Context Specificity of "Market Integration" among the Matrilineal Mosuo of Southwest China

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Market integration (MI) is a complex process through which individuals integrate market-oriented activities into previously subsistence-dominated lifeways. Changes associated with MI alter the landscapes of individual health and reproductive decision-making. While the consequences of MI are often easily detected in aggregate, the specific aspects of MI that affect health and demography are context dependent and underinvestigated. We argue that an evolutionary perspective can inform such investigations by emphasizing individuals' responses to the opportunities and challenges presented by MI in their particular context. Among adult matrilineal Mosuo participants from six villages in southwest China who are experiencing rapid MI driven by ethnic tourism, we investigated relationships between multiple indicators of MI and three outcomes commonly associated with MI: waist circumference, systolic blood pressure, and age at first reproduction. Different MI indicators distributed across individual, household, and community levels of social organization predicted these outcomes. This suggests that commonly used simple metrics of MI can usefully be supplemented by additional context-appropriate indicators of MI. Evolutionary theory and other frameworks that situate hypotheses of MI within specific social, cultural, and historical contexts will be most capable of identifying specific pathways through which multiple elements of MI affect different domains of reproductive and health behavior and outcomes.

Online enhancement: appendix.

Background

How the changing landscapes associated with market integration (MI) affect humanity has long held the interest of anthropologists. However, how MI is defined and operationalized differs across studies, obscuring trends and hampering theoretical advancement. Here, we use evolutionary theory to motivate analyses of different facets of MI in relation to health and reproductive outcomes to investigate whether various common proxies of MI reveal anticipated relationships. We employ evolutionary perspectives here that anticipate flexibility in lifeway adjustments based on individual and context-specific differences (Nettle et al. 2013). These perspectives point to important limitations of characterizations of MI as a quasi-linear process and suggest that theoretical refinement of MI would benefit from recognition (including analytical) of its mosaic and context-specific features.

What Is MI?

Researchers use the broad term "market integration" to capture the various processes by which individuals shift away from subsistence activities and toward market-oriented ones. MI overlaps with related concepts (e.g., market participation); there is remarkably little consistency in the concept's operationalization across studies (table S1.1; tables S1.1, S1.2, S3.1, and S3.2 are available online). Generally, MI is meant to encapsulate shifts in production (e.g., wage labor vs. subsistence) and consumption (e.g., market vs. garden foods; Lu 2007) and variation in "acculturation" (i.e., the changes in culture in response to contact with members of other social groups; see Broesch and Hadley 2012; Colleran 2020).

Many studies implicitly attribute MI to external processes (e.g., infrastructural developments, such as roads and electricity). An evolutionary view recognizes individuals' agency

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and expects individuals and households to make decisions regarding engagement in different aspects of markets in light of person- and context-specific costs and benefits (see Demps and Winterhalder 2019). This theoretical orientation raises the concern that the relevant components of MI are not likely to be captured by single metrics such as distance to market (e.g., McAllister et al. 2012) or percent of calories purchased from markets (Henrich et al. 2010) because each measure reflects only one consideration affecting the costs and benefits of the opportunities presented by MI.

Studies that operationalize MI using compound indexes across levels of decision-making (i.e., individual, household, community) are likely to be more useful in assessing both general and context-specific features of MI because they consider both externally driven and agentive components. Relevant indicators include ownership of consumer electronics (e.g., Olszowy et al. 2018); aspects of both "traditional" and "material" ways of life (e.g., García, Gurven, and Blackwell 2017); participation in activities related to MI, such as purchasing market foods or engaging in wage labor (e.g., Liebert et al. 2013); and others (table S1.1). Such studies can facilitate theory building by identifying which aspects of MI are associated with different realms of decision-making and related outcomes, including the importance of indicators at multiple levels of organization (e.g., Colleran 2020; Gurven et al. 2015).

What Predicts Common MI Outcomes?

We use evolutionary theory to motivate analysis of three outcomes commonly affected by MI to evaluate the utility of a range of MI indicators. First, life history theory (LHT) links MI to variation in age at first reproduction (AFR). LHT anticipates that individuals allocate effort across three fundamental activities in ways that enhance reproductive success: bodily maintenance (e.g., immune function), growth, and reproduction (Stearns and Koella 1986). AFR represents a transition from investing primarily in growth and maintenance toward investing in reproductive effort. All else equal, increasing access to material resources in previously energy-limited circumstances should lead to earlier AFR (Gurven et al. 2017; Jones and Bliege Bird 2014; Mattison and Shenk 2019). However, MI may also favor prolonged investment in learning and/or growth and thus delayed AFR as a result of increasing benefits from education or elevated status competition among adults in emerging and market economies (e.g., Shenk, Kaplan, and Hooper 2016; Snopkowski et al. 2016). This view suggests the importance of accumulated wealth across development and payoffs from education as key components of MI.

Second, evolutionary theory links MI with changes in nutrition and activity that affect waist circumference (central adiposity) and systolic blood pressure (SBP). Specifically, evolutionary theory anticipates individuals preferring market foods and sedentary activity, even if doing so harms their long-term health and survival (Wells 2014), as market foods appeal to humans' evolved preferences for salt, fat, and carbohydrates and because they lower the costs of production and consumption (Lieberman 2006; Wells 2014). As highly processed market foods supplant traditional foods (which are generally low in sugar, higher in fiber, and produced with greater physical effort), metabolic dysfunction and chronic disease result (Wells 2014). In addition, novel psychosocial stresses associated with culture change, increased status competition, and inequality are likely to increase stress-related chronic disease, including hypertension (McDade and Nyberg 2010; see also Wander et al. 2020). This suggests the importance of access to markets, the ability to purchase market goods, and related factors as important drivers of lifeway changes due to MI.

Research Population

We collected data among the Chinese Mosuo, an ethnic minority who, since the 1980s, have experienced intensifying integration with regional markets stemming primarily from increasing tourism (Mattison 2010; Walsh 2005). Farming and animal husbandry are increasingly, if unevenly, giving way to lifestyles based on tourism. Large roads have been paved, whereas smaller roads are still dirt, and houses vary from traditional wood with mud floors to more expensive cement. Electricity is now ubiquitous, as is piped water, although both experience frequent outages, particularly in remote villages. There are several local elementary schools and one middle school; children who advance to high school must travel to the county seat of Ninglang (a three-hour journey) or farther.

Villages close to Lugu Lake have experienced the most dramatic effects of tourism, including the proliferation of shops and guesthouses, offering new opportunities for employment and daily interactions with non-Mosuo visitors. In these lakeside villages, incomes are high, raising the standard of living and increasing emphasis on market-oriented jobs as the Mosuo increasingly look to tourism for their livelihoods. The town of Yongning, which is distant from the main tourism center, houses a central market and provides access to commercial and farmed products brought in from elsewhere.

Mosuo people have responded to this changing landscape in a variety of ways (Blumenfield et al. 2018; Mattison 2010). We examine a suite of MI variables relevant to the Mosuo context as predictors of AFR, SBP, and waist circumference to assess the extent to which one or a small set of variables emerges as relevant indicator(s) of MI.

Material and Methods

Participants and Sampling

We administered questionnaires in six matrilineal Mosuo villages between January and July 2017. We traveled house to house and interviewed a primary adult respondent who was at home and could provide sociodemographic information on all members of the household. Other adults were often also present and helped to answer questions. Our data set contains

10 putative indicators of MI at the individual, household, and village levels (table 1): individual and household income, individual years of education, the highest education achieved by any household member, the proportion of household foods purchased from the market, the number of cars, the number of migrants in the household, total household size, and distances to the large market town and lakeside center of tourism. These are common but not exhaustive measures of MI; we chose them because they are easily measured, commonly used (see table S1.1), and likely to reflect MI at multiple levels, as predicted by evolutionary theory. Supplemental material (SM) section S2 (SM secs. S1–S3 are available online) contains details of variable parameterization; distance variables were estimated from the center of each village to the center of the market town and the main lakeside village using Google Maps (http://google.com/maps).

We collected anthropometric data from household members present at the time of the interview. Waist circumference was estimated three times at 1–1.5 inches above the top of the iliac crest (NHANES 2007) with a body tape, was averaged, and was standardized (waistZ) for men and women. SBP was estimated up to three times using an Omron Series 10 device and was averaged.

Data collection protocols were approved by the University of New Mexico Institutional Review Board (06915), and Fudan University conducted additional ethical review. All participants provided informed consent.

Statistical Analyses

We began with a "global" model of the outcome of interest as a function of 10 putative indicators of MI, gender, age, 10-year age cohort, a three-category cohort variable capturing market exposure (SM sec. S3), and 14 potentially important interactions. We included household (but not village) as a random effect in all models (SM sec. S3). WaistZ and SBP models included everyone aged 16 years and older, with complete information for the outcome and all predictors of interest. AFR analyses assume that MI variables at the time of the interview accurately reflect participants' circumstances before their first reproduction; to minimize temporal disjunctures, we limited AFR analyses to individuals under the age of 30 years at the time of the interview (cohort variables were thus excluded from this model).

For each outcome, we compared corrected Akaike information criterion (AIC_c) values (Burnham and Anderson 2002) across models, including all possible combinations of variables and interactions to identify the model that best explains observed variation (SM sec. S3). We modeled waistZ and SBP using linear mixed models and AFR using a mixed effects Cox

Table 1. Descriptive statistics (means and standard deviations [SDs]) for samples for each analysis

	Level of organization	AFR mean (SD) or %	WaistZ mean (SD) or %	SBP mean (SD) or %
N reproduced before age 30	Individual	47 (18%)	…	…
AFR (years)	Individual	23.3 (2.6)	…	…
Waist circumference	Individual	…	34.71 (3.74)	…
SBP	Individual	…	…	116.0 (21.9)
Age	Individual	23.0 (4.2)	49.1 (14.4)	51.1 (15.3)
Male sex	Individual	53%	37%	37%
Individual income (CNY reported per month)	Individual	1,219 (1,588)	763 (1,680)	705 (1618)
Years of schooling	Individual	10.3 (3.6)	3.5 (4.7)	3.1 (4.4)
Household income (CNY reported for preceding year)	Household	94,419 (146,517)	83,324 (131,638)	84,810 (128,519)
Highest education:				
None	Household	0%	2%	1%
Primary	Household	4%	7%	8%
Secondary	Household	29%	32%	33%
High	Household	16%	15%	15%
Beyond	Household	50%	43%	43%
Household foods purchased from market (%)	Household	29.6 (27.6)	25.0 (24.9)	25.7 (25.3)
No. cars in household	Household	1.0 (1.1)	.9 (1.1)	.9 (1.1)
No. migrants in household	Household	2.2 (2.3)	1.8 (1.9)	1.9 (1.9)
Household size	Household	6.9 (3.3)	6.5 (2.8)	6.7 (3.0)
Kilometers to tourism center	Village	7.9 (5.9)	8.5 (5.5)	8.3 (5.6)
Kilometers to market town	Village	8.4 (5.9)	7.4 (5.6)	7.6 (5.7)

Note. There are 255 individuals (restricted to ages of more than 30 years) and 167 households included in the age at first reproduction (AFR) outcome, 375 individuals and 244 households included in the waist circumference Z-score (waistZ) outcome, and 410 individuals and 249 households included in the systolic blood pressure (SBP) outcome. "Individual income" includes only income attributed to a single participant. "Household income" excludes incomes attributed to any individual household members, with the exception of remittances. "Kilometers to tourism center" refers to the distance to the lakeside tourism center. "Kilometers to market town" refers to the distance to the market town of Yongning. CNY = Chinese yuan.

proportional hazards model. We conducted all statistical analyses in R 4.0 (R Core Development Team 2021).

Results

Sample characteristics (table 1) were similar for the SBP and waistZ models; characteristics of AFR participants differ given the restriction of this model to those under the age of 30 years. The top-supported models (fig. S3.1, available online, shows model AIC_c) had little in common (table 2), suggesting that no single variable or set of variables was consistently related to these expected outcomes of MI in the Mosuo context.

Larger household size and fewer household migrants were associated with earlier AFR (table 2). Multiple interactions were also apparent: being farther from the market town appears to be associated with later AFR; however, at the ages considered in this model (16–29 years), the interaction indicates that increasing distance from the market town was associated with earlier AFR. The effect of distance to the market was more pronounced among men and at higher household incomes. Among women in the market town (0 km from the market) with zero years of schooling, increasing household income was associated with earlier AFR; this association between household income and AFR attenuated with distance from the market town and with increasing education. Having more education was associated with earlier AFR among those with low household income.

Models of waist circumference and SBP are less complex than the AFR model but do not suggest simple patterns in MI and health outcomes. Living farther from the market town (at younger ages), having higher income (at older ages), consuming more market calories, and having more cars were associated with larger waist circumference (table 2; fig. 1*A*). Living in a smaller household, living farther from the market town (among the more educated), and having more education (at younger ages) predicted higher SBP (table 2; fig. 1*B*).

Discussion

Evolutionary theory, including LHT and evolutionary ecology, suggests that MI as a general process should be associated with differences in AFR and chronic disease risk because

Table 2. Top-supported models of associations between outcomes of interest and indicators of market integration

Variable	Coefficient (SE)	Exp	*P*	AIC_c
AFR:				
Age (years)	−.32 (.13)	.72	.0160	401.1025
Gender (man)	−7.88 (5.05)	.0004	.1200	
Household size	.26 (.11)	1.30	.0150	
Kilometers to market	−.49 (.59)	.62	.4100	
Household income (ln)	1.55 (.49)	4.72	.0017	
Household no. migrants	−.37 (.12)	.69	.0029	
Years of school	.59 (.30)	1.80	.0530	
Age × kilometers to market	.06 (.02)	1.06	.0046	
Gender × kilometers to market	−.13 (.09)	.88	.1400	
Gender × household income	.65 (.48)	1.92	.1700	
Kilometers to market × household income	−.09 (.04)	.91	.0150	
Household income × years of school	−.06 (.03)	.94	.0270	
WaistZ:				
Intercept	.79 (.95)		.4099	1,000.203
Age (years)	−.040 (.020)		.0540	
Kilometers to market	.098 (.034)		.0041	
Household income (ln)	−.20 (.10)		.0464	
Individual income (ln)	.052 (.014)		.0003	
Foods from market	.0050 (.0028)		.0730	
Household no. cars	.092 (.050)		.0669	
Age × kilometers to market	−.0018 (.0007)		.0081	
Age × household income	.0057 (.0022)		.0099	
SBP:				
Intercept	72.15 (5.31)		.0000	3,552.85
Age (years)	.93 (.08)		.0000	
Gender (man)	7.90 (1.95)		.0000	
Household size	−.95 (.35)		.0078	
Kilometers to market	−.26 (.21)		.2276	
Years of school	1.19 (.76)		.1193	
Age × years of school	−.033 (.015)		.0301	
Kilometers to market × years of school	.075 (.032)		.0207	

Note. "Kilometers to market" refers to the distance to the market town of Yongning. AFR = age at first reproduction; AIC_c = corrected Akaike information criterion; Exp = exponentiated coefficient or hazard ratio; SBP = systolic blood pressure; SE = standard error; WaistZ = waist circumference Z-score.

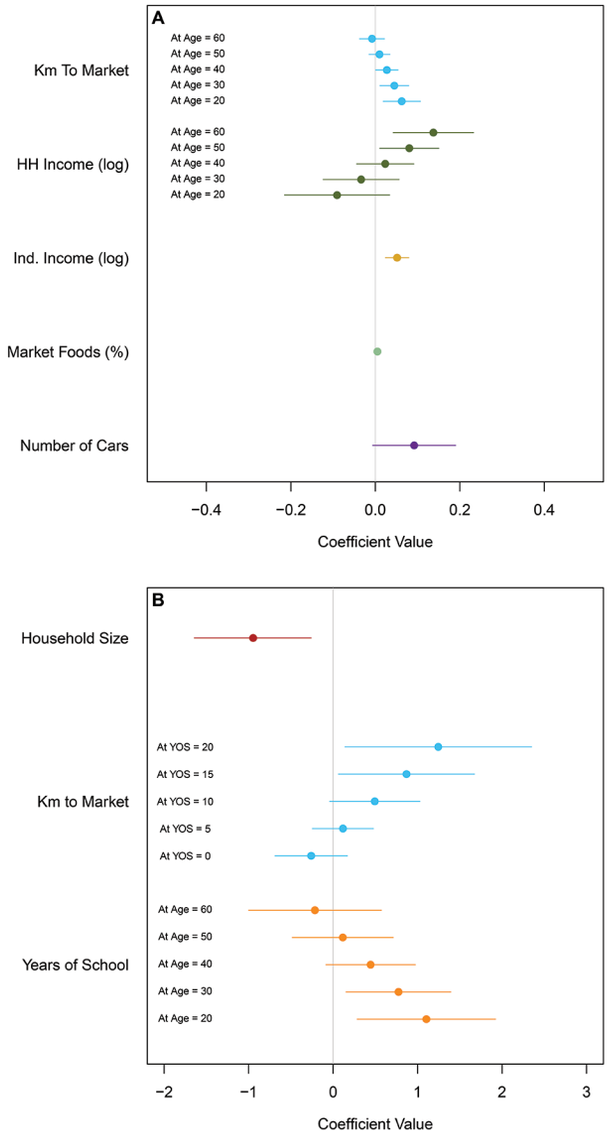

Figure 1. Model coefficients and 95% confidence intervals for scaled waist circumference (*A*) and systolic blood pressure (*B*) from the top-supported models reported. For interactions, coefficients for the predictor of interest were calculated across a range of values for the interacting variable by linear combination of terms. HH = household; Ind. = individual; YOS = years of school.

markets alter the costs and benefits of different lifeway strategies (Demps and Winterhalder 2019). At the same time, empirical evidence reveals limited consistency across studies in the effects of specific measures of MI and the social scale (individual, household, community) at which MI is measured for these outcomes (table S1.1). This presents two immediate possibilities: (1) certain specific indicators of MI are more relevant than others and (2) relationships between MI measures and demographic and health outcomes are context dependent, with MI variables interacting in complex ways to affect outcomes. Our results provide evidence in support of the second possibility.

Is There a "Best" Measure of MI?

Our analyses of Mosuo communities suggest that there is no "best" indicator or set of indicators of MI that is consistently related to all analyzed outcomes. Individual-, household-, and community-level predictors appear in top models for all three outcomes, but their effects are inconsistent and not always in the predicted directions. Our results appear biologically valid—for example, a higher proportion of market foods in the household was associated with larger waist circumference, as predicted—but are also consistent with Lu (2007) in finding limited coherence among measures of MI.

Context Specificity in MI

Our results suggest that models of MI's effects on demographic and health outcomes should account carefully for the context in which MI is occurring. For example, we suspect that proximity to the tourism center is a more appropriate proxy for wage-based than education-based MI. In our study setting, the tourism center generates significantly more wealth and opportunities for wage labor than the market town of Yongning. At the same time, living farther from the market town predicted larger waist circumference and SBP, while distance from the tourism center did not predict any of our outcomes of interest. It is possible that the diverse effects of engagement with tourism were better captured through other MI variables (e.g., income, household size, and purchased foods) or that distance from the market has exerted more consistent effects on outcomes over time.

Our finding that higher education was associated with earlier AFR contrasts with general patterns across societies in which additional education is associated with later AFR and other reproductive decisions likely to reduce lifetime fertility (Colleran and Snopkowski 2018; Snopkowski and Kaplan 2014; Snopkowski et al. 2016) yet is consistent with prior work showing that education does not trade off with reproductive timing in this context (Mattison et al. 2018), illustrating that assumptions underlying expectations about trade-offs induced by MI require validation within a given context.

Surprisingly, material resources (e.g., individual income, household income, number of cars) also did not appear consistently across top-supported models. This may indicate that income and material wealth, per se, are less important for understanding how Mosuo respond to MI than for people in other societies (e.g., Gurven et al. 2015) or that our study failed to capture locally relevant indicators of material wealth. The household proportion of market-purchased foods appeared in only one of our top-supported models (waist circumference), which was unexpected given the importance of diet quality for SBP and findings from studies in other settings that use consumption of market foods (Dancause et al. 2013; van Horn et al. 2019) or the proportion of calories purchased from the market (Henrich et al. 2010) as measures of MI.

The outcomes we used to motivate operationalization of MI may similarly be less universal than generally anticipated. For

example, unlike waist circumference, SBP was not associated with our most direct measures of diet but instead was associated with smaller households and higher levels of education. This suggests that, in the case of the Mosuo, diet and physical activity are not primary pathways by which MI affects SPB. In addition, this may reflect unique dynamics of blood pressures among the Mosuo associated with high-altitude adaptation (Wander et al. 2020). Furthermore, our findings are consistent with evolutionary ecology arguments that trade-offs induced by aspects of MI with respect to fertility outcomes (such as AFR) are likely to be particularly context specific and do not lend themselves to simple universal predictions (Mattison and Shenk 2019; Snopkowski and Kaplan 2014).

Implications for Theorizing MI

Overall, our findings suggest that reliance on a single measure of MI, particularly in efforts to replicate findings across populations, is likely to obscure locally important elements of MI. This follows from evolutionary theory, which suggests that the best operationalizations of MI are likely to differ across research settings and that both unique and universal characteristics of MI are likely to be important at different sites and in relation to specific outcomes at different phases of transition. This context specificity includes differences in how people experience and respond to multiple elements of MI simultaneously and across levels of social organization (Niewöhner and Lock 2018). These contrasting effects can differ in strength and combine in complex ways to produce a given observable phenotypic trend; attention to MI as a process will thus benefit from consideration of its mosaic measures and anticipated outcomes.

Taken together, our analyses point most consistently to distance from the market town and household income as somewhat more consistent elements of MI in understanding the health and reproductive responses in this population. However, to fully understand why these elements of MI are important, we must appreciate the particular context and history of the Mosuo, in which subsistence agriculture and some degree of MI long predate the more dramatic changes brought by access to tourism. We (and others) may have overgeneralized insights from foraging societies to the context of subsistence agriculture, which is associated with very different nutritional and health environments (Mattison and Sear 2016; Page et al. 2016). Data drawn from a multitude of different contexts will help identify whether specific indicators of MI exhibit similar relationships with health and reproductive outcomes across societies. This approach would inform subsequent theorization of MI in ways that produce more nuanced and potentially more accurate hypotheses and predictions.

Limitations

We collected data from individuals at home during household visits, resulting in the inclusion of more women than men in all analyses. These individuals may differ from those who were not at home at the time of the interview. Our estimate of market foods was based on participants' reports and so may be subject to biased or unbiased misestimation. We believe that our samples were large and diverse enough that our sampling method was unlikely to bias our results any more than convenience samples common to similar studies.

Even after restriction to only participants under age 30, AFR is temporally decoupled from indicators of MI in our analyses: many variables were measured after AFR (e.g., incomes) for some participants and may have been influenced by AFR. Although it is clear in this context that many facets of MI are temporally and spatially correlated, our AFR models must be interpreted with particular caution.

Conclusions

Interest in the effects of markets on "premodern economies" is long-standing in anthropology. Our results suggest that research on markets from many theoretical perspectives may benefit from a more nuanced conceptualization of MI. Despite previously well-established patterns, the dynamics of MI within a given society may be subtle, complex, and potentially unique. Our analyses support the need for further theorizing of MI to define appropriate measures and levels of analysis for identifying the complex interactions and effects of the social processes involved. Evolutionary theory and others that devise predictions based on multifaceted, endogenously driven models of MI processes (e.g., material wealth, education, access to markets) and outcomes (e.g., health, fertility, economic behavior) and that situate hypotheses of MI within specific social, cultural, and historical contexts will be best placed to accomplish this task.

References Cited

Blumenfield, T., C.-Y. Sum, M. K. Shenk, and S. M. Mattison. 2018. Poverty alleviation and mobility in southwest China: examining effects of market transition and state policies in Mosuo communities. *Urban Anthropology and Studies of Cultural Systems and World Economic Development* 47(3):259–299.

Broesch, J., and C. Hadley. 2012. Putting culture back into acculturation: identifying and overcoming gaps in the definition and measurement of acculturation. *Social Science Journal* 49(3):375–385, https://doi.org/10.1016/j.soscij.2012.02.004.

Burnham, K., and D. Anderson. 2002. *Model selection and multimodel inference: a practical information-theoretic approach*. New York: Springer.

Colleran, H. 2020. Market integration reduces kin density in women's egonetworks in rural Poland. *Nature Communications* 11(1):266, https://doi.org/10.1038/s41467-019-14158-2.

Colleran, H., and K. Snopkowski. 2018. Variation in wealth and educational drivers of fertility decline across 45 countries. *Population Ecology* 60:155–169, https://doi.org/10.1007/s10144-018-0626-5.

Dancause, K. N., M. Vilar, M. Wilson, L. E. Soloway, C. DeHuff, C. Chan, L. Tarivonda, et al. 2013. Behavioral risk factors for obesity during health transition in Vanuatu, South Pacific. *Obesity* 21(1):98–104, https://doi.org/10.1002/oby.20082.

Demps, K., and B. Winterhalder. 2019. "Every tradesman must also be a merchant": behavioral ecology and household-level production for barter and trade in premodern economies. *Journal of Archaeological Research* 27(1):49–90, https://doi.org/10.1007/s10814-018-9118-6.

García, A. R., M. Gurven, and A. D. Blackwell. 2017. A matter of perception: perceived socio-economic status and cortisol on the island of Utila, Honduras. *American Journal of Human Biology* 29:e23031, https://doi.org/10.1002/ajhb.23031.

Gurven, M., A. V. Jaeggi, C. Von Rueden, P. L. Hooper, and H. Kaplan. 2015. Does market integration buffer risk, erode traditional sharing practices and increase inequality? a test among Bolivian forager-farmers. *Human Ecology* 43(4):515–530, https://doi.org/10.1007/s10745-015-9764-y.

Gurven, M., J. Stieglitz, B. Trumble, A. D. Blackwell, B. Beheim, H. Davis, P. Hooper, and H. Kaplan. 2017. The Tsimane Health and Life History Project: integrating anthropology and biomedicine. *Evolutionary Anthropology* 26(2):54–73, https://doi.org/10.1002/evan.21515.

Henrich, J., J. Ensminger, R. McElreath, A. Barr, C. Barrett, A. Bolyanatz, J. C. Cardenas, et al. 2010. Markets, religion, community size, and the evolution of fairness and punishment. *Science* 327:1480–1484, https://doi.org/10.1126/science.1182238.

Jones, J. H., and R. Bliege Bird. 2014. The marginal valuation of fertility. *Evolution and Human Behavior* 35(1):65–71, https://doi.org/10.1016/j.evolhumbehav.2013.10.002.

Lieberman, L. S. 2006. Evolutionary and anthropological perspectives on optimal foraging in obesogenic environments. *Appetite* 47:3–9.

Liebert, M. A., J. J. Snodgrass, F. C. Madimenos, T. J. Cepon, A. D. Blackwell, and L. S. Sugiyama. 2013. Implications of market integration for cardiovascular and metabolic health among an indigenous Amazonian Ecuadorian population. *Annals of Human Biology* 40(3):228–242, https://doi.org/10.3109/03014460.2012.759621.

Lu, F. 2007. Integration into the market among indigenous peoples. *Current Anthropology* 48:593–602.

Mattison, S. M. 2010. Economic impacts of tourism and erosion of the visiting system among the Mosuo of Lugu Lake. *Asia Pacific Journal of Anthropology* 11(2):159–176, https://doi.org/10.1080/14442211003730736.

Mattison, S. M., C. Moya, A. Reynolds, and M. C. Towner. 2018. Evolutionary demography of age at last birth: integrating approaches from human behavioural ecology and cultural evolution. *Philosophical Transactions of the Royal Society B* 373(1743):20170060, https://doi.org/10.1098/rstb.2017.0060.

Mattison, S. M., and R. Sear. 2016. Modernizing evolutionary anthropology. *Human Nature* 27(4):1–16, https://doi.org/10.1007/s12110-016-9270-y.

Mattison, S. M., and M. K. Shenk. 2019. Ecological evolutionary demography. In *Human evolutionary demography*. R. Sear and O. Burger, eds. http://osf.io/p59eu.

McAllister, L., M. Gurven, H. Kaplan, and J. Stieglitz. 2012. Why do women have more children than they want? understanding differences in women's ideal and actual family size in a natural fertility population. *American Journal of Human Biology* 24(6):786–799, https://doi.org/10.1002/ajhb.22316.

McDade, T., and C. H. Nyberg. 2010. Acculturation and health. In *Human evolutionary biology*. M. P. Muehlenbein, ed. Pp. 581–602. Cambridge: Cambridge University Press.

Nettle, D., M. A. Gibson, D. W. Lawson, and R. Sear. 2013. Human behavioral ecology: current research and future prospects. *Behavioral Ecology* 24(5):1031–1040.

NHANES (National Health and Nutrition Examination Survey). 2007. *National Health and Nutrition Examination Survey (NHANES) anthropometry procedures manual*. Hyattsville, MD: US Department of Health and Human Services, Centers for Disease Control and Prevention.

Niewöhner, J., and M. Lock. 2018. Situating local biologies: anthropological perspectives on environment/human entanglements. *BioSocieties* 13(4):681–697, https://doi.org/10.1057/s41292-017-0089-5.

Olszowy, K. M., M. A. Little, G. Lee, A. Pomer, K. N. Dancause, C. Sun, H. Silverman, et al. 2018. Coming to grips with economic development: variation in adult hand grip strength during health transition in Vanuatu. *American Journal of Physical Anthropology* 167:760–776, https://doi.org/10.1002/ajpa.23704.

Page, A. E., S. Viguier, M. Dyble, D. Smith, N. Chaudhary, G. D. Salali, J. Thompson, L. Vinicius, R. Mace, and A. Bamberg Migliano. 2016. Reproductive trade-offs in extant hunter-gatherers suggest adaptive mechanism for the Neolithic expansion. *Proceedings of the National Academy of Sciences of the USA* 113(17):4694–4699, https://doi.org/10.1073/pnas.1524031113.

R Core Development Team. 2021. R: a language and environment for statistical computing. Vienna: R Foundation for Statistical Computing.

Shenk, M. K., H. S. Kaplan, and P. L. Hooper. 2016. Status competition, inequality, and fertility: implications for the demographic transition. *Philosophical Transactions of the Royal Society B* 371(1692):20150150, https://doi.org/10.1098/rstb.2015.0150.

Snopkowski, K., and H. Kaplan. 2014. A synthetic biosocial model of fertility transition: testing the relative contribution of embodied capital theory, changing cultural norms, and women's labor force participation. *American Journal of Physical Anthropology* 154(3):322–333, https://doi.org/10.1002/ajpa.22512.

Snopkowski, K., M. C. Towner, M. K. Shenk, and H. Colleran. 2016. Pathways from education to fertility decline: a multi-site comparative study. *Philosophical Transactions of the Royal Society B* 371(1692):20150156, https://doi.org/10.1098/rstb.2015.0156.

Stearns, S. C., and J. C. Koella. 1986. The evolution of phenotypic plasticity in life-history traits: predictions of reaction norms for age and size at maturity. *Evolution* 40(5):893–913.

van Horn, A., C. A. Weitz, K. M. Olszowy, K. N. Dancause, C. Sun, A. Pomer, H. Silverman, et al. 2019. Using multiple correspondence analysis to identify behaviour patterns associated with overweight and obesity in Vanuatu adults. *Public Health Nutrition* 22(9):1533–1544, https://doi.org/10.1017/S1368980019000302.

Walsh, E. R. 2005. From Nü Guo to Nü'er Guo: negotiating desire in the land of the Mosuo. *Modern China* 31(4):448–486, https://doi.org/10.1177/0097700405279243.

Wander, K., M. Su, P. M. Mattison, C.-Y. Sum, C. C. Witt, M. K. Shenk, T. Blumenfield, H. Li, and S. M. Mattison. 2020. High-altitude adaptations mitigate risk for hypertension and diabetes-associated anemia. *American Journal of Physical Anthropology* 172(2):156–164, https://doi.org/10.1002/ajpa.24032.

Wells, J. C. K. 2014. Nutrition in a changing world: how economic growth drives chronic diseases. In *Applied evolutionary anthropology*. M. A. Gibson and D. W. Lawson, eds. Pp. 245–270. New York: Springer, https://doi.org/10.1007/978-1-4939-0280-4_11.