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The Tsimane' Amazonian Panel Study (TAPS): Nine years (2002-2010) of annual data available to the public

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Abstract

This brief communication contains a description of the 2002-2010 annual panel collected by the Tsimane' Amazonian Panel Study team. The study took place among the Tsimane', a native Amazonian society of forager-horticulturalists. The team tracked a wide range of socio-economic and anthropometric variables from all residents (633 adults 16 years; 820 children) in 13 villages along the Maniqui River, department of Beni. The panel is ideally suited to examine how market exposure and modernization affect the well-being of a highly autarkic population and to examine human growth in a non-Western rural setting.

1 Introduction

The Tsimane' are a native Amazonian society of horticulturalists and foragers who live mostly in the department of Beni, Bolivia. Every year for nine consecutive years (2002-2010) a multidisciplinary, international team of researchers and Tsimane' assistants measured socio-cultural and anthropometric variables among all Tsimane' living in 13 villages along the Maniqui River that varied in proximity to the town of San Borja. The team

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cleaned, merged, and appended the data, and made it freely available to the public as the study unfolded. To date, over 100 refereed publications by the TAPS team have resulted from this research project (see Appendix A for the list of refereed publications). About 100 international researchers from many disciplines have requested the preliminary data (2002-2007) to explore topics beyond the ones considered by the TAPS team. The aim of this note is to announce the release of the complete annual panel data (2002-2010), and to describe the study's motivation, the topics covered, survey implementation, sample, attrition, uniqueness of the panel, and how to access the data.

2 Motivation

By collecting panel data the TAPS team wanted to find out how modernization and market exposure affected the well-being of people in a relatively remote society of small-scale farmers. The question of how markets and lifestyle “modernization” affect the well-being of autarkic people has played a prominent role in many fields for centuries, but has rarely been addressed with panel data (Friedlaender, 1987; Markovitz et al., 2012; Piperata, Spence, Da-Gloria, & Hubbe, 2011; Shephard & Rode, 1996). The Tsimane’ were chosen as study population in the late 1990s for two reasons. First, they spanned a wide range of acculturation, from very remote communities to those that were within two hours walking distance from towns. Second, the population size of the Tsimane’ was relatively large. Together, these features made the Tsimane’ distinctive. Some lowland Bolivian groups (e.g., Tacanas) were less acculturated, but were small in size, while others (e.g., Moxeños) were large, but very westernized. Over the duration of the panel, we have documented the socio-economic and biological/health consequences of the increased presence loggers and traders in the region. The ongoing work of the TAPS research team is focused on examining the impact of early childhood growth stunting on later-life metabolic health and risks for obesity and cardiovascular disease.

3 Topics covered

Table 1 contains a summary of the topics covered in most of the annual surveys. Using the same protocol, surveyors collected information on: (1) demography, (2) anthropometric indicators of nutritional status, (3) horticultural inputs and outputs, (4) use of natural resources, (5) asset wealth and monetary income, (6) pro-social behavior, (7) perceived health, pregnancy, and lactation, and (8) substance use. As shown in Table 2, a variety of other topics were included only in some years.

We retained fidelity to the original protocols of data collection to enhance the validity of comparisons over time, but added new questions to: (i) capture changes in regional socio-economic conditions, (ii) improve the accuracy of measures, and (iii) study new topics. For instance, at the outset of the study few Tsimane’ received monetary income from the government, so we restricted measures of monetary income to cash earnings from a person’s own wage labor and from the sale of goods. Toward the end of the study, government conditional cash transfer programs for such things as pre-natal visits and primary school attendance had become common. As a result, we added questions to capture the new sources of monetary income, but kept the original questions about earnings.

4 Survey implementation

All of the data collection protocols were approved by the IRB offices of USA universities receiving funding for the research and by the Tsimane' Council, the governing body of the Tsimane'. To collect data we trained a team of Bolivian university students and young Tsimane'; the latter worked as translators and research assistants. Annual data collection was conducted by at least two survey teams, each team composed of at least one university student and one Tsimane', each team working in a different village.

Annual surveys took place during the dry season (May-August). The teams stayed in a village for 7-10 days and canvassed all households in each village. Surveys took place in the participant's home and lasted about two hours per household. We took anthropometric measures during 1-2 days in the village school, with all villagers invited to attend. While in the village, the team tried to find missing participants by re-visiting their homes after the first attempt to interview them, but – except for the 2005-2006 surveys -- we did not track attriters who left the 13 villages of the panel.

5 The sample

Although imprecise, estimates of the Tsimane' adult population during the late twentieth century varied between ~5,000 to 8,000 adults (Ellis & Aráuz, 1998, p. 1; Ringhofer, 2010, p. 73; Santamaría, 2005, p. 36). The baseline sample included all people (n=1,453) residing in the 13 villages during 2002 (Table 3). The sample included 633 adults 16 years of age and 820 children <16 years of age. Thus, our sample of 633 adults captured ~8-12% of the adult population. The only people excluded from the surveys were the physically handicapped and those unwilling to participate. The baseline sample expanded after 2002 to include new arrivals into the villages of the panel. New arrivals included newborns, people who moved into the villages of the panel at marriage, or those who returned after being absent. The total sample of people and households grew by an annual rate of 3.16% and 4.61%. Since we undertook supplementary studies beyond the 13 villages of the panel study, often using the same survey questions used in the panel, the supplementary data (also available to the public) should allow users to assess the external validity of some findings from the panel study.

6 Attrition

Panel attrition took several forms (Table 4). Temporary attriters were surveyed at baseline or during the first year that they moved into a village of the panel study, but were not surveyed in all subsequent years because they: (i) temporarily moved to a settlement outside of the villages of the panel but returned and were surveyed again, or (ii) declined to be interviewed during some of the later years, either because they were too busy or because they experienced panel fatigue. Permanent attriters left the panel after the first time we surveyed them, never to be surveyed again, either because of death, permanent out-migration beyond the villages of the panel, or because they declined to participate in all later surveys.

Table 4 shows that of all participants during 2002-2008, 53.8% left temporarily, and 7.5% left permanently. We limit the analysis of attrition in Table 5 to 2002-2008 because we

cannot assess temporary attrition for the last two years of the panel. To assess if permanent attriters differed from the rest of the sample, during 2005 and 2006 we surveyed villagers from the panel who had moved to a common albeit distant village of destination outside of the Maniqui River basin. The 2002-2010 data for public use includes information for the attriters measured during 2005 and 2006; this additional information should allow users to test for attrition bias when using the 2002-2010 data.

7 Uniqueness

What makes the TAPS panel data unique is that it contains repeated measures of time-varying socio-cultural and biological variables. The variables should allow users to examine the two-way relation between changes in biological and changes in socio-cultural variables, thereby moving beyond the common approach in past anthropological panel studies (and many growth studies) of viewing changes in anthropometric outcomes as a function of only baseline conditions. The TAPS panel is ideally suited to examine the existence and magnitude of catch-up growth and the extent to which early environmental influences may shape variation in body size and composition later in life (e.g., Godoy et al. 2010a; Tanner et al. 2014). In addition, these data also allow for the evaluation of how particular dimensions of lifestyle change (e.g., diet, engagement in wage labor and subsistence activities, access to material wealth; level of traditional knowledge) play a role in shaping both early patterns of development and adult health outcomes (e.g., McDade et al., 2007; Reyes-Garcia et al., 2009; Rosinger et al., 2013; Tanner et al., 2013).

8 Findings: Substantive and methodological

Although we have published using data from the study, we have tended to treat the data as a cross-section rather than as a panel. TAPS researchers and researchers unaffiliated with TAPS have been unable to fully exploit the panel dimensions of the study because data cleaning was only recently finished. As a result, after ~20 years of work researchers are only now in a position to study changes using the panel.

Substantive

Panel analyses suggest that stunted children are catching up in their statural growth, gaining an average of 0.45 SD units in their height-for-age Z-scores (HAZ) between 2002 and 2006 (Godoy et al., 2010a). However, we have also found that early-life stunting is associated with reduced BMI, fatness and muscularity in later life (Tanner et al., 2014). Market exposure and modernization have improved individual well-being, as indicated by significant increases in the monetary value of household food consumption (+6.3%/year) and in adult body mass indices (BMI; 0.7%/year) (Godoy et al., 2009); however, the forces of modernization have put increasing pressure on animal wildlife as increases in household wealth are positively associated with the consumption of forest animals (Godoy et al., 2010b). Our findings also suggest that households are resource constrained, as evidenced by the fact that children with more siblings had poorer anthropometric indicators of nutritional status (Magvanjav et al., 2013). For example, among girls, an additional older brother in the household was associated with a 4% decline in arm muscle area ($p < 0.01$), while an

additional younger sister was associated with a 6% decrease in the triceps skinfold measures ($p < 0.01$).

In an early study we found that patient and impatient people accumulated different forms of human capital between 1999 and 2004 (Reyes-García et al., 2007). Specifically, greater impatience was associated with higher levels of folk knowledge, fewer years of schooling, and lower likelihood of working in wage labor, whereas more patience was linked to higher wage earnings and more modern physical assets. Repeated cross-sectional surveys and panel data suggest that Tsimane' adults experienced a net decrease in reported plant use that ranged from 1%/year for women to 3%/year for people living near market towns (Reyes-García, Gueze, Luz, Macia, et al., 2013). We have also found that people who live closer to their cultural ideal have better psychological health, as reflected in lower reported frequency of alcohol use and negative emotions (e.g., anger, fear, and distress) and higher reported frequency of positive emotions (eg., happiness) (Reyes-García, et al., 2010a), but they do not have better nutritional status (ie., body weight, BMI and waist circumference) (Reyes-García et al., 2010b)

Methodological

People reported accurately the amount of forest cleared (Vadez et al., 2003) but they reported inaccurately other types of data. For instance, we found forward telescoping bias and omission bias when reporting the value of monetary income and barter, and the frequency of illness during the two weeks before the day of the interview. We also found random measurement error in variables such as reported age, parental education (Godoy et al., 2008), rounding errors with measures of height and weight (Godoy et al., 2008), and random measurement errors in test-based measures of adult math skills (Undurraga et al., 2013). The panel allowed us to develop and refine methods to measure the theoretical and practical dimensions of local ecological knowledge (Reyes-García et al., 2006).

9 Training

Using the villages of the panel, the TAPS team ran a summer field school on methods of data collection during 2004-2011 for PhD students in anthropology at USA universities, and, some years, for students from European universities. We trained 46 PhD students from USA universities as part of the program. Fourteen PhD students, 21 MA students, and eight undergraduate students have used TAPS data for their theses.

10 Accessing the data

The complete data available to the public has been cleaned, appended, and merged in Stata 13. Interested users can access the data through any of the following web sites:

Baylor University (Alan Schultz: Alan_Schultz@baylor.edu) <http://alanfschultz.com>

Brandeis University (Ricardo Godoy: rgodoy@brandeis.edu) <http://heller.brandeis.edu/sustainable-international-development/tsimane/index.html>

Northwestern University (William Leonard: w-leonard1@northwestern.edu) <http://www.anthropology.northwestern.edu/people/faculty/leonard.html>

Universidad Autónoma de Barcelona (Victoria Reyes-García: victoria.reyes@uab.cat) http://icta.uab.cat/Etnoecologia/proyecto.php?Id_proyecto=60

University of Georgia (Susan Tanner: stanner1@uga.edu; Asher Rosinger: rosinger@uga.edu; www.asherrosinger.com)

Users who need the raw data should contact Ricardo Godoy: rgodoy@brandeis.edu.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Summary of core topics and variables measured annually during most years, 2002-2010

Level or entity & Topic	Approximate # of variables	Example of variable
Individual (<i>italics=only adults</i>)		
<i>Credit</i>	7	Money owed to others
<i>Addiction</i>	5	Commercial alcohol/cigarette consumption last week
Anthropometrics	27	Standing height, body weight
Demography *	35	Age, birth place, travel frequency to towns
<i>Expenditures & barter</i>	~70	All monetary expenditures in last 14 days and year; value of goods received in barter
Human capital	5	Tests of reading and math; assessment of Spanish spoken fluency; schooling level
Perceived health	4	All symptoms and ailments experienced in last 14 days
<i>Emotions</i>	18	Frequency of emotions (e.g. anger) last week
<i>Monetary income</i>	18	Monetary earnings from sales and wage labor, and remittances received
<i>Shocks</i>	14	Mishaps experienced in last year & ways of coping with mishaps
<i>Pro-social behavior</i>	19	Gifts given/received last week
<i>Assets</i>	48	# of bows, cooking pots owned by person
Household		
Agriculture	30	Forest area cleared last year
Food consumed	31	Basket of food items consumed in last 7 days
Assets	48	Total bows and chickens owned by entire household
Village		
Prices	23	Market prices for basket of assets and foods
Attributes	11	# households, teachers; village-town travel time

* Some of these variables were only measured once (e.g., birth place, sex)

Table 2

Summary of topics measured occasionally in the TAPS panel

Level or entity	Topic	Years
Individual	Local ecological knowledge of	
	Plants	2002, 2003, 2005, 2006, 2007
	Parasites	2007
	(children) Fecal samples, parasite detection and treatment	2003, 2007
	Cultural orientation	2002, 2007
	Encroachment	2002
	Vaccination history	2002
	Time allocation via scans or spot observations	10/2002-8/2003
	Pigeon pea cultivation	2003-2007
	Household decision making	2004
	Correlates of happiness/sadness	2004
	Perceived parental height	2005
	Status, trust	2005
	Regret	2005-2006
	Perceived beauty	2006
	Siblings, mortality, marriage, residence	2007
	Blood pressure and pulse rate	2007
	Aspirations for offspring	2010
Household	Pigeon pea cultivation	2003-2007
	House construction	2002
	House position (GPS)	2007

Table 3

Unique sample size of individuals, households, and villages at baseline (2002) and additions (2003-2010)

<i>Year</i>		<i>Individuals</i>			<i>Households</i>	<i>Villages</i>
		<i>Adult (16)</i>	<i>Children(<16)</i>	<i>Total</i>		
Baseline	2002	633	820	1453	245	13
Additions	2003	28	78	106	10	13
	2004	34	128	162	24	13
	2005	41	111	152	23	13+ (1)
	2006	21	97	118	28	13+ (1)
	2007	9	74	83	14	13
	2008	35	122	157	33	13
	2009	26	109	135	15	13
	2010	36	147	183	23	13
Total without repeats		863	1686	2549	415	13 (14)
Annual growth rate 2003-2010		-1.08%	4.34%	3.16%	4.61%	0

Note: In 2005 and 2006 we included a village outside of the study area that tended to attract permanent attriters from the panel.

Table 4

Annual sample sizes and attrition rate

Person entered panel in	n & (%)	Total n (100%)	Attriters:		Non-attriters n (%)
			Temporary	Permanent	
2002	n	1453	858	74	521
	(%)	(100)	(59.1)	(5.1)	(35.9)
2003	n	106	55	17	34
	(%)	(100)	(51.9)	(16.0)	(32.1)
2004	n	163	80	21	62
	(%)	(100)	(49.1)	(12.9)	(38.0)
2005	n	155	77	21	57
	(%)	(100)	(49.7)	(13.5)	(36.8)
2006	n	118	61	10	47
	(%)	(100)	(51.7)	(8.5)	(39.8)
2007	n	83	30	6	47
	%	(100)	(36.1)	(7.2)	(56.6)
2008	n	158	42	19	97
	(%)	(100)	(26.6)	(12.0)	(61.4)
2009	n	135	na	30	105
	(%)	(100)	na	(22.2)	(77.8)
2010	n	184	na	na	184
Total (2002-2008)	n	2236	1203	168	865
	(%)	100	53.8	7.5	38.6

Note: na = not applicable. Temporary attriters were people who left the panel but returned. Permanent attriters were people who were only measured when they entered the panel, never to be measured again.