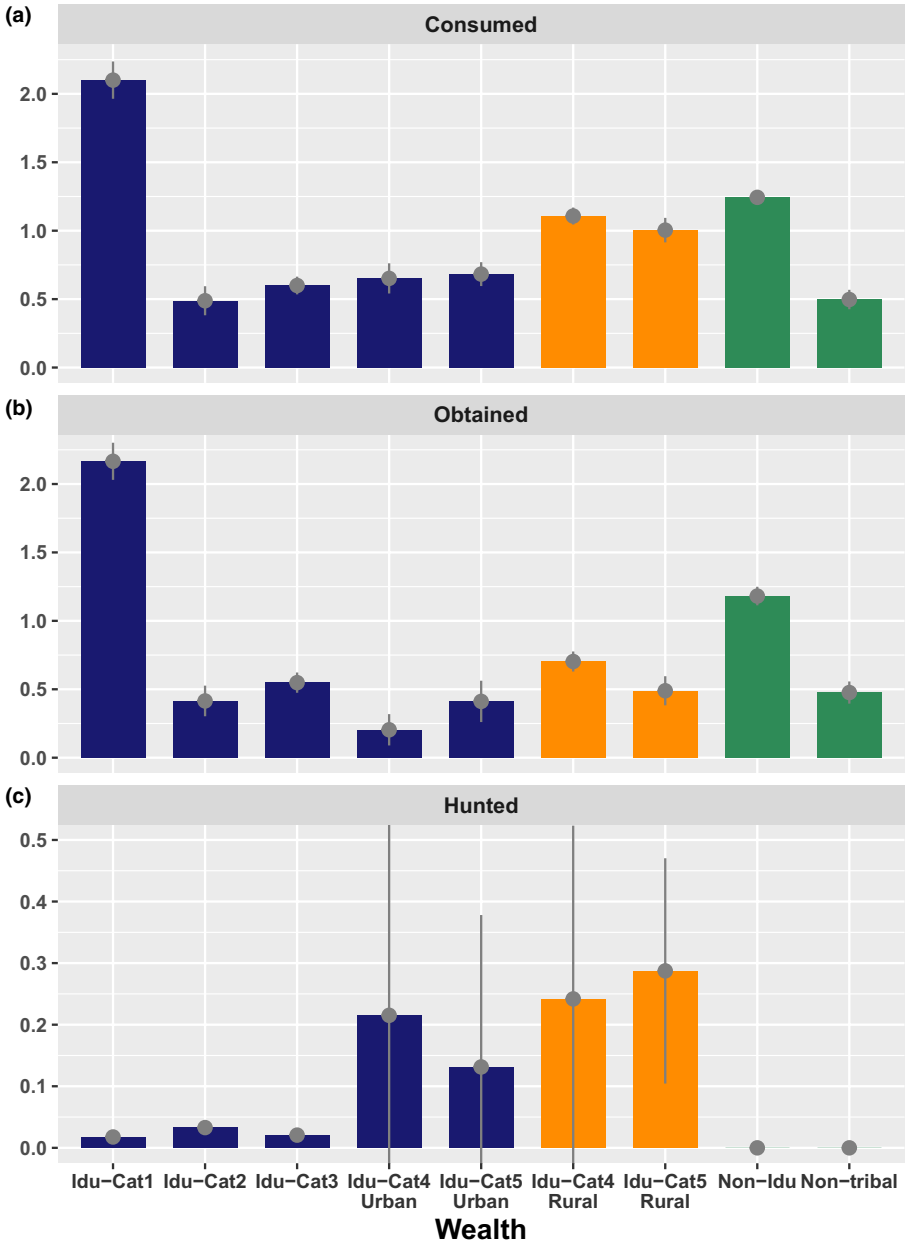

FIGURE 2 Model predicted mean frequency of wildmeat (*y*-axis, from top to bottom): (a) Consumed, (b) obtained, (c) hunted per month per household in winter by different ethno-wealth categories. Dark blue, orange and green represent Idus in the urban area, Idus in rural areas and non-Idus, respectively.

ancestral practices and shamans, has contributed significantly towards maintaining high levels of wildlife abundance and diversity in Dibang Valley, including sustaining a population of endangered tigers (Nijhawan, 2018).

As the Idu society changes, gendered relations constituted by taboos and wildmeat are being reconfigured. Adult women, who make up nearly 40% of the Idu population, overwhelmingly do not consume large mammals. Because the taboo is transferable to anyone who comes into physical contact with someone in *angə*, most Idu women prohibit their husbands from bringing wildmeat into the house. One married Idu woman explained, '*I can't have my husband eat wildmeat, come back home and touch things in the house. I can't use them or wash clothes for a month. This is just not feasible; we have young kids. So, when my husband wants to eat wildmeat, he sleeps outside until the angə is over*'. In traditional Idu longhouses, men and women had separate hearths. However, in most modern homes—especially in urbanising centres—families typically shared a single, western-style kitchen with one gas stove. As one Idu man noted, '*I almost never eat wildmeat, we only have one stove in the house, so my wife does not allow*'. Women, though viewed as being weaker in Idu cosmology and therefore subject to stricter taboos (Nijhawan & Mihu, 2020), seem to wield influence over men's decisions to consume wildmeat. This is especially prevalent in urban areas, where women not only retain traditional roles of cooking and tending kitchen gardens but

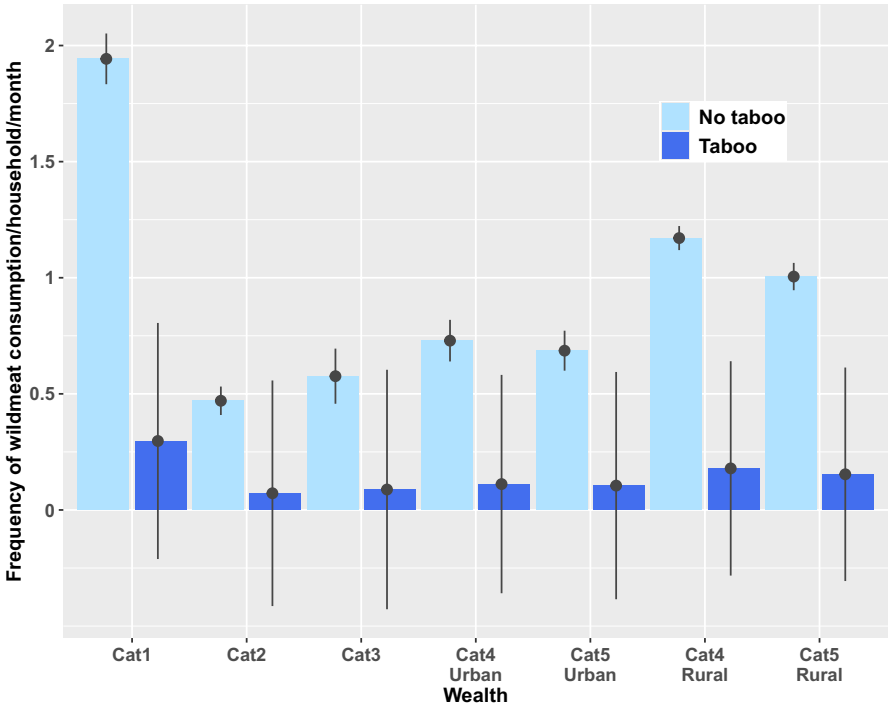

FIGURE 3 The impact of shamanic taboos on model predicted frequency of wildmeat consumption per household per month in winter for different Idu wealth categories.

TABLE 3 Model averaged coefficients of the taboo observance model for Idus only. Non-literate women and traditional animist Idus were used as reference categories.

	Estimate	SE
(Intercept)	15.4004	3.0116***
Graduate	−3.5055	1.9000^
High-school	0.0962	1.6409
Primary-middle	−3.3314	1.9643^
Idu-Christian	−23.2346	3.6872***
Gender-male	−1.5569	1.2879
log(Fam_size)	0.3698	0.9689

^$p < 0.1$.
***$p < 0.0001$.

also hold salaried jobs and contribute to household incomes. Urban middle-class Idu women expressed stronger disapproval of their husbands' consumption of wildmeat than their rural counterparts. In rural settings, men's consumption of wildmeat was not viewed as a collective decision, even though it had practical consequences for the entire household. Eating wildmeat and then observing *ena* was explained as a normal aspect of village life, so much so that women joined their husbands in expressing frustration when wildmeat was not available, even though they themselves rarely ate it.

The results presented here broadly align with previous research showing that socio-economic conditions in urban areas influence bushmeat consumption patterns in ways different from rural sites (Brashares et al., 2011). A wealthy Idu told us, '*I like to eat wildmeat, but I do not like the ena, so I give bullets to hunters. Ena is not very much if you don't hunt*'. When asked how he washed clothes if he ate wildmeat so frequently, he responded, '*We have maids who wash clothes. The person who eats the meat shouldn't wash them. The ena is for one night only, you eat at night, sleep and then when you wake up, it's over*'. In contrast, most hunters who sold meat observed *ena* strictly for five nights.

Another wealthier Idu businessman with younger children who often bought wildmeat said, '*My wife does not eat it. I have relaxed some things and have stopped separating utensils. I have recently brought a washing machine so now I can wash my clothes even after eating meat. An igu (shaman) explained to me ena is not on washing clothes but wringing water out by hand. The washing machine does not do that. It's such a relief!*' In both instances, wealthier Idus have used their resources to manipulate and navigate cultural restrictions without seeming to publicly breach social norms. In a small and close-knit society, conformity to social norms is central to maintaining one's membership in the group. 'Elite capture' of benefits is widely reported in development and conservation projects (Lucas, 2016). We argue that the ways in which wealthy Idus have manipulated cultural norms to their advantage represent a distinctive form of elite capture. In this case, it involves not only the elite capture of wild resources but also the strategic avoidance of the associated cosmological and ritual burden. Through the leverage of newly accumulated wealth, Idu elites shift the burden of conforming to social norms onto poor community members.

Studies have found that not only do non-indigenous in-migrants hunt more (Fa et al., 2016), but also that short-term benefits of hunting accrue disproportionately to them to the detriment of the Indigenous residents (Poulsen et al., 2009). In Dibang Valley, non-Idu Arunachali do not hunt themselves; they possess both economic means and institutional power through their ranks in the administrative bureaucracy. In contrast, non-tribal labourers, restricted by Arunachal's protectionist policies from owning land or businesses,

possess neither (Prasad-Aleyamma, 2014). Many non-Idus allocate contractual work to local Idus as part of their administrative positions. It therefore pays to maintain relations of patronage with them, built and strengthened by occasionally taking them out to hunt, giving wildmeat as gifts, or complying with requests to procure wildmeat. Some non-Idus even send large quantities of dried wildmeat to their families back in their home districts. Non-tribals generally did not hold positions of power in the local government. Those who did, for example, schoolteachers, were often either mostly vegetarian or avoided wildmeat due to religious beliefs.

While our data highlight clear relationships between wealth and wildmeat consumption in Dibang Valley, the impact of formal education is less straightforward as it is closely linked to wealth for certain subgroups within Idu society. Both the poorest and the wealthiest Idus, who had the highest rates of wildmeat consumption, tended to have lower levels of formal education. Idu senior-level government employees, the second wealthiest category, were highly educated and had some of the lowest rates of wildmeat consumption. In-depth interviews conducted with highly educated Idus revealed a generally relaxed attitude towards taboos, with some regarding them as superstitions. A high-ranking Idu employee with a postgraduate degree explained, '*I think Idu culture is too rigid and needs to be liberalized to keep up with the changing times. I don't believe in wildmeat or funeral ena. But I don't go around telling people that I don't do ena, if something untoward happens, I don't want people to point fingers at me. Blame like that wouldn't die with me, it'll follow my children too. I keep my mouth shut*'. A young Idu man who is currently studying for a postgraduate degree in law opined, '*ena is baseless, discriminatory superstitious and outdated*'. When asked if he believed if Idu *ena* has had any impact on wildlife conservation, he replied, '*yes it has probably saved the wildlife so far, but we don't need it anymore*'. The former shows the rejection of traditional values while still needing to conform to societal expectations or 'keeping face,' while the latter pits tradition against perceived notions of modernity and progress.

Drawing on interviews and ethnographic observations, we postulate that formal education influences wildmeat consumption through two possible pathways. First, participation in schooling and full-time employment reduces the time available for hunting and for learning traditional activities—a dynamic observed in other transitioning Indigenous communities (e.g. Luz et al., 2017). Since there are no colleges in the district and the courses offered at the district's only high school are limited, most young people study in boarding schools outside the district. Therefore, they are neither available to hunt nor to learn about the intricacies of *ena*. As one educated young Idu man explained, '*I have never hunted. I also don't know the ena properly, so I just don't eat wildmeat because I don't want to break any rules unknowingly*'. A busy, structured schedule also limits individuals' ability to follow *ena* restrictions, which often interfere with travel and daily routines. Second, some highly educated Idus expressed pride in their own culture and the importance of its preservation. They also drew connections between dominant ideas of wildlife preservation and *ena*.

Our data indicate a negative correlation between Idu taboo observance and conversion to Christianity. However, more broadly, the relationship between religious conversion and taboo observance is complex and context-dependent. In some Indigenous communities in Indonesia and Amazonia, conversion has led to the complete abandonment of taboos (Luzar et al., 2012; Luzar & Fragoso, 2013; Wadley et al., 1997). In contrast, in parts of Madagascar, Christian converts continue to observe taboos despite church efforts to discourage them (Lingard et al., 2003; van Amstel et al., 2022). Knoop et al. (2020) noted that in the Maraguá peoples of Amazonia, hunting taboos were impacted by specific Christian denominations, with Adventists replicating or even creating new taboo systems. They concluded that Christianity had the potential to impact wildlife extraction at a local scale.

In many IPLCs, external pressures interact with individual agency in complex ways to reconfigure identity and relationships with non-human animals. Beyond broader socio-economic-cultural change, the criminalisation of subsistence natural resource use—a central tenet of top-down conservation regimes—has disrupted relationships with wildlife that once spanned use, respect, awe, control and bi-directional fear (Kareri, 2021). The effectiveness of taboos and other traditional institutions as regulatory mechanisms depends on such embodied relationships and the rituals that constantly reaffirm and reinforce them (Oommen, 2022). Once these relationships of dependence are severed, the care and restrain that they generate tend to erode, often leading to unsustainable exploitation and appropriation. It is important to recognise that taboos and cultural norms have never offered protection for all species and resources. Among the Idu, for example, smaller, fast-reproducing species such as rodents and birds are excluded from taboo restrictions. However, under changed external conditions, it is likely that a combination of cultural sanction with increased demand might lead to added pressure on these smaller species. Therefore, moving beyond romanticisation of IPLC traditions and customary institutions, nuanced research is needed to explore how IPLCs adapt, reconfigure, or even reinvent traditional institutions in response to new challenges, and what lessons they offer into evolving conceptualisations of Indigenous sustainabilities (Chandi et al., 2015; Golden & Comaroff, 2015). Crucially, this knowledge must be co-produced with IPLCs to understand how they are building alliances, blending traditions with contemporary systems and developing new approaches to safeguard and use their territories and wildlife (see Tran et al., 2020). To this end, our study provides a unique insight into how change is impacting hunting and its governance across a significant segment of Indigenous and tribal India. Such long-term, empirical, interdisciplinary studies are rare in India because of the legal criminalisation of hunting (but see Datta-Roy, 2023).

We join other researchers who have highlighted the continued importance and resilience of cultural practices and taboos in governing hunting in many IPLCs despite pressures of historical and ongoing colonisation, market capitalism, religious and sociocultural change (Boesch et al., 2017; Chandi et al., 2015; Constantino et al., 2021). Importantly, we caution conservation agencies and researchers against cherry-picking and reinforcing only those elements of traditional cultures that appear to align with conservation

goals (Osterhoudt, 2018). *Ena*-like cultural norms which may produce conservation outcomes are not standalone practices. Rather, they are deeply embedded within complex cosmologies which cannot be isolated and implemented without maintaining relations of use and dependence that give them meaning (Nijhawan & Mihu, 2020; Oommen, 2022). When such institutions are used in an instrumental way, they risk creating new conflicts because of ontological incompatibilities between cultural and conservation pathways and goals (van Amstel et al., 2022). A growing body of research shows that traditional institutions and local governance mechanisms deliver conservation outcomes when communities have secure tenure and rights to resource use and management (Baragwanath et al., 2023; Wilkie & Painter, 2021). Therefore, we argue strongly for supporting IPLCs in their struggles for land rights and to rebuild or strengthen traditional institutions that reflect local ideas of sustainable, moral human–wildlife relations.

5 | CONCLUSION

Our study illustrates the intricate and evolving dynamics of wildmeat consumption, taboos and socio-economic transformations among the Indigenous Idu Mishmi community of Northeastern India. As wealth, urbanisation, religious conversion and formal education reshape traditional lifeways, they also mediate how cultural norms—particularly wildmeat taboos—are interpreted, reinforced, negotiated and at times subverted. Importantly, we show that despite altered socio-economic conditions, temporal taboos continue to regulate wildmeat consumption behaviour. However, their conservation impact is increasingly being shaped by larger socio-economic forces and shifting gender roles. We found that increased wealth not only allows the rich to purchase more wildmeat, it also generates a certain kind of social capital that enables circumvention of ritual obligations. Formal education and Christianity complicate adherence to tradition in ways that may weaken conservation outcomes or, in some cases, reframe them through modernist lenses. We caution against viewing Indigenous cultural practices as static tools for conservation. Instead, they must be understood as embedded in lived experience and cosmological worldviews, their future resilience contingent upon the interplay of local cosmologies, extra-local forces and individual agency. We call for strengthening IPLC land rights, institutional autonomy and cultural self-determination while arguing for co-producing knowledge on how the complex process of sociocultural change reconfigures relationships with nonhuman animals and their conservation.

AUTHOR CONTRIBUTIONS

Sahil Nijhawan, Jibi Pulu, Alinji Rondo and Marcus Rowcliffe conceived the ideas and designed methodology. Sahil Nijhawan, Achili Mihu and Iho Tapo collected the data. Sahil Nijhawan and Marcus Rowcliffe analysed the data. Sahil Nijhawan led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest as per the journal's policy.

DATA AVAILABILITY STATEMENT

This study is based on data on wildlife hunting in an Indigenous community in India. Hunting is illegal as per Indian law which makes the data highly sensitive. Therefore, the data will not be made publicly available in accordance with the conditions stated in the ethical approval.

STATEMENT OF INCLUSION

This research, a component of Nijhawan's doctoral work, is an outcome of a deep, long-term collaboration and relationship between non-local researchers and members of the Idu Mishmi community. Four of the six authors are Idu Mishmi. Participant observation was undertaken by Nijhawan to build rapport and trust to understand cultural concepts through Idu people's lived experience. He learned the Idu language, lived with local families observing food taboos and behavioural prohibitions, and participated in household, farm and forest chores, festivals, funerals and other sociopolitical events. Nijhawan is a part of an Idu-led team working on biocultural conservation and research based in the Dibang Valley. All Idu and non-Idu authors were equal collaborators in all aspects of knowledge-making. The manuscript has been written by combining two positionalities—Idu Mishmi (Indigenous) and Western scientific epistemology.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Figure S1. Percentage of households in each wealth category who educate their children in private schools.

Figure S2. House type for each wealth category.

Figure S3. Percentage of households in each wealth category that owned mithun.

Figure S4. Comparison of different sub-categories in the population (left) and the representative sample (right): (a, b) proportions of Idu, non-Idu and non-tribal households; (c, d) proportions of households in urban, and rural areas; (e, f) proportion of ethno-wealth categories.

Table S1. Correlation coefficients with 95% confidence intervals.

Table S2. Top models arranged in increasing order of their AICc values.

Table S3. Coefficients (and standard errors) of covariates in top averaged models.

Section S1. Wealth categories.

Section S2. Correlations between predictor variables for model building.

Section S3. Model selection.

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