

CULTURAL MODELS AND GENDER DIFFERENCES IN  
TOBACCO USE AMONG CONGO BASIN  
HUNTER-GATHERERS

By

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Abstract

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A paucity of data exists on tobacco smoking in small-scale societies, particularly among central African populations who have had a relationship with tobacco for nearly 500 years. This study aims to extend this largely neglected topic within anthropology by identifying and describing a) indigenous cultural models of tobacco and similar substances smoked and b) age trends and gender differences in smoking, among a group of Aka foragers of the Central African Republic. Several hypotheses exist on why males tend to smoke more than females, particularly in developing countries, yet most studies are conducted in urban-industrial nation states where gender inequality is common. As Aka are a group of egalitarian forest foragers, other factors besides religious and political subjugation are predicted to affect patterns of use for females. This research is placed into a larger theoretical framework integrating cultural, political-economic, and biological factors involved in age trends and gender differences in tobacco use. Aka males use tobacco considerably more than Aka females. While tobacco use appears to be gendered women are not proscribed from smoking, many have tried it, several continue to smoke, and the

likelihood of smoking increases with age. Cultural (tobacco as a 'rite of passage' into adulthood), political-economic (acculturation and tobacco as a labor inducer), and biological (sexual selection and pharmacophagy) factors all potentially contribute to the higher rates of smoking among Aka males.

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## **Dedication**

This thesis is dedicated to Jen Wilcox and my parents, Scott and Marie,  
who have provided invaluable support.

## INTRODUCTION

This study uses a cultural models approach, integrated into a larger political-economic and biocultural framework, to investigate the use of tobacco. The research is largely exploratory and aims to identify and describe a) indigenous cultural models of tobacco and similar substances smoked and b) age trends and gender differences in smoking, among a group of egalitarian Aka forest foragers. Aka forest foragers of the Central African Republic (CAR) smoke four different products: two forms of tobacco (*ndako*), manufactured cigarettes, often called *blancs*, and locally grown tobacco called *gbangaya*; *tunga*, a forest plant (*Polyalthia suaveolens*, Engl. and Diels, Annonaceae); as well as cannabis (*bangi*). Aka foragers are an excellent population for tobacco research for several reasons. First, tobacco use is on the rise in many areas of the developing world (Mackay and Eriksen 2002; Nichter and Cartwright 1991; WHO 2007), such as in the Central African Republic where Aka foragers live, but a paucity of data exists on tobacco use in the Congo Basin. Second, research on tobacco use among hunter-gatherers is extremely limited. Little is known about the cultural beliefs of tobacco, the prevalence of tobacco use, or how such use is impacting African foragers. Third, Aka are relatively isolated from Western cultural influences, such as the popular media (TV, radio, magazines) and biomedical care. This offers a unique opportunity to examine the effects of indigenous socially transmitted information on smoking behaviors in a population seldom considered by Western tobacco researchers.

While tobacco use is a wide spread human activity it is relatively understudied in anthropology. It is unfortunate that the use of tobacco has not been studied more, particularly in medical anthropology. To begin with, culture is a variable that affects human behavior (Pelto and

Pelto 1996). How people think and feel about particular domains, such as drugs, largely directs their actions. In turn, these behaviors are related to health outcomes. As Singer (2004:518) states, the patterns of use that are tied to health outcomes, are themselves tied to the “social structuring of people’s ideas, actions and relationships.” However, to date tobacco use has been relatively neglected. This study therefore aims to extend this largely ignored, yet extremely important, topic in anthropology by identifying and describing cultural models of tobacco and related substances.

A second aim of this research is to investigate gender differences in patterns of use. Considerable data exist on gender differences in smoking and how and at what age individuals start to smoke (Kaplan *et al.* 1990; Mackay and Eriksen 2002; Marshal 1979; Waldron *et al.* 1988; WHO 2007). In developing countries the difference between the rate of men and women who smoke is considerably large and these differences are thought to be due to religious and legal restrictions (Mackay and Eriksen 2002). Studying tobacco use in an egalitarian population, however, offers the chance to examine how other cultural, social, political, economic, and biological factors besides religious and political subjugation of women affect gender differences in patterns of tobacco use.

Tobacco smoking also poses a major public health threat. This is becoming ever more apparent in developing countries where the use of tobacco has been on the rise and illness and deaths related to tobacco use are also expected to rise (Mackay and Eriksen 2002; Nichter and Cartwright 1991; Stebbins 2001; WHO 2007). The increased use of tobacco products in the developing world is tied to larger political-economic factors. In a review of anthropological studies of tobacco, Singer (2004) points out that smokers throughout the developing world are becoming dependent on cigarettes supplied by Western transnational tobacco companies and that

through their consumption of these products and through their labor, indigenous societies have been incorporated into the global economic system. It is therefore important to incorporate the political-economic dimensions of substance use in anthropological studies. Finally, because human behavior has both cultural and biological antecedents, this paper will examine patterns of use in a broader biocultural perspective. Biological and psychological factors involved in tobacco use, particularly as they pertain to gender differences in use, will be examined from an evolutionary perspective.

It is the hope of this study that it will contribute 1) to our overall understanding of tobacco use behaviors and of how cultural, political-economic, and biological factors pattern such use, and 2) how tobacco use impacts central African forest foragers, both how it affects their health and how it is tied to larger political-economic forces such as acculturation and globalization.

## **BACKGROUND & THEORETICAL OVERVIEW**

“Drugs” have been used throughout history by societies for a number of reasons. However, the term “drug” is misleading when speaking of the way that plant and animal substances have been consumed in traditional societies. In Western industrial societies, drugs refer to substances consumed other than for nutritional reasons, namely medicines and narcotics (Sherratt 1995a). Medicines are taken for therapeutic and prophylactic reasons while narcotics, although chemically similar, are consumed for hedonistic purposes (*ibid.*). Therefore in Western society plant and animal substances can be classified as “foods”, “narcotics/drugs”, and

“medicines” (Hugh-Jones 1993). Caffeine, for instance, is a food, cannabis is a narcotic, and morphine, when taken as prescribed, is a medicine.

In traditional societies, in contrast, the use of plant and animal substances can be classified as religious, medical and secular (Sherratt 1995b). While anthropologists working in traditional societies have found that plant and animal substances are often used for secular reasons (i.e. to escape or cope with difficult life circumstances or for pleasure), the interrelationship of the use of plant and animal substances with religion and medicine dominates (Lehman *et al.* 2005). Throughout the Americas, for instance, indigenous peoples use *Nicotiana* to feed the gods, for curing, and for shamanic intoxication (Furst 1976). As Furst (1976:23) points out, traditional Native American tobacco was and still is regarded as “the special gift of the gods to humanity, given to assist mankind in bridging the gulf between ‘this’ world and ‘the other’—the world of the gods themselves.”

### Origin and Diffusion of Tobacco

According to Goodspeed (1954) there are over sixty species in the genus *Nicotiana*, 75 percent are native to the Americas and the remaining 25 percent to Australia and the South Pacific. Based on genetic evidence *Nicotiana* seems to have originated in the Andean highlands of South America (Wilbert 1987). From there *Nicotiana* spread south and northward, expanding across North and South America, and eventually making its way to Australia and the South Pacific (Goodspeed 1954). In the Americas, where tobacco had a wider geographical and cultural distribution than any other vegetal hallucinogen, tobacco was smoked, drunk, snuffed, licked, sucked, eaten, and injected rectally as enemas (Furst 1976) (see Wilbert 1987 for an overview of the traditional uses of tobacco in South America; Winter 2000 for an overview of the traditional



uses in North America; and Groark 2010 or Thompson 1970 on traditional Mayan use of tobacco).

Today tobacco is used in almost every society. Since European contact with the New World the tobacco complex spread quickly. According to Laufer *et al.* (1930), the Portuguese, Hollanders and Arabs each had a role in introducing tobacco to Africa. *Nicotiana rustica* was introduced to Guinea in the 1500s, probably by the Portuguese, who were growing it in Lisbon in 1558. *Nicotiana tabacum* followed soon after from Brazil. Tobacco was then brought to the interior of Africa by the caravan trade (*ibid.*). According to Jeffreys (1963) the Bushongo, an ethnic group along the Congo River, have an oral tradition that suggests that tobacco was introduced to the area as early as 1510. By the late 1800's, German botanist and ethnologist Georg August Schweinfurth noted that tobacco was largely appreciated in the Congo region (Laufer *et al.* 1930). Generally speaking, tobacco was adopted enthusiastically throughout Africa.

### Ethnographic Studies of Tobacco Smoking

Although tobacco use, particularly smoking, is a widespread human behavior, it is relatively neglected in anthropological and ethnographic studies (Black 1984). As Nichter (2003) and others (Pavis *et al.* 1998) have noted, ethnographic studies that highlight the effects of cultural and social factors on smoking add to our overall understanding of smoking behavior. Nichter (2003) states that these examinations should be seen as a compliment to evaluations of other intraethnic group differences in tobacco use, such as social class, education, residency and acculturation. In a review of anthropological studies of tobacco use Singer (2004) notes that

tobacco use is ubiquitous in the developing world, where it has been incorporated into larger cultural complexes.

If ethnographic studies of smoking are rare, they are even more rare among hunter-gatherers and other small-scale societies. Outside of indigenous populations in the Americas (cf. Groark 2010 or Thompson 1970), the use of tobacco, although clearly pervasive, is noticeably absent in most ethnographic studies of small-scale societies (however, see Black 1984, Brady and Long 2003, Kaplan *et al.* 1990; Mougne *et al.* 1982, Vallance *et al.* 1987; and Waldron *et al.* 1988).

In one of the only studies to investigate the social reasons for smoking in an African hunting-gathering population, Damon (1973) found that !Kung Bushmen viewed tobacco more positively than other traditional societies (i.e. more than the six other populations studied: four Melanesian populations—the Lau, Baegu, Nagovisi, and Aita—and two African populations—the Buganda and Herero). While the !Kung are the least acculturated of the groups, they attribute social as well as personal advantages to tobacco, they feel that smoking increases strength, wisdom, cleverness, agility, working capacity, planning ability, friendliness, social rapport, and kindness towards others. Unlike any of the other populations studied the !Kung have incorporated tobacco into a ritual (the medicine trance-dance) believing that it can induce trance states. Tobacco is also a social activity, much more so for the !Kung than for the other populations. The !Kung prefer smoking with other people and often pass a pipe around during group discussions. Most (57%) !Kung smokers began smoking between the ages of 10 and 19. Nobody started smoking below the age of 10 and an additional 43% started smoking between the ages of 20 and 24. Almost half (44%) initiated smoking with a family member while 27% initiated with a friend. Finally, while the !Kung were aware of the health hazards of smoking,

they continue to smoke and are also one of the least able to abstain from smoking for more than 3 days. All the respondents smoked, including seven males and seven females. However, no data were available on the mean rate of smokers or mean rate by gender.

### Theoretical Orientations

Below I briefly describe three theoretical orientations that influenced data collection and interpretations of the data. While they are separate and often fiercely defended theoretical orientations within anthropology, the discussion part of the paper illustrates ways in which they can be integrated and useful for interpreting the results.

#### **1) Cultural Models of Tobacco Use**

Anthropologists have long been interested in the sociocultural factors affecting substance use behavior (cf. Bennett *et al.* 1998; Heath 1987; MacAndrew and Edgerton 1969; Room 2001). As Rowe (1994) points out, cultural meanings, along with nicotine's reinforcing effects, give tobacco its functional value that maintains its use in a community. In medical anthropology as well, culture is seen as a cluster of variables that account for actual behaviors (Pelto & Pelto, 1996). Medical and epidemiological studies also note the importance of culture in smoking. For instance, the Surgeon General's Report (US Department of Health and Human Resources 1998) recognizes culture, or 'ethnicity', as a variable affecting smoking behavior.

Since little is known about tobacco use among hunter-gatherers, I use a cultural models approach to begin to understand how Aka view and explain tobacco use. A *cultural models* (D'Andrade and Strauss 1992; Strauss 1992; Strauss and Quinn 1997) approach, one of several perspectives within cognitive anthropology, is one way to examine cultural variables. Cultural

models refer to local knowledge and feelings about a particular domain. What are the local terms for tobacco? What are local reasons for using tobacco? In what contexts is it good or bad to use tobacco? What are the perceived costs and benefits of smoking? Cultural models are cognitive schemas (D'Andrade 1989) that are culturally formed, learned and shared with those who have similar experiences (Strauss 1992, Strauss & Quinn, 1997). Therefore, those members of a particular social, economic, political, or geographic community tend to have similar cultural models. Cultural models also have motivational force; they label and describe the world and set goals (D'Andrade 1981, 1984).

Examining cultural models and their effects on smoking behavior is complex. As Strauss (1992:11-16) notes: "... public social messages may change, be inconsistent, or hard to read ... [and] internalizing these messages does not mean copying them in any straight-forward way." That is, although cultural models are shared with those who have similar experiences and are thus similar amongst members of a particular community, they do not necessarily equate to actual behaviors. However, it is generally assumed that, for the most part, "a person's most general interpretations of what is going on... function as important goals for that person" (D'Andrade 1992:30). Thus, although acquiring motivations from cultural models is complex, the way people describe and make sense of particular domains largely directs their behavior.

Smoking also serves as a social signal (Rowe and Linver 1995). As Sherratt (1995b:12-13) comments, the choice of particular items of consumption, such as tobacco, "embody notions of status and value as well as conceptions of identity and belonging, whether actual or desired." Thus, tobacco often plays an important role in image management (Nichter 2003). In semiotic terms, tobacco is a sign or a prop that allows people "to act out their constantly varying roles on the stage of everyday life" (Danesi 1999:14). Marshall (1979), for instance, found that on the

Pacific islands of Truk, tobacco and alcohol are symbols of masculinity. Nichter (2003) argues that examining the symbolic dimension of smoking helps determine how smoking is used as a marker of gender and age identity. This study will therefore examine how cultural models and the symbolic value of tobacco affect gender differences in patterns of use as well as adopting a smoking habit.

### ***Culture and Gender Differences***

There has been substantial research on gender and substance use (McDonald 1994), such as alcohol (Room 1996; Suggs 1996 and 2001), *tchat* (Almedom and Abraham 1994), and tobacco (Kaplan *et al.* 1990; Waldron 1988). Culture plays an important role in gender differences in substance use, particularly in the developing world where gender differences in use are the greatest. For instance, according to the World Health Organization about 50% of males and 9% of females in developing countries smoke, a difference of over 40% (Mackay and Eriksen 2002). Gender differences in tobacco use, particularly in Africa, are caused by religious proscription (Laufer *et al.* 1930) often in conjunction with higher socioeconomic status for males/lower socioeconomic status for females (Mackay and Eriksen 2002; WHO 2007). Throughout West Africa, for instance, while men are free to smoke, Islamic religious beliefs prevent women from smoking (Laufer *et al.* 1930). In East Africa, gender differences among Kenyans, as well as pastoralist Maasai and Samburu, are related to more social power for men (Kaplan *et al.* 1990). Furthermore, in a cross-cultural study of smoking, Waldron *et al.* (1988) found that in many parts of Africa, Asia, the Pacific and Latin America Western influences, such as the Church, have helped foster the idea that smoking is morally wrong, and hence smoking has been restricted to men. Rowe (1994) argues that in societies with patriarchy and religious proscriptions, the distributional overlap of sex differences is overlooked. In contrast, where

religious and legal restrictions on smoking are removed, females' use usually increases and levels off at a rate "diagnostic of their biological proclivities" (Rowe 1994:189).

### ***Starting to Smoke***

No more is the symbolic nature of tobacco evident than its ability to signal adult role status. Throughout the world, societies tend to restrict the use of tobacco to adults. In most South American indigenous populations for instance, children were (and still are) proscribed from using tobacco (Wilbert 1987). The same is true in most Western industrial countries where there are often age restrictions on purchasing and using tobacco. This occurs in Africa as well. The !Kung Bushmen, for instance, forbid their children from smoking (Damon 1973). Regardless of these age restrictions however, three quarters of adult tobacco users began smoking between the ages of 11 and 17 (Eissenberg and Balster 2000). Precisely because the young and sub-adult are forbidden from using tobacco, tobacco use is easily recognized as an adult activity. Rowe and Linver (1995:68-69) argue that this is why tobacco is initially experimented with—tobacco can be used "like a raised flag, for adult sexual and social ambitions." For instance, in Western societies such as the United States, tobacco use is seen as a coming-of-age rite; it signals "sex difference, maturity, and attractiveness to peers" (Danesi 1999:5). Such 'rites-of-passage' are also common for males and are associated with earlier onset of smoking for young men (WHO 2007).

## **2) Political Economy of Tobacco Smoking**

While I emphasize a cultural models approach in this paper, it is also important to consider the political economy of tobacco use in central Africa. Most contemporary anthropological studies of tobacco are conducted within a political economy framework, i.e.,

how multinational tobacco companies foster dependence, especially in the developing world, how the multinational media promote smoking, and how access to health care and education impact smoking (Stebbins, 1990, 2001; Marshall, Ames & Bennett, 2001; Marshall, 1993; Nichter and Cartwright, 1991).

As pointed out by Black (1984), the use of tobacco in small-scale societies needs to be examined in light of the worldwide tobacco complex. Ever since tobacco use started to decline in the West multinational tobacco corporations have shifted their focus to the developing world (Nichter and Cartwright 1991). Populations are rapidly growing in most parts of the developing world (UN 2006) and many of these countries have no limits on the levels of tar and nicotine in tobacco products, no health warnings required on their packaging, and generally no public awareness of potential health risks associated with smoking (Stebbins 1990). For instance, most central African nations, including the Central African Republic, require no warnings on packs of cigarettes (Mackay and Eriksen 2002). This has made developing nations a lucrative market for tobacco companies. Tobacco companies spend about \$12.5 billion annually on advertising in the Third World (Singer 2004). Hence, tobacco use has steadily increased in these countries (Mackay and Eriksen 2002; Nichter and Cartwright 1991). In Africa and Asia, for instance, between 1970 and 1985, cigarette consumption significantly exceeded population growth (Nichter and Cartwright 1991). In developing countries males are particularly influenced by tobacco advertising, especially as advertising plays into the notion that Western goods afford social prestige (Stebbins 2001; WHO 2007). However, transnational tobacco companies have started targeting women, as they are one of the largest untapped markets (WHO 2007). Furthermore, the availability of low-nicotine cigarettes in Western nations may have factored into the increased use of tobacco by young women in the West during the 1960s and 1970s

(Silverstein, Feld, and Kozlowski 1980). While most cigarettes in developing countries have higher amounts of nicotine, the increased availability of low nicotine cigarettes may also lead to increases in the frequency of women who smoke.

### ***Tobacco as Labor Enhancer***

Several anthropologists have pointed out that tobacco and other “drug foods”, such as coca leaves, sugar, coffee and tea (Mintz 1985 and 1997; Jankowiak and Bradburd 1996 and 2003; Gladwell 2001), have played a key role in facilitating trade within the expanding global economy. Early stages of cultural contact are particularly affected by drug foods, as they are often the only foreign commodities accepted by native populations (Jankowiak and Bradburd 1996). As Jankowiak and Bradburd (1996) point out, ‘agents of colonialism’, such as traders, merchants, and settlers, initially lacked the means to motivate local indigenous populations to perform new forms of labor. They therefore used drug foods to foster chemical as well as social dependency. The use of drug foods encourages immediate consumption therefore consumer demand for them remains high making them exceptionally effective labor inducers. Furthermore, Jankowiak and Bradburd (*ibid.*) found that drug foods as labor inducers are most often used during early contact situations or during contacts with remote populations of hunter-gatherers and pastoralists.

The interaction between Western commodities and indigenous cultures, however, is not a one-sided affair. Sahlins (1988) used the term “commodity indigenization” to refer to the way indigenous populations respond to Western commodities. Native cultures, he points out, mediate “global-material forces” by providing them with local cultural schemes. They assimilate them into their cultural system, a system that is far removed from “native-European commodity fetishism” (Sahlins 1988:5-6). Once tobacco is introduced, traditional societies are free to



incorporate it into their existing cultural system. Making tobacco even more amenable to ‘commodity indigenization’ is that it lacks what Black (1984) calls ‘symbolic specificity’. It does not come with “highly culture-specific, complex, or inescapable symbolic meaning” (Black 1984:481). Furthermore, exchanges of labor for food drugs often match traditional biocultural demands of labor (Mintz 1985 and 1997; Jankowiak and Bradburd 1996 and 2003; Gladwell 2001; Nichter 2003), especially when native drugs were used prior to European contact (Brady and Long 2003).

The Kukatja of Western Australia, described by Brady and Long (2003), are an excellent example of tobacco being incorporated into an indigenous cultural and economic system. Prior to European contact, the Kukatja used several local plants including native tobaccos and *pituri*. The tobacco that Europeans and others brought to Australia fit well into existing patterns of drug use. It fulfilled many of the same purposes as *pituri* and the indigenous tobaccos. In order to get the new tobacco, the Kukatja merely changed their gathering behavior from gathering *pituri* and native tobaccos to “gathering” tobacco from Europeans and others by providing labor. Tobacco replaced *pituri* and the native tobaccos because it was available in volume and represented a savings in labor, much like other Western goods have replaced their indigenous counterparts (e.g. flour and sugar) (*ibid*).

### ***Health and Acculturation***

Tobacco use is a major public health problem. The medical community describes tobacco use as an “invisible and chronic” danger because its harmful effects are often delayed for several years (Briggs, Lindorff and Ivers, 2003). Smoking is responsible for 90% of all lung cancer, 75% of chronic bronchitis and emphysema, and 25% of cases of ischaemic heart disease (Mackay and Eriksen 2002). The World Health Organization estimates that 7 million people will die

prematurely each year by 2025-2030 (*ibid.*). As mentioned above, tobacco use is on the rise in most areas of the developing world which is expected to lead to increases in tobacco related diseases and deaths (Mackay and Eriksen 2002; Marshall 1993; Nichter and Cartwright 1991; WHO 2007).

Cultural ecological factors such as logging, mining and acculturation significantly impact forest-foragers throughout Africa (Hewlett 1996b; Hewlett *et al.* 1986; Knight 2003). These factors might also lead to increases in the use of tobacco and related health effects, particularly as they affect access to tobacco products and influences of tobacco advertising. For Aka acculturation is linked to changes in labor patterns. Aka are beginning to move into a cash economy and they are settling near the village for longer periods of time in order to work more often for villagers. Thus, as Aka become more and more acculturated, tobacco becomes more and more available through increased work opportunities and income. Unfortunately, while forest-foragers have access to tobacco and similar substances, they have limited access to Western medical care. As the prominent geneticist Luigi Cavalli-Sforza (1986:421) has noted:

“If the chances of receiving Western medical help for Africans living in remote villages are very limited, those of Pygmies are practically nonexistent. They are even further removed from hospitals. African health agents usually do not treat Pygmies. Medical help comes exceptionally and almost always from rare visiting foreigners.”

### **3) Biocultural Approaches to Tobacco Use**

Data for this paper was collected in the context of a larger study on the evolution of drug use in humans. The results of that study will be published elsewhere (Hagen *et al.* n.d.) but I

want to briefly discuss a few evolutionary and biocultural approaches that influenced data collection and interpretation.

### ***Reinforcing and Dependence Producing Effects***

The development of a smoking habit is complex and involves interacting cultural, environmental, and biological factors. Nicotine, a natural ingredient in tobacco, produces both positive and negative motivations, contributing both to the consistency of cigarette smoking, as well as providing an “upper limit” to smoke intake (Kumar, Pratt, and Stolerman, 1983). Tobacco manages to promote itself due to its principal secondary compound, nicotine. Most smokers smoke to maintain plasma nicotine levels and smokers absorb about 1 mg of nicotine each time they smoke a cigarette (Benowitz and Jacob 1984; Gori and Lynch 1985). Nicotine is highly addictive (Benowitz 1999) and this addictiveness is the cause of the continued use of tobacco products (Hukkanen *et al.* 2005). Nicotine levels rise quickly during smoking and smokers can control the level of nicotine they absorb, hence smoking is one of the most reinforcing and dependence-producing ways of administering nicotine (Benowitz 1990; Henningfield and Keenan 1993). Nicotine, along with nearly all drugs of abuse, also stimulates dopamine neurons. Dopamine has the net effect of exciting the nucleus accumbens (Kalat, 2007) and is hypothesized to mediate the reinforcing and dependence producing effects of nicotine (Huang *et al.*, 2008).

### ***Sexual Selection and Life History***

Aside from physiological pleasure induced by nicotine, other biological and psychological factors might influence patterns of use for particular gender and age cohorts. Sexual selection is a factor influencing sex differences in sexually reproducing species (Trivers 1972). In these species, including *Homo sapiens*, females invest more in offspring because they

are obligated to pregnancy and lactation. Female reproductive success (RS) is therefore limited by physiological and energetic constraints and they are the 'choosy' sex. Consequently, male RS is limited by access to females and they must compete with other males for access to mating opportunities (Bateman 1948, Darwin 1871, Trivers 1972; Williams 1966). According to life history theory, organisms face inherent trade-offs in survival and reproduction. The principal trade-offs are those of somatic vs reproductive effort, mating vs parental effort, current vs future reproduction, and quantity vs quality of offspring (Roff 1992; Stearns 1992). Because male RS is limited by access to mates, males invest more in quantity of offspring, current reproduction, mating effort, and reproductive effort. However, this comes at the expense of increased vulnerability to both internal and external causes of morbidity and mortality (Trivers 1985; Hazzard 1986; Kruger and Nesse 2006; Bateman 1948), including susceptibility to dangerous risky behaviors (Daly and Wilson 1978 and 1997; Wilson and Daly 1985) and infection from pathogens (Kraemer 2000; Møller, Christe, and Lux 1999; Moore and Wilson 2002).

### ***Male Vulnerability to Risk-Taking***

Variance in RS is usually much higher for males than it is for females. This means that some males have no offspring while other males seem to monopolize reproduction. This, along with differences in body size, age at puberty, rate of senescence and life expectancy, appears to reflect a history of effective polygyny (Wilson and Daly 1985:60). Several studies (Chagnon 1982, Daly and Wilson 1978) have shown that males in small-scale polygynous societies, including the Aka (Hewlett 1987), have greater variance in reproductive success. Hewlett (1987) found that: 1) Aka males have greater reproductive variance; 2) 'exploratory range' was a function of distance traveled to find mates and males had a larger exploratory range and greater

variance in exploratory range than did females; and 3) ‘successful’ males such as *kombeti* were more likely to be polygynous than the average Aka male.

Greater variance in reproductive success equates to greater fitness payoffs for competitive abilities and risk-taking (Trivers 1985). This is particularly true for young males who are just entering mating competition (Hill and Kaplan 1999; Kruger and Nesse 2006). However, increased competitiveness and risk-taking also leads to increased external causes of injury and mortality, such as those caused by motor vehicle accidents, violent behaviors, hazardous occupations, and use of alcohol, tobacco and other drugs (Daly and Wilson 1997; Hazzard 1986; Kraemer 2000, Kruger and Nesse 2006, Wilson and Daly 1985). Aka adolescent and young males, for instance, are more likely to die from risky behaviors such as falling from a tree or hunting and gathering accidents (Hewlett 1987). Thus, smoking (as well as the use of other drugs) can be viewed as a risky behavior, one typically engaged in by males, as they are the ones with more to gain from partaking in risky, and potentially costly, behaviors. That smoking is a risky or costly behavior is also consistent with findings that smokers tend to be risk takers and sensation seekers (Zuckerman 1991).

Competitive abilities and risk taking occur in social settings, contexts that favor “honest advertising” (Wilson and Daly 1985). Honest signaling is required so others cannot cheat the system. As Wilson and Daly (1985:66) point out, “A signal or display that is supposed to be indicative of high resources or estimable personal qualities is only convincing when it cannot be counterfeited by individuals with fewer resources of lesser qualities.” Zahavi’s (1975) handicap principle demonstrates that such costly displays guarantee signal honesty precisely because lesser-equipped individuals cannot afford the display. These costly displays are known as handicap signals, or costly signals. Anthropologists have used handicap signaling models to

examine a variety of topics including “maladaptive” cultural practices, monumental architecture, wasteful foraging behaviors, men’s work, and charity (Bliege Bird 1999; Bliege Bird and Smith 2001; Boone 1998; Hawkes and Bliege Bird 2002; Miller 1999; Neiman 1998; Smith and Bliege Bird 2000; and Sosis 2000). Diamond (1992) extended Zahavi’s concept of handicap signaling to describe how drinking and smoking might be a form of costly signaling. This may be particularly applicable to young males just entering mating competition. If one can use tobacco and not be affected by its unpleasant or intoxicating effects, or continue to use it and remain alive and healthy, then the signal must be honest and the user must be superior, or so we think (Diamond 1992). As Wilson and Daly (1985:67) point out, risk acceptance has attained a “generalized prestige value” which may often be irrational. People use imperfect rules of thumb to make behavioral decisions. One rule of thumb is to follow the successful, even if the particular trait being copied has nothing to do with the actual accomplishments of the successful individual (*ibid.*). In sum, it is likely that the use of tobacco and similar substances will be most prevalent among men, particularly young men who are entering mating competition and are more likely to be risk-takers. It may also be used as a costly signal. Females with a particularly high inclination for risk may also be more likely to smoke.

### ***Male Vulnerability to Pathogens***

Increased selection in males for reproductive effort over somatic effort also leads to increased vulnerability to internal causes of morbidity and mortality (Kruger and Nesse 2006). Males, compared to females, are more susceptible to infection, injury, stress, physical challenge, and degenerative diseases (Kraemer 2000), which may result from other sex-specific vulnerabilities including parasitism (Moore and Wilson 2002). Nicotine, an ingredient in tobacco, is part of the plant’s chemical defense system against predation from herbivores

(Baldwin 2001). Importantly, the same categories of parasites that attack plants also attack humans and other animals and some animals are known to sequester plant toxins for their own defense against these parasites (Daly *et al.* 2002; Laurent *et al.* 2005). This is known as *pharmacophagy* (Boppré 1984). Hagen *et al.* (2009:64) hypothesize that the use of plant drugs, most of which have anthelmintic properties, is a form of human pharmacophagy—an “evolved response to chronic infections of helminthes.” If this were true, than one would expect more males, than females, to use tobacco and similar plant substances as they are at greater risk of being infected by helminthes.

### ***Toxin Avoidance***

Exposure to dangerous plant toxins, such as nicotine, usually produces two responses: reinforcing and aversive reactions (reviewed in Hagen *et al.* 2009). It is well known that the initial use of tobacco tends to be unpleasant, triggering a suite of aversive responses (Gilbert 1995). Nicotine stimulates the central nervous system and exposure can lead to salivation, sweating, nausea, dizziness, headache, vomiting and diarrhea (Shoaib 1998; Risinger and Oakes 1995; Eissenberg and Balster 2000; Laviolette and van der Kooy 2003; DiFranza *et al.* 2004; Reigart and Roberts 1999). Exposure to aversive stimuli also elicits aversive learning, the function of which is to change the behavior of the organism so that it avoids that which caused the aversive response (Hagen *et al.* 2009). Aversion and aversive learning probably limit the consumption of drugs (*ibid.*). For instance, nonsmokers tend to have more aversive responses than those who become smokers, which might prevent them from developing a smoking habit (Eissenburg and Balster 2000; Srivastava *et al.* 1991) and women may also be particularly sensitive to the aversive effects of nicotine (Silverstein *et al.* 1980).

Differences in the perception (e.g. taste or smell) of stimuli affect differences in aversive

responses, and subsequently aversive learning. Females would benefit more from acute olfactory (see Brand and Millot 2001) as well as gustatory senses as women can transfer toxins to offspring via amniotic fluids and breast milk, and because in our hominid past women were more likely to gather and prepare plant foods (Profet 1992). In nearly every major sensory system there are reports of gender differences (Velle, 1987) with females almost always displaying higher acuity than males (Oloffson 2005). Clinical studies have also found differences in taste perception associated with reproductive status (Doty 1986). It has also been shown that women in their first trimester of pregnancy tend to avoid highly spiced foods (spices are plants high in plant secondary compounds) (Sherman and Billing 1999) and Profet (1988, 1992) demonstrated that pregnancy sickness during the early phase of embryogenesis functions to reduce the maternal intake of foods containing dangerous toxins (teratogens).

Young children may also benefit from higher acuity as they are still developing and are at more of a risk for damage caused by toxins. Clinical studies have found differences in taste perception associated with age (Doty 1986). Young children, for instance, tend to avoid highly spiced foods (Sherman and Billing 1999). This is perhaps the evolutionary outcome one would expect, considering the different life history constraints for males and females, as well as young and old. Therefore, it would not be surprising to find that young children and females, especially those who are pregnant or of reproductive age, would generally avoid dangerous plant toxins, such as nicotine, more than adult males.

### Summary

Hundreds of studies exist on tobacco use in urban industrial nation states, but a paucity of data exists on its use in small-scale groups, especially hunter-gatherers. This study examines the



cultural models and patterns of use among one of the last remaining forager groups. Several hypothesis also exist on why males tend to smoke more than females, particularly in developing countries, yet again most studies were conducted in urban-industrial nation states where gender inequality is common. Consequently, gender differences are a secondary issue examined in this paper. Finally, while I take a cultural models approach, both political-economic and biocultural perspectives are considered.

## STUDY POPULATION

Aka forest foragers of the Central African Republic have an interesting relationship with tobacco because they have access to commercial and locally grown tobacco during parts of the year, however, due to their remote and marginal territory, they are relatively isolated from contact with Westernized societies and Western and urban cultural influences (e.g. lack of visual media, radios, etc). Aka (also called BaAka, Biaka and Bayaka) are a group of generally peaceful and egalitarian hunter-gatherers/forest foragers located in the western Congo Basin, a tropical forest region encompassing southwestern Central African Republic (hereafter referred to as CAR) and the northern part of the Democratic Republic of the Congo (DRC) (Bahuchet 1984, 1992; Hewlett 1990, 1991, 1992). (Aka forest foragers, like other African forest-foragers, are generally small in stature and are therefore commonly referred to as “pygmies.” Because of that term’s generally derogatory emphasis on size, the term “forest forager”, which emphasizes a subsistence strategy, is used throughout<sup>1</sup>.)

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<sup>1</sup> Local farmers use the Bantu term *babinga* to refer to forest-foragers. The term is also derogatory and carries with it the double meaning of forest-foragers as “nothing” and “everything” (Knight 2003:83).

There are an estimated 30,000 Aka (Bahuchet 1992; Hewlett 1996a). Most Aka spend a majority of the year in the tropical forest hunting and gathering. Aka have a strong identity with and preference for forest life yet maintain social and economic relations with neighboring farming populations (Hewlett 1996a). Aka speak a distinct Bantu language they call *diaka*, which is part of a subdivision of the Congo-Kordofanian phylum, and also speak a separate yet related language of their farming neighbors, the Ngandu (Hewlett 1992 1996a). Along with the !Kung, Aka represent one of the earliest modern human populations in the world (Chen *et al.* 2000). Aka belong to a larger family of West African forest foragers whose ancestral population may have diversified ~2,800 years ago, concurrent with the Neolithic expansion of agriculturalists (Verdu *et al.* 2009). Aka are also more related to other African forest-foragers than they are to their farming neighbors (Ramachandran *et al.* 2005; Verdu *et al.* 2009).

Although there are nearly 30,000 Aka, most Aka live in small camps scattered throughout the western Congo Basin. Camps range in size from 20 to 35 individuals, usually based on a particular patriclan. Camps may consist of groups of three to four adult males (usually brothers or first cousins), their wives and kids, a few older women belonging to the patriclan (an elderly mother or an older divorced sister of one of the males), a daughter of one of the males and her husband who is performing bride service, as well as a couple of visiting families (Hewlett 1991:21). As with other hunter-gatherer populations, fertility and mortality is high, and the population is relatively young (Hewlett 1990, 1991).

Aka have few status positions. There is a *kombeti*, usually the oldest male in a camp who is more influential in discussions over subsistence and camp movements and who is often the liaison between Aka and Ngandu (Hewlett 1991). However, the *kombeti* commands no authority in these discussions. He, or sometimes she, is not like a chief. As mentioned, Aka are egalitarian.

They have a number of non-institutional and informal methods of maintaining this egalitarianism, particularly prestige avoidance, rough joking and demand sharing (*ibid*). These methods run counter to those in hierarchical societies, such as chiefdoms, where prestige, respect, and accumulation of wealth prevail (Earle 1991). Aka core values, in contrast, include sharing, cooperation, and autonomy (Hewlett 1991).

Aka are transitional foragers (Hewlett 1996b). While they focus largely on net hunting and gathering resources in the forest, they nonetheless consume agricultural products on an almost daily basis. Aka also reside near the village for three to four months to provide labor to their *konza* (village patron or trading partner). In return Aka get plantation foods. However, they also receive clothes, salt, cigarettes, alcohol, axes and knives, and occasionally money (Lehman 2005). The trading relationship between Aka and their farming neighbors/trading partners is multidimensional with economic, social, emotional and religious dimensions (Hewlett 1996a). Aka, for instance, do not have their own traditional clans. Instead they have adopted the name of their patriclan from their Ngandu trading partners. This helps strengthen trading relationships as Ngandu and Aka children grow up with their future trading partners (Hewlett 1991). Despite these similarities however, both Aka and Ngandu regard each other as socially, economically, ideologically and politically different (Bahuchet 1993).

Aka and Ngandu have been in contact for centuries, perhaps well over 500 years (Bahuchet 1999). Once agriculturalists expanded into the area it had major effects on traditional relations between foraging populations. Genetic data (Verdu *et al.* 2009) suggests that the expansion of agriculturalists introduced new constraints on African forest forager mobility and intermarriages. Gene flow reduced between forest foraging groups and increased between forest foragers and their farming neighbors (*ibid.*). Hence, although African forest-foraging populations

are more related to each other than they are to their trading partners (Ramachandran *et al.* 2005; Verdu *et al.* 2009), ever since the Neolithic expansion of agriculturalists African foragers have become more genetically isolated, thus increasingly genetically differentiated (Verdu *et al.* 2009).

Research was conducted with Aka associated with Bokoka, a quartier of Bagandou located in the western Congo Basin, a tropical forest region encompassing southwestern CAR. There are approximately 300 foraging Aka associated with Bokoka (hereafter the Aka of interest to this study are alternatively called Aka or, when necessary, Bokoka Aka). In contrast, there are over 2000 Aka associated with the greater Bagandou area. Most of the nearly 800 villagers in Bokoka are Ngandu farmers. The Aka spend part of the year working in the fields for the Ngandu farmers and the rest of the year in the forests hunting and gathering (Hewlett 1992, 1996a). The Aka of interest to this study were camped along a trail leading from the Bokoka quartier to the forest. They often camp here until the caterpillar season starts, working for villagers and trading forest products to them. There are 12 camps in all, approximately 1400 meters apart. The first camp is 347 meters from the trailhead, located behind a villager's house in Bokoka. The last camp is 1,714 meters from the trailhead. These camps contained nearly all of the study participants, with an additional male participant obtained from a camp on an adjacent trail. In all, 106 Aka participated in the study, 66 adult females and 40 adult males. Because the Aka do not keep track of ages, adults were defined as being a married Aka with at least one child. Age ranged from approximately 18 to 70+.

## METHODS

Research took place between July 1 and July 31, 2008. Researchers stayed in the village of Bagandou, in the Bokoka quartier (neighborhood). Semi-structured open-ended focus group interviews and three separate structured surveys were conducted. All interviews/surveys took place with the aid of a local research assistant. Participants were paid the equivalent of \$1 USD for participating in the survey. Statistical analyses were conducted using Stata/IC 11.0 for Mac. The results of a separate yet related study that examines the relationship between parasite load and smoking is also shown (Hagen *et al.* n.d.). As I helped in the data collection of this study and am also displaying some of the results, the methods used to collect the data are also shown.

### Semi-Structured Focus-Group Interviews

In order to understand cultural models, social norms and beliefs related to *ndako*, open-ended and semi-structured informal interviews (Bernard 2006, 1988; Schensul *et al.* 1999) were conducted with adult Aka; first with a group of male Aka, then with a group of female Aka. Information on the types of *ndako* used, proscriptions and prescriptions for its use, and traditional beliefs about its use and of its medicinal uses was collected. These data were used to develop a working model of the beliefs and social norms for *ndako*, including what they use, how they use it, and the traditional beliefs about its use.

### Structured Surveys

In order to verify social norms and beliefs with a sample of adult Aka, as well as to begin to establish patterns of use, three structured surveys were compiled (Bernard 2006, 1988;

Schensul *et al.* 1999). The first survey included forty Aka, ages 25-45 (female n=20, male n=20). Variables consisted of gender, age (25-45), camp residence, smoking status (smoker, non-smoker or quit), types of *ndako* preferred and/or used the most, and age of initiation/experimentation. Data used in the present study include the most preferred substances to smoke, age started to smoke how they were influenced to start using, reasons females give for not smoking, and reasons why smokers continued to smoke.

A second structured survey, using 38 of the same Aka (female n=19, male n=19), was compiled to further assess cultural data and patterns of use. (As Aka often travel to the forest to hunt and forage it is difficult to ensure that each participant was available for questioning, thus explaining why two participants were excluded for the second structured survey.) Variables in this survey included gender, age (25-45), camp residence, smoking status (smoker, non-smoker or quit), mate preference (whether or not one prefers a partner who uses *ndako*), perceived health effects of using *ndako*, whether it is okay for pregnant women to use *ndako*, restrictions on who could use *ndako*, whether or not their grandparents smoked *tunga*, and parental smoking status. Additionally, a self-report health assessment was conducted as part of this survey to determine Aka beliefs about the effects of prolonged *ndako* use. Participants were asked whether they had ever developed a case of diarrhea, vomiting, or prolonged coughing and chest pain from smoking *ndako*. Data used in this paper include the traditional beliefs about the effects of *ndako*, whether or not they preferred a member of the opposite gender (mate) who smoked *ndako*, the perceived effects of prolonged *ndako* use, the effects of maternal smoking while pregnant, and whether or not their grandparents smoked *tunga*.

A final structured survey was conducted in order to increase the sample size and evaluate the broader distribution of *ndako* use as well as further investigate the effect of parental smoking

status. Participants include the same 40 as the first survey along with an additional 66 adults (18-70+ years) (N=106; female n=66, male n=40). Variables in this survey included gender, age (18-70+), camp residence, smoking status, and parental smoking status by sex (whether or not a parent is a smoker or quit). Self-reports of parental smoking were double checked with genealogical data to correct and clarify any contradictions (e.g. where two siblings disagree on a parent's smoking status). Mean rates for *ndako* use as well as prevalence of use by age and gender are displayed. Parental smoking status was excluded from the analysis.

### Stool Samples

In order to assess mean intestinal helminth loads, each participant provided stool samples. Participants collected stool samples using ParaPak collection vials with PVA formalin preservations. Participants were paid an additional \$1 USD for these samples. The Institute Pasteur in Bangui, CAR, semi-quantified levels of each intestinal helminth on a 0-4 point scale (absent, rare, some, numerous, very numerous). Techniques employed were direct examination (wet mount), pellet examination after centrifugation at 200g/10min, and concentration by sedimentation (MIF) (see Hagen *et al.* n.d. for more information on methods as well as additional results of the study).

## **RESULTS**

### Cultural Models

#### **Things One Smokes**

Aka smoke a variety of substances, including cigarettes, locally grown tobacco, cannabis, and a leaf that grows on trees in the rain forest (*Polyalthia suaveolens*, Engl. and Diels, Annonaceae). Of interest to this study are two forms of tobacco, called *ndako*—manufactured cigarettes called *blancs* and tobacco locally grown by Ngandu farmers, called *gbangaya* (*Nicotiana* sp.), and *tunga* leaves of *Polyalthia suaveolens*, a forest tree. Cannabis, called *bangi*, is also smoked, but data on it are limited because I did not have human subjects approval to investigate its use.

Aka prefer and primarily smoke manufactured cigarettes, called *blancs*. The word “*blanc*” (white) refers to the color of the cigarette packaging. Manufactured cigarettes used to be called *bleu* (blue) or *jaune* (yellow) when cigarettes were sold in blue and yellow boxes (Hewlett, personal communication). The only cigarettes currently sold in the village are sold in white packages, so all cigarettes are currently called *blancs*. Aka mainly work in the villagers’ gardens for *blancs* or money for purchasing them. They will also trade forest products to villagers for cigarettes. While in the forest (8-9 months out of the year) Aka get *blancs*, by trading forest products to villagers, loggers, and miners, but that is only when they encounter such outsiders, which is infrequent.

Aka also smoke *gbangaya*, a locally grown tobacco (*Nicotiana* sp.). In Bagandou, the villagers grow *gbangaya* in their fields<sup>2</sup> and sell the dried leaves in small, baseball sized, balls (Figure 1). Most Aka get *gbangaya* by working for villagers in their gardens or by trading forest products to them. A few Aka also plant *gbangaya* in the forest, yet this is not common. While Aka might use pipes (*makundu*) to smoke *gbangaya*, it is more common that they roll it in a

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<sup>2</sup> Tobacco is relatively easy to grow in a variety of climate and soil conditions (Akehurst, 1981). There are two major varieties of tobacco used worldwide, *Nicotiana rustica* and *Nicotiana tabacum*. *Nicotiana rustica* is the hardier of the two while *N. tabacum* is the most widely diffused (Furst, 1976). According to Thomas (2004) the variety grown in and around southwestern Central African Republic is *N. tabacum*.



dried leaf. Aka refer to a rolled *ndako* cigarette as a *mobinza* (a term used to refer to being rolled in a leaf, such as *gbangaya mobinza* or *tunga mobinza*). Most Aka prefer *gbangaya* (i.e. tobacco) to *tunga* because it is “more like a *blanc*”. *Gbangaya mobinzas* are usually more difficult to smoke than manufactured cigarettes are. *Bidis*, found throughout Southeast Asia, are also known to be more difficult to smoke than manufactured cigarettes. Because of the need to puff harder *bidis* often have higher deliveries of tar and carbon monoxide than paper-rolled cigarettes (Mackay & Erickson, 2002). The same may also be true of *gbangaya mobinzas*. This may also explain why Aka prefer manufactured cigarettes to *gbangaya* and *tunga mobinzas*. Aka consider *gbangaya* and *tunga* to be stronger and make them cough more than *blancs* and they usually only smoke *gbangaya* when there are no *blancs* around.



**Figure 1**  
**Rolls of *Gbangaya***  
 Image courtesy of Ed Hagen, Ph.D.,  
 Washington State University  
 Vancouver, 2008.



**Figure 2**  
***Polyalthia Suaveolens*, Annonaceae (*Tunga*)**  
 Image courtesy of Ed Hagen, Ph.D.,  
 Washington State University  
 Vancouver, 2008.

The third substance studied, and one the Aka may have been using the longest, is *tunga* (*Polyalthia suaveolens*, Annonaceae) (Figure 2). One traditional healer (*nganga*) informant mentioned that *tunga* is the “*ndako* of the ancestors.” Several other informants call it “forest tobacco”. *Polyalthia suaveolens* is common in the primary forest. Aka say that when they are in the forest it is easy to get *tunga* because the trees grow everywhere. Like *gbangaya*, Aka roll

*tunga* in a leaf. Most Aka feel that too much *tunga* at one time will make one cough a lot and some Aka consider it to be stronger than *gbangaya*. When near the village Aka rarely smoke *tunga*, and do so only when there are no *blancs* or *gbangaya* around. Even then one must go into the forest to collect some. When in the forest *blancs* and *gbangaya* are more difficult to get, which makes one rely more on *tunga*.

Aka refer to the leaves of *tunga* as *mango*, the roots as *fimbu*, the inner fleshy part of the root as *tunga kli*, and the bark of the tree as *ekoko*. The leaves, along with several other plant leaves, are often used to cover the base of the hut (*huma*) and the wood from *Polyalthia suaveolens* is also considered a good wood to burn for heating (Motte 1980).

As mentioned above, when something is rolled in a leaf and smoked it is usually called a *mobinza*. There are several types of rolling leaves the Aka use. Aka most commonly use *moseti* (*Renealmia* sp.) leaves for wrappers. They also use *mongongo* (*Megaphrynium* sp.) and *bendjo* (species name unknown). They will also use *esanja*, *undolu/ mutongelenge*, palm leaf, and *likoka* (species names unknown), but not as frequently. Hewlett (1977) also mentioned that Aka use a leaf called *ndilingbey* (species name unknown).

Aka sometimes smoke *ndako* with a pipe. They place tobacco in the bowl and inhale through the stem, sometimes through water. Pipes are common among central-African forest foragers. Efe archers, for instance, use bamboo and gourd water pipes, and Mbuti net-hunters use four-foot banana-stem pipes (Hewlett 1977). Aka pipes are not as elaborate as Efe and Mbuti pipes (*ibid.*), and it appears that the use of them is declining. While in the field, for instance, I never saw one being used. Pipes are currently known as *makundu*. Some Aka still refer to pipes by their old name, *pokbo*. Aka smoke all types of *ndako* with a pipe, including *gbangaya*, *blancs* (when they are broken), *tunga* and *bangi*. Aka use them both in the forest and near the village.

Pipes were probably adopted from Bantu villagers (*ibid.*), who might have adopted the technology from Arab traders (Laufer *et al.* 1930).

Dry snuff, a powdered tobacco inhaled through the nose or taken by mouth, is also common in and around Bagandou. However, Ngandu farmers use it much more often than Aka. Some farmers chew *gbangaya*, much like chewing tobacco is used in the West (Barry Hewlett, personal communication). However, the most common form of *ndako* ingestion among Bokoka Aka is either smoking manufactured cigarettes (*blancs*) or self-rolled *gbangaya* or *tunga* cigarettes (*mobinzas*).

## Cultural Models

### **Why smoke?**

Bokoka Aka believe that *ndako* makes one warmer and stronger. This has several effects. First, if one is warmer and stronger they are a better hunter and forager. The forest is often very cool, covered constantly by a canopy of vegetation. Therefore, smoking tobacco while in the forest to stay warm, according to the Aka, helps one become a better hunter. Being stronger and warmer also allows one to work harder for villagers. The more work an Aka does on a villager's plantation or the more forest products they can collect and trade to the Ngandu, the more cultivated foods, Western goods, and/or money they get. Finally, being stronger makes a person a better dancer/singer. The forest spirit, *dzengi*, likes it when people sing and dance, so smoking is something that *dzengi* enjoys. Smoking is particularly prevalent at dances (such as funeral dances), where *dzengi* often appears. Aka extensively share *ndako* (as well as alcohol) during these dances. *Ndako* plays an important role in many social affairs including hanging out with others, while at dances, as well as on hunts. Aka give about half of all the tobacco they obtain

from villagers to other Aka, often lighting it up and passing it around with friends and family members. In general, Bokoka Aka smoke *ndako* for its motivational and social effects. Aka are using it to help them be a better hunter and forager, to work harder, and to dance and sing better.

When participants were asked why they continue to smoke *ndako*, most (73.3%, n=11) Aka mentioned desire, *ndjala* (such as to desire *ndako*, sex or food). Some Aka (13.3%, n=2) also claimed that smoking *ndako* is their “normal thing”. Although Aka believe that smoking *ndako* gives strength and warmth, which can increase success in hunting, foraging and dancing, only a few Aka (13.3%, n=2) claimed that this is why they currently smoke.

### Cultural Models

#### **Medicinal Uses**

Medicinal plants are an important component of Aka curative treatments (Motte 1979). Most diseases and illnesses are treated with plants. In fact, over 80 percent of the resources extracted by *ngangas* from the environment to treat diseases and illnesses are derived from plants (Motte 1980). Besides smoking tobacco and *tunga*, Aka also use them medicinally. Bokoka Aka treat *dombo*, an unidentified skin-infection, by placing *gbangaya* directly on the infected skin. They also use *tunga* to treat stomach parasites (*madjembe*) by drinking a tea made of the roots and bark of the plant. They shave the roots and bark into ½ to 1-cup water where it soaks for five minutes (If one is really sick he or she can scrape the bark off of the tree and eat it right away). Children (*mona*) should take ¼ to ½ the dose of adults. Aka say it is very bitter tasting. A *tunga* tea was also listed as a treatment for prolonged coughing and chest pain due to smoking *ndako* (discussed below).

## Cultural Models

### **Perceptions of Health Risks Associated with Smoking**

This section examines cultural perceptions of health risks of smoking. Cultural beliefs about the effects of maternal smoking while pregnant and perceived impacts on long-term *ndako* use are considered.

#### ***Maternal Smoking While Pregnant***

Overall, 89.7% (n=35) of Aka questioned believed that maternal smoking while pregnant (MSP) was unhealthy for the baby. They listed several health risks including makes the baby sick, causes the belly to “get dizzy”, makes the baby cough inside the womb or once born, makes the baby suffocate and die once born, causes the baby to get diarrhea, makes the baby’s eyes “dizzy”, turns the baby very black, and makes the baby not listen when it grows up. One person stated that it was okay for women to smoke in later trimesters but not early on. Another informant stated that later trimesters were not okay to smoke during because *ndako* causes warmth and warmth makes birth difficult. Others thought it depended on the women and that the baby was fine if the mother did choose to smoke.

Although it was generally agreed that MSP was not healthy for the baby, there was no cultural taboo against MSP per se. *Ekila* is a term used by Aka and Baka to refer to practices or rules concerning hunting, eating, sex, and menstruation (Lewis 2008; see also Hewlett et al., 1986 or Bahuchet, 1985 for a description of *ekila* practices among the Aka). One is free to follow these prohibitions but if they do not (except by accident) there could be terrible consequences to one’s self or even to one’s child (Motte-Florac *et al.* 1993). For instance, in a causes-of-death study, Hewlett van de Koppel and Van de Koppel (1986) found that, according to Aka, *ekila* was the second leading cause of death of infants. When asked if MSP is *ekila*, most Aka (77%; n=30)

said it was not. Although most Aka did not think that smoking was *ekila*, a large minority (23.1%, n=9) still felt that it was. Of the few Aka who felt that smoking was *ekila*, these reasons were given: baby gets sick after birth; bad when breastfeeding because the baby gets the smoke of the *ndako* when mom is smoking; baby gets coughing inside the womb and diarrhea; and baby gets coughing once born. One participant mentioned that smoking was *ekila*, or *ekila* of *yama* (smoke), and explained it as “pregnancy eats the child.”

### ***Effects of Prolonged Ndako Use***

Aka associated several health effects with smoking *ndako*. Prolonged coughing and chest pain due to either *blancs* or *gbangaya* were the most commonly reported effects, with 82.6% (n=19) of respondents claiming these symptoms. Most Aka respondents (78.3%, n=18) also reported prolonged coughing and chest pain due to *tunga*. About half (47.8%, n=11) of the smokers reported vomiting from smoking *blancs*, and another 39.1% (n=9) reported vomiting due to *gbangaya* and *tunga*. The least present symptom was diarrhea (21.7%, n=5 for *blancs*; 17.4%, n=4 for *gbangaya*; and 13%, n=3 for *tunga*).

Aka mentioned several treatments for these illnesses. Treatments for coughing included bloodletting the chest, putting *mbaso* flowers in water and drinking it; making a *mongi* leaf tea; making a *moondango* bark tea; and making a *mokata* (*Garcinia Punctata*, Clusiaceae) and *tunga* (*Polyalthia suaveolens*) leaf tea. Headaches were also frequently mentioned as a consequence of prolonged *ndako* use. Treatments for headaches included bloodletting the head, using an *ekama* leaf snuff, *moondango* bark tea, or using *enzembe* bark mixed with water and snorted through a leaf (possibly also for coughing) (species names of plants listed unknown).

### Patterns of Tobacco (*Ndako*) Use

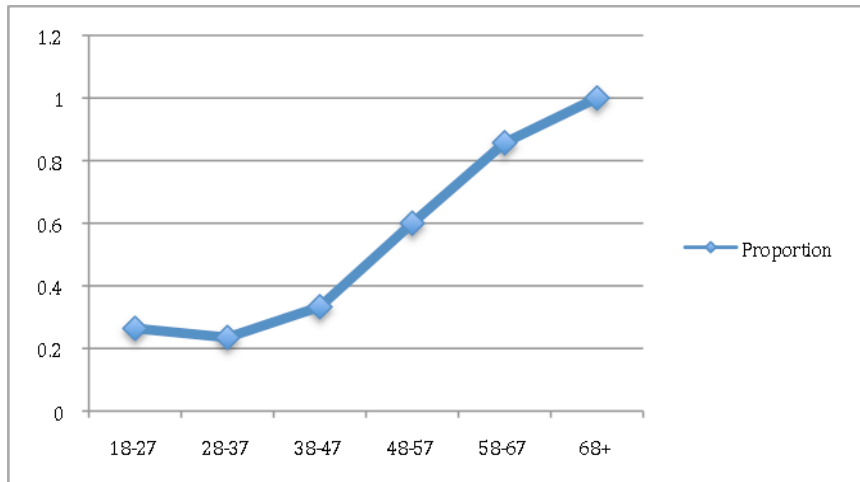
This section examines the overall mean rates of smoking tobacco. Although Aka also smoke *tunga* and cannabis, *tunga* is rarely smoked near the village where the study was conducted and I also did not have IRB approval to study cannabis. Therefore, the following results should be interpreted as referring to the use of both manufactured cigarettes and *gbangaya mobinzas*. Included are the mean rates of smoking by sex and by age, as well as reasons women gave for not smoking.

#### ***Gender differences***

Over half (58.5%, n=62) of the 106 adult female and male Aka participants (female, n=66; male, n=40), were smokers (i.e. self-report as regular users of *ndako*). When broken down by sex, 95.0% (n=38) of adult male Aka smoked compared to 36.7% (n=24) of adult female Aka, a highly significant difference ( $t=-7.3061$ ,  $df=105$ ,  $p=0.0000$ ). a difference of 58.3%. The only two males that did not smoke used to smoke but had quit for health reasons.

#### ***Female Age Trend***

A steadily increasing proportion of women smoked as their age increased. Over twenty percent of females ages 18-27 (25.9%, n=7) and 28-37 (23.5%, n=4) were smokers (Figure 3). Over thirty percent (33.3%, n=3) of females age 38-47 were smokers. Sixty percent (n=3) of the women between 48 and 57 were smokers and over eighty percent (85.7%, n=6) of the women between 58 and 67 years were smokers. The only participant over 68 years also smoked.



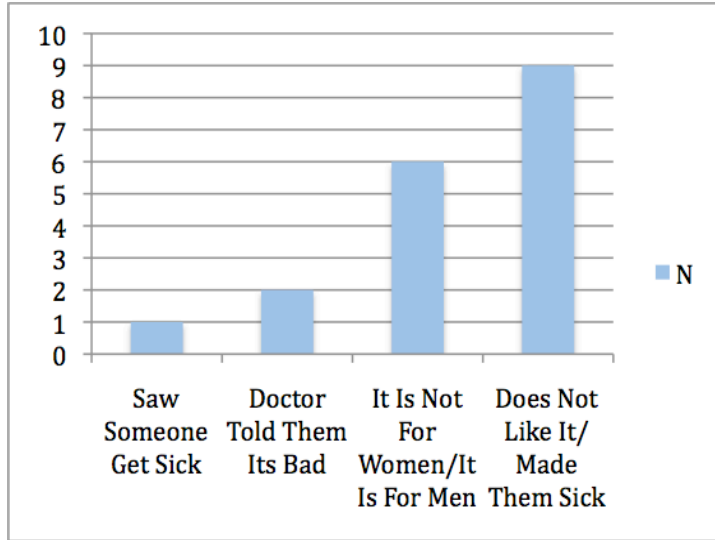
**Figure 3**  
**Female Use by Age**  
 N=66

Interestingly, while only 27.8% (n=15) of women between 18 and 44 smoked *ndako*, 75% (n=9) of women 45 and older smoked *ndako*. The difference between the two groups is statistically significant ( $t=-3.3$ ,  $df=105$ ,  $p=0.0017$ ). As nearly every male smoked age trends did not exist therefore they were left out of the analysis.

### ***Female Reasons for Not Smoking***

Half (50%, n=9) of the female non-smokers mentioned that they did not smoke because they did not like it/it made them sick (Figure 4). One third (33%, n=6) of the women also mentioned they did not smoke because it was not for women/it is for men. Two participants did not smoke *ndako* because a doctor told them it was bad, while an additional participant saw someone else get sick so decided not to smoke.





**Figure 4**  
**Reason Given by Females for Not Smoking**  
 N=18

Patterns of Use

**Social Learning and Mate Choice**

This section displays factors involved in social learning and mate choice including the age smokers began smoking, who influenced individuals to smoke, and whether or not each participant preferred a mate who smoked *ndako*.

***Starting to Smoke***

Aka generally did not want their young and sub-adult children to use *ndako* and believed that if they do they would get pains or get sick, and/or they would grow up to not respect their parents. While Aka generally believed smoking was bad for children and only adults should smoke, most Aka started smoking during adolescence. Twenty-two, or 84.6%, of the smokers started smoking when they were a *bokala/ngondo* (*bokala* is a male of about eleven or twelve to an adult while *ngondo* is a female of the same age). Four additional Aka (15.4%) started as a *mona* (a child who is starting to walk until about seven or eight years old).

The majority of Aka started smoking with their father or with a slightly older friend/sibling. Most (71.4%, n=15) of the smokers either had a smoking father as a role model or the father actively participated in the child's first smoking experiences (e.g. lighting it for them or passing them a lit cigarette). Another 14.3% (n=3) initiated smoking with an older friend or sibling. One female initiated smoking with her husband. Another participant mentioned they started because they "desired" to do it. The last participant mentioned they started with someone but did not mention whom that person was.

### ***Mate Preferences***

Both Aka males and females felt that if both people in a marriage smoked it could be either advantageous or disadvantageous for the relationship. It may be a good thing, because of the "similarity", or a bad thing that can cause a "struggle" between husband and wife. However, most Aka males preferred a woman who did not smoke while most females preferred a man who did smoke. All males (100%, n=19) preferred a woman who did not use *ndako*. Aka males did not like women who smoked for several reasons. Women may not listen or obey, they might become promiscuous, or they could take his *ndako*. They also mentioned that *ndako* makes women dizzy, lazy, and/or crazy. Most felt that *ndako* was for men, not for women.

Most females (78.9%, n=15) preferred a mate who smoked *ndako* because it gives them "strength" for subsistence hunting and foraging or for working for the villagers. Although most women preferred a man who smoked, reasons women offered for preferring a non-smoker mate were that *ndako* made men talk too much and get angry, it smelled bad, and men ended up stealing money for *ndako*.

### Mean Helminth Load by Gender

No significant gender difference in mean helminth load was found for the general population, although males do score slightly higher than females (Welch Two Sample t-test;  $t = -0.2772$ ,  $df = 36.655$ ,  $p\text{-value} = 0.7832$ ). Males had a mean of 3.2 helminthes while females had a mean of 3.0. Four males and two females had worm scores of 0 (i.e., no evidence of infection).

## DISCUSSION

### Cultural Models

#### **Things One Smokes**

Considering the Aka's long residence in and adaptation to the forest, it is only likely that they would have known of some indigenous plant with psychoactive properties. Several central African forest-foraging groups consume indigenous psychoactive plants. Hewlett (1977) reports that forest-forager archers<sup>3</sup> have a plant similar to cannabis they call *madeaka*, and that the Aka forest-foragers of Gabon smoke a native plant with opiate properties. While *tunga* does not seem to have the same properties as these psychoactive plants (Aka consider *tunga* to be more like tobacco than cannabis and even refer to *tunga* as "forest-tobacco"), *tunga* is nonetheless smoked for its psychoactive effects.

Although *tunga* is now the least desired substance to smoke, having such a substance in use prior to the introduction of tobacco and cannabis may have made the adoption of these substances much easier. Brady and Long's (2003) description of the political-economic and

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<sup>3</sup> Aka do not hunt with bows, but rather with nets.

sociocultural factors involved in the Kukatja's adoption of tobacco parallels that of the Aka's. Once tobacco was introduced to the Aka, especially commercially produced cigarettes, it may have represented a "savings in labor" over *tunga*, as tobacco is available in more volume and for less work than *tunga* is. One does not have to search for cigarettes in the forest nor spend the time and effort drying the leaves, finding the appropriate rolling leaf, rolling it, and smoking it (self-rolled *tunga* cigarettes, much like bidis, are more difficult to smoke than manufactured cigarettes). Aka also "gather" tobacco and other agricultural and Western goods from villagers (and occasionally loggers and miners) by trading or providing labor. They, like the Kukatja, may have simply shifted their gathering behavior from gathering traditional psychoactive substances like *Polyalthia suaveolens*, to "gathering" cultivated tobacco, and later manufactured cigarettes, from local farmers and others. Tobacco thus helps facilitate trade and seems to match traditional biocultural demands of work cycles, or "gathering" behaviors.

Tobacco use may fit well into preexisting patterns of psychoactive plant use by Aka forest foragers and the cultural model for *tunga*, perhaps, was applied to tobacco and cannabis once they were introduced. In this way, cigarettes may have become readily adopted and preferred. However, little is known about traditional patterns of psychoactive plant use prior to the introduction of these plants or how long *tunga* has been smoked. It is just as likely that smoking *tunga* became popular only after the introduction of tobacco and cannabis. *Tunga* could have been adopted during times when access to these commodities was limited. When Aka were asked whether or not their grandparents smoked *tunga* however, all Aka said yes (n=33). Thus, while it is unknown how long *tunga* has been smoked, it appears that it was commonly used as far back as two or three generations. Oral histories of the use of *tunga* and the introduction of

tobacco and cannabis need to be collected to better understand the adoption of tobacco and how it fits into preexisting patterns of psychoactive plant use, if any.

### Cultural Models

#### **Tobacco, Cannabis and Sharing**

Although not studied, African foragers also commonly smoke cannabis (*bangi*). Hewlett (1977) points out that Aka rarely smoke cannabis, especially considering its illegal status (meaning their Ngandu trading partners also use less cannabis so access to cannabis is limited). However, Hewlett's description of cannabis use by the Aka, Mbuti, and Efe forest-foragers dovetails nicely with the cultural model of *ndako* for Bokoka Aka. As Hewlett (1977:97) states: "Within minutes after acquiring the *bangi* the Aka smoke it in the same manner they would smoke tobacco, *ndako*, which is in a pipe or rolled like a cigarette in an *ndilingbey* or other leaf. In some instances tobacco is mixed in with the cannabis." Hewlett also found that foragers were using cannabis for its motivational forces (e.g., that African forest-foragers smoke cannabis to work harder for Europeans or villagers or to dance better or have more courage on a net hunt). Efe archers, for instance, smoke cannabis to keep warm and to increase their energy, courage, and skill in hunting (*ibid.*).

The cultural beliefs and norms for *ndako* fit well with other cultural schemes. First, as mentioned, Aka are egalitarian hunter-gatherers and three of their core values are autonomy, sharing and cooperation. *Ndako* is widely shared, both given away and smoked with others, in agreement with the core values of sharing and cooperation. Second, hunting for meat and collecting honey are two of the Aka's most important activities (Bahuchet 1984; Thomas 1987; Motte-Florac *et al.* 1993). Meat and honey, eaten to satiety, are essential for wellbeing. Meat,

especially, represents health. As Motte-Florac, Bahuchet & Thomas (1993:551) state, “the presence of meat reflects the hunter’s health (and through him the vitality of the whole camp) with which ‘meat’ is unconsciously assimilated.” To ensure success in hunting Aka often perform a number of rituals and practices. These are done to improve one’s hunting abilities, including hand-eye coordination, strength and intuition or luck (*ibid.*). It is not surprising then that Aka smoke *ndako* to stay warm in the cool forest, which helps one be a better hunter. Third, fumigation is also important to Aka. It links the world of men with the invisible world of Spirits. It is often used to solve problems with the spirits since smoke is capable of traveling from a visible to invisible state (Motte-Florac *et al.* 1993:558). Again, it is perhaps not surprising to find that Aka like to smoke during dances, at which the forest spirit, *dzengi*, is a central figure. Aka use smoke to appease *dzengi*, to make him happy by dancing well, which seems to agree with their use of smoke in relations with the Spirits.

Similarly, the !Kung hunter-gatherers, described by Damon (1973), attribute social as well as personal advantages to tobacco. They feel that smoking increases strength, wisdom, cleverness, agility, working capacity, planning ability, friendliness, social rapport, and kindness towards others. Tobacco is also a social activity, much more so for the !Kung than for the other populations. The !Kung prefer smoking with other people and often pass a pipe around during group discussions. They also incorporated tobacco into a trance-dance, although the Aka’s use of tobacco in relations with the spirits does not appear to be as ritualized as that described for the !Kung.

As pointed out by Groark (2010), although there are numerous health risks associated with smoking, for people who live outdoors, traditional tobacco use, at controlled doses, offers a number of benefits. The nicotine alkaloid, for instance, can increase attentional focus (Newhouse

*et al.* 2004), elevate mood (Gilbert 1995), enhance memory (McGehee and Role 1996; McGehee *et al.* 1995), reduce fatigue (Benowitz *et al.* 1990), reduce pain (Badio and Daly 1994), and decrease the surface temperature of the skin (Benowitz and Jacob 1982). Nicotine also reduces negative affect and may improve subjective wellbeing by enhancing concentration and task performance (Gilbert 1995). It has recently been demonstrated that nicotine may also benefit novelty detection and subsequent memory cognition in both smokers and nonsmokers (Foeliger *et al.* 2009). Smoking tobacco is highly situational and the situations which smoking is likely to occur are those associated with perceived benefits of tobacco use (Gilbert 1995). For Aka, the benefits of smoking are related to hunting, working and dancing, tasks that might require enhanced memory, reduced fatigue and pain, better novelty recognition and subsequent memory cognition. Therefore, Aka appear to be using tobacco as a labor/activity enhancer.

### Cultural Models

#### **Medicinal Uses of *Ndako* and *Tunga***

The medicinal use of tobacco is common among indigenous populations throughout the world, particularly in North and South America where tobacco originates (Winter, 2003; Wilbert, 1987). In many South American Amerindian groups tobacco is seen as a panacea. It has been used as a rectal enema to fight helminthic infestations, as a topical application to reduce pain, and some groups believe that it has the ability to endow human skin with its power, thus cleansing the body and restoring it to good health (Wilbert, 1987). Although tobacco is not native to Africa and was introduced in the 1500's, it is now a long-standing constituent in traditional pharmacopeias. People throughout the continent use it to treat epilepsy as well as to

combat the egg-laying Guinea worm. In southwest CAR, people drink a tobacco liquid to treat hemorrhoids and by placing tobacco into the anus (Neuwinger, 1996).

Like tobacco, *Polyalthia suaveolens* has medicinal uses throughout Africa. Okorie (1980) points out that the fruits, roots, and leaves of *Polyalthia suaveolens* are commonly used in Africa for its antiparasitic and anti-inflammatory activities, as a treatment of rheumatism and toothache, and even as an aphrodisiac. Baka foragers, a distinct yet closely related group of forest foragers (Bahuchet 1992, 1993) use *Polyalthia suaveolens* (called *botunga*) for a variety of medicinal purposes (Betti 2004; Hattori 2010). In the Dja Biosphere Reserve in Cameroon, for instance, the plant is used to treat headaches, snakebites and malaria (Betti 2004). To treat malaria Baka use the stem bark, by either soaking it in water (a maceration) and taking it orally or burning it and rubbing the ashes into the forehead via scarification (*ibid.*).

Interestingly, the leaf and stem bark extracts of *Polyalthia suaveolens* have been shown to contain several different chemical compounds including alkaloids, triterpenes, aporphine alkaloids, indolosesquiterpene alkaloids and polyphenols (Okorie 1980), many of which have been shown to have antileishmanial (Lamidi et al, 2005; Nyasse, et al., 2006) and antifungal (Lamidi et al, 2005; Abad *et al.* 2007) properties. Lamidi et al. (2005), for instance, tested the cytotoxic, antileishmanial and antifungal properties of *Polyalthia suaveolens* against *Leishmania infantum*<sup>4</sup>. They found that the stem bark methanolic extract from *Polyalthia suaveolens* displayed potent antipromastigote activity against the promastigote form of *Leishmania infantum* parasites as well as antifungal activity on all the tested strains. Nyasse et al. (2006) also found that the compound polycarpol, obtained from dried bark pieces of *Polyalthia suaveolens*, has both motility reduction and viability reduction activity on *O. gutterosa* worms (microfilaria)

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<sup>4</sup> Leishmaniases are parasitic diseases caused by the protozoa of the genus *Leishmania*, intracellular parasites transmitted by the bite of a sand fly.



which cause Onchocerciasis (“river blindness”)<sup>5</sup>. Using two similar experiments, polycarpol was found to have a motility reduction value of 28.6% and 7.1% and a viability reduction value of 80% and 42% against adult male *O. gutterosa* worms (*ibid.*). Findings such as these make it all the more likely that *tunga* might be as effective at treating stomach parasites (*madjembe*) as some Aka believe it to be. However, the specific type of worm Aka are trying to combat remains unknown.

## Cultural Models

### **Perceptions of Health Risks Associated with Smoking**

#### ***Maternal Smoking While Pregnant***

The Aka’s perception of the health effects of maternal smoking while pregnant (MSP) is consistent with what is known in the biomedical literature. As stated, Aka believe that MSP can make the baby sick, cause the belly to “get dizzy”, make the baby cough inside the womb or once born, make the baby suffocate and die once born, cause the baby to get diarrhea, make the baby’s eyes “dizzy”, turn the baby very black, and make the baby not listen when it grows up. According to the biomedical literature, MSP leads to several fetal health problems including spontaneous abortion or miscarriage, ectopic pregnancy, abruptio placentae, placenta praevia, premature rupture of the membranes, premature birth, smaller infant, stillborn infant, increased likelihood of the infant smoking when they are older, and other psychological and developmental problems (Mackay and Eriksen 2002).

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<sup>5</sup> Onchocerciasis is an insect-borne disease found in tropical areas such as West Africa. It is transmitted through the bite of infected black flies (*Simulium* spp) carrying the immature larval forms of the parasitic *O. gutterosa* worms.

### ***Effects of Prolonged Ndako Use***

Aka's perception of the effects of prolonged use is also consistent with what is known in the biomedical literature. Most Aka report prolonged coughing and chest pain, while vomiting and diarrhea were also mentioned. Smoking is responsible for 90% of all lung cancer, 75% of chronic bronchitis and emphysema, and 25% of cases of ischaemic heart disease (Mackay and Eriksen 2002). In 2000, 4.2 million premature deaths were related to tobacco. Men accounted for 3.4 million of those deaths. In the U.S. in 2000, over 25% of the deaths of men over 35 years old were related to tobacco, while 15-19% of female deaths were related to tobacco. In CAR, under 5% of men and women died as a result of tobacco use in 2000 (*ibid.*). The World Health Organization estimates that 7 million people will die prematurely each year by 2025-2030 (*ibid.*). Many of these deaths will occur in developing countries following the increased use of tobacco in those countries (Mackay and Eriksen 2002; Marshall 1993; Nichter and Cartwright 1991; WHO 2007). However, as with most populations (Gilbert 1995), although Aka associate smoking with ill health effects, the majority smoke anyways.

### **Political-Economic Factors**

#### ***Colonialism***

As mentioned, tobacco was introduced to Africa in the 1500s (Laufer *et al.* 1930) and it may have reached the Congo as early as 1510, according to Bushongo oral history (Jeffreys 1963). By the late 1800s German botanist and ethnologist Georg August Schweinfurth noted that tobacco was widely appreciated in the Congo region (Laufer *et al.* 1930). While little is known about the use of tobacco by Aka foragers during this time period, it seems to correspond well with the impact of colonialism. Hewlett (1991) points out that the colonial period was a time of

remarkable change for the Aka and their forest life. In the 1700s Ngandu farmers, fleeing Dutch slave traders, moved northward and settled on the southern banks of the Lobaye River which probably increased the population density of the area. By the late 1800s the demand for ivory had an affect on exchanges between farmers and Aka. While villagers were responsible for supplying ivory to European merchants, Aka were the ones who killed the elephants and provided the villagers with the ivory. As Hewlett (1991) points out, this increased the frequency and type of exchanges between the farmers and Aka.

The twentieth century also brought about dramatic change for the Aka. In the early part of the century Europeans became interested in rubber and while Aka were never employed to collect rubber, farmers were. Some farmers fled the forced labor situation to live with the Aka in the forest while others, not being able to hunt for themselves, increased their demands for meat from the Aka (Hewlett 1991). In the 1920s the French became interested in duiker skins and the market peaked in the 1950s. All these factors contributed to more demand for meat and the Aka eventually adopted net hunting. In the 1930s the French also attempted a 'taming policy' with little success (Bahuchet 1985). Today Aka move into the village for part of the year to work on villagers' coffee plantations. The coffee eventually makes its way to European markets and it is the principle source of income for villagers. Thus, the labor ties Aka into the larger global political-economic system. At the same time, the labor comes at the expense of missing the best net hunting season of the year (Hewlett 1991). The impact of colonialism on tobacco use among Aka foragers is unknown. However, it is likely that as colonialism intensified the relationship between the Aka and their Ngandu trading partners, tobacco played an important role in facilitating their transactions.

### ***Tobacco as Labor Inducer***

Tobacco use among the Aka is imbedded in their relationship with Ngandu farmers, particularly of labor exchanges. Aka, for example, get most of their tobacco by providing labor to their village *konza*. Particularly attractive to males is access to substances like tobacco, alcohol and cannabis. Females also provide labor to villagers, but they are not as interested in receiving these substances. The same is true for interactions with loggers, miners, and other foreign workers in the area, who use these commodities to induce labor. As mentioned, several anthropologists have pointed out that tobacco and other “drug foods”, such as coca leaves, sugar, coffee and tea (Mintz 1985 and 1997; Jankowiak and Bradburd 1996 and 2003; Gladwell 2001), have played a key role in facilitating trade within the expanding global economy. Jankowiak and Bradburd (1996) found that drug foods are most commonly used as labor inducers during early contact situations or during contacts with remote populations of hunter-gatherers and pastoralists. Tobacco also seems to function as a labor-inducer in relations between Ngandu farmers and Aka foragers. However, it is Aka males who participate most in this relationship. Furthermore, Aka also use tobacco as a labor enhancer; they smoke to become a better hunter, forager, worker and dancer.

### ***Shifting Patterns of Use***

Traditional patterns of *ndako* consumption seem to be declining among the Aka. Aka now prefer manufactured cigarettes to other forms of *ndako* and the use of pipes is also declining. Throughout Africa there has been a trend of an increasing use of manufactured cigarettes and a decreasing use of traditional plants and locally grown tobacco (Goodman 1993). Much of this is due to transnational tobacco companies and their advertising efforts. Developing nations are a profitable market for tobacco companies. Tobacco companies spend about \$12.5

billion annually on advertising in the Third World (Singer 2004), which has helped increase the number of people who smoke in those countries (Mackay and Eriksen 2002; Nichter and Cartwright 1991). Another factor involved in this shifting trend, especially in parts of Africa, is urbanization and acculturation (Kaplan *et al.* 1990; Waldron *et al.* 1988; Stebbins 2001). It is likely that these factors may affect patterns of tobacco consumption among Bokoka Aka as well.

At present, while Bokoka Aka have access to manufactured cigarettes they are relatively isolated from capitalist media influences (TV, radio, they cannot read magazines, etc.) including tobacco advertising; and while cultural-ecological factors impact forest-foragers throughout central Africa, Bokoka Aka are less acculturated and more mobile compared to other forest foragers, such as the Baka in Gabon (Knight 2003) and Bofi-foragers in southwestern CAR (Hewlett *et al.* 1986). Although the use of tobacco as a labor inducer must factor into patterns of tobacco use, the Aka's preference for manufactured cigarettes may simply be due to the fact that cigarettes are more pleasurable to smoke. For instance, Aka mention that *blancs* are easier to smoke, and that *tunga* and *gbangaya mobinzas* make them cough much more than cigarettes. And studies have demonstrated (Vallance *et al.* 1987; Mougne *et al.* 1982) that inhalation is much easier with manufactured flue-cured cigarettes than with traditional air-cured tobacco, partially explaining why manufactured cigarettes are usually preferred over traditional tobaccos.

### ***Health and Acculturation***

Infectious-parasitic and diarrheal causes of death account for nearly half of all Aka deaths, with diarrhea being the number one cause (26.2%) of all adult Aka deaths. Many of these deaths may be related to cultural-ecological factors, including acculturation and the effects of logging and mining, which put the Aka at risk for malaria, schistosomiasis, smallpox, pneumonia, measles, and poliomyelitis (Hewlett *et al.* 1986). These cultural-ecological factors

may also have an effect on patterns of tobacco use and related health problems. Respiratory deaths, including bronchitis (*mombandja*), for instance, account for a major fraction of Aka deaths (*ibid.*). However, bronchitis accounts for 3.9% of all adult Aka deaths in Bokoka whereas among Bofi-foragers, a closely related group of foragers, 30.8% of the deaths were related to bronchitis (*ibid.*). Bofi-foragers are closely associated with the Bofi, a local village ethnic group. They speak Bofi, not the Aka language, and have generally become sedentary, residing in the village most of the year.

Since Bofi-foragers stay in the village more often, they have more access to and smoke tobacco more often (Barry Hewlett, personal communication). In fact, Bofi-foragers have a cultural emphasis on tobacco and hence have a higher frequency of smoking than other Aka (Hewlett *et al.* 1986). Hewlett van de Koppel and van de Koppel (1986) suggest that the higher frequency of tobacco use, relative to Bokoka Aka, might account for the increased incidence of bronchitis. If acculturation accounts for the differences in smoking behavior between Bofi-foragers and Bokoka Aka, then increased acculturation for Bokoka Aka may also lead to similar increases in prevalence of smoking and respiratory illnesses. As mentioned, Aka are already beginning to settle near the village for longer periods of time in order to work more often for Ngandu farmers. This likely results in increased access to tobacco. As the area becomes more urbanized Aka are likely to come under the influence of tobacco advertising as well. Unfortunately, although health effects of tobacco smoking are realized, several illnesses and deaths related to smoking may often go unnoticed. For example, in Hewlett *et al.*'s (1986) causes-of-death study, according to the Aka, supernatural forces (*amu wa diuwa, dja dijundi*) account for over ten percent (10.8%) of all Aka adult deaths, while another 21.4% of deaths were

unknown to the informant or were unclear descriptions (*ibid.*). Therefore, it is reasonable to speculate that smoking causes a greater health problem than self-report data alone can estimate.

### Patterns of Use

#### ***Prevalence of Use***

Compared to developed Western industrial societies, most developing nations and indigenous societies, particularly those that have been colonized by other people (Brady and Long 2003), have a higher prevalence of tobacco use (Mackay and Eriksen 2002). In the United States and Italy, for instance, 23.6% and 24.9% of the population smoke, respectively. In Guinea and Kenya, however, 51.7% and 49.4% of the population are smokers, respectively (Mackay and Eriksen 2002). The Aka, like those of other indigenous and underdeveloped populations, also have a higher prevalence of smokers relative to Western Industrial countries (Table 1). The high rates of smoking in developing countries is related to political-economic factors including aggressive marketing of cigarettes by transnational tobacco corporations, acculturation, and a history of colonialism and globalism (Stebbins 1990 and 2001; Nichter and Cartwright 1991; Singer 2004; Mackay and Eriksen 2002; WHO 2007).

### Patterns of Use

#### ***Prevalence of Use by Gender***

According to the World Health Organization about 50% of males and 9% of females in developing countries smoke, a difference of over 40% (Mackay and Eriksen 2002) (Table 2). In developed countries, 35% of the males and 22% of the females smoke, a difference of only 13%. In the Democratic Republic of the Congo (DRC), for instance, 40-49% of the males smoke

compared to 10% of the females, a difference of 30-39% (*ibid.*). Aka follow a similar trend as developing countries, with the mean rate of adult male smokers being almost 60% higher than that for adult female Aka.

**Table 1: Prevalence of Smokers, World Populations**

<b>Population</b>	<b>Mean Rate of Smokers</b>
United States*	23.6%
Italy*	24.9%
India*	16.0%
Guinea*	51.7%
Kenya*	49.4%
Aka**	58.5%

\*Data from Mackay & Eriksen (2002)

\*\*N=106

While religious proscription and the subjugation of women can often be cited as the cause of the gender differences in smoking in developing nations it does not appear to be the case for Aka. Aka are egalitarian and although there is an evident sexual division of labor, Aka essentially have no ascribed gender hierarchy. While males usually retain all the named positions, such as *kombeti*, *tuma* (great elephant hunter) and *nganga*, their power and authority is subdued and women tend to have pronounced political power and prestige (Hewlett 1991). Aka men and women often net-hunt and forage together and one is not ridiculed for participating in activities usually designated for the opposite sex. Men will often carry baskets and digging sticks and women will carry the men's nets, spears and crossbows (*ibid.*). Autonomy, rough joking,



prestige avoidance and demand sharing are all core values that help maintain this marked egalitarianism.

**Table 2: Prevalence of Smokers by Sex, World Populations**

<b>Population</b>	<b>Females</b>	<b>Males</b>	<b>Difference</b>
Developed*	22%	35%	13%
Developing*	9%	50%	41%
China*	<10%	60%	>50%
Democratic Republic of the Congo*	10%	40-49%	30-39%
Aka**	36.7%	95%	59.3%

\*Data from Mackay & Eriksen (2002)

\*\*N=106

Considering these core values, it is likely that females are free to smoke *ndako* or not. Given this freedom, it appears that Aka women choose to smoke at rates comparable to rates in more developed countries, where women also have the freedom to smoke or not. For instance, the prevalence of use for Aka women is 36.7%, much closer to the 22% of women in developed countries than it is to the 9% of women in developing countries.

***Female Reasons for Not Smoking***

While there is definitely a gendered effect to smoking patterns (e.g. most smokers are men, several women do not smoke because *ndako* is “for men/not for women”, and men do not prefer women who smoke) among the Aka, most women who do not smoke do so for personal (do not like it/made them sick) rather than gendered or proscriptive reasons. This is as expected, considering Aka values of autonomy and egalitarianism. If women wish to try *ndako* they will not be ridiculed. In fact, several women have tried *ndako* and many of them remain smokers. On

the other hand, several of them tried and did not like it and do not use *ndako*. Rowe (1994:189) argues that in societies where religious and legal restrictions on smoking are removed, females' use usually increases and levels off at a rate "diagnostic of their biological proclivities." This seems to be the case for Western democratic societies as well as Aka foragers, where values such as gender equality and autonomy give women the freedom to try smoking and decide if they like it or not.

### ***Female Age Trend***

Aka females are more likely to smoke as age increases. One possible reason may be that as younger women are more likely to be pregnant, they are more likely to avoid tobacco smoking. Aka, for instance, believe that smoking while pregnant is unhealthy for the baby. It might also be that the gendered effect of smoking is strongest for young women, who are trying to attract potential mates (and most males do not like women who smoke), or some combination of both.

Additionally, post-menopause is a period when many Aka women, having divorced a husband or been widowed, move back in with their brothers or sons (Hewlett 1991). Living with close kin may present additional liberties for older women. Older women tend to have fewer restriction or prohibitions. For instance, Motte-Florac et al. (1993) points out that while women and children are prohibited from eating monitor lizard meat, old women are 'strong' enough to consume it. Women also claim that after menopause they become "more like a man" (Bonnie Hewlett, personal communication). Thus, although smoking seems to be a "male" activity, it is by no means restricted to males only. In fact, the majority (77.6%, n=13) of women ages 48 to 68+ use *ndako*.

## Patterns of Use

### **Social Learning and Mate Choice**

#### ***Starting to Smoke***

Societies throughout the world, for the most part, proscribe the young and sub-adult from using tobacco, particularly as they are at greater risk of being affected by its aversive effects. Likewise, Aka also do not want their children to smoke and believe that if they do they will get pains or get sick, and/or they will grow up to not respect their parents. This is not to say that smoking by children and adolescents is proscribed (Aka children are granted a substantial amount of autonomy), just that it is generally frowned upon. Regardless of age restrictions, three quarters of adult tobacco users began smoking between the ages of 11 and 17 (Eissenberg and Balster 2000). According to Damon (1973) most (57%) !Kung smokers also began smoking between the ages of 10 and 19. Likewise, most Aka smokers also begin smoking during adolescence, as *bokala/ngondo* (from about the age of 11 to around 18). Considering that most Aka smokers also initiate smoking with an older male, it may be that young Aka males associate using *ndako* with being an adult, as these older men provide role models for proper adult behavior; a sort of ‘rite-of-passage’ into adulthood. This ‘pro-tobacco socialization’ may explain why so many more males than females are smoking. For example, social norms for tobacco use are known to play a role in gender differences in use when smoking is viewed as a rite of passage for boys (WHO 2007). Interestingly, in a study performed by Boyette (2010), investigating patterns of sharing among Aka juveniles, of all the resources shared 92% were food items shared by girls. This is consistent with an adult female’s role as food distributor. Shared cigarettes made up an additional 6% of the items shared. However, 14 out of 15 of the cigarettes shared were

shared by males (*ibid*). Thus, even early on, Aka boys and girls are beginning to act out their gendered roles, and for males this includes experimenting with tobacco.

### ***Mate Preference***

Aka males do not like women (as potential mates) who smoke and think that if they do they get dizzy, lazy, and/or crazy. Several thought that they may not listen or obey, they might become promiscuous, or they could take his *ndako*. Most, however, felt that *ndako* was for men, not for women. In general there is an idea that females should not smoke and those that do are easily affected by tobacco's psychoactive and aversive effects or else they are 'deviant' in some sort of way. In contrast, most females prefer a man who does smoke. Women prefer a man who smokes because it gives them strength in subsistence activities. Tobacco, thus, seems to represent not just adulthood, but masculinity as well. To be an adult male Aka, that is if one wants to be a provider (a good hunter, worker and forager), properly appease the spirits (i.e. dancing well for *dzengi*), and most importantly acquire a mate, then one smokes *ndako*.

Overall, there appears to be marked pro-*ndako* socialization for young males; primarily males use *ndako*, initiation typically occurs under the influence of an older male, and women generally prefer men who smoke. In effect, tobacco use is like a rite-of-passage into adult role behavior for Aka males.

### **Biocultural Approaches**

According to D'Andrade (1980:182), an important assumption of cultural models is that:

“... in the process of repeated social transmission, cultural programs come to take forms which have a good fit to natural capacities and constraints of the human brain. Thus, when similar cultural forms are found in most-societies

around the world, there is reason to search for psychological factors which could account for those similarities.”

Aka cultural models, social norms and patterns of use for *ndako* seem to be consistent with the biological and psychological factors detailed above.

### ***Risky Behaviors***

As Hewlett (1987) demonstrates, Aka males are more likely to engage in and die from risky behaviors, which is a function of increased variance in reproductive success. Interestingly, tobacco use is seen as a risky behavior partaken predominantly by males or other people “strong” enough to handle its effects. For the most part, women prefer a man who smokes while men prefer a woman who does not smoke. Aka males also smoke exceedingly more than Aka females. Furthermore, while the use of *ndako* by young Aka is frowned upon, most Aka initiate during adolescence coincident with their entry into mating competition. Once young males think they are “strong” or “tough” enough to handle *ndako* they likely begin to smoke. Thus, the high prevalence of smoking could be a product of male-male competition. It could also serve a function, however, in that young males use tobacco as a sort of costly signaling display. Finally, the idea (from the males’ perspective) that women smokers don’t listen or obey, become promiscuous, or steal *ndako*, or that children who smoke grow up to not respect their parents, is consistent with studies that have shown that tobacco smokers tend to be risk takers and sensations seekers (Zuckerman 1991), traits usually characteristic of males, but also present in females to a lesser degree.

### ***Toxin Aversion***

At a general level, Aka adults tend to think kids get sick if they use *ndako*. Aka men also think that women who smoke get dizzy and sick and think that smoking is not for women.

Likewise, women have the freedom to try *ndako* and several have. Many of those that try tobacco also do not like it or it made them sick. Aka also believe that maternal smoking while pregnant is dangerous for the developing baby. Thus, the use of tobacco and *tunga* is recognized as a risky behavior, particular for certain segments of the population such as young women and children. This is consistent with the evolutionary perspective that women in their childbearing years, particularly those that are pregnant, and children, are more averse to toxins as they are investing more in somatic effort compared to adult males. Furthermore, once Aka women are past the age where they risk harming a fetus with dangerous teratogens (post-menopause) their mean rates of smoking increase. This is also an age where women are “strong” and “more like a man”, which means that certain proscriptions held for children and young women no longer pertain to them.

### ***Infectious and Parasitic Diseases***

Although males do not have significantly higher amounts of parasites, it may be that as males smoke more their higher intake and absorption of nicotine helps prevent helminth infection. There is some preliminary support for the pharmacophagy hypothesis however, in that smokers with higher salivary cotinine levels had significantly fewer parasites ( $r=-0.5$ ,  $p=0.04$ ) (Hagen *et al.* n.d.). Additionally, it is interesting that Aka both smoke *Polyalthia suaveolens* and use it as a medicinal anthelmentic. Considering that *Polyalthia* has been shown to have antileishmanial and antifungal properties it is possible that *tunga* was used as a form of human pharmacophagy long before tobacco was introduced.

## Integration

The integration of culture, political economy/ecology and evolutionary factors contribute to an understanding of gender differences in tobacco use.

Evolutionary theory predicts that males are more likely to use tobacco and other substances, as they are more likely to be risk takers (due to increased variance in reproductive success), as well as carry pathogens (due to increased investment in reproductive effort at the expense of somatic effort). This is not to say that all males will smoke, just that males are more likely to smoke than females. While the predictions hold for the Aka, however, they cannot explain why all males smoke. Cultural factors seem to be amplifying the biological differences. As Wilson and Daly (1985:59) point out, while “manifestations of ‘taste for risk’” is primarily a male trait, it is “socially facilitated by the presence of peers in pursuit of the same goals.” Young males, for instance, are more likely to have tobacco be a part of their entry into adulthood—as a sort of ‘rite of passage’. Once they enter into adolescence and young adulthood, the peak of mating competition, they begin to take on adult male roles, and smoking is part of the symbolic repertoire of that role. Other factors, such as religious subjugation or legal restriction, often play a role in gender differences in tobacco use in other small-scale societies, but this is not the case for Aka. Here, egalitarianism and autonomy are core values that allow Aka females to try tobacco if they so desire.

Political ecological factors can also amplify or diminish the gender differences. For Aka, and many other populations, for instance, tobacco is used as a labor inducer. This particularly affects Aka males, who are interested in acquiring tobacco. Aka females, in contrast, are less interested. Therefore, tobacco as a labor inducer does not relate to females as much as it does to males. Males are also more likely to be infected with parasites, which may influence their high

rates of use. While the prevalence of helminthes did not significantly differ by sex, it is possible that as men are more likely to smoke they are preventing more parasites. Therefore, one would not expect to find a significant difference in parasite load. In other words, if females were also using tobacco to the degree that males were, they might have significantly fewer parasites than males.

Young women who are more likely to be pregnant, as well as young children who are still developing, should also be less likely to use. Not only does this correspond to what is known about gender differences in olfactory and gustatory senses, but it also corresponds to the age trend for Aka females in that the younger a female is (and hence nearer her peak reproductive years) the less likely she is to smoke. The Aka belief that pregnant women should not smoke because it is dangerous is also consistent with the model and does not appear to be affected by Western biomedical information. The belief that older women are stronger and more like a man than young women and children is also consistent.

To summarize, cultural factors (tobacco as a 'rite of passage' into adulthood), political-economic (acculturation and tobacco as a labor inducer), and biological (sexual selection and pharmacophagy) all potentially contribute to the higher rates of smoking among Aka males.

## CONCLUSIONS

Beyond nicotine's reinforcing and dependence producing effects, culture also plays a major role in the maintenance of tobacco use. This study highlights such cultural factors among Aka foragers of the Central African Republic. The use of tobacco (*ndako*) and similar substances is consistent with the cultural beliefs and social norms of egalitarianism, sharing, autonomy, hunting and foraging, dancing, and traditional plant medicines. Namely, Aka believe that tobacco



and similar substances (*Polyalthia suaveolens* and cannabis) give them strength and warmth. This helps one become a good worker, hunter, forager, dancer and singer.

Gender differences in tobacco use were also examined. Aka gender differences in prevalence of use are pronounced, much like they are in developing countries. Males smoke significantly more than females. However, while women in most developing countries are proscribed from using tobacco, Aka women have the freedom to choose to smoke or not. Many have tried tobacco, some of those became smokers and many others did not like it. Generally speaking, the large gender difference exists because so many males smoke (nearly 100%), and the high mean rate of Aka male smokers is due to the marked pro-tobacco socialization for young males. The majority of smokers are male, they begin smoking during adolescence, and they were influenced by an older male figure. Aka females also prefer males who smoke because of their potential success in hunting, working, and foraging. There is also an age trend for females. Older women are more likely to smoke than younger women, consistent with the idea that older women are “more like men.” Younger women are also more likely to be pregnant and most Aka think that maternal smoking while pregnant is bad for the baby, which may contribute to why so few Aka women between the ages of 18 and 44 (compared to the rest of the population) use *ndako*.

Tobacco use is also linked to larger political-economic factors including labor exchanges between Aka and farmers, a history of colonialism, as well as the expanding global economy. Aka acquire most of their tobacco by working for villagers, colonialism has affected that relationship, and cultural-ecological factors such as urbanization and acculturation make cigarettes more available. However, this seems to be affecting men more than women, as men are more likely to engage in labor for tobacco. Some of the biological factors involved in gender

differences in tobacco use were also highlighted, in order to contextualize the research in a broader biocultural framework. Males may be using more to prevent infection of helminthes and/or because they are more likely to engage in risky behaviors. Young women, in contrast, are at risk of transferring dangerous toxins to offspring via amniotic fluids and breast milk and are therefore more likely to avoid tobacco. Interestingly, many of the cultural models are consistent with the evolutionary perspectives. Future studies should also take a holistic approach, and integrate the cultural, political-economic, and biological dimensions of tobacco use.

This is one of the first studies to examine the cultural models and patterns of use for tobacco among a group of central African forest foragers/hunter-gatherers. Future work will aim to tease apart the biological and cultural factors involved in female patterns of use. Better measures of frequency of use need to be used as well in order to examine dimensions of male tobacco use. Oral histories of the introduction of tobacco and of the use of other substances also need to be collected. Finally, as Aka have a close economic, social, and religious relationship with Ngandu farmers, it is important to investigate the cultural models and patterns of use of tobacco and similar substances for the Ngandu.

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