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# Areca Nut Dependence Among Chewers in a South Indian Community Who Do Not Also Use Tobacco

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# Abstract

**Aims**—The goal of this study was to examine evidence of areca dependence in a large, representative sample of areca-only (i.e., no tobacco) chewers using established measurement scales. Information was also gathered on use patterns in this population.

**Methods**—Daily chewers (N=59) from Karnataka State, India were surveyed in 2005. Questionnaires assessed chewing history, patterns of use, and dependence features. Additionally, the relationship between topography and dependence scores was evaluated.

**Results**—Approximately half of respondents reported 1–3 chews/day (mean = 1.9; SD = 0.98). The average number of chewing episodes/day was 4.4 (SD = 3.4) and the average number of nuts/ day was 1.2 (SD = 1.1). Users' typical chew lasts up to 20 minutes and includes spitting out the juices and rinsing the mouth with water. Overall, the levels of reported dependence symptoms were low, but approximately 44% of chewers endorsed at least one of the following items: continued use despite illness or wounds, difficulty refraining from chewing in forbidden places, or craving during periods of abstinence. Approximately 15% of chewers reported at least one quit attempt, and 13.6% had scores indicative of dependence on the modified Cigarette Dependence Scale (Score >16). Dependence scores were positively correlated with frequency of use.

**Conclusions**—High levels of dependence were not observed in this sample of regular betel-only users, but many users reported at least one symptom and a few had several symptoms. The levels of dependence observed in a subset of informants' warrant further investigation as evidence for possible betel dependence.

# Keywords

Areca; Betel; Dependence; Topography

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# Introduction

Areca nut is the fourth most commonly used social drug, ranking after nicotine, ethanol, and caffeine (1). Over 600 million people presently use some form of areca nut worldwide, with the centers of heaviest use in Asia and the Western Pacific, as well as the Asian Diaspora who have settled in Africa, Australia, and the United States and United Kingdom (1, 2). Areca preparations and specific ingredients vary by cultural group and individual user. In South Asia, for example, use involves the chewing of raw, dried, boiled or fermented nut (seed of the Areca catechu palm). In India, shards of the nut are traditionally rolled into a betel leaf (*Piper betle* plant) with slaked lime (calcium hydroxide) and other additives (spices, sweeteners, tobacco) (3). This betel quid is typically placed between the users' gum and cheek for juice extraction. Still others prefer commercially manufactured dry areca products (e.g., Paan masala, Supari), which are convenient and imperishable mixtures that allow for widespread use. For example, these products are sold in the U.S. in Asian grocery stores (4). Made available in the past ten years, the majority of these manufactured products contain tobacco (e.g., Gutkha, Mawa). Such areca-tobacco mixtures have been the subject of controversy given their popularity among adolescents (e.g., 5) and the well-established dependence syndrome associated with use of oral tobacco products (6). Additionally, inclusion of tobacco in the chew exacerbates health risks associated with areca nut use alone, including cardiovascular disorder (8), oral submucous fibrosis (OSF), leukoplakia, and erythroplakia (9, 10, 11, 12).

Areca nut self-administration, with or without tobacco, is likely supported in part by arecoline, the primary psychoactive constituent in the nut. Arecoline is an alkaloid with primarily muscarinic cholinergic agonist properties (13). Thus, areca nut consumption affects both sympathetic (e.g., increased adrenaline and noradrenaline) and parasympathetic (e.g., increased heart rate and blood pressure, pupil dilation) as well as the central (increased attention, dizziness) nervous systems (14, 15, 16). These findings parallel chewers' subjective reports of increased perspiration and salivation, improved digestive function, and focused attention following quid consumption (e.g., 17). The question remains, however, whether self-administration of areca nut supports any level of dependence in chewers (see 18 for review). Unfortunately, well-designed studies examining the presence of classic substance dependence features (e.g., tolerance, withdrawal, craving, continued use despite harm, unsuccessful efforts to reduce use; 19) in areca nut users are virtually non-existent (but see 20, 21). Most available studies reporting evidence of dependence include those which fail to delineate users of areca nut with and without tobacco, are based on a small sample size (e.g., N=10 or 28), and/or rely on anecdotal or retrospective data (22, 23, 24, 25). Moreover, reports which describe a withdrawal syndrome during periods of areca nut abstinence (i.e., difficulty concentrating, fatigue, craving, and anxiousness) are largely observational in nature (e.g., 17, 23). Thus, a more systematic evaluation of these factors, and their relationship to any evidence of dependence, is warranted. A starting point might be to identify regular chewers of areca-only products for assessment of dependence evidence using generic criteria using various measures. In addition, very little is known about the topography of betal only use. Consequently, a purposive sample of areca nut users without tobacco was surveyed from a South Indian community and asked detailed questions about their use and possible dependence.

# Methods

#### Selection of participants

A purposive sampling procedure was used to identify and enroll participants who were regular users of betel-only products. Specifically, interviewers familiar with the area (M.N.,

M.N., and J.S.) visited six different villages in Dakshina Kannada District, Karnataka State, India. Key informants, agricultural workers at two nearby plantation research centers (one on the Karnataka side of the border and the other on the Kerala side of the border; within 40 Km of each other), narrowed the search to households where chewers were known. Additionally, an advertisement placed in the local paper to disseminate the knowledge that interviewers were in the area and recruiting areca chewers. This combination of sampling procedures resulted in a total of 95 complete interviews with chewers who initially appeared to fit the inclusion/exclusion criteria (daily use of areca nut without tobacco for at least one year and no current use of other tobacco products). Thirty-six of these respondents, however, were eventually excluded from analyses due to use of areca with tobacco (n=2), current use of other tobacco (n=20), use of areca for < 1 year (n=6), or less than daily chewing frequency (n=8). Thus, all data reported below are based on a final sample of 59 chewers.

#### Interview procedures

Semi-structured, open-ended interviews were conducted from January to March, 2005 by authors M.N, M.N. and S.J.S. Given that the region is multilingual, questions were translated between Kannada and Tulu languages and English. Respondents were explained the purpose of the study as an examination of the patterns of chewing and the beliefs and attitudes toward its use. Following the interview, all informants were given an oral examination by a dentist, author S.J.S. If pre-cancerous lesions were detected, a brief educational session was administered.

#### **Questionnaire characteristics**

**Demographic, tobacco, and areca use characteristics**—Participants reported age, gender, past/current use of any tobacco, and patterns of areca use: initiation age, type and quantity of nut, preferred additives, number of chew episodes/day, number of areca nuts used in all chews/day (one Supari packet contains  $\leq 0.5$  grams), duration of each chew episode, time of day for each chew, and preference for spitting versus swallowing juices. Informants were observed preparing and chewing a quid to confirm reported topography data.

**Perceived benefits, harm, and addictive quality**—Questions targeted perceived benefits ("what do you like about chewing?", "do you derive any health benefits from chewing?") and harms ("do you chew while ill?", "do you chew with lesions in your mouth?") associated with chewing, as well as opinions on the addictive potential of areca use. Number of quit attempts and reasons for attempts were also probed.

**Dependence assessment**—Dependence scales were adapted from measures developed for assessing nicotine/tobacco dependence: Fagerström Tolerance Questionnaire (FTQ; 26), 5-item Cigarette Dependence Scale (CDS-5; 27), and Smokeless Tobacco Dependence Scale (STDS; 28). Items within each of these measures were modified for areca use and additional questions were included to reflect areca-specific topography characteristics (similar to items modified and added for smokeless tobacco users; see 29). The decision to use nicotine/ tobacco-specific dependence scales, as opposed to more generic scales (e.g., DSM-IV criteria), is manifold: users of oral tobacco and areca chew/park the drug and extract the juices by sucking, drug juices tend to be spit rather than swallowed, reports from many areca users that the subjective effects are similar in nature to tobacco (mild stimulant-like), and evidence that both arecoline and nicotine have cholinergic agonist properties. Moreover, use of these particular scales may assist with future work which focuses on 1) delineating the effects of areca from tobacco and 2) assessing whether areca alters the dependence potential of tobacco in users of areca-tobacco combination products.

#### Data analysis

Five respondents were not able to provide detailed information about their chewing frequency. Thus, data from these individuals were not included in analyses for chewing topography or FTQ measures. Additionally, two respondents were not able to answer some questions on the Smokeless Tobacco Dependence Scale; thus, data from these participants were excluded from this analysis.

Data analyses were largely descriptive, intended to summarize user characteristics, chewing patterns and topography, and perceptions of areca use. Thus, many study outcomes are reported using frequency and central tendency (mean/SD, mode, median) calculations. Items are presented individually for all measures except the CDS-5 (scale range 5–25) and STDS (scale range 0–19), which are reported as summary scores. Although the FTQ is typically reported as a summary score, certain questions were not able to be modified for areca use (e.g., "What brand of cigarette do you smoke?"). Pearson correlation coefficients (r) were used to examine relationships between these dependence scores and measures of use.

# Results

#### Demographic and areca/tobacco use history

Table 1 summarizes demographic and use history characteristics of all respondents (N=59). Respondents (n = 47 males and n = 12 females) ranged in age from 12 to 70 years (median = 43.0; mode = 42.0). The number of years chewing varied from 1 to 55 years; however, 67.8% of the 59 respondents had been chewing for no more than 15 years. Many chewers initiated use as adolescents or young adults, with 52.5% starting before age 30. The large majority of respondents chewed individualized quid (nut rolled in betel leaf with preferred ingredients) as opposed to raw/dry nut pieces, preparations sold lose in the market, or prepackaged Supari (areca and spice mixes).

#### Perception of areca-associated benefits, harm, and addiction

**Perceived benefits of chewing**—Reasons for initiation of chewing areca included prevention of boredom (39.0%) and facilitation of socialization (28.8%). Additionally, many respondents stated that chewing promotes productivity and concentration at work. As one chewer described, "Before chewing I might get several unwanted thoughts, but chewing helps me to divert such thoughts!!" Another informant noted "chewing helps me to think what to do next, or how to do other work".

Areca was touted as a medicine for digestive and dental health. For example, many chewers use areca to facilitate bowel movements ["*Chewing (ele adakke) clears off motion!!*"] and reduce intestinal worms (as used in Ayurvedic medicine). Approximately 19% reported using areca to alleviate tooth pain, as well as strengthen teeth and prevent decay. An oral examination of these chewers confirmed the presence of flat occlusal surfaces from chronic chewing (but no pre-cancerous lesions in areca-only chewers). Informants also use areca as a mouth freshener and to reduce unwanted "tastelessness in the mouth" (*Bayi chappe*).

Many respondents deem areca use as healthy to post-partum women. Elders and Ayurvedic practitioners have given chewers the impression that slaked lime additive nourishes the breastfeeding mother's body with calcium and that betel leaf juice will return a woman's uterus to its original size after delivery.

**Perceived harms of chewing**—No informant thought use of areca nut without tobacco was harmful to users' health ["*Beeda chewing is good for overall body health, but tobacco is dangerous*"] unless chewed constantly throughout the day and evening. Locals who

chewed in this way were described by informants as those most likely to engage in other unhealthy habits like smoking and drinking, and were assumed to be using tobacco in their quid.

**Perceived chewing-related addiction**—Respondents had difficulty judging the potential addictiveness of areca without comparing the drug to other substances. Informants' general reply was "not like alcohol or tobacco" but "more like coffee or tea". One respondent commented: "Chewing is routine (samanya); it is a habit (rudi) like drinking tea (chai) or coffee (kapi) a few times a day or with friends to pass time; it does not become trouble (dosha) if one does not chew with tobacco." Another respondent stated that chewing, "...is a habit (abhyaasa) that becomes routine (rudhi), but is not an addiction (chata) like tobacco or alcohol. Addiction is when you cannot avoid it if it is there and a have deep hunger to consume it always....you must have it or you feel something needed is not there." Consequently, chewing appears to be perceived as beneficial when consumed in moderate amounts and having addictive properties equal to caffeine.

#### Topography of use

Items related to chewing topography are included in Table 2. Approximately 52% reported 1–3 chews/day (mean = 1.9; SD = 0.98), 27.8% reported 4–6 chews/day (mean = 5.4; SD = 0.90), 16.7% reported 7–12 chews/day (mean = 8.3; SD = 1.9) and 3.7% reported > 12 chews/day (mean = 15.0, SD = 0.00). Collectively, the average number of chewing episodes per day was 4.4 (SD = 3.4; median = 3.5). The average number of areca nuts consumed daily in all chews was 1.2 (SD = 1.1; mode = 0.5; median = 0.5). Most informants used a total of 1 to 2 nuts per day (38.9%), though many reported using <0.5 nuts (27.8%) or between 0.5 and 1 nuts (25.9%). Only 7.4% reported using 3 or more nuts per day in their quid.

Most respondents hold the chew in their mouths for  $\leq 10$  minutes duration (mean = 5.9, SD = 2.4), as compared to 11–20 minutes (mean = 15.0, SD = 2.2), 21–30 minutes (mean = 29.4, SD = 1.8), or >30 minutes (mean = 66.7, SD = 46.5). The average number of minutes a chew is held in the mouth by this sample is 14.6 (SD = 17.9), with a wide range of 1.5 to 120 minutes, a mode of 5 minutes, and a median of 10 minutes. As for the length of the chewing day, 85.2% reported <14.5 hours of daily chewing time, whereas only 14.8% reported >14.5 hours (all respondents mean = 9.6 hours; SD = 4.4; mode = 13.5 hours; median = 10 hours; range = 1 to 17 hours). Typically the first chew of the day occurred during the morning hours (before noon) and the last chew of the day during the evening hours (after 5 pm). However, few respondents chewed within the first 30 minutes of awakening or chewed more during the first few hours after awakening compared to the rest of the day. Swallowing the areca juices was not a common occurrence in this sample, as most stated that they always or sometimes spit while chewing (68.5% total).

#### Dependence among areca chewers

Taking the sample as a whole only low levels of dependence were observed, but there were some users who reported one or more symptoms and a few who endorsed several dependence questions. Table 2 displays modified items from the FTQ, as well as supplementary items assessing dependence characteristics. It can be seen the only a minority of respondents endorse any of the items which would be indicative of dependence. Most respondents stated that they do not chew when ill or with wounds/lesions in their mouth. Overall, respondents do not find it difficult to refrain from chewing in places where it is forbidden and/or considered disgraceful (e.g., inside temples, on buses, in hospitals, etc). Over two-thirds of respondents stated that they would not find it difficult to give up any particular chew during the day (i.e., 'can quit any chew') or that they do not experience craving during periods of abstinence (i.e.,  $\ge 2$  hours abstinent). Despite the generally low levels at which respondents reported dependence, approximately 44% of chewers endorsed at least one of the following items from the modified FTQ: continued use despite illness or wounds, difficulty refraining from chewing in forbidden places, or craving during periods of abstinence; nonetheless most of these reported only one of these symptoms. Almost half of respondents had made at least one attempt to abstain from areca nut use (not shown in table), for reasons such as prolonged illness (34.6%) and inability to obtain fresh areca due to off-season (34.6%). Some (15.4%) quit intentionally or no particular reason (15.4%). Of these individuals who experienced a prolonged period of areca nut abstinence, 27% reported feelings of discomfort or craving during the abstinence period, yet many did not.

The average score for the CDS-5 was 10.6 (SD = 4.6), based on a 5–25 scale range. The most frequently occurring score for this scale was 5 (15.3%; n = 9) and almost half of all respondents had summary scores  $\leq 10$  (59.3%). Comparable results were found for the STDS (scale range of 0–19), where the average score was 3.0 (SD = 3.9; mode = 0.0; median = 1.0). Nonetheless, for both dependence measures, a small subset of respondents had scores which reflected a greater level of dependence (13.6% had scores >16 for the CDS-5 and 5.3% had scores >11 for the STDS scale). Almost 25% stated that they experienced strong cravings for chew if they go >2 hours without chewing. Table 3 shows dependence scale scores as a function of chewing topography. Higher dependence scores were related to a greater frequency of chewing (i.e., number of chews/day). For example, the number of chews/day was positively correlated with CDS-5 (r = 0.62; p<.001) and STDS (r = 0.32; p<.01) scores. Other correlations were not significant.

# Discussion

This study attempted to identify any evidence of dependence on areca in areca-only chewers from a South Indian community and to provide more detailed information on the topography of betel use. Areca nuts and betel leaves are grown locally and thus are available via small provision shops, roadside vendors, vegetable shops, and individual homes (readily available trays that residents display for guests (1, 32) The majority of chewers identified were males (79.9%), middle-aged, (64.4%  $\geq$  40 years of age) and began chewing around young adulthood (56% began  $\leq$  30 years of age). The field impression was that younger users of betel primarily used it in combination with tobacco, thus the somewhat older sample obtained here of betel only users.

#### Perception of areca-associated benefits, harm, and addiction

Among those surveyed, chewing is largely viewed as a healthy practice as along as tobacco is not introduced into the quid. Informants explicitly distinguish between areca chewing with versus without tobacco. For example, chewing was referenced as a "habit" no different from caffeine consumption, but clearly different from tobacco and alcohol consumption. Of course, strong evidence is now available for the existence of a caffeine dependence syndrome (33, 34), consisting of many features which overlap with those observed for dependence on nicotine and alcohol. In the Indian culture, however, these specific comparisons are often made (e.g., 35) with the resulting opinion that areca nut use is not considered addictive. Rather, areca has been labeled by many as a "drug food": items such as coffee or tea used as a low-cost food substitute to increase productivity and alleviate pain as was observed in 15<sup>th</sup> and 16<sup>th</sup> century laborers (36, 37).

No informant mentioned any of the well-established health concerns associated with areca use (e.g., OSF, oral cancers; 9, 12). Such an ignorant attitude toward the negative health consequences of chewing has been noted elsewhere (e.g., 23, 35). These findings are unfortunate considering the concerted efforts of public health officials in many India states

(e.g., Karnataka, Kerala) to ban areca/tobacco mixtures and more recently to propose bans of areca nut use alone (e.g., 38). Quite the contrary, chewing areca is overwhelmingly viewed as a positive practice. Common reasons cited for chewing included reduction of boredom and anxiety, promotion of focused attention at work, social facilitation among friends, and as a medicine for digestive and dental health. Noteworthy is the fact that a large number of chewers across many studies endorse these areca nut effects (as in 12, 20, 22, 24, 35). Nonetheless, available data derive largely from surveys which require retrospective reports rather than from direct administration of areca nut to users under controlled laboratory conditions. An important next step would be to obtain systematically a physiological and subjective effect profile of areca doses in a sample of users.

#### Topography of use

The majority of informants reported chewing 1-3 quids per day (mean = 1.9) confirming previously reported frequencies of areca use without tobacco among Indian populations (20, mean = 3; 24; 31, mean = 1.7). Informants reported that they typically spit rather than swallow the juices, rinse while chewing (i.e., rinse and spit water to clean their mouth), and chew for no longer than 20 minutes. This average use episode is consistent with preliminary data in animals (39) and in humans (14) showing that parasympathetic activity of arecoline occurs within 5 minutes of administration and lasts an average of 15-20 minutes. For comparison, the average number of smokeless tobacco dips per day ranges from 5-10 and the average dipping episode ranges from 24–59 minutes (6). The preferred chew type for this sample was individualized betel quid, which deviates from some work (20, 24) where younger age groups were sampled. Young adult areca chewers are known to prefer prepackaged products over traditional quid (24, 32, 40), possibly because manufacturers aggressively market them toward these younger groups (i.e., < 30 years of age). Consequently, the prevalence of use among the young has increased, as has the prevalence of OSF (e.g., 41). Public health officials interested in the adverse consequences of new products would likely benefit from further inquiry into the existence of areca dependency.

#### Dependence among areca chewers

Another study goal was to examine the presence of areca dependence. Given that established measures for this purpose are nonexistent, a decision was made to employ nicotine/tobacco dependence scales. This choice was based on data demonstrating an overlap between the physiological and subjective effects of arecoline and nicotine (i.e., actions at nicotinic cholinergic receptors; 43), as well as between areca and smokeless tobacco use patterns (6, 30). Results showed that the majority of users did not endorse items suggestive of substance dependence (craving, chewing when ill, etc). Additionally, scores on the CDS-5 and STDS were low for most respondents and the group average was low. Nonetheless, results for a subset of respondents were indicative of some areca dependence. Approximately 44% of chewers endorsed at least one of the following items: continued use despite illness or wounds, difficulty refraining from chewing in forbidden places, or craving during periods of abstinence. At least 15% of respondents had intentionally made a quit attempt. During periods of abstinence for any reason, 27% reported feelings of discomfort or craving. Many of these participants were those who scored high on the dependence measures and/or reported a high frequency of use. Of the 13 informants who reported the highest number of nuts chewed/day (i.e., 5), nine had scores  $\geq 16$  on the CDS-5. These individuals also reported the greatest number of use episodes/day, with 6-15 chews daily. In contrast, individuals with low CDS-5 scores (i.e., 5-8) were those who chewed infrequently throughout the day: out of 25 informants, 19 chewed 1-2 nuts/day within 1-3 chewing episodes. Thus, there was a significant positive correlation between CDS-5 scores and frequency of use. This same pattern of results was observed for the Smokeless Tobacco Dependence Scale. These findings would confirm earlier reports (13, 17, 23, 25, 44) that an

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areca dependence syndrome can occur in the absence of concurrent tobacco use and should be studied more systematically in population or clinical samples.

#### **Limitations and Future Directions**

It is not clear whether the results obtained in this non-randomized sample are generally applicable. At this juncture in research, however, purposive sampling techniques are needed to better characterize the phenomenon among different cultures and user groups. For example, chewers in parts of rural Uttar Pradesh, India typically pack a quid in their cheeks for hours or even over night (though often with tobacco additives; 45), a pattern not observed in the district sampled here. Additionally, the dependence scales employed do not necessarily account for features unique to areca nut use and/or cultural differences. Other modified, and perhaps more global (i.e., DSM-IV; 20), dependence measures might be more sensitive to the detection of areca dependence symptoms. Although, the positive correlation observed between area use frequency and scale scores validates this approach.

Future work would benefit from the development of an areca dependence measurement scale. Especially useful will be items for large scale surveys which are culture-specific, possibly developed through the use of focus groups. Importantly, laboratory-based studies are needed for a systematic examination of the acute subjective effects of betel use and dependence syndrome components such as tolerance and withdrawal. Scientifically-validated evidence for dependence could only improve public health efforts aimed at areca consumption awareness and behavior.

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#### Table 1

Demographics and chewing patterns (N=59)

	n	%	Mean (SD)
Gender			
Male	47	79.7	
Female	12	20.3	
Age (years)			44.1 (16.2)
< 20	7	11.9	
20–40	15	25.4	
41-60	26	44.1	
> 60	11	18.6	
Age of Initiation			29.4 (12.5)
< 20	14	23.7	
20–29	17	28.8	
30–39	18	30.5	
40–49	5	8.5	
50–59	4	6.8	
60–69	1	1.7	
Years of chewing			14.3 (13.1)
<10	25	42.4	
10-15	15	25.4	
16–30	11	18.6	
31-50	7	11.9	
> 50	1	1.7	
Type of chew			
BQ	38	64.4	
AN	9	15.3	
BQ and AN	3	5.1	
Supari	2	3.4	
Supari & AN	5	8.5	
Other	2	3.4	

BQ = betel quid (individualized preparation)

AN = raw/dry areca nut

#### Table 2

# Chewing topography and modified FTQ items

1. How soon after waking do you have your first chew? $b$ $\leq 30 \text{ min}$ 1222.2> 30 min4277.82.9 Do you find it difficult to refrain from chewing in places where you should not chew? $b$ Yes59.3No4888.93.4 Do you chew even if you are so ill that you cannot work? $b$ Yes1527.8No8870.44. How often do you swallow the juices from the chew? $b$ Never3259.35. How often do you rinse your mouth while chewing?Never2037.0Sometimes59.3Always1731.56.7 Do you chew more in the morning than the rest of the day? $b$ Yes713.0No4583.3Can quit any chew11.97. Which chew would be most difficult to give up? $b$ 1st in morning47.4Any other35.65.611.19. Do you use chew even if you have wounds in your mouth?Yes1527.89. Do you use chew even if you have wounds in your mouth?Yes1527.29. Do you use chew even if you have wounds in your mouth?Yes1527.211. Do you keep the chew in your mouth?Yes11.912. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes313. On average, how many minutes do you take cach day? $b$ 1t to 32851.914. When is your first chew of the day? $c$ 1to 32851.915. Do you keep the chew in your mouth	Questions	Answer Choices	n	Response %
2.9 Do you find it difficult to refrain from chewing in places where you should not chew? <sup>b</sup> No 48 889 3.9 Do you chew even if you are so ill that you cannot work? <sup>b</sup> No 58 74 A low often do you swallow the juices from the chew? <sup>b</sup> Never 50 933 5. How often do you smallow the juices from the chewin? Never 50 933 5. How often do you rinse your mouth while chewin? Never 50 933 5. How often do you rinse your mouth while chewin? Never 50 933 5. How often do you rinse your mouth while chewin? Never 70 1301 Sometimes 15 278 Always 17 131 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> No 45 8833 6.9 Do you chew more in the moming than the rest of the day? <sup>b</sup> No 45 8833 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> No 45 8833 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> No 45 8833 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> No 47 130 No 48 933 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> Not sure 40 14 19 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> Not sure 50 833 1. Jour our chew more in the moming than the rest of the day? <sup>b</sup> Not sure 40 85 Not sure 51 85 Not sure 51 85 Not sure 51 85 Not sure 51 95 1. Jour our chew even if you have wounds in your mouth? Not sure 51 95 1. Jour our echew even if you have wounds in your mouth? Not sure 51 95 1. Jour our echew even if you have wounds in your mouth? Not sure 51 95 Not sure 51	1. How soon after waking do you have your first chew? $^{b}$	≤ 30 min	12	22.2
2.4 Do you find it difficult to refrain from chewing in places where you should not chew? b No 48 889 No 48 889 No 48 889 Yes 15 278 No 49 48 74 No 48 75 No 48 75 No 49 75 Never 20 75 No 49 75		> 30 min	42	77.8
No       48       88.9         3.4 Do you chew even if you are so ill that you cannot work? <sup>b</sup> Yes       15       27.8         No       38       70.4         No       38       70.4         No       38       70.4         No       38       70.4         No       50       9.3         Sometimes       5       9.3         Always       17       31.5         5. How often do you rinse your mouth while chewing?       Never       20         Sometimes       15       27.8         Always       19       35.2         6.4 Do you chew more in the morning than the rest of the day? <sup>b</sup> Yes       7       13.0         No       45       83.3         Can quit any chew       1       1.9       1.5         7. Which chew would be most difficult to give up? b       Not sure       4       7.4         Any other       3       5.6       Not sure       4       7.4         8. What is the length of the chewing day?       Yes       13       1.5       27.8         9. Do you use chew even if you have wounds in your mouth?       Yes       13       2.7         10. On average, how many minutes do you ke	$2.^{a}$ Do you find it difficult to refrain from chewing in places where you should not chew? $^{b}$	Yes	5	9.3
3,° Do you chew even if you are so ill that you cannot work? <sup>b</sup> Yes       15       27.8         No       38       70.4         No       50       50.3         Sometimes       5       9.3         At how often do you swallow the juices from the chew? <sup>b</sup> Sometimes       5       9.3         Always       17       31.5         No       80       70.0       30.0         Sometimes       19       25.2         6.° Do you chew more in the morning than the rest of the day? <sup>b</sup> Yes       7       13.0         No       45       83.33         Can quit any chew       1       1.9         7. Which chew would be most difficult to give up? b       Ist in morning       4       7.4         Any other       3       5.6         Not sure       4       7.4         Any out sure would be most difficult to give up? b       Ist in morning       4       7.4         No       4       7.4       7.4       7.4         Any other       3       5.6       7.5         9.0 by ou use chew would he most difficult to give up? b       <14.5		No	48	88.9
No         38         70.4           No         38         70.4           A. How often do you swallow the juices from the chew? $b$ Never         32         59.3           Sometimes         5         9.3         Always         17         31.5           F. How often do you rinse your mouth while chewing?         Never         20         37.0           Sometimes         15         27.8         Always         17         13.0           Sometimes         15         27.8         Always         17         13.0           Sometimes         15         27.8         Always         10         19           Always         1         1.9         1.10         1.10         1.10         1.10           7. Which chew would be most difficult to give up? $b$ 1st in morning         4         7.4           Any other         3         5.6         No sure         4         7.4           Any other         3         5.6         No sure         4         7.4           Any other         3         5.6         No sure         5         2.3.7           9. Do you use chew even if you have wounds in your mouth?         Yes         15         5.6	$3^{a}$ Do you chew even if you are so ill that you cannot work $2^{b}$	Yes	15	27.8
A. How often do you swallow the juices from the chew? b       Never       32       59.3         Sometimes       5       9.3         Always       17       31.5         Sometimes       15       27.8         Always       19       35.2         6. <sup>d</sup> Do you chew more in the morning than the rest of the day? <sup>b</sup> Yes       7       13.0         No       45       83.3         Can quit any chew       1       1       1         7. Which chew would be most difficult to give up? b       1st in morning       4       7.4         Any other       3       5.6         Not sure       4       7.4         Any other       3       5.6         Not sure       4       7.4         Can quit any chew       43       79.6         8. What is the length of the chewing day?       <14.5 hours	5. Do you chew even if you are so in that you cannot work:	No	38	70.4
4. How often do you swaltow the juices from the chew?       Sometimes       5       50.         Sometimes       5       9.3         Always       17       31.5         Never       20       37.0         Sometimes       15       27.8         Always       19       35.2         Can quit any chew       1       1.9         Sometimes       15       27.8         Always       19       35.2         Can quit any chew       1       1.9         7. Which chew would be most difficult to give up? b       1st in morning       4       7.4         Any other       3       5.6       Not sure       4       7.4         Any other       3       5.6       Not sure       4       8.5         8. What is the length of the chewing day?       <14.5 fours	AN ALL NATE ALL AN	Never	32	59 3
AlwaysJJ.5. How often do you rinse your mouth while chewing?Never205. How often do you rinse your mouth while chewing?Sometimes15 $27.8$ Always1935.2 $Always$ 1935.2 $Always$ 1045 $Always$ 101.9 $Always$ 101.9 $Always$ 101.9 $Always$ 101.9 $Always$ 101.1 $Always$ 101.1 $Always$ 101.1 $Always$ 101.1 $Always$ 101.1 $Always$ 103.1 $Always$ 112.1 $Always$ 1111 $Always$	4. How often do you swallow the juices from the chew?	Sometimes	5	0.3
A low often do you rinse your mouth while chewing?Never 2031.35. How often do you rinse your mouth while chewing?Never 202037.0Somectimes1527.8Always1935.26. <sup>d</sup> Do you chew more in the morning than the rest of the day?Yes713.0No4583.3Can quit any chew11.91. Which chew would be most difficult to give up?11.97. Which chew would be most difficult to give up?11.91. What is the length of the chewing day?<14.5 hours		Alwows	17	21.5
5. How other do you finde you mount where chewing: Sometimes 15 27.8 Sometimes 15 27.8 Always 19 35.2 A ways 19 35.2 A ways 19 35.2 Yes 7 13.0 No 45 83.3 Can quit any chew 1 1.9 Ist in morning 4 7.4 Any other 3 5.6 Not sure 4 7.4 Can quit any chew 43 79.6 8. What is the length of the chewing day? <14.5 hours 6 11.1 >15.5 hours 6 11.1 >15.5 hours 2 3.7 9. Do you use chew even if you have wounds in your mouth? Yes 15 27.8 No 34 63.0 No 34 63.0 Not sure 5 9.3 10. On average, how many minutes do you keep the chew in your mouth? 11–20 min 11 20.4 21–30 min 8 14.8 >30 min 3 5.6 11. Do you keep the chew in your mouth? Yes 4 7.4 No 50 92.6 12. Do you experience strong cravings for chew if you go > 2 hours without chewing? 13. On average, how many chews do you take each day? $b$ 14. When is your first chew of the day? $c$ Morning 44 81.5	5. How often do you rives your mouth while showing?	Always	20	31.5
	5. How often do you finse your mouth while chewing?	Sometimes	15	27.0
19 = 35.2 $Since A and Since A and Sinc$		Almana	10	27.0
6.6 Do you chew more in the morning than the rest of the day?1 (13.0)No4583.3Can quit any chew11.91 st in morning47.4Any other35.6Not sure47.4Any other35.6Not sure47.4Any other35.6Not sure47.4Can quit any chew4379.68. What is the length of the chewing day?<14.5 hours		Always	19	33.2 12.0
No         45         83.3           Can quit any chew         1         1.9           7. Which chew would be most difficult to give up? b         1st in morning         4         7.4           Any other         3         5.6         Not sure         4         7.4           Any other         3         5.6         Not sure         4         7.4           Any other         3         5.6         Not sure         4         7.4           Can quit any chew         43         79.6         <14.5 hours	$6.^{a}$ Do you chew more in the morning than the rest of the day? <sup><i>p</i></sup>	res	1	13.0
Can quit any chew11.97. Which chew would be most difficult to give up? $b$ Ist in morning47.4Any other35.6Not sure47.4Can quit any chew4379.68. What is the length of the chewing day?<14.5 hours		No	45	83.3
7. Which chew would be most difficult to give up? $b$ Ist in morning47.4Any other35.6Not sure47.4Can quit any chew4379.68. What is the length of the chewing day?<14.5 hours		Can quit any chew	1	1.9
Any other35.6Not sure47.4Can quit any chew4379.68. What is the length of the chewing day?<14.5 hours	7. Which chew would be most difficult to give up? $^{b}$	1st in morning	4	7.4
Not sure       4       7.4         Can quit any chew       43       79.6         Can quit any chew       43       79.6         8. What is the length of the chewing day? $< 14.5$ hours       46       85.2         14.5-15.5 hours       6       11.1         > 15.5 hours       2       3.7         9. Do you use chew even if you have wounds in your mouth?       Yes       15       27.8         No       34       63.0         Not sure       5       9.3         10. On average, how many minutes do you keep the chew in your mouth?       1-10 min       32       59.2         11-20 min       11       20.4         21-30 min       8       14.8         > 30 min       3       5.6         11. Do you keep the chew in your mouth most of the time?       Yes       4       7.4         No       50       92.6         12. Do you experience strong cravings for chew if you go > 2 hours without chewing?       Yes       13       24.1         No       41       75.9         13. On average, how many chews do you take each day? b       1 to 3       28       51.9         14. When is your first chew of the day? c       Morning       44       81.5		Any other	3	5.6
Can quit any chew4379.68. What is the length of the chewing day? $< 14.5$ hours4685.2 $14.5 - 15.5$ hours611.1 $> 15.5$ hours23.79. Do you use chew even if you have wounds in your mouth?Yes1527.8No3463.0Not sure59.310. On average, how many minutes do you keep the chew in your mouth?1-10 min3259.2 $11 - 20$ min1120.4 $21 - 30$ min814.8 $> 30$ min35.611. Do you keep the chew in your go > 2 hours without chewing?Yes1324.1No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day? b1 to 32851.94 to 61527.87 to 12916.7 $> 12$ 23.714. When is your first chew of the day? cMorning4481.5		Not sure	4	7.4
8. What is the length of the chewing day? $< 14.5$ hours       46       85.2         14.5-15.5 hours       6       11.1         > 15.5 hours       2       3.7         9. Do you use chew even if you have wounds in your mouth?       Yes       15       27.8         No       34       63.0         Not sure       5       9.3         10. On average, how many minutes do you keep the chew in your mouth?       1-10 min       32       59.2         11-20 min       11       20.4         21-30 min       8       14.8         > 30 min       3       5.6         11. Do you keep the chew in your mouth most of the time?       Yes       4       7.4         No       50       92.6         12. Do you experience strong cravings for chew if you go > 2 hours without chewing?       Yes       13       24.1         No       40       75.9         13. On average, how many chews do you take each day? b       1 to 3       28       51.9         14. When is your first chew of the day? c       Morning       44       81.5		Can quit any chew	43	79.6
14.5-15.5 hours611.1> 15.5 hours23.79. Do you use chew even if you have wounds in your mouth?Yes1527.8No3463.0Not sure59.310. On average, how many minutes do you keep the chew in your mouth?1-10 min3259.211-20 min1120.421-30 min814.8> 30 min35.611. Do you keep the chew in your mouth most of the time?Yes47.4No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.91to 32851.913. On average, how many chews do you take each day? b1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? cMorning4481.5	8. What is the length of the chewing day?	< 14.5 hours	46	85.2
> 15.5 hours23.79. Do you use chew even if you have wounds in your mouth?Yes1527.8No3463.0Not sure59.310. On average, how many minutes do you keep the chew in your mouth?1–10 min3259.211–20 min1120.421–30 min814.8> 30 min35.611. Do you keep the chew in your mouth most of the time?Yes47.4No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.9110.32851.913. On average, how many chews do you take each day? b1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? cMorning4481.5		14.5-15.5 hours	6	11.1
9. Do you use chew even if you have wounds in your mouth? No $34$ $63.0$ Not sure $5$ $9.3$ 10. On average, how many minutes do you keep the chew in your mouth? 10. On average, how many minutes do you keep the chew in your mouth? 10. On average, how many minutes do you keep the chew in your mouth? 11-20 min $32$ $59.2$ 11-20 min $11$ $20.4$ 21-30 min $8$ $14.8> 30 min$ $3$ $5.611. Do you keep the chew in your mouth most of the time?12. Do you experience strong cravings for chew if you go > 2 hours without chewing?13. On average, how many chews do you take each day? b14. When is your first chew of the day? cMorning 44 81.5$		> 15.5 hours	2	3.7
No3463.0Not sure59.310. On average, how many minutes do you keep the chew in your mouth?1–10 min3259.2 $11-20 min$ 1120.4 $21-30 min$ 814.8> 30 min35.611. Do you keep the chew in your mouth most of the time?Yes47.4No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day? b1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? cMorning4481.5	9. Do you use chew even if you have wounds in your mouth?	Yes	15	27.8
Not sure       5       9.3         10. On average, how many minutes do you keep the chew in your mouth?       1–10 min       32       59.2         11–20 min       11       20.4         21–30 min       8       14.8         > 30 min       3       5.6         11. Do you keep the chew in your mouth most of the time?       Yes       4       7.4         No       50       92.6         12. Do you experience strong cravings for chew if you go > 2 hours without chewing?       Yes       13       24.1         No       41       75.9         13. On average, how many chews do you take each day? b       1 to 3       28       51.9         4 to 6       15       27.8         7 to 12       9       16.7         >12       2       3.7         14. When is your first chew of the day? c       Morning       44       81.5		No	34	63.0
10. On average, how many minutes do you keep the chew in your mouth? $1-10 \text{ min}$ $32$ $59.2$ $11-20 \text{ min}$ $11$ $20.4$ $21-30 \text{ min}$ $8$ $14.8$ $> 30 \text{ min}$ $3$ $5.6$ 11. Do you keep the chew in your mouth most of the time?Yes $4$ $7.4$ No $50$ $92.6$ 12. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes $13$ 24.1No $41$ $75.9$ 13. On average, how many chews do you take each day? $b$ $1 \text{ to } 3$ $28$ $7 \text{ to } 12$ $9$ $16.7$ $>12$ $2$ $3.7$ 14. When is your first chew of the day? $c$ Morning $44$ $81.5$		Not sure	5	9.3
11-20  min $11$ $20.4$ $21-30  min$ $8$ $14.8$ $> 30  min$ $3$ $5.6$ $11.$ Do you keep the chew in your mouth most of the time?Yes $4$ $7.4$ No $50$ $92.6$ $12.$ Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes $13$ $24.1$ No $41$ $75.9$ $13.$ On average, how many chews do you take each day? $b$ $1  to  3$ $28$ $51.9$ $4  to  6$ $15$ $27.8$ $7  to  12$ $9$ $16.7$ $>12$ $2$ $3.7$ $14.$ When is your first chew of the day? $c$ Morning $44$ $81.5$	10. On average, how many minutes do you keep the chew in your mouth?	1-10 min	32	59.2
21-30  min814.8> 30 min35.611. Do you keep the chew in your mouth most of the time?Yes47.4No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day? b1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? cMorning4481.5		11–20 min	11	20.4
> 30  min35.611. Do you keep the chew in your mouth most of the time?Yes47.4No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day? b1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? cMorning4481.5		21-30 min	8	14.8
11. Do you keep the chew in your mouth most of the time?Yes47.4No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day? $b$ 1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? $c$ Morning4481.5		> 30 min	3	5.6
No5092.612. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day?1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day?Morning4481.5	11. Do you keep the chew in your mouth most of the time?	Yes	4	7.4
12. Do you experience strong cravings for chew if you go > 2 hours without chewing?Yes1324.1No4175.913. On average, how many chews do you take each day? $b$ 1 to 32851.94 to 61527.87 to 12916.7>1223.714. When is your first chew of the day? $c$ Morning4481.5		No	50	92.6
No       41       75.9         13. On average, how many chews do you take each day? $b$ 1 to 3       28       51.9         4 to 6       15       27.8         7 to 12       9       16.7         >12       2       3.7         14. When is your first chew of the day? $c$ Morning       44       81.5	12. Do you experience strong cravings for chew if you go > 2 hours without chewing?	Yes	13	24.1
13. On average, how many chews do you take each day? $b$ 1 to 3       28       51.9         4 to 6       15       27.8         7 to 12       9       16.7         >12       2       3.7         14. When is your first chew of the day? $c$ Morning       44       81.5		No	41	75.9
$\begin{array}{cccc} 4 \text{ to } 6 & 15 & 27.8 \\ 7 \text{ to } 12 & 9 & 16.7 \\ > 12 & 2 & 3.7 \\ 14. When is your first chew of the day? c & Morning & 44 & 81.5 \\ \end{array}$	13. On average, how many chews do you take each day? <sup>b</sup>	1 to 3	28	51.9
7 to 12       9       16.7         >12       2       3.7         14. When is your first chew of the day? $c$ Morning       44       81.5		4 to 6	15	27.8
>12 2 3.7 14. When is your first chew of the day? <sup>c</sup> Morning 44 81.5		7 to 12	9	16.7
14. When is your first chew of the day? $c$ Morning 44 81.5		>12	2	3.7
	14. When is your first chew of the day? $c$	Morning	44	81.5

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Questions	Answer Choices	n	Response %
	Afternoon	9	16.7
	Evening	1	1.9
15. <sup><i>a</i></sup> When is your last chew of the day? $^{c}$	Morning	0	0.0
	Afternoon	9	16.7
	Evening	45	83.3

All items based on n = 54

<sup>*a*</sup>Items 2, 3, and 6 based on n = 53 due to missing data

<sup>b</sup>Original FTQ items modified for areca use

<sup>c</sup>Morning = before noon; Afternoon = noon to 5 pm; Evening = after 5 pm

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# Table 3

Dependence Scale Scores and Topography as a Function of STDS Score

STDS Score Range	u	Mean STDS Score	Mean CDS-5 Score	Areca per day	Age Initiation	Years Chewing
0	25	0.0	7.6	2.2	27.4	10.6
1 to 5	19	2.7	11.4	3.9	29.9	13.6
6 to 10	10	7.8	14.4	3.8	30.9	23.0
11 to 19	З	13.0	21.0	5.0	28.7	28.0

Based on N=57

STDS = Smokeless Tobacco Dependence Scale

CDS = Cigarette Dependence Scale