

# Are women reservoirs of traditional plant knowledge? Gender, ethnobotany and globalization in northeast Brazil

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This study examines the degree to which knowledge of traditional plant medicine is gendered among communities settled near Chapada Diamantina National Park in eastern Bahia state, northeast Brazil. Employing a quantitative analysis of a sample plant pharmacopoeia, I focus on the relationship between gender, age and the socioeconomic impacts of globalization in this tropical region. Results indicate that women are more familiar with both the field identities and the medicinal values of the local flora than are men. This division is pronounced among older participants (30–80 years) who represent a reservoir of medicinal plant knowledge that is in danger of disappearing. I suggest that this heightened understanding among women is due to historical gender divisions of space and labour; the inherently high potential for medicinal plant identification and collection in anthropogenic habitats; and the role of women as primary healthcare givers for the family.

**Keywords:** ethnobotany, medicinal plants, gendered knowledge, healers, tropical rainforest, cultural erosion, African diaspora

## Introduction

The selective value of ethnobotanical knowledge acquisition – the quest to explore, discover and remember the myriad names, utilities and management strategies of non-domesticated plants – has been considerable throughout human history. Along the mode of subsistence continuum from hunting and gathering to small-scale cultivation, our Holocene ancestors became increasingly proficient in cognitively organizing and efficiently exploiting their wild material resources: food, fibre, fuel, timber and medicine. Although much of this accumulated oral text in temperate latitudes has been erased by acculturation and genocide, many of the material and spiritual relations with the plant kingdom that once fostered this domain of understanding persist in tropical landscapes.

Within this mix of traditional cognitive resources, tropical medicinal plants in particular have drawn the attention of western scientists in the search for novel drug compounds to treat human ills, resulting in a momentary convergence of the disparate fields of ethnobotany and pharmacology. Among the strategies employed for discovering nature-derived pharmaceuticals, the ethnobotanical approach – reaching back at least to the ‘age of exploration’ (Frampton, 1580; Balick & Cox, 1994; Dalby, 2000; Shaw, 1992) – assumes that species found in the plant pharmacopoeias employed by traditional societies represent especially strong candidates for investigation. Farnsworth (1988) reported, for example, that 74 per cent of the plant-derived compounds currently used in western pharmaceuticals had maintained the same or similar medicinal applications in traditional/folk healing. Moreover, several authors (e.g. Cox, 1989; Balick, 1990; Lewis, 2003) report that plants identified by herbalists demonstrate significantly higher pharmacological activity than taxa chosen at random. Thus, the shamans and other traditional healers once relegated by western science to the realms of hocus-pocus are increasingly

portrayed by scientists and the media as living conduits of powerful and perhaps profitable medicinal wisdom passed down over generations.

Coeval with this resurrection of respect for traditional healers, bioprospecting activities are increasingly critiqued as an exploitation of intellectual property rights such that government agencies, pharmaceutical companies, multinationals and scientists are struggling to fashion systems of reciprocity that benefit the range of stakeholders. The lesson emerging from the case of prostratin (Cox, 2001), a compound with promising anti-HIV attributes and derived from an indigenous Samoan pharmacopoeia, may represent a model for future drug development efforts. In this instance, profits are to be shared between the investigating research unit, the Samoan government, the community where the original ethnobotanical research was carried out and the family of the healers who provided the ethnomedical lead. At the same time, mounting efforts to understand and document the complexities of traditional ethnomedical systems – indigenous and diasporic – are confronting the combined forces of destructive forest exploitation and eroding ethnobotanical knowledge (Plotkin, 1993; Voeks & Leony, 2004). In locations such as Samoa, Kenya, Brazil and Venezuela, deforestation is reportedly causing decreased access to medicinal plant species (Voeks, 1997; Jungerius, 1998; Cox, 1999; Heckler, 2002). Elsewhere, unsustainable levels of medicinal plant collection, sometimes to meet the demands of international markets, are extirpating locally important healing plants (Anyinam, 1995; Lebbie & Guries, 1995; Pandey & Bisaria, 1998; Tuxill, 1999).

The most pressing threat to the knowledge and existence of medicinal plants in tropical regions, however, appears to be culture changes, especially with the seductive influences of globalization. The cognitive link with nature sustained by traditional healers and their oral traditions may well be at greater risk of extinction than the medicinal floras (Anyinam, 1995; Cox, 2000). Western missionaries and other religious zealots continue to school rural converts to abandon the use of medicinal plant recipes, arguing that the occult powers of magical and medicinal plants are thinly veiled manifestations of paganism (Voeks, 1997; Caniago & Siebert, 1998; Voeks & Sercombe, 2000). Likewise, the immediately seen results of commercial drugs and attendant status associated with pills and injections among such rural communities, translates into waning attraction for the rainforest remedies so long employed by their elders (Milliken *et al.*, 1992; Ugent, 2000). Finally, there seems to be little or no interest among younger members of traditional communities to assimilate and pass on the medicinal plant legacy of previous generations, a fact frequently lamented by ethnobotanical researchers (Phillips & Gentry, 1993; Coe & Anderson, 1996; Bernstein *et al.*, 1997; Begossi *et al.*, 2000; Luoga *et al.*, 2000; Ugent, 2000; Voeks & Nyawa, 2001). Exploring the process of ethnobotanical erosion, Westman and Yongvanit (1995) reported that increasing wealth was inversely associated with knowledge of indigenous food plants in Thailand. Benz *et al.* (2000), working in Mexico's Sierra de Manantlan, found that socioeconomic marginality in some cases correlated with ethnobotanical importance values. Voeks and Leony (2004) discovered that relative prosperity in a rural Brazilian community was not associated with degree of knowledge of the local pharmacopoeia, but that literacy and increasing access to formal education were negatively correlated with knowledge of medicinal plants.

Is this crisis in ethnobotanical knowledge evenly distributed in tropical landscapes, or are there pockets of medicinal plant knowledge that have in part resisted such erosional processes? Several studies addressing the often overlooked gendered dimension of plant knowledge (Kothari, 2003) have discerned significant divisions between the ethnobotanical knowledge maintained by men and women in rural communities. With few exceptions, research indicates that men tend to be better acquainted with the

ethnobotany of old-growth forested habitats, and especially arboreal species, whereas women tend to be more informed about disturbance species associated with homegardens, swiddens and other products of human habitat change (Kainer & Duryea, 1992; Coe & Anderson, 1996; Gollin, 1997; Caniogo & Siebert, 1998; Luoga *et al.*, 2000; Pfeiffer, 2002). It has been further hypothesized that in addition to division of labour and space, modern gendered ethnobotanical knowledge may also be explained in part by the differential role of globalization in rural communities. Heckler (2002) suggests that the availability of wage labour jobs in rural regions, and thus the process of acculturation, are likely more accelerated among the male population and that this may lead to women serving as bearers of traditional plant knowledge. In other words, the widely reported decline of ethnobotanical knowledge may be gender specific.

This paper examines the possible role of gender as a feature of medicinal plant knowledge in tropical landscapes. By establishing and censusing a medicinal plant trail bordering the Chapada Diamantina National Park in Bahia state, Brazil, I examine the degree to which knowledge of nature is associated with gender, age and socioeconomic variables. The null hypothesis in this study is that women and men sustain roughly equal understanding of the medicinal properties of the local flora.

### Study setting

The study area selected is adjacent to the Parque Nacional da Chapada Diamantina in eastern Bahia, located roughly at 12° 33'S; 41° 23'W (Figure 1). Established as a protected national park in 1985, it covers about 152 000 ha in a region dominated topographically by a deeply dissected upland plateau, with mesas and isolated peaks ranging from 1000 to 2000 m (Figure 2). The park encompasses much of the north–south trending Serra do Sincorá range. These hills and valleys are dominated by an ancient complex of quartzites, sandstones, limestones and conglomerates. Mean annual precipitation for the plateau is 1000–2200 mm, with a distinct dry season from August–November (Silva, 1984). Vegetation ranges from semiarid savannas at lower elevations to semi deciduous forest and broadleaf evergreen rainforest on higher slopes (Funch, 1999). Anthropogenic fires are common in all but the most protected locations.

The Chapada Diamantina escaped serious human impacts until discoveries in the late 1700s of local gold deposits, which panned out early, followed in 1832 by the enormous



Figure 1. Locations of the Chapada Diamantina National Park and the town of Lençóis in the immediate vicinity of the study site in Bahia state, Brazil.



Figure 2. *Physical landscape of the Chapada Diamantina National Park, Bahia state, Brazil.*

alluvial 'diamond rush' that gave the region its name. Because most of the labour during this period was supplied by African slaves, the communities settled in the region were, and continue to be, dominated by people of African descent. By the end of the nineteenth century, overexploitation and competition from diamond sources in Africa led to a long period of economic stagnation.

Beginning in the 1970s, nature enthusiasts and backpacker tourists began visiting the area, drawn by the spectacular physical environment and the rustic colonial towns of Lençóis and Mucujé. According to the first director of the national park, Roy Funch (field interview, Lençóis, 2005), the projected growth of ecotourism-related economic development was one of the primary catalysts for establishing the park. By 2000, 'ecotourist' visits had exceeded 60 000 per year and tourism now represents the dominant economic activity in the region. Although no figures have been collected, reportedly some 50 per cent of the young men and a few women residing in the nearby town of Lençóis (population roughly 7000) list their primary occupation as 'ecotourist guide' (Leony, 2002). While most guides are local, a significant number come from elsewhere in Brazil and from other countries. This focus on nature tourism has clearly benefited the overall economy of the region as well as the integrity of the park's natural values (cf. Sills & Muller, 1996). In recent years, all cattle have been removed from the park and the extraction of minerals has been curtailed. Animal poaching for bush meat is, however, a continuing problem (field interview, Roy Funch, Lençóis, 2005).

The cultural impacts of this transition are more problematic. Whereas the more offensive forms of cultural assimilation and commodification are not yet evident (King & Stewart, 1996; McLaren, 2003), there has been an almost complete economic realignment in the major communities surrounding the park. Young people have abandoned traditional small-scale agriculture and diamond mining in favour of serving as ecotourist guides, or working in the many small hotels and restaurants. This transition in relations with nature has produced an unexpected side-effect, as casual discussions with local guides point to

little motivation to learn about traditional plant use – in spite of the interest evidenced by visitors. Conversely, many of the guides who are recent arrivals in the region appear to recognize the marketable value of sustaining this folk knowledge and have made efforts to learn about the various local uses of plants, especially those related to healing and diamond mining.

### Study site and methods

My objective was to set up a sample plant pharmacopoeia consisting of locally common medicinal species, and then to census a sample of the local community to identify the names and uses of the species. Prior consent was established with the collaborators and the participants. In order to set up the sample unit, I sought out two local collaborators well known for their knowledge of medicinal plants – Nildo, a 48-year-old man, and Dona Senhorinha, a 68-year-old woman. I selected a nearby trail leading down to and along the Lençóis River, and used by most of the community to reach a clothes washing and drying area; tourists seldom if ever use it. The study site represented a compromise between physical convenience for participants, who would have been unwilling or unable to journey a significant distance, and reasonable habitat diversity. I also focused on a disturbed rather than relatively pristine habitat because these are believed to be better sources of medicinally useful plants (Stepp, 2004; Voeks, 2004). The medicinal trail (of roughly one kilometre) began beside a homegarden, descended through a highly disturbed area dominated by weeds and extended up a second-growth riparian zone before terminating on a rocky cataract of the river.

Nildo and Dona Senhorinha identified the vernacular names and medical uses of 45 species with which they were familiar along the trail. These taxa were collected using standard voucher methods, deposited in the herbarium at the Universidade Estadual da Feira da Santana in that nearby city, and identified by the herbarium staff (see Voeks & Leony, 2004). All vouchers remained in Brazil. Also, in order to protect local intellectual property rights, binomials of medicinal species that have not appeared elsewhere in the literature are not listed in this or other publications.

All participants in the study were drawn from the nearby community of Lençóis. Censusing ran from July through August 1999, with additional field data collected in 2001 and 2002. Altogether, 67 people (comprising 52.2 per cent males) ranging in age from 11 to 82 years agreed to participate. This was not a random sample of the community; rather, I approached people who were about to use the trail and, because elderly people seldom walked the trail, I also went into Lençóis and specifically solicited the participation of people in their 70s and early 80s (I compensated economically disadvantaged participants with a payment of about USD 2). Prior to examining the plants on the trail, each participant was asked to respond to a series of questions including details of their age and sex, as well as what I perceived to be region-sensitive indicators of socioeconomic marginality or prosperity – such as having a refrigerator or television, indoor plumbing, and being able to read and write – with formal education divided into categories beginning with ‘none’ and ending at ‘postgraduate education’.

The boom in tourism in the region has led to significant in-migration of Brazilians and foreigners, including some tourists who became enamoured with the physical beauty of the region and have chosen to stay. As a result, there is an apparent distinction in general ‘worldliness’ between locals and outsiders. In order to get a sense of the ethnobotanical knowledge of locals versus immigrants, I also included questions to elicit whether participants were or were not born in the immediate vicinity and where exactly they were

born, and also the farthest distance from the town of Lençóis they had ever travelled (the latter two responses were converted later to kilometres in air miles).

After responding to the questionnaire, participants walked down the trail. Stopping at each of the 45 identified medicinal species, I asked if they knew a name for the plant, if the plant had any use known to them, and if they knew of and could describe a medicinal application for the plant. The trail census took from 20 minutes to just over two hours per person.

## Results

Participants elicited a wide range of responses to the socioeconomic questionnaire. Superficially, they appeared to represent the range of ages, economic conditions and travel experience common to the Lençóis community. Participants varied significantly in their ability to identify both the floral elements on the medicinal plant trail and their individual medicinal properties. While nearly all could supply the names of the domesticated fruit and oil-producing trees – for example, avocado (*Persea americana*), African oil palm (*Elaeis guineensis*), guava (*Psidium guajava*), genipap (*Genipa americana*) and Surinam cherry (*Eugenia uniflora*), among others – only a small percentage of participants could identify the medicinal application of these cultigens. Genipap, for example, makes a tasty fruit juice that is believed to treat anaemia and colds. And while papaya (*Carica papaya*) is commonly known as a typical breakfast food, few were aware that the male (staminate) flowers are brewed into a tea to treat symptoms of respiratory ailments. At the other extreme, the names and medicinal properties of relatively uncommon and undomesticated species were often completely unknown to participants. A list of herbaceous plants fell into this category (including pega-pinto or *Boerhavia coccinea*, louco or *Plumbago scandens* and bonina or *Mirabilis jalapa*).

I had to make some subjective decisions regarding whether or not to accept the names of plants supplied by participants as valid because a few were university-trained naturalists who had immigrated into the region to work in the ecotourist trade and often did know the scientific name, at least to the rank of genus, but not the vernacular name. I decided to include these responses as correct, not because they demonstrated the continuance of traditional knowledge, but rather because they hinted at the lexical and knowledge transition that appears to be occurring with the expansion of ecotourism.

The data were analyzed first by means of a cluster analysis using Ward's minimum variance method (Figure 3). The results point to three general clustered associations that I respectively term 'worldliness', 'high medicinal plant knowledge' and 'local prosperity'. Participants in the first cluster (namely one Argentinean, one American and one French) could be described as people who had settled in the region relatively recently, that is, worldly in terms of their travel experience. They tended to have journeyed further from home during their lives, to be born a greater distance from the study area, to have flown in an airplane and attained a higher level of formal education, but not to exhibit a strong linkage to knowledge about the local medicinal flora. Like their worldly counterparts, participants in the third cluster – namely those who tended to be relatively prosperous on a local level, that is, were more likely to have indoor plumbing, to own a refrigerator or a television, to have more rooms in their home and to be literate – did not cluster with medicinal plant knowledge. Participants falling into the second cluster, however, were especially proficient in the identification of the sample plant pharmacopoeia; neither locally prosperous nor worldly, they tended to be older, to have lived in the immediate area for much of their lives and to be female.

In Table 1, several of the variables are further analyzed in respect to gender (one-way analysis of variance; SPSS version 10.1 for Windows). A number of the features elicited no significant difference between women and men, including average level of formal education, furthest distance ever travelled from home and general economic indicators (having a television, refrigerator and indoor plumbing). Several other variables did vary significantly between men and women: women knew a greater percentage of medicinal plant vernacular names (48.2 per cent versus 36.7 per cent for men) and also a greater percentage of the medicinal uses of the species (27.4 per cent versus 17.7 per cent for men). These results fail to support the null hypothesis that women's and men's knowledge of medicinal species is equal. Women in the Lençóis community did appear to serve as receptacles of medicinal plant wisdom.

The data were further considered with regards to the age of participants, which elsewhere has been shown to be a defining feature of level of plant-based knowledge and a powerful indicator of the process of ethnobotanical decline over time. Linear regression of the ages of participants with knowledge of medicinal plant names is very highly significant ( $F = 51.499$ ,  $P < 0.0001$ ). The age factor is even more pronounced for medicinal plant usage ( $F = 76.275$ ,  $P < 0.0001$ ) in this community: knowledge of the medicinal properties of nature steadily increases with increasing age of the participant. Finally, the relationship between age, gender and medicinal plant knowledge were regressed (Figure 4). The results show that both men's and women's knowledge of the medicinal properties of the local flora grows during their lifetimes. But it is also evident from the regression lines that women accumulate this knowledge of nature more rapidly throughout their lives than men – thus, in old age, women know much more about the medicinal properties of plants than do men.

Informal discussions with the participants during the census were informative and generally supported the quantitative results. Young boys (13–17 years), for example, made it clear that they knew very little about the medicinal properties of the plants and that they were distinctly uninterested in learning them. This was especially surprising because many noted that they were also ecotourism guides. When I asked several of them if this type of knowledge would enhance their status as a guide, they responded that there were already several scientists who were guides for visitors who cared about that sort of thing. One such expatriate American tour guide was highly educated in the natural history of the region, including many of the vernacular names and medicinal properties of plants. This type of knowledge is, however, purely folkloric because, as he noted, he personally did not use local plants medicinally. Another well known guide with a scientific background, an older Brazilian from a distant region, had taken the time to learn about many medicinal species, also not for his own use but to enliven nature walks with tourists.

Three adult participants who were also occasional guides presented quite different attitudes regarding plant medicine. All were well educated and from a distant region (a man from Argentina; two women from elsewhere in Brazil) and each for their own reasons was pursuing an 'alternative' lifestyle that included favouring alternative healing methods over western medicine. They had settled in the region due to its natural beauty and were actively learning about the local healing traditions (one of the women particularly), including knowledge of medicinal plant species, as well as various more spiritually oriented practices. This is as close as I came to witnessing the actual transmission of medicinal plant knowledge from elders to a younger generation.

The two most elderly participants in the census, a woman and a man, provided valuable commentary on these issues. The woman, Dona Belinha, who passed away soon

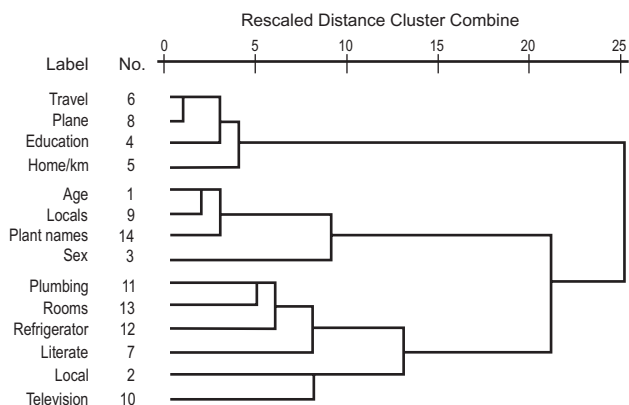


Figure 3. Cluster analysis dendrogram using Ward's technique.

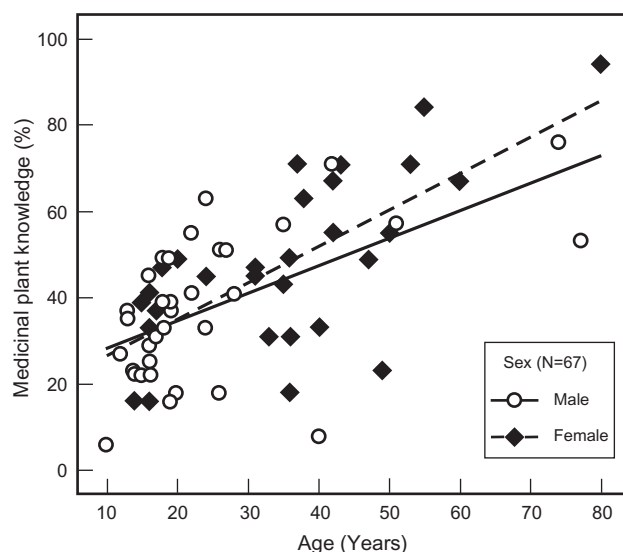


Figure 4. Linear regression of gender, age and medicinal plant knowledge.

Table 1. Relationship between gender, medicinal plant knowledge and socioeconomic variables.

	Women mean (%)	Men mean (%)	F-value	
			(df = 1, 66)	P-value
Vernacular names	48.2	37.6	5.628	0.021
Medicinal uses	27.4	17.7	4.705	0.034
Years of school (level)	1.83	1.86	0.005	0.943
Distance travelled from home (km)	1746	1210	0.492	0.486
Television	80.0	86.5	0.497	0.484
Indoor plumbing	73.3	70.3	0.074	0.786
Refrigerator	70.0	70.3	0.001	0.981

after the study, was able to provide a lengthy narrative on nearly all of the 45 plants on the trail. Each individual plant species represented for her a piece of her personal history. While some were simply part of her everyday pharmacopoeia, employed for simple stomach and respiratory ailments, others were successful or unsuccessful remedies in local episodes of life-threatening illnesses. Dona Belinha described, for example, a horrible epidemic in the 1930s, probably yellow fever, which killed many in the community, including her sister. During that difficult period, the full force of the local pharmacopoeia was brought to bear, mostly with little effect. At the same time, the eldest man, a tailor by trade, who had scored fairly high in medicinal plant knowledge, had seldom actually employed or prepared plants in medicinal recipes but had often observed his deceased wife do this work.

### Discussion and summary

In rural regions of the tropics, gendered divisions of labour among subsistence communities predominate. Men are often engaged in hunting, fishing, livestock herding and timber extraction, activities that would take them to relatively undisturbed habitats distant from their settlements. Women are more likely involved in managing local resources, such as homegardens, swiddens and other disturbed habitats relatively near the home (Momsen, 2004). Because men and women often travel and toil in different spaces, their familiarity with nature is bound to vary (Kainer & Duryea, 1992; Pfeiffer, 2002; Howard, 2003; and see Mendez *et al.*, 2001). Ethnobotanical acquisition is, in turn, about species salience (Berlin, 1992). People give names to and learn about the properties of plants that are highly visible, familiar and accessible (Logan & Dixon, 1994; Voeks, 1996). For men, with notable exceptions, these features are associated with relatively undisturbed nature, a plant kingdom under the influence of mostly natural ecological processes. Among women, such knowledge of nature generally derives from more anthropogenic landscapes, ecosystems with ecological properties and patterns of cognitive accessibility that are often under the control of human habitat alteration.

The ethnobotanical consequence of gendered divisions of space and habitats in tropical rural communities is reasonably consistent. For instance, Heckler (2002) indicates that men and women in indigenous Venezuelan communities maintain similar levels of ethnobotanical knowledge (although the study suffers from several methodological difficulties). The results of other studies, however, point to sharp ethnobotanical unconformities along gendered boundaries. On the island of Flores, Indonesia, Pfeiffer (2002) identifies significant spatial partitioning of ethnobotanical knowledge of native fruit species between women and men. In a rural Brazilian community, Begossi *et al.* (2002) report that women know a greater number of medicinal species than men, although men show an overall higher diversity and heterogeneity of plant citations. Working among rural mestizo communities in the Peruvian Amazon, Stagegaard *et al.* (2002) note that men, who often work in old-growth forests, are more knowledgeable about trees than are women. Regarding medicinal plants, they suggest that men know more about tree and liana medicine derived from forest species and that women are more proficient in knowledge of medicinal weeds, herbs and crops. Coe and Anderson (1996) reported that Garifuna women in Nicaragua are much more knowledgeable about medicinal species than are men. They relate this to the life history of the local healing flora, which is mostly successional and, thus, within the dominant purview of women. Likewise, among indigenous groups in northwest Amazonia, women exhibit hegemony over domesticated crops and homegardens, whereas men have dominion over non-managed forest

resources. As a result, the women acquire secret knowledge of plants, seeds and tubers from their mothers and the men learn about the properties of mostly mind-altering cultigens like coca, tobacco and, for fermenting into alcohol, pineapples (Reichel, 1999). Luoga *et al.* (2000) also find that women in eastern Tanzania know more about herbaceous plants, whereas men are more knowledgeable about trees. Gollin (1997) notes that Dayak women in Indonesian Borneo are more knowledgeable about medicinal plants than men, as do Kainer and Duryea (1992) for a rural community in northeast Amazonia. Women and men quite clearly exhibit differing knowledge of their local floras, a difference that is especially pronounced in relation to tropical healing floras.

The results of the present study largely mirror the above reported gender divisions of plant knowledge. Women in the town of Lençóis are significantly more proficient than are men in identifying, naming and describing the medicinal properties of plant species in the field. Most of the species are cultigens or maintain *r*-selected life histories, that is, they are often herbaceous weedy annuals or perennials and distinctly associated with human disturbance. This gendered knowledge gap grows over the years, to the point that middle-aged to elderly women constitute cognitive repositories of traditional ethnomedical knowledge.

I suggest that the source of this gendered ethnobotanical division is threefold. First, until a few decades ago, men and women in Lençóis operated in quite different spaces, as noted elsewhere in other studies. Resource extraction, whether for wood, game, or more often alluvial diamonds, took men away from the community and into the mountains for days and weeks at a time. Many maintained small mining camps, often in sandstone caves, where they survived largely on what they could hunt and gather while searching for diamonds (Funch, 1999). Women were occasionally field miners as well, although this was rare. Mostly women managed the *roças* (swiddens), the *quintais* (homegardens) and the healthcare of the family. Thus, women came to know plant species that for the most part were products of disturbance – successional species like weeds, shrubs, climbers and garden cultigens – and a ‘nature’ that was quite different from that known by men.

Second, and equally important, these moderately humanized landscapes, such as trails, swiddens, homegardens and recent forest fallows, represent optimal medicinal plant foraging habitats. This disturbed flora is ethnobotanically salient because it is so much a part of daily routines of planting, weeding, collecting and relaxing. Unlike the bewildering plant diversity found in old-growth forests, anthropogenic landscapes are floristically simpler and thus easier to remember. Disturbance species, cultivated or wild, are encountered constantly, providing repeated opportunities for observation, recognition, lexical codification and experimentation. Moreover, because disturbance species are so much a part of the known landscape, they are easy to locate when needed. Gardens, trails and swiddens are immediately at hand; old-growth forest is less so. Furthermore, disturbed areas are usually dominated by low-growing species of herbs, shrubs, climbers and treelets, which are also relatively easy to collect. Several quantitative studies comparing the ethnobotanical value of old-growth to second-growth tropical forests underscore the primacy of disturbed habitats as the preferred collection sites for healers (Toledo *et al.*, 1992; Voeks, 1996; cf. Chazdon & Coe, 1999; On *et al.*, 2001). Finally, although it seems trivial to note that food is healthy, it is not usually appreciated how many food plants enter into pharmacopoeias (Johns, 1996; Bennett & Prance, 2000). Tropical homegardens and swiddens are rich in crop species and varieties, many of which enter into medicinal formulas. Among the Hausa in Nigeria, Etkin and Ross (1991) report that 49 per cent of medicines taken for gastrointestinal disorders also serve as foods. Ogle *et al.* (2003) note that one-third of censused wild food plants in rural Vietnam maintain medicinal

properties. In spite of the negative perception often associated with weeds and other successional species (Clayton, 2003), the so-called tropical rainforest pharmaceutical factory is largely associated with humanized landscapes (Stepp, 2004; Voeks, 2004).

Third, women in Brazil, especially older women, represent the primary healthcare providers for the family and the community, a situation that prevails in many other regions in the developing world (Coe & Anderson, 1996; Voeks & Nyawa, 2001; Kothari, 2003), as it had, historically, among native communities in North America, for example (Schrepfer, 2005). If a child or adult becomes ill, the neighbourhood *curandeira* (female healer) will be called for assistance. Except for highly specialized male healers (such as found in the Brazilian Candomblé magico-medical system; see Voeks, 1997), most rural and small town Brazilian communities depend on their women to diagnose illness and identify the appropriate herbal remedy (Voeks, 1999; Begossi *et al.*, 2000). Elderly *curandeiras* achieve considerable community prestige as a result of their healing abilities.

The rural community of Lençóis has passed through a dramatic cultural and economic transition in the last few decades, from a petty extractive and subsistence economy to near complete dependence on nature-based or ecotourism. Wage labour is quickly supplanting any subsistence dependence, encouraged in part by establishment of the Chapada Diamantina National Park in 1985, and the prohibition (rarely enforced) on the extraction of plants, animals and minerals in this protected region. Division of labour between men and women still exists, with men spending considerable time in distant locations in intimate contact with relatively undisturbed nature and women mostly bound to the towns and the immediate surrounding areas. But this spatial separation of labour, according to the data, is not encouraging any continued gendered divergence in knowledge of nature. Many young males in the community, as noted, are part- or full-time guides, which takes them into the park several times a week but, at least for now, does not seem to be facilitating familiarity with the surrounding vegetation. Informal discussions with young local guides indicate that many have little if any interest in learning the identities or uses of local plants. Very few young local women act as guides; most are employed in tourist related services (hotels, home-stays, restaurants, laundry services etc.). Few however are involved with the homegardens maintained by the older women in the family, although this could well change as they grow older. For the present, there seems to be little interest on the part of either local young men or women to sustain the medicinal knowledge of nature that served their immediate ancestors. Medicinal plant knowledge among this local community, as well as gendered distinctions in this realm of nature–society understanding, is fading quickly.

This situation is somewhat different among recent immigrants to the region, many of whom have a vested interest in learning about the native flora – whether as scientists out of innate curiosity or professional necessity, as nature guides out of obligation to satisfy the curiosity of tourists, or as ‘alternative’ life seekers for a variety of reasons. The result is that a measure of medicinal plant knowledge is being transferred and retained, perhaps not between mother and daughter as in the past but between two groups with a personal interest in maintaining it. Whether this passage could represent anything approaching an ethnobotanical rescue seems unlikely. Ethnomedical knowledge for the recent arrivals in this community represents more a folkloric and ecotourist commodity than a survival skill. Moreover, the level of ethnobotanical knowledge that is being assimilated by nature guides encompasses little more than the vernacular name and a description of how a plant is or was once used medicinally. Finally, if ethnobotanical transference is taking place, it is largely from older local women to younger immigrant males, a process that would seem to further undermine traditional gendered relations with healing habitats.

## Acknowledgements

Partial funding for this research was provided by a Fulbright Senior Fellowship to Brazil, a National Geographic Society Research & Exploration Grant (#7280-02), and a California State University, Fullerton, Faculty Research Grant. I thank Kelly Donovan for assistance with the graphics, Angela Leony for valuable field assistance and Jeanine Pfeiffer for pointing me in the direction of previous research on the topic. Gratitude is owed to the people of Lençóis for contributing their knowledge and for their hospitality, especially Nildo and (the late) Dona Senhorinha.

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