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Ecuadoran Amazon Indigenous Fertility Dynamics Revisited: Why Sizable Contraceptive Uptake has not Dampened High Fertility

Abstract

In 2001, demographic data were collected from 36 communities, representing five indigenous populations residing in the Northern Ecuadoran Amazon. Results showed high fertility rates (TFR 7.6-8.3) and negligible use of modern contraception. Follow-up data collected in 2012 show continuing high fertility (TFR 7.1-7.5) despite desires to have fewer births and an appreciable increase in the use of modern contraception. This indicates a disconnect between reported use of modern contraception and observed fertility. Meanwhile, with fertility remaining very high while mortality continues to fall due to vaccination campaigns, the virtual disappearance of traditional tribal warfare and other factors, natural increase is rising, increasing pressures on the extraordinarily rich ecosystem. Thus, these fertility results, along with continuing in-migration to the Amazon from the outside, portend medium-term challenges. However, the long-term prospects for ecosystem protection would be better if contraceptive effectiveness could be improved. What are the prospects for such improvements?

Introduction

Indigenous populations have subsisted in the planet's most biodiverse ecosystem - the Amazon Basin - for millennia without exacting the rapid, large-scale land use changes we are witnessing today. However, for many Amazonian Amerindians, Lu (2001) disabuses us of the notion that they are conservationists at heart. Other demographic and socio-cultural reasons help explain why these groups have not caused rapid, large scale land use change: their populations have always been small, they have lacked modern tools to facilitate such change, and they were often nomadic. Lu and Richard Bilsborrow's ethnographic fieldwork with indigenous populations in the Northern Ecuadoran Amazon (NEA) exposes the ontology that conservation was not a necessary livelihood concept because the natural resources upon which they depend never reached a level of scarcity that could not be solved by moving to another location (Holt et al. 2004). However, we are entering an era where Amazonian indigenous populations are coping with natural resource pressure and scarcity attributable to the encroachment of outside groups (e.g. non-indigenous colonists and petrochemical interests) in addition to their own demographic and social changes (population growth and a shift to sedentary lifestyles). Such circumstances are forcing many of these indigenous populations to reveal their inherent conservation ethic.

This investigation will address reproductive trends, including the occurrence of unmet need for contraception, for five of Ecuador's indigenous populations between 2001 and 2012. Furthermore, we will discuss the relationship of these trends to demographic change for the study's indigenous populations and concomitant ramifications for the high value Amazonian natural resources upon which they depend. The Cofán, Huaorani, Kichwa, Secoya, and Shuar

ethnic groups differ from one another in their remoteness (Figure 1) from and integration into Ecuador's greater society, their population sizes, and the composition of their agrarian livelihood strategies (Lu 2007; Gray *et al.* 2008). The Kichwa and Secoya have interacted with European groups since the Spanish Conquest while at the opposite extreme, the Huaorani were only befriended by missionaries in 1958 (Lu and Bilsborrow 2011). Within the NEA, the population sizes of most of the groups are relatively low: Cofán and Secoya contain less than 1,000 individuals, the Huaorani include about 1,600 individuals, and the Shuar hold 3,000 individuals. The Kichwa are an exception with a much larger populations of approximately 60,000 individuals (Bremner 2009). According to Gray *et al.* (2008), all five ethnic groups practice agriculture but the variety of agricultural practices differs greatly among the groups. The Secoya are predominately cattle ranchers, the Shuar tend to specialize in cash commodities (coffee and cattle), while the Huaorani are purely subsistence farmers growing only manioc and plantains. The Kichwa and Cofán, on the other hand, have a more even mix of land in pasture, coffee and subsistence crops.

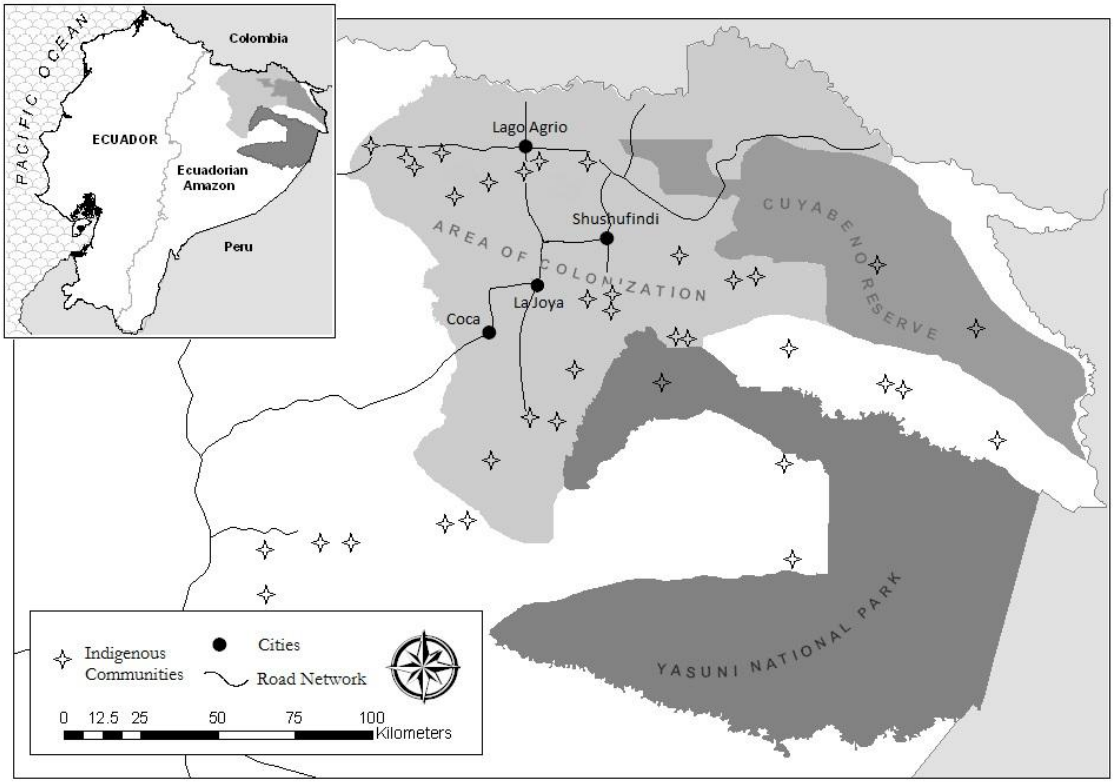

Figure 1. Map of the study area

Since contact with non-indigenous groups that has occurred most intensively since the 1950s, the lifestyles of Ecuadoran Amerindian populations have changed. Assimilation into Ecuador's economy continues to occur where indigenous peoples integrate themselves into external labor

markets including taking employment with petrochemical companies and ecotourism operations or other types of wage labor following migration to regional cities (Holt *et al.* 2004). Furthermore, indigenous peoples have integrated into commodity markets by increasing the production and/or extraction and sale of commercial crops and other natural resources to outside marketplaces (Gray *et al.* 2008). To varying degrees, ethnic populations have incorporated educational curricula from the Ecuadorian government into their schools (Rival 2002) and have abandoned their nomadic lifestyles (Lu 2001). The introduction of non-indigenous medicine including antibiotics and vaccinations has led to a decline in mortality, especially infant mortality. Furthermore, when comparing infant mortality and under-five mortality rates over the last 20 years between the study's indigenous populations and Ecuador as a whole (Table 1), mortality appears to be dropping similarly, but with about a ten year lag for indigenous groups.

As with much of South America, Ecuador is well into its demographic transition. It has witnessed a sharp decline in mortality followed by a subsequent decline in fertility. A gradual, long-term decline in mortality began in the early 20th century, as throughout Latin America (Arriaga1976). Then, starting from a high total level of fertility of 7.0 as late as1969, Ecuador has experienced a sustained decline in fertility, documented in its national fertility surveys, from 3.8 in 1989, 3.4 in 1994 and 3.3 in 1999 (Ishida *et al.* 2009). Since the last national survey in 2004, Ecuador's total fertility rate (TFR) is estimated by the UN to have dropped from 3.3 to 2.5 (UN 2010). Furthermore, Ecuador's fertility decline extends into Amazonian frontier regions. According to Carr *et al.* (2006), fertility levels among non-indigenous Amazonian colonists dropped markedly between 1990 and 1999. In contrast to the falling fertility rates of greater Ecuador and the non-indigenous Amazonian colonists, Ecuador's indigenous fertility rates appear to have remained high in recent times. Thus, Bremner *et al.* (2009) and Bilsborrow *et al*. (2004) found the TFR for the NEA indigenous populations to be almost eight children per woman in 2001, though this varied greatly by ethnic group and was far smaller for smaller groups.

The two realities stated above, high fertility and falling mortality, could have short-term negative ramifications for the high-value natural resources upon which indigenous communities depend. The tropical natural resources that comprise the NEA occupy a unique ecotone where the highland Andean biome transitions into the lowland Amazonian ecosystem. Such overlap of biologically productive ecotypes provides the conditions from which biodiversity flourishes. For example, Bass *et al.* (2010) describe the southeastern section of the NEA, Yasuní National Park, as an area of species richness convergence with record numbers of four taxonomic categories (amphibians, bats, reptiles, and trees) – making it one of the most biodiverse areas of the planet. Giving further weight to the value of the NEA environment is the fact that there are large expanses of land that remain in relatively pristine condition without roads or the presence of non-indigenous people (Bass *et al.* 2010). However, conditions are changing and outside forces including petroleum interests are actively encroaching on the natural environments endemic to the NEA (Bremner *et al.* 2009). Their encroachment has increased road construction throughout

the territory, facilitating colonization by both indigenous and non-indigenous people. This has precipitated deforestation for agriculture and other resource extraction activities. Placing more burdens on the NEA ecosystem may substantially harm its ability to fully function as well as compromising the natural resource upon which indigenous peoples depend. Thus, the goals of this investigation are to understand the pace of indigenous people's fertility change and to explore potential ramifications from these changes, or lack of, for the high value, natural resource surroundings that they inhabit in the NEA.

Data Resources and Methods

This project represents the second phase of a unique data collection effort that chronicles lifestyle conditions of five Amerindian populations that inhabit the NEA. Data collection for the follow-up survey took place earlier this year (2012). Specifically, Clark Gray and Richard Bilsborrow returned to 32 of the 36 original communities and resurveyed all baseline households and all new households that had split from the original households. The second phase resulted in 533 households being interviewed according to the protocol established in 2001 to determine how demographic trends have changed within indigenous communities over the decade.

In 2001, the first phase of this investigation was initiated where 512 households were interviewed within 36 indigenous communities, representing the study's five indigenous populations. We briefly summarize the Phase I sampling protocol here, while a more detailed description of the sampling procedures can be found in Bremner *et al.* 2009. Because the total population size and number of communities occurring in the NEA by ethnic group differed greatly, a sample of communities was selected to reflect this as well as different locations and population sizes in the phase I survey: 14 Kichwa, 10 Shuar, 7 Huaorani, 3 Cofan, and 2 Secoya communities. A greater number of Kichwa and Shuar communities were selected based on their large population sizes in the study area, while the three smaller ethnic groups were oversampled to increase the validity of inter-ethnic comparisons. At the community level, the sampling of households was dictated by the distribution of households which ranged from five to greater than 50. For the 26 smallest communities with up to 22 households, all households were interviewed. For the 10 largest communities, 22 occupied households were randomly selected for interview.

The reproductive portion of the overall survey entailed a private interview between a female interviewer and the female head of household or the wife of the head of household. During this interview, a series of questions were asked including a listing of all children born to her by date of birth, her current desire for more children and a contraceptive use history. Furthermore, each woman between 15 and 49 years of age currently living in the household was asked to report her fertility history, use of birth control, educational attainment and Spanish proficiency, among other things. Answers to these questions allowed us to assess changes in fertility and unmet need for contraception between 2001 and 2012.

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Table 1. Characteristics of women aged 15-49 by ethnicity in 2012.

	All Ethnicities		Kichwa		Shuar		Huaorani		Cofan		Secoya	
	2001	2012	2001	2012	2001	2012	2001	2012	2001	2012	2001	2012
Number of sample communities	36	32	14	14	10	8	7	5	3	3	2	2
Number of sample households	512	533	246	297	103	85	76	54	53	53	34	44
Number of women 15-49	648	711	361	411	144	106	126	78	69	78	47	38
Mean age (years)	27.6	26.9	27.8	26.8	27.6	27.6	27.0	26.0	26.73	28.1	28.9	25.7
Mean parity	4.0	3.4	4.2	3.5	4.5	3.7	3.4	2.9	3.4	3.3	3.0	2.6
No education (%)	12.9	5.1	8.3	2.2	10.3	4.7	24.8	12.8	25.0	14.1	10.8	0.0
Primary education (%)	65.5	52.0	66.7	53.5	69.2	54.7	60.0	43.6	66.1	57.7	64.9	44.7
Some secondary education (%)	21.6	42.7	25.0	44.3	20.7	40.6	18.3	43.6	8.9	28.2	24.3	55.3
Speaks Spanish (%)	89.0	96.1	95.6	98.5	97.7	100.0	70.6	80.0	64.3	91.0	94.6	100.0
Do not desire another child (%)	49.4	60.3	52.2	58.8	68.5	68.4	35.1	49.0	35.1	69.1	59.1	69.6
Using modern contraception[a] (%)		13.1		14.1		18.9		1.3		9.0		10.5
Unmet need for contraception[a] (%)		53.9		54.4		55.4		53.2		59.7		45.5

[a] Includes all women in the study

Table 1 provides a summary of the total number of sampled communities, households and women of reproductive age by ethnicity. It also provides summary statistics for women in the study by ethnicity including mean age, mean parity, education level, Spanish speaking proficiency, desire for more children, contraceptive usage, and unmet need for contraception.

Results

We calculate a TFR of 7.5 using direct methods and 7.1 using indirect Brass methods (United Nations Department of Economic, Social Affairs 1983). These differ little from 2001 when Bremner *et al.* (2009) found a TFR of 7.6 using direct estimation methods and 8.1 when using indirect Brass methods. However, as shown in Table 2, we find an appreciable increase in the use of modern contraceptives by women who are either married or in a consensual union, growing from < 5% to approximately 30%. It is striking that the latter is about the same for both those desiring to have another birth and those not desiring another child. In Table 1, we also note a drop in mean parity across all five ethnic groups between 2001 and 2012. This drop corresponds with a 0.7 year decrease in the mean age of the sample population which would contribute to the decrease in mean parity across the ethnic groups.

Table 2. Change in desires to have another birth and in modern contraceptive usage between 2001 and 2012, women in a marriage or consensual union.

	Using modern contraception			
	2001		2012	
Desire more children	Yes	No	Yes	No
Yes	5 (3.4%)	142 (96.6%)	21 (29.2%)	51 (70.8%)
No	3 (1.9%)	**159 (98.1%)**	59 (32.6%)	**122 (67.4%)**
Do Not Know	0 (0%)	19 (100%)	8 (25.8%)	23 (74.2%)
Total	8 (2.4%)	320 (97.6%)	88 (31.0%)	196 (69.0%)

*Unmet need in bold

Table 1 shows that the desire for more children has decreased for all five indigenous populations combined as well as for each ethnic group except the Shuar where there has been no practical change. Strikingly, the decreased desire for more children has nearly doubled in the Cofan communities, from 35% to 69%. Furthermore, the desire for another child by 5-year age groups and by parity levels for women aged 15-49 who have a sexual partner decreases within every age group except 40-44 year olds (trivial 1% increase) and at every level of parity except women who have not had a child (1.3% increase).

Looking at the types of modern contraceptives used by the 96 women using them finds that the vast majority are using injectable contraception (56) and birth control pills (27), with a few using condoms (3), IUDs (4), or tubal ligations (6). The age distribution of the study's women does not appreciable differ between 2001 and 2012. The range of contraceptive use by 5-year age group finds a low of 5 and 6% use at the ends of the age range (aged 15-19 and 45-49) and a high of

22% use by 30-34 year olds. The bulk of contraceptive use (73%) occurs by women between the ages of 20 and 34. As shown in Table 1, the percentage of women with at least a secondary education has doubled or nearly doubled for every indigenous group between 2001 and 2012 while the percentages of women without any education and with only a primary school education has dropped across the ethnic groups. Spanish proficiency has also increased in all ethnic groups (Table 1).

Discussion

Since 2001, the desire for more children by indigenous women has dropped by 11% bringing to 60% the total percentage of women not desiring to have another child across all ethnicities in 2012. This reduction in desire for more children corresponds with an approximate 30% rise in the use of modern contraception—although without a successful reduction in total fertility combined for the five groups (further discussed below). Interestingly, the 30% rise in contraceptive use applies to both women desiring and not desiring more children, respectively – indicating that many women are using contraception for birth spacing in addition to preventing future births. These changes provide strong indications that the study's indigenous women want access to effective contraception to manage childbearing, but this leads to questions regarding contraceptive effectiveness, high rates of unmet need for contraception, and ultimately how demographic change within indigenous communities will impact the Amazon rainforest.

Contraceptive increase with minimal fertility decrease

The biggest conundrum that this investigation exposes is the contradiction between nearly unchanged total fertility with a substantial increase in women's education, desires to not have another birth, and use of modern contraception in the last 11 years. Several possible explanations exist, including: (1) errors in the data collected; (2) too few modern contraception users to effect a drop in the TFR; (3) a reduction in the length of breastfeeding; and (4) contraceptive ineffectiveness due to geographic remoteness.

One explanation for why there is a minimal drop in the TFR even though the study has witnessed a 30% rise in the use of modern contraceptives by women who are married or in a consensual union over the last decade is women may be predominately using contraception for birth spacing rather than to limit childbearing. McSweeney (2005) reports that some indigenous groups with pronatalist views have adopted the use of modern contraception not as a means to reduce their total family size but rather as a means of increasing their total completed fertility. A similar theory argues, in societies just entering the demographic transition, that as women with initially low levels of education become better educated, that they often use their increased knowledge of family planning technology to increase their fertility rather than to prevent future childbearing (Bongaarts 1978). From a health perspective, using contraceptives to space births makes sense because it allows women's bodies to fully recover from the physically demanding process of pregnancy and childbirth, thus allowing them to have more children over their lifetimes

compared with the less healthy practice of having numerous births in short succession (Bledsoe *et al.* 1998). However, we do not think birth spacing to increase lifetime fertility is occurring within the indigenous groups studied here because 60% of all women reported not wanting any more children including 59 of 80 women (74%) who were actively using modern contraception.

Another possible explanation for the contradiction noted above is the number of women who are using modern contraception (88 of 284) is not substantial enough to have an effect on the total fertility rate. While we believe that there is much truth to the fact that when 67% of women of childbearing age in a population are not using modern contraception that the fertility rate is likely to be high, we also believe that a 25 to 30% rise in the effective use of modern family planning methods over a 11-year time period by women who are either married or a consensual union should have a much stronger downward pull on the fertility rate than the 0.1-1.2 fertility rate change witnessed here.

Bongaarts (1978) suggests another plausible explanation for the lack of decline in a population's fertility rate when its use of modern contraceptives rises. He notes that as societies begin to adopt the ideas of modern family planning, including the usage of modern contraceptives, that other changes to determinants of fertility may occur including a decline in the length of lactational infecundability. Essentially, women in societies who are adopting the use of modern contraception are also likely to reduce the duration of breastfeeding – a natural birth control method that can delay a woman's return to fecundability by up to 22 months (Bongaarts 1978). Unfortunately, we do not have breastfeeding data to access whether it practice has changed between 2001 and 2012.

However, the most likely contributor to the high fertility rate/increased use of modern contraception paradox is a combination of geographic isolation and contraceptive ineffectiveness. In 2001, Bremner *et al.* (pg. 113, 2009) note that the city of Lago Agrio provides the only public health clinic in the Ecuadoran Amazon, "focused on providing family planning and reproductive health services…". They also state that there are other health care providers that may supply modern contraception dotted throughout the study area but family planning is not their primary charge. For some of the indigenous groups addressed by this investigation, this means women must travel hundreds of kilometers (see Figure 1) to access the family planning resources provided there. This geographic reality when combined with the fact that the contraceptives used by an overwhelming majority of women require frequent use, sets the stage for contraceptive ineffectiveness. Instead of using more long-acting reversible and irreversible contraception such as IUDs and tubal ligation procedures, the two most common modern contraceptive devices being used are birth control pills and 3-month injections – representing 86.4% of all modern contraceptive users. The drawback to these two methods is obvious: their short-term effectiveness. Pills require daily usage while injectable contraception is effective for up to 3-months. These facts necessitate regular visits to distant pharmacies and health clinics at a minimum of once every three months in the case of injectables and maybe more frequently with the pill, depending upon how many pills a woman can receive in one visit. Family planning research performed in other developing world setting has discovered many instances of contraceptive supply inadequacy. In a report prepared by the USAID, they report several

instances of contraceptive stockout (out-of-stock) for all modern contraceptive methods in numerous developing world countries (USAID 2010). Of note, Paraguay reported a lack of pills while two Central American countries, El Salvador and Nicaragua, reported a periodic lack of injectables. Contraceptive stockout of short-term contraceptives (injections and pills) represents just one more constraints posed to women who live in remote, developing world settings who wish to prevent unwanted pregnancies.

Unmet Need

Between 2001 and 2012, the use of modern contraception for women who are married or in a consensual union, of reproductive age, and not desiring another child has increase from < 5% to 30%. For many, this indicates that women are taking active steps to control their reproductive lives. However, by starting from near zero use of modern contraception in 2001, this still leaves 67% of women not using modern contraception today. And, as discussed above, there is strong evidence that for the 30% of women using modern contraception, that they may not be using it effectively. Given the fact that a majority of women in the study wish to control their fertility both by stating that they lack a desire to have more children and by using contraception to space and prevent future births (when users of traditional methods are combined with modern contraceptive users, the use rate increases to 74%), it is incumbent upon the public health community to help solve some of the unmet need realities exposed by this study.

It appears that many of the unmet needs for modern contraception can be alleviated through a combination of education and the availability of more effective, long-acting reversible and permanent contraceptive methods including IUDs, implants, tubal ligation procedures, and vasectomies for male partners. While these methods require more training on the part of the health care providers and likely a greater travel burden on the part of the user, from both an economic and family planning perspective, such barriers pale in comparison to reliance on inferior contraceptive methods such as pills and injections given the problems that arise for women living in remote settings. It is likely that these long-acting methods will not be as plentiful as pills or injections, but in the case of IUDs and female and male sterilization procedures, they only need to be accessed once rather than every three months or more depending on their supply. Regarding the potential lack of trained health care providers who can perform IUD insertions/removals and female/male sterilizations, the fact that some women in the study area have received them indicates that they are available with some effort.

Additional follow-up research in the study's communities should take place to determine if there are other barriers to the acceptance of all forms of modern contraception especially long-acting methods. Numerous studies throughout Latin America have shown rampant misinformation about the safety and efficacy of modern contraception for both potential users (e.g. Davis and Lopez-Carr 2010) and providers. Women have expressed fears of high blood pressure, cancer, sterility, and death associated with pills and IUDs. Taking measures to determine whether these realities existing within the study's indigenous populations would go a long way toward developing public health

information campaigns to provide the best available information about the safety and efficacy of modern family planning technology.

Ramifications for the Amazon and Indigenous Communities

With a falling mortality rate and a high and stable fertility rate, indigenous populations residing in the Ecuador Amazon are likely growing at a substantial pace. Such population growth, if it is not alleviated through out-migration could have indirect impacts on the high-value natural resources upon which these indigenous populations depend. While Geist and Lambin (2004) make a strong argument that population growth is rarely the only or main perpetrator of tropical deforestation, there are exceptions to this norm especially within addressing population growth resulting from fertility outpacing mortality for communities that exist within tropical rainforest environments. Pan *et al.* (2004), for instance, show for Ecuadoran Amazon non-indigenous colonists that high population growth and large household size had contributed to both fragmentation of farm plots and an increase in forest extensification (deforestation).

During ethnographic fieldwork performed on a subset of the study's communities, a general sentiment arose where informants voiced concerned about dwindling natural resources and the implications for their children (Holt *et al.* 2004). In several communities, families had reduced hunting activities in surrounding forests due to a reduction in hunting success. Villagers in Kichwa communities, when asked about the future prospects of their children, replied that their children will likely live in a forest with few trees, no animals, and polluted streams due to population growth, new road construction and the encroachment of oil companies. Within the Shuar communities, informants voiced concerns that the combination of a desire to live in a more developed setting with a locally declining natural resource base due to internal population growth and pollution caused by petroleum companies, would force many villagers to out-migrate to other villages or Ecuadoran cities in the future.

Conclusion

Although the medium-term prospects for natural resource harm loom large for the natural environments that surround indigenous Ecuadoran communities due to high internal population growth – amongst other stressors – we see positive signs for dampening this threat through the adoption of modern family planning strategies. A full 60% of the study's women, across all age groups and ethnicities, do not desire to have more children. Additionally, women are taking active steps to control their fertility as evidenced by the fact that 74% of all women in the study use some form of contraception (modern and tradition), while the use rates of modern contraceptive methods have jumped from <5% to 30% between 2001 and 2012. Even though we are not witnessing an appreciable decline in the total fertility rate across the five ethnic groups, the factors listed above provide strong evidence that the potential for effecting fertility change is high. Indigenous woman are amenable to the use of contraception in general and are rapidly

adopting the use of modern methods. However, the preferred modern methods (pills and injections) are not conducive to the remote locales that most of the study's women live.

If the study's results accurately indicate that 60% of indigenous women of reproductive age do not desire more children, then a major goal of the public health community should be to provide credible information to indigenous women that correctly describes how all forms of contraception work: their use, effectiveness, and potential side effects. This is especially true for long-acting reversible and permanent forms of contraception, including IUDs and male and female sterilization procedures. These methods can alleviate the difficulties of regularly travelling long-distances for repeat injections or additional supplies of pills. They also obviate the need to remember to take pills daily or return every three months to a health clinic or pharmacy to receive more contraceptive shots. There are certainly some upfront costs in the terms of travel time and the initial expenses associated with IUD insertion or sterilization operations, but compared with the constant need to travel to obtain short-term contraception (pills and injections) or the cost of raising more children, these long-term birth control methods are undoubtedly the most cost effective methods for women wishing to control their fertility in remote, developing world settings. Furthermore, the more universal adoption of modern contraception by indigenous women will likely translate into a declining fertility rate and concomitant reduction in natural resources stress. This will reduce the need for households and communities to consider the out-migration of their members so entire communities are not faced with dwindling natural resources and potentially the need to relocate entire communities to more resource abundant locations within the Amazon Basin, as the Shuar are doing to cope with rising population densities in the Southern Ecuadoran Amazon (Holt *et al.* 2004).

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